July 1983
vol. 9, no. 7
$2.95

Focus On Graphics:

creative computing®

the #1 magazine of computer applications and software

In-Depth Evaluations:
- **Jupiter Ace Computer**
- **CompuCorder**
- **Audex**
- **Sight 'n Sound**
- **Vic Music Synthesizers**
- **GEAP Dot Writer**
- **The Graphics Solution**
- **Newtrieve**
- **Quik-Vis**
- **Transparent Sort**
- **Pursuit Of The Graf Spee**

Interview With Saul Bernstein: Pixel Picasso

Report On Music Synthesis

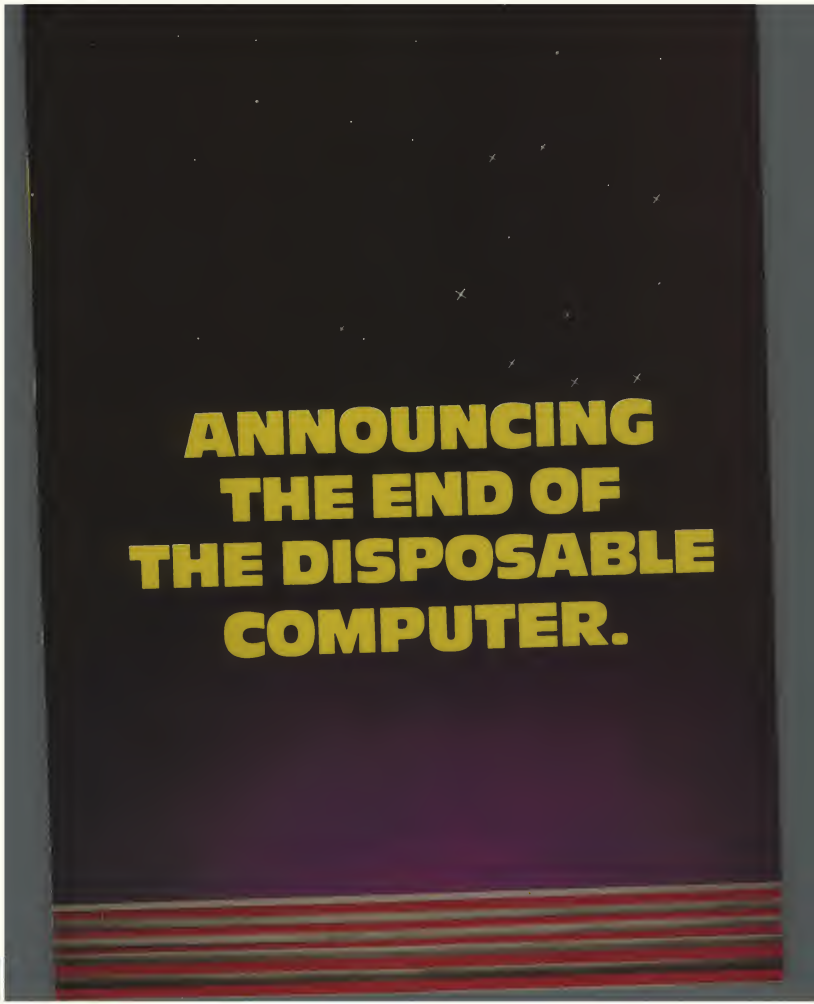
Graphics Programs For Apple, TRS-80, Atari, Vic, IBM

Apple Sound Tables

Layman's Guide To Disk Protection

Sailing Tutorial

Royal Computer Art


ANNOUNCING
THE END OF
THE DISPOSABLE
COMPUTER.

THE REMARKAB
SV-318 PERSONAL CO
You'll grow into it, not o

© 1983 SPECTRAVIDEO INC.

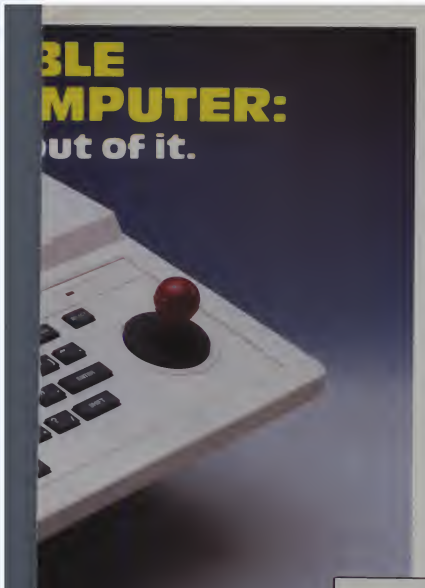
SV-601 SUPER EXPANDER

The real value in any computer system lies in its ability to accommodate a large variety of input/output devices simultaneously. With the addition of the SV-601, the SV-318 can interface with as many as seven different devices at one time. Although lightweight, the SV-601 can support a 15" T.V. monitor. Special front view slots have been designed to monitor the operation of the different interface cards that are connected to the system.

SV-903 DATA CASSE

This feature packed data cassette
power from the SV-318, to which it
connected. By using a stereo head,
data on one channel, and voice or
other. This greatly enhances the
stored data. Programs such as
tutorials and voice assisted training
and data stored. The data cassette
be an integral part of your system
choose to expand into a disk drive.
cassette even has a built-in
you write your own voice support

BLE MPUTER: out of it.



FOR UNDER $300

Mon has only recently tested the woters of the home computer age, and he hos found the waters to his liking. But with o broin copable of storing severol trillion bits of information, he will be continually pushing his new found toy to greater limits. Will his machine live up to this challenge?

Sadly, many personol computers will become tomorrow's junk in the attic. The SV-318 is one that will not. Because as you get better, it gets better. It does so because of its capability and expandability—both for beyond those of ony other affordable computer.

CAPABILITY. *The SV-318 isn't just more copable. It's much more copable. No other computer ot even twice the price combines oll these extraordinory features: 32K ROM expandable to 96K; 32K RAM expandable to 144K; Extended Microsoft Bosic (the industry standard); even Standard CP/M 80-column copobility so you con immediately utilize over 10,000 existing software programs. The SV-318 also has o unique built-in joystick/ cursor control—an immeosurably useful feature when it comes to playing your favorite video game.*

EXPANDABILITY. *As you become more and more skillful with computers, you'll love how the SV-318 "stretches" to meet your demands (and actually leods you in foscinoting, new directions). For one thing, oll eleven of our impartant peripherols are ovoilable immediately. With most other models, you have to wolt months. For another, the SV-318 is beautifully designed to interface with new options os they become ovoilable.*

AFFORDABILITY. *The SV-318 is not only eminently offordoble, it's the first true bargoin of the computer oge! Besides home budgeting, business opplications, word processing, programming and self-teaching, the SV-318 is the best entertainment value in town. Not only can you use it with your TV to play hundreds of different video gomes, you con also use your SV-318 with o TV os o drawing tablet or music synthesizer. In ploy, as in work, the SV-318 will continuoly exoand your potential.*

Whether you're just wetting your toes in computers, or fully osoil on the woters, the SV-318 is o computer that will serve you for many, many yeors. You see, we believe that even in the computer oge, you don't become an object of real value unless you're around for o while.

SPECTRAVIDEO SV-318 COMPUTER COMPARISON CHART

BASE PRICE	SPECTRAVIDEO SV-318 $299	APPLE II PLUS $1,540	ATARI 800 $899	COMMODORE 64 $595	NEC 8001 $399	RADIO SHACK COLOR COMPUTER $299
COMPUTING POWER FEATURES						
BUILT IN ROM	32K	12K	10K	20K	16K	8K
ROM EXPANDED TO	96K	N/A	N/A	N/A	32K	16K
BUILT IN EXTENDED MICROSOFT BASIC	YES	N/A	ADDITIONAL COST	YES	YES	ADDITIONAL COST
BUILT IN RAM	32K*	48K	16K	64K	64K	16K
EXPANDABLE TO	144K**	64K	48K	N/A	32K	16K
KEYBOARD FEATURES						
NUMBER OF KEYS	71	51	61	66	71	70
USER DEFINE FUNCTIONS	10	N/A	8	10	10	NONE
BUILT IN WORD PROCESSING	YES	NO	NO	YES	NO	NO
GENERATED GRAPHICS (FROM KEYBOARD)	YES	NO	YES	YES	YES	NO
UPPER/LOWER CASE	YES	UPPER ONLY	YES	YES	NO	YES
GAME/AUDIO FEATURES						
SEPARATE CARTRIDGE SLOTS	2	NO	2	NO	NO	NO
BUILT IN JOYSTICK	YES	NO	NO	NO	NO	NO
COLORS	15	15	128	16	8	9
RESOLUTION (PIXELS)	256 @ 192	280 x 160	320 x 192	320 x 200	256 x 192	128 x 64
SPRITES	32	N/A	4	8	N/A	N/A
SOUND CHANNELS	3	1	4	3	1	1
OCTAVES PER CHANNEL	8	8	3	8	8	10
ADSR ENVELOPE	YES	NO	NO	YES	YES	NO
PERIPHERAL SPECIFICATIONS						
CASSETTE	2 CHANNEL	1 CHANNEL	2 CHANNEL	1 CHANNEL	1 CHANNEL	1 CHANNEL
PRINTER	YES	NO	YES	NO	NO	NO
BUILT IN MIC	YES	NO	NO	NO	NO	NO
DISK DRIVE CAPACITY	256K	143K	90K	170K	N/A	170K
FLOW PROFILED	YES	NO	NO	NO	NO	NO
CP/M® COMPATIBILITY (80 column programs)						
CP/M® 2.2	YES	NO***	NO	NO****	NO	NO
CP/M® 3.0	YES	NO	NO	NO	NO	NO

* 16K user address area plus 16K graphic support
** 128K user address area plus 16K graphic support
*** Apple II can accept modified 40 or 80 column CP/M
**** Commodore 64 accepts 40 column CP/M

Microsoft is a registered trademark of Microsoft Corporation
CP/M is a trademark of Digital Research, Inc.

TTE

aws its
handily
ioi can record
ound on the
pe of cassette
an language
.com be used
will continue to
en if you
he data
er mic to help
grams.

SV-902 FLOPPY DISK DRIVE

This extremely compact, low profile unit uses standard 5¼" flexible diskettes. Its single side double density configuration allows a capacity of 256K bytes of data (unformatted). Linked to the Super Expander, the SV-902 is your key to the virtually unlimited scope of CP/M O/S as well as a complete variety of program languages such as LOGO, PASCAL, FORTRAN, COBOL and PL-1.

SPECTRAVIDEO

SV-318

PERSONAL COMPUTER

SPECTRA VIDEO INC. 39 W. 37th Street, New York, N.Y. 10018

CIRCLE 261 ON READER SERVICE CARD

Representative Spokesperson for The Lawrence Group: (212) 684-7515

YOU WILL NEVER AGAIN HAVE TO WASTE TIME WAITING FOR YOUR PRINTER.

MICROBUFFER ALLOWS YOU TO PRINT AND PROCESS SIMULTANEOUSLY.

Microbuffer will instantly increase your efficiency — and eliminate the frustration of waiting for your slowpoke printer.

Now you can simply dump your printing data directly to Microbuffer and *continue processing.* Microbuffer accepts the data as fast as your computer can send. It stores the data in its own memory buffer, then takes control of your printer.

THERE IS A MICROBUFFER FOR ANY COMPUTER/PRINTER COMBINATION.

Whatever your system, there is a specific Microbuffer designed to accommodate it.

FOR APPLE II COMPUTERS, Microbuffer II features on-board firmware for text formatting and advanced graphics dump routines. Both serial and parallel versions have a power-efficient low-consumption design. Special functions include Basic listing formatter, self-test, buffer zap, and transparent and maintain modes. The 16K model is priced at $259 and the 32K, at $299.

FOR EPSON PRINTERS, Microbuffer/E comes in two serial versions — 8K or 16K (upgradable to 32K) — and two parallel versions — 16K or 32K (upgradable to 64K). The serial buffer supports both hardware handshaking and XON-XOFF software handshaking at baud rates up to 19,200. Both interfaces are compatible with standard Epson commands, including GRAFTRAX-80 and GRAFTRAX-80+. Prices range from $159 to $279.

ALL OTHER COMPUTER/PRINTER COMBINATIONS are served by the stand-alone Microbuffer In-line.

The serial stand-alone will support different input and output baud rates and different hand-shake protocol. Both serial and parallel versions are available in a 32K model at $299 or 64K for $349. Either can be user-upgraded to a total of 256K with 64K add-ons — just $179 each.

SIMPLE TO INSTALL.

Microbuffer II is slot-independent. It slips directly inside the Apple II in any slot except zero.

Microbuffer/E mounts easily inside the existing auxiliary slot directly inside the Epson printer.

The stand-alone Microbuffer is installed in-line between virtually any computer and any printer.

MICROBUFFER FROM PRACTICAL PERIPHERALS.

So what are you waiting for? Write to us for more information or ask your dealer for a demonstration.

When you see how much freedom Microbuffer will allow, you'll understand why it's so silly to be without one.

PRACTICAL PERIPHERALS, INC.™
31245 LA BAYA DRIVE
WESTLAKE VILLAGE, CA 91362
(213) 991-8200

CIRCLE 240 ON READER SERVICE CARD

Stake a Claim on the most exciting New Game for your Atari Home Computer.

- From the programming team that brought you "Robot Attack", "Defense Command" and many other great Arcade games for your TRS-80™
- 100% machine language
- 16K ROM Cartridge, the largest available anywhere!
- Written specifically for the Atari® — not a converted Apple® game.
- Ten different rounds
- Difficulty adjustment
- High score table
- Demo mode
- Spectacular sound and graphics
- Runs on any 400/800 with at least 16K memory
- Only $49.95

Here are just three of ten rounds in the game:

Round 1: The Mine Shaft.

Round 5: The Teleporters.

Round 10: [illegible]

5200 version available now

BIG FIVE SOFTWARE

P.O. Box 9078-185 Van Nuys, CA 91409 (213) 782-6861

CIRCLE 122 ON READER SERVICE CARD

in this issue...

evaluations & profiles

16 **The Jupiter Ace** ... *Helck*
A low cost computer that speaks Forth

22 **CompuCorder** ... *Stolker*
Speech storage and output for S-100 systems

33 **Sound Software** ... *Archibald*
Audex and Sight 'n Sound

43 **Making Music With Your Vic** ... *Goldstein*
Piper, Vic Music Composer and Synthesound

48 **GEAP Dot Writer** ... *Steur*
A character and font generator

64 **The Graphic Solution** ... *Anderson*
Bytes, camera, action for Apple graphics

76 **Pursuit Of The Graf Spee** ... *Murphy*
Warfare in the Atlantic

80 **Newtrieve** ... *Johnson*
Rapid random record retrieval

84 **Quik-Vis** ... *Ahl*
Apple VisiCalc with a joystick

87 **The Transparent Sort** ... *Ahl*
A demonstration of the Shell/Metzner sort

articles

63 **Hello, My Name Is 420724-7091** ... *Mosey*

96 **Saul Bernstein: Pixel Picasso** ... *Anderson*
An interview with our cover artist

111 **Computers Make Music** ... *Smith*
What's happening in music synthesis

117 **Translingo** ... *Murken*
English-like musical notation

122 **Variable Speech** ... *Friedman*
Listen faster and learn more

130 **A Layman's Guide to Disk Protection** ... *Tubb*
Why it works and why it doesn't

250 **The Metaphysical Exam** ... *Payack*

July, 1983
Volume 9, Number 7

Creative Computing (ISSN 0 097-8140) is published monthly by Ahl Computing, Inc., a subsidiary of Ziff-Davis Publishing Company. David Ahl, President; Elizabeth B. Staples, Vice President; Selwyn Taubman, Treasurer; Bertram A. Abrams, Secretary. P.O. Box 789-M Morristown, N.J. 07960. Second Class postage paid at New York, NY 10001 and at additional mailing offices.

Copyright ©1983 by Ahl Computing, Inc. All rights reserved

Editorial offices located at 39 East Hanover Ave., Morris Plains, NJ 07950. Phone (201) 540-0445.
Domestic Subscriptions: 12 issues $24.97, 24 issues $43.97, 36 issues $57.97. POSTMASTER: send address changes to Creative Computing, P.O. Box 5214, Boulder, CO 80321. Call 800-631-8112 toll-free (in New Jersey call 201-540-0445) to order a subscription.

applications & software

89 **Lo-Res Sort Display** ... *Schwaegler*
Watching algorithms in action

Improving TRS-80 Graphics

135 **Medium-Res Plotting With A Line Printer** ... *Rudeen*
142 **Line Drawing Routines** ... *Wagner & Wagner*

154 **Lo-Res Fantasy Graphics** ... *Foxx & Holforty*
Colorful abstract patterns for the Apple

161 **Graphics Routines For The IBM PC** ... *Gabrielson*

176 **Expanded Monsters For The Vic** ... *Luce & Wheeler*
Custom characters for the expanded Vic

188 **Sound Tables** ... *Adams*
Fast sound effects from Basic

196 **The Well-Tempered Apple** ... *Fink*
Tuning the Apple speaker

200 **Computer Art For The Tektronix 4052** ... *Jacobson*
Wobbly spirals

202 **Celestial Music Revisited** ... *Perkins*
Modifications to Leo Christopherson's program

206 **Animated HI-Res Sailboat** ... *Schug*
A sailing tutorial

222 **Cavern Quest** ... *Jaeger*
An adventure for the Vic-20 and Bally Arcade

departments

6 **Input/Output** ... *Readers*

10 **Notices** ... *Fee*

14 **Dateline: tomorrow** ... *Ahl*
News and views

226 **New Products** ... *Devlin*

238 **Controller Corner** ... *Riley & Riley*
A sketch pad for the Apple

252 **Apple Cart** ... *Anderson*
The IAC meets the IIe

260 **Outpost: Atari** ... *Anderson*
Electronic Arts and the Title Card Generator

276 **Commodore's Port** ... *Swank*
Monitoring the contents of Vic memory locations

282 **IBM Images** ... *Glinert-Cole*
The PC XT, utilities and more on the p-system

288 **TRS-80 Strings** ... *Gray*
Update on SuperScripsit

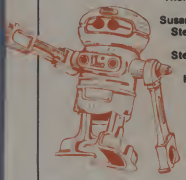
294 **Book Reviews** ... *Gray*

the cover

The British crown came to Silicon Valley for a visit dampened by rain, but not in spirit. Saul Bernstein created the computer image for the approval of the Royal Family using the Hewlett-Packard HP-2700. The story begins on page 96.

staff

Founder/Editor-in-Chief	David H. Ahl
Editor	Elizabeth B. Staples
Managing Editor	Peter Fee
Associate Editors	John Anderson Joseph Devlin Stephen Arrants
Editor-at-Large	Ken Uston
Contributing Editors	Dale Archibald Charles Carpenter Thomas W. Dwyer Will Fastie Susan Gilnert-Cole Stephen B. Gray Glenn Hart Stephen Kimmel Ted Nelson Harold Novick Peter Payack Alvin Toffler Gregory Yob Karl Zinn
Staff Writers	Owen Linzmayer Chris Vogell
Editorial Assistants	Andrew Brill Laura Gibbons
Art Director	Patrick Calkins
Assistant Art Director	Chris DeMilla
Artists	Diana Negri Rudic Eugene Bicknell Paul Krasner
Typesetting	Karen K.Brown Renea C. Cole
Advertising Director	Jeff Weiner
Creative Computing Press	Laura Conboy
Operations Manager	Patricia Kennelly
Comptroller	Jennifer H. Shafer
Accounts Receivable	Joanne Saplo
Retail Marketing	Susan DeMark
Fulfillment	Frances Miskovich Rosemary Bender Linda Blank Pat Champion Elsie Graff Linda McCathern Carol Vita Jim Zecchin
Shipping & Receiving	Ronald Antonaccio Mark Archambault Bill Thomas Scott McLeod Mike Gribbon Strawvey Montgomery



advertising sales

Advertising Director
Jeff Weiner
Creative Computing
Ziff-Davis Publishing Company
One Park Avenue
New York, NY 10016
(212) 725-7957

Advertising Coordinator
Ruth Darling
Creative Computing
Ziff-Davis Publishing Company
One Park Ave.
New York, NY 10016
(212) 725-3446

Northern California, Northwest
Jeff Miller
Ziff-Davis Publishing Company
3030 Bridgeway Blvd.
Sausalito, CA 94965
(415) 331-7133

Southern California, Southwest
Tom Whiteway
Ziff-Davis Publishing Company
3460 Wilshire Blvd.
Los Angeles, CA 90010
(213) 367-2100

New England
CEL Associates, Inc.
27 Adams Street
Braintree, MA 02184
(617) 848-9306

Midwest
Jeff Edman
The Pattis Group
4761 W. Touhy Ave.
Lincolnwood, IL 60646
(312) 679-1100

Mid-Atlantic
Larry Levine
Ziff-Davis Publishing Company
One Park Ave.
New York, NY 10016
(212) 725-7666

Southeast
Browning Publications
P.O. Box 61306
Atlanta, GA 30366
(404) 455-3430

Canada
The Pattis Group
1623 Younge St.
Toronto, Ontario M4T 241
(416) 462-6266

Consumer Computers & Electronics Magazine Division
President: Larry Sporn
Vice President Marketing: J. Scott Briggs
Vice President Circulation: Carole Mandel
Vice President/General Manager: Eileen G. Markowitz
Creative Director: Peter J. Blank

permissions

Material in this publication may not be reproduced in any form without permission. Requests for permission should be directed to Bette Amado, Ziff-Davis Publishing Company, One Park Avenue, New York, New York 10016.

where to send it

All **editorial material**, including article submissions, press releases, and products for evaluation should be sent to:
Creative Computing
39 E. Hanover Ave.
Morris Plains, NJ 07950

Correspondence regarding other Creative Computing products and publications should also be sent to the Morris Plains address.

Correspondence related to **advertising**, including ad copy, questions on billing, and requests for rates, should be sent to:
Advertising Department
Creative Computing
Ziff-Davis Publishing Co.
One Park Ave.
New York, NY 10016

Correspondence regarding **subscriptions**, including orders, changes of address, and problems should be sent to:
Creative Computing
P.O. Box 5214
Boulder, CO 80321

Your help in choosing the correct address for your correspondence is appreciated. An incorrectly addressed letter or package can take as long as several weeks to reach its proper destination.

subscriptions

All subscriptions orders and other correspondence related to subscriptions should be addressed to:
Creative Computing
P.O. Box 5214
Boulder, Colorado 80321.
Foreign subscriptions must be accompanied by payment in U.S. currency.

Subscription prices:

U.S.	Canada	Foreign
1 year $24.97	1 year 29.97	1 year 34.97
2 years 43.97	2 years 53.97	2 years 63.97
3 years 57.97	3 years 72.97	3 years 87.97

Airmail delivery on foreign subscriptions is available for a one-year period only at $75.00 additional for mail to Asia and Australia, and $50.00 additional for all other foreign.

Subscribers in the United Kingdom may send payment in sterling to:
Hazel Gordon
10 Bishops Way
Sutton Coldfield
West Midlands B74 4XU

Please allow at least eight weeks for change of address. Include old address as well as new—enclosing if possible an address label from a recent issue.

attention authors

Creative Computing will not be responsible for the return of unsolicited manuscripts, cassettes, floppy disks, program listings, etc. not submitted with a self-addressed, stamped envelope.

VIC-20 OWNERS

FLIP-N-MATCH™ - Find twin objects before time runs out.

CREEPY CORRIDORS™ — Find the jewels before the creepy critters find you!

ULTIMA - Escape from Mt. Drash™. A real-time, fantastic adventure.

The sky's the limit! Now Vic 20 owners can get a bigger piece of the action with Sierra On-Line's new titles. We're starting with CREEPY CORRIDORS,™ FLIP-N-MATCH,™ and ULTIMA - Escape from Mt. Drash,™ and as weeks pass, we'll be bringing you more of our most popular titles.

AVAILABLE AT YOUR LOCAL COMPUTER STORE.

Sierra ON-LINE INC

SIERRA ON-LINE BUILDING COARSEGOLD CA 93614 (209) 683-6858

CIRCLE 243 ON READER SERVICE CARD

™ indicates trademark of SIERRA ON-LINE INC

tput...input/output...inpu

April Fool

Dear Editor:

I would like to comment on your April Fool's ads. I was writing down the address of the firm that made DELIZA II to tell them that it appears to be no better than a dull Eliza game I have played. Then I noticed the oddity of the address. It dawned on me that it was very obviously an April Fool's joke. This is not the first time I have been taken in by jokes like this. So I searched the issue for other such gag ads. I found the one about the surgically implanted computer to be a jeer at Barney Clark who recently died after 112 days of being a hybrid of man and machine. For his courage and endurance, he deserves better than being jeered at by your tasteless jokes.

Paul R. Wilson
19 Sunset Pl.
Bergenfield, NJ 07621

As writer of the ads, I would like first to say that I view Mr. Barney Clark as a modern hero—a man of intense personal courage. It hurts me to think that anyone would view the MicroManframe *ad as somehow intended to detract from him. It poked fun only at the computer industry.*

I should also point out that the lead time of Creative *is such that the ad was written before Mr. Clark underwent surgery.*

The Deliza *ad meant to point out the shallowness of "interpersonal" relationships with computers. The journal* Computers in Psychology and Psychiatry, *by the way, has requested reprint rights for the ad.—JJA*

Objectivity as Subject

Dear Editor:

Don Berry's guest editorial, "Experience, Experiments, and Intelligence" in the December, 1982 issue of *Creative Computing* was an absolute marvel of misunderstanding and inconsistency. I have seldom seen such an eloquently written expression of ignorance.

First of all, since the misstatement of physical theory has always been a pet peeve of mine, let me set Mr. Berry straight on quantum theory. Quantum wave equations say nothing at all about subjective versus objective reality. Yes, quantum theory says that there is an interaction between the observer and the observed—but any two observers running the same experiment will observe the same thing. The observer's opinion never enters into the experiment, i.e. it is not subjective.

Mr. Berry pooh-poohs the idea of using experiments rather than theory to determine the origin of human consciousness. In science, an idea is not called a theory unless it is testable. The only way to test a hypothesis is to run an experiment. Mr. Berry also apparently confuses "experience" with "experiment." Regardless of their origin, the second word describes an attempt to undergo a repeatable instance of the first.

Mr. Berry says that there has been a "Lack of true experimental investigation of the nature of consciousness." Is he blind? The amount of evidence supporting a biochemical foundation of intelligence is enormous! People who have had portions of their brains removed (by accident or surgery) show altered mental abilities. People who have other portions of their anatomy removed may be altered emotionally, but they still have all their mental faculties. Draw your own conclusions.

Mr. Berry states that "living languages" (called "natural languages" by most) are unusably vague. He misses the point altogether, though, when he claims that "thought," "consciousness," and so on have more definite meanings in Sanskrit than in English. The "meaning" of something is separate from the language it is expressed in, so any language should be able to express it.

Mr. Berry seems to think that trying to match human abilities by more complex programming is a mistake. I don't agree. People are certainly more complicated than the programs we have written so far! I, for one, am not tired of all the talk about Artificial Intelligence, except perhaps the talk of what computers can never do. Let's just wait and see, shall we?

Ron Lunde
1210 W. Dayton St.
Madison, WI 53706

Score 1 for the 64

Dear Editor:

I have implemented the "Large Factorials" program by Donald Piele in the March issue on my Commodore 64. I decided to check the results against the factorial tables of the *CRC Standard Mathematical Tables*, 25th Edition, 1978. The values are given for exact results up to 30! You can imagine my surprise when I found CRC to be wrong, starting with 22! The Commodore 64 agreed with CRC up to 21! and then diverged, but hand calculations of 22!, 23!, and 24! all agreed with the computer output. In addition, the result for 52! and the computer agreed for the value of 52! given on page 180.

I have written CRC and am interested to see their response. I have also modified the program to give other large numbers exactly, such as Mersenne primes (607 is such a generator, and $2^{607} - 1$ is a prime number of 183 digits) and perfect numbers. This last step required the ability to multiply some large numbers and a generalization of Piele's routine. Thank you for the article and I hope this anomaly amuses you as it did me.

Vincent J. Mooney Jr.
607 Wyngate Dr.
Frederick, MD 21701

TECMAR'S GRAPHICS MASTER.™

It adds graphics to your IBM Monochrome Display, or 16 high-resolution colors to your color monitor!

Now your IBM-PC can run monochrome or color displays with remarkably enhanced graphics... and all from this one multi-function board — no other video board needed!

With your IBM Monochrome Display, the Graphics Master™ board gives you truly high resolution graphics, allowing 640 horizontal x 350 vertical pixel display.

With other monochrome display screens you can obtain even higher resolutions — up to 640 H x 480 V, with full-page 80-character x 60-line text display.

With a color monitor, it extends your color graphics to 640 horizontal x 400 vertical, 16-color interlaced display.

Graphics Master™ accepts external sync, so you can add labeling to images, you can overlay characters or other computer-generated images on a video picture using the PC-Mate™ Video Cassette Recorder Controller.

This remarkable new board fully supports all IBM advanced BASIC color graphics functions.

Pot further information about our Graphics Master™ and the largest line of options available anywhere for the IBM Personal Computer, call or write for the latest catalog of PC-Mate™ peripherals from Tecmar.

TECMAR
The Next Step

[illegible]

Homeless Accountant

Dear Editor:

We read with interest your review of *The Accountant* in your February issue. Unfortunately, your reference to "Home Accountant" on the cover may have confused some readers.

For the record, the program you reviewed is *not The Home Accountant*, the world's most popular home finance program, according to several independent tabulations. *The Home Accountant* is published by Continental Software for Apple II/IIe, IBM PC, TRS-80 Model III, Osborne 1, Commodore 64, Atari 400/800, and Texas Instruments Professional Computer systems.

Jim Sadlier
President
Continental Software
11223 S. Hindry Ave.
Los Angeles, CA 90045

3-DeBugging

Dear Editor:

I have found a couple of problems in your 3-D Plotting program. In the January issue the "Three Ways of Looking at a Function" program had save and display programs. I could not get either of them to work. The following corrections will remedy the situation:

In the save program, add a comma just before A$2000 in line 140. In the display program, add a new line 125 as shown below

Save PGM
140 Print CHR$(4);"BSAVE";A$;",A$2000,L$1FFF"
Display PGM
125 INPUT "NAME OF PICTURE";A$

Steve Rollins
4730 Elmhurst Ave.
Norfolk, VA 23513

Boot Loops

Dear Editor:

Donald Piele's article "Electronic Geoboard", in the May, 1983 issue was well written and especially valuable to novice programmers, such as myself. One small error should be called to the attention of your readers. Line 82 should be deleted since it prevents the for-next loop from operation.

Thomas Schneck

Zeroing In

Dear Editor:

Your review of *Donkey King* by Tom Mix Software is quite accurate. It is simply the finest arcade game I have ever seen for the Color Computer. As your reviewer suggests, though, this game is fairly difficult (which probably accounts for the length of time our family has continued to enjoy it).

Young children or arcade novices may be frustrated because they are unable to put their names and scores on the session "scorecard" at the end of play unless the score exceeds 11,000 points. This is because the game, when loaded, already includes names and scores from 11,000 to 20,000. To get the high score requires a very high score in excess of 20,000 points!

I have developed a Basic program which erases the names of the ten high scores that come with the game and sets the high score to zero. This allows for more keen competition between players of less than expert skill.

```
10 CLEAR200,10000
20 FORJ=31634TO31717STEP9
30 FORK=J TOJ+4:POKEK,32:NEXTK
40 POKEJ+6,0:POKEJ+7,0:NEXTJ
50 EXEC12803
```

This program should be keyed in or CLOADed after the *Donkey King* cassette is CLOADMed, but before it is EXECed. When run, the program makes the necessary modifications and executes the game program.

If line 50 is deleted, the program will make the needed modifications to the machine language game program, but it will not be executed. This allows for saving of a modified version by:

```
CSAVEM"NEWDONKY",12803,32513,12803
```

This modified version can be CLOADMed and EXECed in the normal manner. Each time it is loaded, the scores will be zeroed out. If you make a modified copy, duplicate only your OWN game; software piracy is just an unnecessarily polite term for STEALING.

Thanks for a fine magazine. I eagerly look forward to each issue and have learned a lot from *Creative Computing*.

Robert C. Lake
3206 Covered Bridge Rd.
Montgomery, AL 36116

Humbugs?

Dear Editor:

I found Mr. Spahitz's article "Rediscovering Level II" in the December issue very interesting but I would like to point out one possible problem. The "flip flopping device inside the keyboard that controls cassette input/output" is the relay that controls the cassette motor start/stop. This particular relay has been known to have a fairly high failure rate and I, personally, would not recommend putting undue stress on it for making "hums, buzzes, and clicks." This may seem a trivial matter, but for the non-technical user who may have to have a relay replaced in the shop, it is a needless waste of money and downtime!

Sound output from the Model I can be achieved with no hardware modification and minimal software. The method is to lengthy to go into in this letter, however, if any readers are interested they can contact me at the address shown below. Please include a SASE.

Richard W. Elliott
#901, 820 5th Avenue S.W.
Calgary, Alberta T2P 0N4
Canada

GORILLA GUARANTEED TOUGH

BUY A BANANA.™ SAVE A BUNCH.

Meet the Banana,™ the very tough, versatile, portable, and reliable dot-matrix printer from Gorilla.™

At $249.95 retail it's an ideal and inexpensive companion for personal computers like Apple® (or Apple "look alikes" such as Franklin® or Albert®), TI,® Commodore,® TRS-80,® Kaypro,® Timex,® Osborne,® etc.

After that, it's merely comparable to other printers that can cost up to three times as much: 10" carriages (to handle standard 9½" paper), 80 columns, graphics capability, 10 characters per inch (expandable to 5 cpi) draft-quality print (for perfectly acceptable form letters, data processing, business reports, etc.) tractor feed (for precise alignment and quick loading), parallel or serial interface (take your pick), self-inking ribbon cassette (for long life and easy installation), 10 portable pounds in weight, and compatibility with so many of the most popular personal computers on the market.

Plus its printhead features a unique single-hammer design that eliminates a lot of moving parts, to eliminate a lot of annoying repairs.

That's the Banana: silly name, serious service. It's everything the expensive dot-matrix printers are . . .

Except expensive.

CIRCLE 188 ON READER SERVICE CARD

Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021
Toll-free: 1-800-343-6833; In Massachusetts (617) 828-8150. Telex 951-624.

ices...notices...noti

National Conference On Artificial Intelligence

"Is my opponent a human or a machine?" Chess players will be asking themselves this question as participants in the Fredkin Chess Prize Competition, part of the National Conference on Artificial Intelligence (AAAI-83) to be held at the Washington Hilton Hotel in Washington, D.C., August 22 to 26, 1983.

A two-day tutorial program, August 22-23, aimed at a technical and business audience, will precede the conference.

Industrial computer software and hardware of interest to the intelligence research community, along with leading books and journals will be on display at the AAAI-83 Research and Development exhibit program August 22-26, 1983.

For information, contact Claudia Mazzetti, AAAI, 445 Burgess Dr., Menlo Park, CA 94025. (415) 328-3123.

Health Education Competition

The Association for the Advancement of Health Education is sponsoring a Health Education Software Competition. Entries should be original pieces designed for educational use in schools, homes, hospitals, voluntary and public health organizations, clinics, and industry. All entries should use the capabilities of the microcomputer. There will be a $1500 cash award for the best entry; two $500 awards for second place, and five $100 third place awards. Entries must be received by November 1, 1983.

AAHE is an association of the American Alliance of Health, Physical Education, Recreation, and Dance and all winning entries will become property of AAHPERD, with royalties being paid to the authors.

For more information and an application packet, contact the Association for the Advancement of Health Education, Computer Software Contest, 1900 Association Dr., Reston, VA 22091.

PC '83

PC '83, an International Conference and Exposition featuring IBM Personal Computers and Compatibles, will be held Saturday through Monday October 8-10 (Columbus Day Weekend), 1983 at Boston's Bayside Exposition Center. The show hours are 10:30 a.m. to 5:30 p.m. daily. Ticket prices are $4 for a three-day exhibits and conference badge or $8 for a one-day exhibits only badge.

For more information, call or write Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167. (617) 739-2000 or (800) 841-7000.

Correction

As a result of the feature in the *Buyer's Guide to Personal Computers*, entitled "Telecommunications for Atari Users," the authors, David and Sandy Small have been inundated with mail requests for information about the Microconnection and *TSMART*.

The Microperipheral corporation, manufacturer of the products, asks that all requests for information be sent to them at 2565 152nd Ave. N.E., Redmond, WA 98052. (206) 881-7544.

BLYTHE VALLEY SOFTWARE is now producing a broad line of software for business, education and home use.

Now available is the first of the storybook series for both home and educational use. Hansel and Gretel, Briar Rose and The Story Teller are packaged and ready for delivery. Now in production are a wide range of large and small business systems.

For information call: (209) 683-4735 or write, 40879 Highway 41, Silver Creek Center, Suite 1-I, Oakhurst, Ca. 93644.

BLYTHE VALLEY SOFTWARE

A Division of R. Crandall 40879 Highway 41, P.O. Box 353, Suite 1-I, Oakhurst, Ca. (209) 683-4735

CIRCLE 121 ON READER SERVICE CARD

DIAGONAL SCROLLING...GROUND-TO-AIR FIRING...3-D STRAFING RUNS

SOMEBODY FINALLY DID IT RIGHT!

BLUE MAX™ by Bob Polin takes you back to World War I, with 3-D scrolling the other games only wish they had.

For the Atari 400/800/1200

BLUE MAX, at software dealers everywhere, or AVAILABLE DIRECT FROM SYNAPSE ELITE, ONLY $34.95 plus $2 shipping & handling. Send check, money order or your VISA/MASTERCARD number to SYNAPSE ELITE, or order by phone (415) 527-7712.

synapse

5221 Central Avenue, Richmond, CA 94804 · (415) 527-7712

Finally, aliens your kids can reason with instead of destroy.

This year, thousands of kids will be searching for the most amazing thing.

At Spinnaker, we don't believe in the "kill or be killed" concept behind most computer games. In fact, we believe computer games should be instructive. Not destructive. But just as importantly, they should be fun.

That's why IN SEARCH OF THE MOST AMAZING THING™ is designed to let your kids negotiate with aliens instead of destroying them. Because given the opportunity, kids enjoy using their minds.

It's Amazingly Fun.

The Most Amazing Thing is out there somewhere. Finding it won't be easy.

But relax, your kids will have the help of their old uncle Smoke Bailey. He'll give them a B-liner (sort of a cross between a hot air balloon and a dune buggy) to use on their journey. They'll have to learn how to fly the B-liner and navigate it through storms and fog. But before they do anything, your kids will have to talk to Old Smoke. He'll tell them about the Mire People and the strange language that they speak. He'll also tell them to avoid the dangerous Mire Crabs and how to get fuel for the B-liner.

Your kids will visit the Metallican Auction where they'll trade with the aliens for valuable chips. Your kids will then use these chips to buy things they'll need for their trip. And your kids will learn how to fly over the planet using their jet pack.

The Most Amazing Thing holds great powers, but it will take great skill, persistence and imagination to find it.

It's Amazingly Educational.

IN SEARCH OF THE MOST AMAZING THING is written by Tom Snyder, educator and author of the best-selling Snooper Troops™ Detective Series.

And like all Spinnaker games, IN SEARCH OF THE MOST AMAZING THING has real educational value. For instance, your kids will sharpen their ability to estimate distances and quantities. And since they'll be navigating their B-liner, they'll become aware of distance, direction and time. They'll also develop a knack for economic and monetary principles through trading with the aliens. And they'll solve problems through trial and error.

They'll learn all of these things, plus they'll learn that nothing is impossible if you put your mind to it.

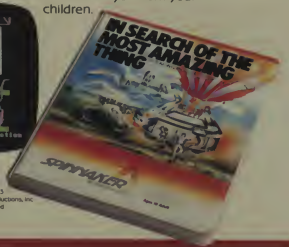
A Novel Approach to Computer Games.

Besides offering your children all of the above, IN SEARCH OF THE MOST AMAZING THING gives them an opportunity to develop their reading skills. Because included with the game is Jim Morrow's new novel The Adventures of Smoke Bailey.* So your children will have hours of fun reading the book or playing the game. And they'll be learning at the same time.

Parental Discretion Advised.

If you're a parent who would rather see your kids reason with aliens than destroy them, you've got plenty of reasons to ask your local software retailer for IN SEARCH OF THE MOST AMAZING THING. It's compatible with Apple,® IBM,® Atari,® and Commodore 64™ computers. And it offers so much fun you'll probably be tempted to play it yourself. Or you can write us directly at: Spinnaker Software, 215 First Street, Cambridge, MA 02142.

You'll find this is one computer game that won't alienate you from your children.



© Copyright 1983
Tom Snyder Productions, Inc
All rights reserved

SPINNAKER™

We make learning fun.

Apple, IBM and Atari are registered trademarks of Apple Computer, Inc., International Business Machines Corp. and Atari, Inc., respectively. Commodore 64 is a trademark of Commodore Electronics Limited
© 1983 Spinnaker Software Corp. All rights reserved

ow...dateline:tomorrow...da

David H. Ahl

Watch for WarGames at a Theater Near You

WarGames is a wonderful new movie--good, solid adventure balanced by warm, human feeling. It will have you biting your nails one minute and laughing the next. It has the most real entertainment packed into 90 minutes that I've seen for a long time.

Briefly, a teenager, David Lightman, uses his home computer (an IMSAII) to tap into a Dept. of Defense war game that turns out to be more real than game. You might want to watch near the beginning when David is leafing through a magazine at home--I'll send $5 to the first person who writes and identifies which issue of Creative Computing it is.

Playing Games by Telephone? It's Here Today.

Control Video announced the first interactive telecommunications service linking Atari Video Computer Systems (VCS) and compatible systems with mainframe computers for downloading games. To use the service, called GameLine, a master module (essentially a high-speed modem) is plugged into the VCS cartridge slot, and you dial the GameLine computer.

The master module costs around $53, membership is $15, and each game loaded costs about 10 cents or $1.00 for an hour of play. For the first 10,000 people who sign up (for $49.95), Control Video is throwing in $25 worth of play time and waiving the membership fee.

For more info write William vonMeister, Control Video, 8620 Westwood Center Drive, Vienna, VA 22180.

Street Price Index

Starting next month, Creative Computing will run a new monthly column called the "Street Price Index." Similar to the stock market tables in the daily paper, the index will show the list price for most major computers and peripherals, as well as the high and low price seen that month.

Some price movement this month was seen on many popular makes. The Timex 1000 dropped to $39 in many areas and as low as $29 from some dealers trying to unload stocks in anticipation of the Model 1500 (a 1000 with 16K of on-board memory) and the 2000 (similar to the Sinclair Spectrum).

TI dropped plans to market the low end 99/2. Instead, they lowered the price of the 99/4A to $99 in two steps--$149 in the spring, and $99 starting in June. TI claims to be selling 30,000 units per week at the $149 price level.

Atari instituted a $50 rebate on the 400, generally thought to be a move to get rid of existing stocks in preparation for the introduction of an upgraded machine. Depending upon how you look at the $70 free software offer also still in effect, the street price on the 400 is as low as $79 in places, although $99 to $139 is more the norm. In any case, it is a great deal!

Astonishingly, we have already seen the Apple IIe and Atari 1200XL heavily discounted. The IIe with 128K and 80-col board is going for $1345 in many places and we saw a 64K 1200XL priced at $569 (after a $100 rebate).

We weren't surprised to see the official 20% price cut on the Apple III. List now on the 128K unit is $2495 and on the 256K unit, $2695. Even so, the systems seem glued to dealer shelves.

With Epson's announcement of a new printer, MX-80 prices have plummeted; $369 is not uncommon. This, of course, puts the pressure on other comparable units. The Okidata 82A is going for about the same ($370-$390), the Star Gemini 10 for as low as $339, and the NEC 8023 for $435.

Notes from the Far East

Here are a few tidbits I picked up while on a recent trip to the Orient.

Hong Kong: Robert Roberts, president of Texas Industries met with a group of stock brokers and businessmen for lunch. They were presented with the usual package describing the company with one difference--the financial data was on a floppy disk in VisiCalc for the Apple. Some of the attendees were a mite surprised!

Heard on the street in Hong Kong: IBM will have their personal computer manufactured by Tatung in Taiwan.

Singapore: Tandon is relying more and more heavily on part time housewives at their factory for such jobs as touching up PC boards, packing, and making disk drive subassemblies. A person working 20 hours per week would earn about $70/month. Obviously 88 cents per hour would have little appeal here but for part time work in Singapore, it's not bad.

Headline in a paper in Thailand proclaimed, "National Workshop on Computers Agrees: The Computer Era is Here!" What a surprise.

When is a Mouse a House?

The usually accurate Wall Street Journal in an article about the MacIntosh, the low-end Lisa-like computer from Apple, reported that "it uses a house, or hand-held controller. A house is also a feature of the $9,995 Lisa computer."

A house once is a typo. Twice is a major blunder. Or do they know something we don't?

Speaking of the mouse controller, at least one manufacturer of them refers to more than one as mouses. Editor Staples prefers mice. Perhaps it is time to reinstate our Effective Writing column again. Any opinions out there?

Before you buy a printer look at the fine print.

There's a big difference in printers, and the proof is right before your eyes.

This is an actual printout from Digital's Letterprinter 100. As you can see, it's good enough to send out to customers.

But that's not all the Letterprinter 100 can do. Suppose, for instance, you're in a hurry.

JUST PUSH A BUTTON AND YOU CAN PRINT OUT A WHOLE PAGE OF DRAFT COPY IN LESS THAN TEN SECONDS.

There are other fine points. You can see how the Letterprinter 100 can print multiple typefaces. It can also print in **BOLD**, **double-width** and condensed. And do all these styles automatically, without stopping. And with its wide range of graphics capabilities, you can even draw your own conclusions.

You simply can't find a more versatile printer than the Letterprinter 100. And it's just one of a family of printers we offer for Digital's personal computers and video terminals. Including a daisy-wheel printer, the LQP02, and a low-cost Personal Printer, the LA50, that still make you look good on paper.

So now that you've read the fine print, see our fine printers. Call 1-800-DIGITAL, extension 700, for the distributor near you or write Digital Equipment Corporation, Terminals Product Group, [illegible] Royal Avenue, CP01-5, Marlboro, Ma. [illegible]

digital

The Jupiter Ace: A Forth Computer

Christopher Helck

No matter how you look at it, the Jupiter Ace, manufactured by Jupiter Contab Limited, is a small machine. Measuring 8½" by 7½" by 1¼", it is slightly larger than the Timex Sinclair. The price is also small. The machine is available by mail order for $150 from Computer Distribution Associates of Oxford, PA.

The most interesting thing about the Ace is that it comes with the Forth programming language in ROM. This means that when you turn the machine on, Forth, not Basic, is running. Because there is not much software currently available to run on this machine, those who buy it are buying an opportunity to learn to program in Forth, one of the up and coming microcomputer languages. A selection of games and programming tools is promised in the near future should you yearn for other diversions once Forth is mastered.

The Keyboard

Almost half of the surface of the Jupiter Ace is covered by its keyboard. The keyboard consists of sculpted rubber keys under which lies a flat keyboard. It is much easier to type on than the flat plastic membrane on the Timex and the Atari 400. That is not to say that it rivals the keyboard of a typewriter—the keys rock a little bit while you are typing.

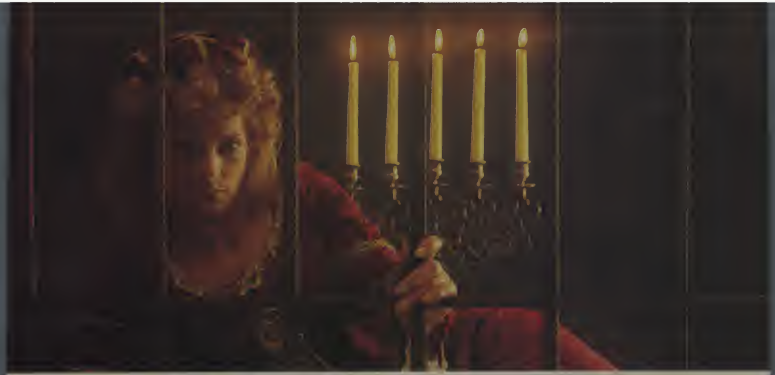
The space bar has become just another small key beneath the enter key, and a special symbol shift key is used to access punctuation. Overall, the keyboard has a nice feel, although those accustomed to full-sized keyboards will find it a bit cramped.

The computer itself is housed in a stylish white plastic case with red racing stripes and is a breeze to set up. It comes with an American plug adapter, a video cable with an RF modulator and two lines for hook-up to a cassette recorder. An ON/OFF switch would be a welcome addition. At the present time, to shut the machine off you must pull the plug.

The Ace is built around a Z80 microprocessor. It comes with 8K of ROM and 3K of RAM, expandable to 53K. The manufacturer promises to make 16K and 48K memory expansion modules available soon for $50 and $125 respectively. There are two card slots on the back. One is the Z80 pinout and the other is an edge connector that will support the memory expansion packs and an RS-232C interface when they become available.

The Ace is designed to be hooked up to a cassette recorder. A printer can also be added. The writers of the manual seem to be encouraging adventurous hardware designers to let their imaginations run wild and build exciting new peripherals. There is an example in the manual of how to hook up a traffic light controller. A built-in speaker allows beeps and even musical tones to be played.

Christopher J. Helck, Children's Computer Workshop, 1 Lincoln Plaza, New York, NY 10023.



GWENDOLYN.

THERE ARE SOME THINGS YOU KEEP SEARCHING FOR, BEYOND REASON.

Kidnapped in revenge and locked in hatred somewhere deep beneath your castle, is your princess.

Gwendolyn.

The prosperity of your kingdom, the end of a bitter feud, your very future depend on finding her.

You swear that no obstacle can stop you. But the high-resolution, 3-D graphics, animation and sound effects make the obstacles that await you more formidable than you can imagine.

And with over ninety different screens and two full sides of play, those obstacles and the decisions you must make can appear endless. In fact, you may have to endure hours of searching to rescue Gwendolyn.

But for her, you would endure anything, wouldn't you?

These are just three of over ninety exciting screens.

Gwendolyn—a non-violent, intermediate graphic adventure game, written by Marc Russell Benioff, Atari 40K Disk $27.95, Artworx Software Co., Inc., 150 N. Main St., Fairport, N.Y. 14450. For a free catalog of Artworx Software for the Atari, Apple, VIC-20 & Commodore 64 computers, write or call 800-828-6573.

Artworx®

So you can play.

Atari, Apple, VIC-20 & Commodore 64 are registered trademarks

The rear view reveals the Z80 pinout and an edge card connector.

Forth And The Jupiter Ace

Forth is an interpretive language which is gaining popularity. At its best, Forth is fast and compact; at its worst, it is unreadable. For numerical calculations, it uses reverse Polish notation—to add 3 to 2 enter

```
3 2 +
```

rather than the more logical

```
3 + 2
```

Instead of writing programs as in Basic, what you do on the Jupiter Ace is to write words in Forth. These words may then be used in other Forth words. For instance, once a square root function has been defined, it may be used anywhere, anytime, either in another word or interactively. As each word is defined in Forth, it is appended to the dictionary.

The Forth that comes with the Ace is a subset of Forth 79. The power of this small subset is a tribute to the strength of Forth. With the words included, an enterprising programmer could write a version of Basic if he so chose.

One or two additions to the standard vocabulary are worth mentioning. The Ace allows you to inspect and modify old words that have gotten buried within the dictionary without disturbing the words on top. In standard Forth, you would have to recompile the dictionary all over again.

The words IN and OUT are of potential interest to people like myself, who are intimidated by hardware and yet feel they should know something about it. IN and OUT allow you to read and write the input and output ports of the Z80. I haven't had the nerve to connect anything to the 80 pinout yet, but I am far more likely to do that than I would be to attach something to my IBM PC. Maybe I would even learn something.

The Ace version of Forth has its limitations as well as its advantages. The most important is that there are fewer than 1000 bytes of usable space to work with in the 3K version. This is not enough to write even a bad version of Pac-Man. In addition, the compiler is rather severe; it tends to wipe out the system when it runs into trouble. The main problem, however, seems to be in the user interface. After you type a line and hit ENTER, the computer tries to interpret the entire line, including the garbage to the right of the cursor (which is there because you did not bother to erase it when you backspaced) as a command. I found this very frustrating. On the other hand, the Ace does include a fairly nice line editor, and if you use it correctly, you won't have any garbage to the right of the cursor.

Related to this problem is the question, "Where is the input line?" When the machine is brought up, the input line is at the bottom of the screen, which is where we come to expect it. However, certain commands move the input line about on the screen, leaving chaos in their wake.

Graphics On The Ace

The display is black and white. There are two display modes: a character mode, which provides 23 lines of 32 characters, and a graphics mode, which provides 46 lines of 64 pixels. The character set is defined in RAM, and it is amusing to play with it.

The only graphic command that the Ace supports is a point plotting routine; there are no line drawing commands built in. You can key in a Forth word, DRAW, for drawing lines. This command is described in the manual, along with a detailed explanation of how it works.

Overall, the manual is well written. It has some of the best beginner's explanations of some of the more difficult Forth words that I have seen anywhere. Everything it explains, it explains well.

In conclusion, the Jupiter Ace is a nicely designed but limited computer that is appropriate for people who want to learn to program in Forth. It is nice to have a computer that does what it is supposed to do—even if what it does is limited. Small can sometimes be beautiful.

Computer Distribution Associates, 53 South 3rd St., Oxford, PA 19363. (215) 932-4807. □

CIRCLE 400 ON READER SERVICE CARD

Now...all the advantages plus COLOR...

FRANKLIN ACE Computer

Add COLOR-only $59.95

Convert graphics to color w/Adwar FCB plug-in board. Available now in stock at your local dealer – or

ADWAR

335 West 35th St. / New York 10001

(212)691-0976

PROMPT SHIPMENT · MASTERCARD/VISA

CIRCLE 106 ON READER SERVICE CARD

SOFTWARE FOR TRS-80 I + III

PEDESTRIAN CRASH-OUT LEM I

ADDRESS FILER FINANCE MATH SKILLS

MORE SOFTWARE AVAILABLE SOON FOR THE *TRS-80* AND *SINCLAIR ZX81*.

WRITE FOR YOUR FREE CATALOGUE TO:

DDL SOFTWARE, INC. PO BOX 116 WESTTOWN, PA. 19395

TRS-80 IS A REGISTERED TRADEMARK OF THE TANDY CORP. SINCLAIR ZX81 IS A REGISTERED TRADEMARK OF SINCLAIR RESEARCH, LTD.

CIRCLE 156 ON READER SERVICE CARD

5 Year Warranty

SAVE 50% ON Verbatim Datalife Diskettes

DEALER INQUIRIES INVITED

5¼"	Specify Soft or 32 Sector	prices/10
MD525	1 side/dbl dens	$24.90
MD550	2 sides/dbl dens	35.00
MD577	1 side/quad 96tpi	33.75
MD557	2 sides/quad 96tpi	44.50
8"	Specify Soft or 32 Sector	
FD34-9000	1 side/sgl dens	30.00
FD34-8000	1 side/dbl dens	33.00
DD34-4001	2 sides/dbl dens	41.00

Checks-VISA-MC-C.O.D./Add $2 Shipping
Call or write for our discount catalog

LYBEN COMPUTER SYSTEMS
27204 Harper Ave., St. Clair Shores, MI 48081
Phone (313) 777-7780

DATALIFE - THE NAME IS THE PROMISE THE WARRANTY IS THE PROOF

CIRCLE 191 ON READER SERVICE CARD

HOT STUFF

You'll find it wherever computergamers go to score the latest and greatest in entertainment software.

The HOT RACK. It's where the "hot" ones are.

You'll find games that'll grab you, thrill you, and hurl you to worlds you never dreamed were possible. Best-sellers like CHOPLIFTER. CASTLE WOLFENSTEIN. AZTEC. STAR-BLAZER... and many, many more.

So, stop wasting your time and money on games that could leave you cold. Look for the HOT RACK at your local computer store.

If you don't see it, ask for it.

Dealer inquiries invited.
Dealers only, call 800 432-3129 (Inside California) or 800 854-6801 (Outside California).

Another marketing first from MICRO D.

CIRCLE 211 ON READER SERVICE CARD

QUADRAM INAUGURATES THE

Use Apple software in your IBM PC and XT
Who said you can't mix Apples and IBMs? Innovation by Quadram makes it possible with Quadlink.™ A simulated Apple computer on a revolutionary new enhancement board.

Most programs designed for the Apple II, II Plus or IIe — including educational software and entertainment options — are now compatible with IBM PCs sophisticated business capabilities.

That's right. An Apple and an IBM. In one computer with no software limitations. Quadlink by Quadram opens a whole new world of possibilities.

Easy to use
Quadlink plugs inside IBM PCs. No conversion or reformatting of diskettes needed. Just load Apple software in the IBM and key one command. That puts you in the Apple mode. When ready to switch back, just press a different key. It's that simple. Like having an Apple 64K computer inside your IBM.

Keep the extras
Quadlink allows use of all IBM enhancements while running Apple software. Printers, buffers, monitors and more.

When using a monitor there's no plugging or unplugging cables. Apple programs will appear on an

Apple and the Apple logo are registered trademarks of Apple Computer, Inc.
IBM and the IBM logo are registered trademarks of International Business Machines Corporation.

MERGER OF APPLE AND IBM

IBM monochrome or color monitor, like Quadram's chrome vivid RGB color monitor Quadchrome, more clearly than Apple's own screen — even while working with Apple's high resolution color graphics.

Explore your options

Quadlink comes standard with 64K memory. Requiring only one expansion slot, it offers a game port and works with all I/O devices designed to enhance the IBM PC. Like parallel and serial ports for operating printers, modems and other peripheral accessories. There's nothing like Quadlink. And nothing like reliable Quadram Quality to stand behind it.

Quadram Corporation is an Intelligent Systems Company. For over a decade, ISC has been an innovator in personal computer enhancements and color graphics peripherals.

Quadram products are available only through authorized dealers worldwide. Visit one and ask for a demonstration of Quadlink. Priced at only $680, we think you'll like what we've discovered.

Check on our other enhancements too, especially Quadboard, the original multifunction board for the IBM PC.

QUADRAM CORPORATION

4357 Park Drive / Norcross, Ga. 30093 / (404) 923-6666
TWX 810-766-4915 (QUADRAM NCRS)

Available for delivery to retail stores worldwide in late June.

CIRCLE 225 ON READER SERVICE CARD

CompuCorder Speech Storage And Output Device

Bud Stolker

When I first read the flyer announcing Computalker Consultants' newest product, CompuCorder, I thought back to that crisp winter evening in early 1979 when Oric, my Vector Graphic computer, spoke his first words. Installing the software had taken a month, and had exposed me for the first time to software patching and (shudder) assembly language.

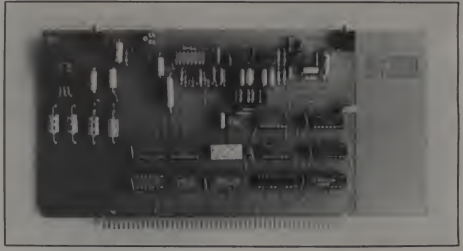
Daily I called the Computalker lab across the continent, reporting on the progress of the previous night, and asking for new equates to assemble, new bytes to poke. My speech synthesizer just wouldn't speak. Desperately I hoped that I hadn't thrown away money on a technology that I might never comprehend, and on a device that might never work.

CompuCorder is essentially a solid-state tape recorder.

I needn't have worried. Like the Heathkit people, Computalker Consultants wouldn't let me fail. My progress was slow at first, then quicker as I grasped how the software worked. I remember vividly my sense of wonder when the mysterious black box mounted on my new circuit board finally cleared its electronic throat and spoke. "How do I sound, Boss?" it said. It was more of a mumble than a crisp question, but I imagined that I understood. What a proud papa was I that night!

Technology has come a long way since synthetic speech first appeared in the microcomputer world in the mid 70's. The development of reliable, inexpensive circuit boards for voice output by Votrax and Computalker Consultants amounted to a genuine breakthrough in both price and performance.

The late 70's saw much of the hardware reduced in size from boards to



Bud Stolker, Landmark Towers, Apt. 1506, 101 S. Whiting St., Alexandria, VA 22304.

Be Wise. Be Thrifty. Be A Night Owl.

Your Own University Library Online At Home!

If you're free between the hours of six and midnight, make a date with one of the world's fastest, most powerful online information services — at a fraction of what it would cost during the business day. All you pay is a $50 registration fee to receive your classified user's password. Then, any evening, you can summon up a wealth of information for as little as $6 per hour.

Technical and scientific abstracts. Medical journals. Government studies. Business indexes. Major newspapers. BRS/AFTER DARK gives you access to the same comprehensive data files used by BRS Search Service subscribers, which include major corporations and reference libraries throughout the world. All instantly accessible with simple, interactive language.

Of course, BRS/AFTER DARK also gives you valuable peripheral services like a home-computer Newsletter and nationwide communication via electronic mail. Plus, shop-at-home services and instant software delivery programmed for the very near future.

Don't let another evening go by without BRS/AFTER DARK. All you need is your phone and any dial-up system or terminal. For more information about BRS/AFTER DARK, just fill out the coupon.

CIRCLE 124 ON READER SERVICE CARD

BRS AFTER DARK

Sign me up as a BRS/AFTER DARK subscriber for a one-time subscription fee of $50. (Basic user's rate as low as $6 hour.) **CC783**

☐ Charge to MASTER CARD/VISA (circle one)

Acct No _____ Expires _____

☐ Send more information

Signature _____

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Mail to: BRS • 1200 RT 7 • LATHAM, NY 12110 • (518) 783-1161

chips. Today several manufacturers offer synthesizer chips, and devices ranging from elevators to automobiles are talking back to their operators.

Talks In Its Master's Voice

Now the makers of that original Computalker speech synthesizer [reviewed in *Creative Computing*, Sept.-Oct. 1978] have introduced CompuCorder, a new circuit that allows any S-100 computer to talk—or bellow or whisper—in its master's voice. The CompuCorder board, which retails for $295 plus $10 for CP/M-compatible driver software, can reproduce speech, as well as music and sound effects, with surprisingly high quality. By talking into a microphone, you can personalize the machine to speak in any voice, in any language, with any message. When Oric speaks now, he sounds just like The Boss. And once again I feel like a proud papa.

CompuCorder is essentially a solid-state tape recorder. It accepts sounds from a microphone or other audio input, stores them as data in random access memory (and on disk files if desired), and plays them back on demand through a conventional amplifier and speaker. The incoming sounds are converted to digital pulses by the on-board hardware, and stored in compressed format as individual bytes. For playback, the driver software sends the circuitry a byte at a time. The hardware converts the digital data back into analog waves which can then be amplified and sent to a speaker.

High-Fidelity Encoding Scheme

The encoding process, known as Continuously Variable Slope Detection (CVSD), enables high fidelity reproduction of speech or other sounds. The concept is simple but powerful. As a person talks into a microphone, the mike generates high frequency electrical waves that may be seen on an oscilloscope. The idealized version of one cycle of these waves is the classic sine wave: a gradual slope up to a peak, down again and through the baseline to a bottom point, then back up again.

The CVSD technique closely approximates the patterns of speech by continuously correcting the voltage output of the board to mimic the original waveforms. The signal produced on playback hugs the slope of the original wave, dropping a notch when the slope rises higher than it should, or boosting the signal when it starts to fall below the value of the original speech curve. Each instruction becomes either an "up" or a "down," or in a digital computer, a high bit or a low bit.

This technique can reproduce sounds with remarkable clarity, but at a price: it eats up lots of memory. At its highest bit rate (32 kilobits or 4K of memory per second), CompuCorder can only record 9.5 seconds of speech in a 48K CP/M system. And the speech files can be enormous. But in a computer with a 5mb hard disk, it is possible to record up to 20 minutes of continuous speech or 40 minutes with moderate frequency loss at the lowest (2K/second) data rate.

Other Methods Of Storing Speech

An alternative method of encoding speech is the one used by Texas Instruments in its Speak and Spell educational computer: linear predictive code (LPC). LPC-generated speech requires only a tenth as much memory as the CVSD method, but encoding the information in the first place requires a mainframe computer. In fact, LPC speech analysis on a microcomputer could require as much as a day's worth of computation per second of speech.

Voice recognition is, alas, impractical with the Compucorder.

"Big deal," you may be saying, "I can record and store speech in my Apple for 40 bucks, and I don't need any extra hardware." That's true; *The Voice* from Muse records speech through the cassette port and outputs it to the built-in Apple speaker. But the technique used is different, and fidelity loss is inevitable. *The Voice* simply counts the number of times the waveform swings across the baseline from positive to negative, and then POKEs the Apple speaker once for each boundary crossing. This form of frequency modulation ignores most of the speech information and produces a characteristically harsh rasp.

The Voice and several similar programs make use of an ingenious and inexpensive way to make a computer talk and they don't require a great deal of memory to operate. But without specially tuned supporting hardware, they just can't produce high fidelity.

CompuCorder, on the other hand, can detect and reproduce the fine, often redundant details of a speech signal that give it an indefinably rich quality.

System Can't "Understand" Speech

Voice recognition is, alas, impractical with the CompuCorder, even though it is clearly listening as you speak into the microphone. The CVSD technique generates a very compact coding, which effectively disguises such things as the ends of words, so there is no way to tell how long the word "hello" is, for example. This makes it very difficult to analyze the waveforms using a standard approach.

"Current methods of doing continuous speech recognition require tens of thousands of dollars worth of equipment," says Ron Anderson of Computalker. "I don't expect to see continuous recognition of unlimited vocabulary before the year 2000. It will take years of research and small improvements. Maybe it will have to wait for new hardware, like 100 MHz processor chips. But don't look for any breakthroughs soon."

The Japanese are having some success with speech recognition, but that is to be expected, according to Anderson. "The Japanese language lends itself phonetically to speech recognition by computer. It has a very regular structure, with only about 60 different syllables, while English has hundreds, with much more complex patterns of connected consonants. With a precise language like theirs, the solutions are almost trivial." Well, almost.

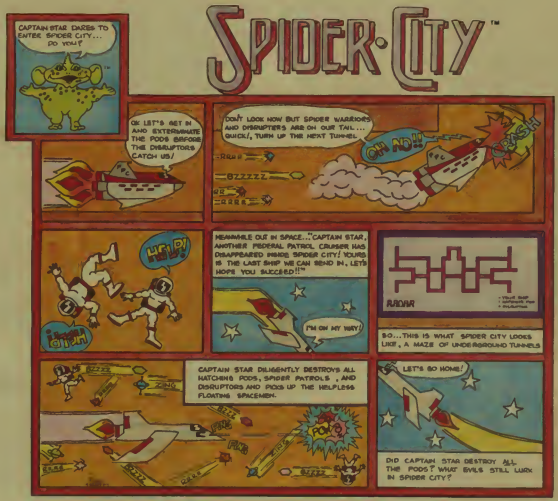
Developed For The Military

But the development of CompuCorder was guided by the need to reproduce speech, rather than to understand it. It was developed for the military for use in a battle game simulator. A computer could, for example, select pre-recorded messages for broadcast by walkie-talkie in response to changing conditions on the simulated battlefield. And CompuCorder can mimic anyone from a four-star general to the lowliest grunt.

There are other military applications, too: computerized air traffic control systems, cockpit instrument panels that vocally warn pilots of potential problems, and sophisticated tutoring machines with foreign language vocabularies stored on disk, to name just a few.

These are situations which demand a device that can do more than a traditional phoneme synthesizer. Speech output can be used effectively when machine operators are already overloaded with visual information, as is the case in the complex control room of a nuclear power station. When a large number of messages must be heard and understood the first time, the job calls for a high capacity random access stored speech device. A CompuCorder-equipped computer with 64K of memory and a 5mb hard disk can do such jobs as well as systems costing three times as much.

Because the capabilities of CompuCorder are greatly extended when used with a hard disk system, the manufacturer is promoting this device as a board-level component suitable for OEMs (Original Equipment Manufac-



© 1983 Sirius

Sirius™

For more information contact your local Sirius dealer or contact Sirius directly at 10364 Rockingham Drive, Sacramento, CA 95827 (916) 366-1195.

Atari 400, 800 & 1200 Cartridge
VIC-20 Cartridge

Game design by David Lubar. VIC-20 version programmed by Leonard Nelson. Atari versions programmed by Tom McWilliams. Package, program and audio visual © 1983 Sirius Software, Inc. Sacramento, California 95827. All rights reserved

Sirius and Spider City are trademarks of Sirius Software, Inc. Atari 400, 800 and 1200 are trademarks of Atari, Inc. VIC-20 is a trademark of Commodore Business Machines, Inc. Sirius is not affiliated with Atari or Commodore

CIRCLE 246 ON READER SERVICE CARD

Look what for your VIC 20.

Fast action. Complex strategies. Interesting characters. Superior sound effects. Multiple levels of play.

These are the things you want from your VIC 20™.

They're also the things you get from Tronix. From the people who brought you *Swarm!*, *Sidewinder* and *Galactic Blitz.*

And now, there's more.

Now Tronix brings you the same rewarding rapid-fire excitement in three brand-new game cartridges.

Each one is something different. Something new. But they all have one thing in common.

They're all designed to bring out the best in your VIC 20.

You shouldn't settle for anything less.

By Jimmy Huey

In a predatory world of killer worms, dragons, stalkers, pods and fly traps, the scorpion prowls the maze in search of sustenance. Frogs and their eggs mean survival to the scorpion. But they can also mean instant death! (Suggested retail $39.95)

we have in store

By
Thomas Kim.

Your helicopter gunship hovers over the enemy's military bases and missile emplacements. Your mission is to destroy them. But as the sky fills with smart bombs and anti-aircraft fire, there's less and less room for a wrong move! (Suggested retail $39.95)

By
Corey Ostman.

Deep in the earth, a fortune awaits. But the dark passageways are filled with peril as well as profit. Runaway boxcars. Crashing boulders. A claim jumper with murder in his eyes. Be careful. But be quick—oxygen is in short supply! (Suggested retail $39.95)

TRONIX™

8295 South La Cienega Blvd., Inglewood, CA 90301

Look for Tronix games in your nearest store. If you can't find them there, write to us.

VIC 20™ is a trademark of Commodore Electronics Ltd.

CIRCLE 274 ON READER SERVICE CARD

turers). It is designed for folks who want to sell voice store-and-forward systems, paging systems, automatic announcing machines, and the like, where the presence of a high speed, high density disk drive is a given. But CompuCorder presents possibilities for the imaginative computer hobbyist with floppy disk drives as well.

A Singing Adventure Game?

Consider, for example, the radio amateur who wants an automatic repeater system. Or the hacker who wants to spice up his latest Adventure game with the creak of an opening door, the roar of an erupting volcano, or the siren song of a beautiful Lorelei. How about a really intelligent telephone answering machine, or a burglar alarm that can dial police and yell for help, or perhaps an alarm clock that sounds off with an appropriate reminder statement, selected from a repertoire of dozens—or hundreds—of messages?

All of these applications are possible with CompuCorder, but some will tax the computer—and its programmer—to the limit. The biggest problem is the enormous appetite of the device for memory. I have been working with CompuCorder for a month now, and have found it to perform adequately, given the constraints of my memory and disk capacity.

Variable Sampling Rate

The user must decide before he installs CompuCorder how much memory to allocate as a speech buffer. Four headers supplied with the system control the bit rate of the device, and therefore the fidelity and length of each message. Sample rates run from 10K to 32K bits per second. The higher the sample rate, the better the speech quality becomes, but the more memory must be dedicated as a speech buffer.

The 32K rate reproduces sounds clear as you could want; the 10K rate is barely intelligible. For applications involving the telephone you would use the next-to-lowest rate, 16K bps, since Ma Bell limits her bandwidth anyway. Even so, in my 48K system, I was able to squeeze out only 19 seconds per message at this bit rate.

The sampling rate is optimized for human speech, so don't get the impression that this is a poor man's digital sound studio. Really high fidelity music would require a higher bit rate. That could easily be achieved by changing a resistor or two on the removable headers, but again, as the sampling rate goes up, the length of the sound segment drops.

I would have preferred that the resistor headers be switch-selectable; instead, the user must remove the board from the computer and manually plug in the header of his choice. The assumption, I suppose, is that a user will stick with one bit rate for most of his applications.

Microphone And Amplifier Required

CompuCorder requires a quality amplifier to reproduce accurately the full range of the vocal tract. If the high frequency sibilants (ssssss) don't come through, speech sounds a bit mushy. If the lows are cut off, speech sounds tinny. No amplifier is supplied with the system. This is not a major problem, though, since most people who have a computer probably have a high fidelity amp as well.

Two miniphone plugs on the board accept jacks for microphone input and amplifier output. Because the plugs are flush against the top of the board, I had a problem with cabling. My computer has a low-profile cabinet that would not close with cables connected to the CompuCorder. I went to the largest audio distributor in the city looking for right-angle miniphone plugs, but to no avail. When I am using the CompuCorder, therefore, I have to keep the lid of the computer open—an inelegant solution. I hope that on the next version of this board, Computalker Consultants will move the I/O plugs inboard.

CompuCorder requires a quality amplifier to reproduce accurately the full range of the vocal tract.

CompuCorder occupies two consecutive ports on the computer bus, one for status and the other for data. The board is set up initially to use ports AC and AD hex. A dip switch allows for changing the port assignments, but such a change also requires modifying the software slightly.

CP/M Software Supplied

While the well documented software supplied with CompuCorder is easy enough to use, it does require some working knowledge of assembly language. Although my assembly language skills have not significantly improved since I patched in my original Computalker software three years ago, I had no particular difficulties.

The software consists of five machine language programs written for the Intel 8080 microprocessor and will therefore work on Z80s and 8085s as well. Each is assembled for use with the CP/M operating system, but the author provided a way to move the code easily from one operating system to another.

The input/output routines are contained in "universal I/O modules" that can be inserted into the source code before assembly. Computalker makes available drop-in modules for close to a dozen popular 8080-based systems. This is a smart approach to software portability, and one which I hope will catch on. Not everyone has or wants CP/M! I prefer the North Star Disk Operating System to CP/M, and was able to convert the main demo program to be North Star-compatible without trouble.

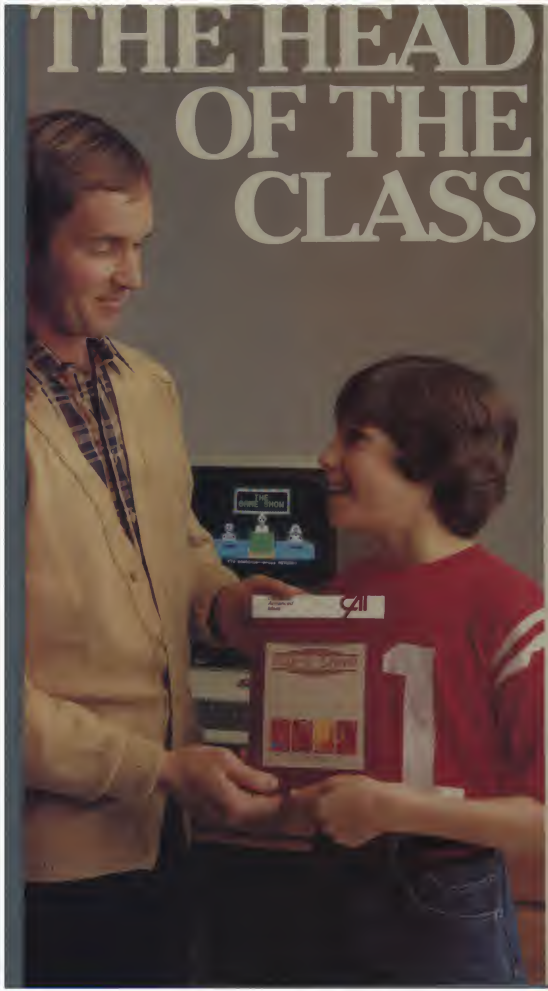
The main demonstration program, Corder, operates like a tape recorder. By typing R, you can record a speech sample. Since the program automatically allocates memory, it will not crash the computer if you talk too long. If you want to say only a word or two, you can type D for Done. Typing a P will play back the speech as often as you like.

Two other demo programs, Record and Speak, store sounds in diskfiles and retrieve them. Because CP/M accepts concatenated commands, creating and saving a speech file is as simple as typing RECORD MESSAGE, then speaking into the microphone. To retrieve the speech, the command is SPEAK MESSAGE. Because the diskfiles are potentially quite long, there may be a significant delay between typing the command and having it processed. My single density Shugart drives take as long as 15 seconds to load the Speak program and the Message file it needs. A Winchester disk would speed up the process considerably.

Computalker also provides subroutines for recording and speaking that can be used with any programming language that can call a machine language subroutine. I had no particular difficulty linking these programs to Basic, but it did require reassembling the subroutines to an unused corner of memory. I also had to reserve some space for a speech data buffer. A 48K system with an operating system, Basic, CompuCorder driver software and a speech buffer doesn't leave much room for anything else, so the Basic programs I wrote were necessarily very limited.

Any serious executive program would have to be written in assembly language and shoehorned into whatever space was available. This may or may not be a serious flaw, depending on the application at hand and the skills of the programmer. Come to think of it, my Computalker speech synthesizer uses lots of memory also: 22K just for the

THE HEAD OF THE CLASS



Give your child the thinking tools that stand in a class by themselves: programs for your home from Computer-Advanced Ideas.

For The Fun Of It

As professional educators and programmers we've been proving for over a decade that motivated learners do best. Featuring full-color graphics, our animated learning games are fun. They talk like a friend, play like a teammate and teach like a tutor. And they stimulate eager young minds.

Partners In Learning

CAI programs come with a library of knowledge for your child to explore. But that's just the beginning. They also feature a unique authoring system that lets you create lessons on any subject, tailoring the program to your child's needs. No knowledge of computers is required. Our programs make sense to *people* — from 4 to 94 — and grow right along with your child.

A Success In Schools

Over 1800 school districts have chosen CAI programs to teach essential vocabulary and logic skills in a full range of topics. Our products get recognition — because they work.

Head Start

Your child's future begins with opportunities you create at home. Choosing resources that are stimulating, challenging and fun can be one of the best decisions you make. Ask your computer retailer for a demonstration of CAI programs and see for yourself how enjoyable a good education can be.

Computer Advanced Ideas

CAI

Bringing Ideas Home

1442A Walnut Street, Suite 341
Berkeley, CA 94709 (415) 526-9100

For the Apple II / IIe

CIRCLE 141 ON READER SERVICE CARD

Sakata COLOR MONITORS

... we promise performance

NOW you can obtain the finest quality line of CRT DISPLAY MONITORS at prices far below competition, (if there is any) BUT, with unsurpassed quality found in more expensive CRT MONITORS. Illustrated 13" **COLOR** Model SC-300 is super high resolution—RGB video input—with every quality feature you d expect and demand; compatible with IBM, APPLE, ATARI 800, NEC and other fine personal, popular computers. The modern design will sell itself on sight and the splendid performance will meet your most discriminating requirements.
Also available: Model SG-1000 . . . 12" monochrome, high resolution CRT MONITOR. Model SC-100 . . . 13" composite **COLOR** CRT MONITOR. Model SC-200 . . . 13" RGB high resolution **COLOR** CRT MONITOR.

SAKATA CRT MONITORS are available wherever personal computers are sold . . . or, write for technical, illustrated literature and prices.

SAKATA SC-300 COMPATIBILITY CHART

COMPUTER	SC-300 COLOR
APPLE II	✔
APPLE III	✔
ATARI 800	
COMMODORE 64	
IBM-PC	✔
NEC-PC	✔
OSBORNE	
TI 99	
VIC-20	

NOTE: ON CERTAIN COMPUTERS ADAPTER CABLE REQUIRED.

SAKATA U.S.A. CORPORATION
651 Bonnie Lane
Elk Grove Village, IL 60007
(312) 593-3211/800-323-6647 (outside Illinois)

Sakata

"SAKATA . . . serving industry worldwide . . . since 1896"

CIRCLE 241 ON READER SERVICE CARD

driver software and speech buffer in its most "intelligent" mode.

System Human–Engineered

I found this board extremely easy to use. The software worked on the first try, and the microphone (which the user must supply) is a natural as an input device. More important, using a mike eliminates the need to generate words or phonemes (pieces of words) through the software. Gone is the awkward build-a-word approach that required the programmer to work double duty as a phonetician. Now all you have to do is talk.

One problem with using a mike near the computer is the proximity of external, unwanted noise, both mechanical and electrical. The blower fan on the computer registered as white noise. My magnetic mike, sensitive to electrical fields, picked up hum near Oric's power transformer. A friend's condensor mike

Using a mike eliminates the need to generate words or phonemes (pieces of words) through software.

was less sensitive, but didn't sound as good. I achieved best results by crawling under the far end of the computer table, cupping my hand around the mike and my mouth to acoustically seal them, and speaking softly yet distinctly. It was hard to give keyboard commands that way, but the sound quality was worth it. Different types of microphones would no doubt require other recording techniques.

In all, I am pleased with the performance of the board, and would not hesitate to recommend it to anyone who understands its limitations. Its full potential will not be realized unless you are willing to link it to a Winchester disk or perhaps a 5mb memory card. For some folks, that isn't a problem. For others like myself, well, we can just keep waiting for those prices to fall . . .

The Computalker people appear to be more interested in research and development than in marketing, so your local dealer may not be aware of this remarkable board. The Computalker staff will take direct product orders. I have found through experience that they support their customers after the sale with impressive expertise, courtesy, and prompt response. Their address is 1730 21st St., Santa Monica, CA 90404. (213) 828-6546. □

CIRCLE 401 ON READER SERVICE CARD

Imagine the TRS-80® Color Computer Combined with the Educational Ingenuity Of Children's Computer Workshop

Come September, You Won't Have to Imagine. Radio Shack proudly announces a new addition to our line of educational software from Children's Computer Workshop. CCW is an activity of Children's Television Workshop—the people who brought you Sesame Street™, The Electric Company™ and 3-2-1 Contact™. CCW has designed this wholesome software to encourage active learning with constructive play.

Play-With-Language. This exceptional package consists of three word and reading activities for first and second graders. The included diskette is for use on our 32K TRS-80 Color Computer with joysticks. Includes teacher's guide, board games, posters, spirit masters and activity cards.

Sight Words and New Vocabulary. In *Picture Place!*, children select a scene, choose from a large list of sight words, and turn the words into images to create a colorful picture.

Word Families. In *Roll-A-Word*, children master rhyming words. Exciting visuals are combined with word families, encouraging creation of sentences, poems and stories.

Reading Comprehension. In *Bagasaurus*, children collect words and pictures by answering questions to create amusing stories.

The Learning Manager. This special editor on the disk permits the teacher to create individualized lessons and exercises. No programming knowledge is required.

Complete Support. We have 24 Regional Educational Coordinators across the country to inform you about Play-With-Language and our other educational software.

For the name of your Regional Educational Coordinator, call 800-433-5682, toll-free. In Texas, call 800-772-8538.

Radio Shack®
The Name in Classroom Computing
A DIVISION OF TANDY CORPORATION

CIRCLE 226 ON READER SERVICE CARD

FRANKLIN'S BAKER'S DOZEN!

13 Good Reasons to Buy the ACE 1200

1. Apple® II-compatible
2. CP/M®-compatible
3. 128K of RAM
4. Built-in floppy disk drive
5. Disk controller
6. 80 column card
7. Serial interface
8. Parallel interface
9. Upper and lower case
10. VisiCalc® keys
11. Cursor control pad
12. Numeric pad
13. Auto repeat keys

Extras can more than double the price of your personal computer. Not so with the Franklin ACE 1200. It's the professional computer system that includes the extras—and a long list of exclusive Franklin features that make it the most extraordinary value on the market today.

The ACE 1200 has everything you'll need to add a color or black and white monitor, modem, printer, back-up disk drive and other accessories. You can choose from the enormous selection of Apple programs and peripherals because the ACE 1200 is hardware- and software-compatible with the Apple II. And, with the built-in CP/M card, you can run both Apple II and CP/M programs. Franklin's CP/M operates three times as fast as many competing systems, drastically reducing processing time for most business applications.

The Franklin ACE 1200—the most extraordinary value on the market today. Call or write today for the name of your local authorized Franklin dealer.

Franklin ACE is a trademark of Franklin Computer Corporation.
Apple is a registered trademark of Apple Computer Inc.
CP/M is a registered trademark of Digital Research Inc.
VisiCalc is a registered trademark of Visi Corp.

FRANKLIN
COMPUTER CORPORATION

2138 Route 38, Cherry Hill, NJ 08002 609-482-5900 Telex: 837-385

CIRCLE 168 ON READER SERVICE CARD

creative computing software evaluation

Sound Software

Audex

Dale Archibald

I have to admit, my previous exposure to sounds through the 2" Apple speaker has been limited. That is, I have heard guns go off, bombs explode, lasers zap, swords clang, that sort of thing. For the most part I have been on the receiving end, able to emit only a plaintive beep now and again.

Not any more. Friends, I have heard the light. That is, I have heard how *Audex* allows the Apple user to manipulate sound, and it is amazing.

I won't take any more backtalk from my Apple. Instead, I'll snip sounds here and there, take a tuck in a tenor, falsify a falsetto. I'll tape record a hammer and rapidly repeat it to sound like a machine gun, or stretch it and expand it until it's an artillery shell arriving.

Audex, by Pete Kosel, is furnished with a 65-page instruction booklet. The instructions are clear, concise, and well illustrated. In fact, this is a much better book than those which come with some much more expensive programs. Happily, the program is a good match for it.

Four Sections

There are four sections to the program, each based upon a complete tutorial approach in the booklet. First what a procedure does is described, then the user is taken step-by-step through the procedure. Help screens are abundant throughout.

Draw-A-Sound is the first program. It allows you to draw a sound pattern by individual sound pulse on the monitor screen, then save, transfer, modify, blend, and shape these patterns. In effect, this adds some of the options of a good graphics package to a sound program.

You haven't lived until you have heard an Apple crooning part of "Lydia the Tattooed Lady."

Part of Draw-A-Sound is Analysis/Adjustment. This lets you modify any part of entire segments of a pulse pattern. Using this, you can lower or increase pitch, increase or decrease pulse length, or make large or small differences in the contrast between pulses.

Excerpt-A-Sound, third utility on the disk, is my favorite. It allows you simply to record audio onto a tape recorder, then transfer it into the Apple through the cassette port. It excerpts that audio as a sound pulse, and lets you save it.

I'll admit, the sound is badly distorted, but you haven't lived until you have heard an Apple crooning part of "Lydia the Tattooed Lady" in Groucho's voice. ("She has eyes that folks adore so, and a torso, even more so.")

Next, Build-A-Sound can examine the individual files in detail, connect short patterns into longer ones as tables, and combine and edit pulses and tables.

Last, the Audio Opcodes give you a selection of six minor utilities. These let you mix all the sounds you have created

Dale Archibald, 1817 Third Ave. N., Minneapolis, MN 55405.

creative computing
SOFTWARE PROFILE

Name: Audex
Type: Sound effects generator
System: 48K Apple II
Format: Disk
Language: Assembly
Summary: Low-priced but amazingly complete
Price: $29.95
Manufacturer:
Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827

with the above major utilities into your own programs.

Sound Ideas

As I understand the explanation of sound generation in the *Audex* instruction book, this program stores the length of time a sound wave crosses from zero to zero in increments of 50 microseconds (millionths of a second) from 50 to 12,750 microseconds. See Figure 1.

The digitized sounds are played back through the tiny Apple speaker or a separate amplifier as a series of clicks.

Digital recordings work more or less the same way, although with tremendous fidelity. For example, an audio engineer can re-record an old, scratchy record digitally, then set the equipment to remove all the frequencies that make up the scratches.

A digital tape recorder that costs over $150,000 slices each second of sound into 50,000 parts—20 times smaller than *Audex* can. Its fidelity, naturally, is much higher than that of the Apple.

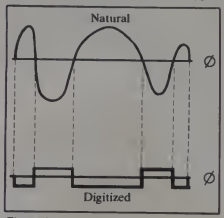


Figure 1.

Nevertheless, the *Audex* can do what a digital recorder does, even if only on a small scale.

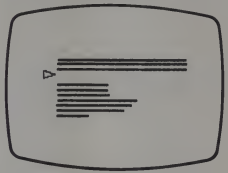
Pulses are the basic building blocks of *Audex*. A pulse is a delay of from 50 to 255*50 microseconds followed by a click.

In the *Audex* vocabulary, 255 of these pulses make a sound, 255 sounds can be in a soundset, and you can blend these onto a disk.

When you select the DRAW NEW SOUND or REDRAW A SOUND ALREADY DRAWN from the Draw-A-Sound menu, you can select from either of the above, save or load soundsets to tinker with, or move into other options.

If you decide to draw a new sound, on the left side of the screen will appear an arrowhead. This can be moved from pulse to pulse (and silence can be a pulse) by hitting N back with L. If you put it on autocursor, C, the arrowhead pointer will continue moving in the direction you select until you hit another key.

You can Enter a pulse by length from 1 to 255, or use the right and left arrow keys to adjust the length. When you use the autocursor and hit N, the arrowhead will continue to add pulses of the previous value until either you hit another key to stop it or it reaches pulse 255. In



Audex pulses with cursor arrow.

other words, should you enter a pulse of value 40 on autocursor, then hit N, the arrow will tick down the screen adding pulse after pulse of 40.

At the bottom of the screen is a listing of which pulse the cursor is on, the sound number you are working on, and the value of the pulse designated. By hitting K you get a help screen.

One weakness of the program is that you can't just enter the pulse to which you want the arrowhead to move. You must use either L or N with the autocursor. Then you must wait while the cursor ticks its steady way up and down the screen. That can take a while for a sound of 255 pulses.

When you have finished "drawing" a sound, you can select the second part of the utility, Analysis/Adjustment. This lets you modify entire segments of the sound at one time. You select the range of pulses you want to adjust.

You can lengthen the average pulse and lower its pitch, or reduce the average and raise the pitch. You might adjust the percent of drift to set the shift of the pitch. (A long block of pulses set with a 100% drift could sound like a bomb dropping.)

Finally, the contrast adjustment contrasts each pulse with its neighbor; high contrast makes jagged pulse arrangements, while zero contrast looks and sounds smoother.

The lengthier the sound you are working upon, the longer it takes to change all the figures when you make an adjustment. After an adjustment is made, you are shown the chart of the sound. Hit H, and you hear what it sounds like.

You can save the sound to disk whenever you are ready, redraw sounds, hear the sounds you have already drawn, delete individual sounds from memory, even clear all sounds from memory. Each of the above is part of the Draw-A-Sound menu.

Excerpt-A-Sound

With the Excerpt-A-Sound utility, you can digitize tape recordings. Simply play them into the Apple cassette port, then select the segments you want to save. You can excerpt any selected portion you wish up to 255 pulses long. Later, you can edit these sounds on a pulse-by-pulse basis using the Draw-A-Sound utility.

Another neat trick is to attach a microphone to the tape recorder, then select Load Audio from Cassette from the Excerpt-A-Sound menu.

Hold the little tab on the upper left side of the cassette in while you press the record and play keys at the same time. With many cassette recorders, you will then be able to speak directly into the memory of the Apple. Note: the Heartape utility also allows you to do this.

Raw sound is organized into 28 segments of 256 bytes each, but only 128 bytes can be displayed at one time. By running through the segment in memory, you can pick the page in memory in which that segment is located.

Move to that page, and you can adjust the length of the sound you want to excerpt, up to 255 pulses. As an example, you might have a hammer pounding that you want to change into a machine gun through repetition, but you don't want the dog barking in the background.

You might have a hammer pounding that you want to change into a machine gun through repetition.

Looking at the pulses onscreen is rather like looking at seismograph printouts: even on the left, extending to the right. By moving your starting cursor to the beginning of the hammer bang, then adjusting the finishing cursor to the end, you exclude the unhappy pooch. As you are adjusting the pointers, you can hit H to hear what the sound is within them.

When satisfied, save that soundset to disk.

Build-A-Sound

Build-A-Sound lets you connect the sounds you have digitized into a Jabber table, then combine and edit the

COMPUTERS: A RENAISSANCE IN CREATIVITY.

During each age of man, the discovery of new technology has given artists greater freedom to create. Moveable type and printing presses gave birth to the novel, the photographic process ushered in motion pictures. Now, computers are allowing artistic spirits to soar as never before. Artists are creating new visions, musicians are creating new sounds, writers are turning their thoughts into text almost as fast as they can think them. All through computers. **Genesis II–Creation and Recreation with Computers**, by Dale Peterson, thoroughly explores the computer revolution and how artists are turning it into a creative revolution. It's the kind of reading that can help free the artist in any computer owner's soul. And it's only from Reston.

Reston Publishing Company
A Prentice-Hall Company
11480 Sunset Hills Rd. Reston, VA 22090
Available at your local bookstore
and computer retailer or call us at (800) 336-0338.

CIRCLE 229 ON READER SERVICE CARD

A SECRET IBM WOULD LIKE TO KEEP.

THE ADVANCED PERSONAL COMPUTER BY NEC® OFFERS THE ADVANTAGE OF THESE BUILT-IN GRAPHICS BENEFITS:

- *Optional 7220 high performance graphics controller*
- *Intergrated hard disk and graphics display controller*
- *Asynchronous and synchronous for communications flexibility*
- *User definable character sets allow definition and creation of unlimited symbols*
- *Double sided-double density 8" floppy technology for 1 megabyte of storage per drive*
- *5½" Winchester technology hard disk offers up to 20 megabytes of storage*
- *Programmable function keys offer 22 dual mode keys and are shiftable to 44*
- *Screen resolution (color or monochrome) 640 × 475 for 1024 × 1024 addressable area with scrollable window displaying four (4) partitions simultaneously*
- *One million addressable pixels of display memory*
- *Graphics controller does not sacrifice any user memory because it has its own dedicated memory*
- *Expandable 128K to 640K of user RAM*
- *Supports CPM-86®, MS-DOS® and P-SYSTEM®*
- *Melody processor*
- *Battery backed RAM of memory*
- *Built in clock and calendar*
- *Several NEC® supported software packages are available. Vertical and application development packages are available from third party sources*
- *Engineering and designer software programs available*

Inquire about this multi-purpose BUSINESS AND COMMUNICATIONS TOOL today. Learn why the APC SECRET IS NOT BEING KEPT AND HOW YOU CAN GAIN ADVERTISING AND SUPPORT THROUGH THE DDD AUTHORIZED DEALER PROGRAM

DDD HAS THE PACKAGE TO GIVE YOUR BUSINESS THE COMPETITIVE EDGE.

- *Turnkey service from computer to repair*
- *Financial alternatives*
- *Toll free end-user hot line for support and repair*
- *Toll free dealer hot line for your support*
- *Training and dealer support programs*
- *Co-operative advertising in major business and professional publications*
- *Reliable service that is unparalleled in the computer industry*

APC is a product of NEC Information Systems, Inc.

CONTACT

Dallas 214/263-1277
8204 Elmbrook Dr., Suite 300 A
Dallas, Texas 75247

Denver 303/296-3807
2500 Curtis Street, Suite 102
Denver, Colorado 80205

Data Design & Development

"WE CAN GIVE YOU THE COMPETITIVE EDGE"

CIRCLE 110 ON READER SERVICE CARD

soundsets and tables. For example, you might want the dog's bark to be repeated four times, then have the sound of the hammer going off in a machine gun burst 10 times.

The Audio Opcodes section has several machine language programs to install in your own programs. These include Squalk, to play sounds from a soundset; Jabber, a high speed multisqualker;

As your cassette player belts out a song through an auxiliary speaker, the graphic on the TV or monitor will keep the beat.

Heartape, that transfers the signal of the cassette input port directly to the speaker until the appropriate key is pressed.

It also offers Audio-in, which loads sound from the cassette port into memory in 256-byte pages; Playback, which can take data from memory and play them back through the speaker as if they were sounds; and Tone, which generates single high-precision tones.

I wish there were some way the user could get printouts of the various screen patterns. These might be helpful to experimenters.

I also found it was necessary to blend short sounds rather than use long ones. A word like "three" takes up a great many pulses. As the manual explains, the program is for sound effects rather than voice.

Overall, however, I would have to say that this is a very interesting and complete program for anyone interested in playing with sound. For the price, it is an amazing value.

Sight 'n Sound

If it were only possible—and I'm sure some bright programmer will uncover a way—to blend a sound utility with this one . . . . As it stands, *Sight 'n Sound* by Ray Balbes is one of the most unusual utilities I have ever run across.

Basically, it is designed to animate a specific type of Apple graphic in time to voice or music from a separate sound source. That is, as your cassette player belts out a song through an auxiliary speaker, the graphic on the TV or monitor will keep the beat.

I saw something like this at a word processing trade show once. At the IBM booth was a large TV screen with a cartoon of a man. He would look left, right, or straight ahead, gesture, and move his mouth.

Hovering in the background, I'm sure, was an IBM employee with a microphone who might say "You, madam, in the gray suit. Aren't you impressed with the way our new Displaywriter operates?" The little cartoon would move its mouth in time to this, the woman in the gray suit would stutter, and the crowd would chuckle appreciatively.

Sight 'n Sound could do the same sort of thing—that is, move the mouth—using an Apple. According to the memory map in its 22-page instruction booklet, it does this by taking up memory from hex 800 to 8000.

This area includes the main *Sight 'n Sound* program, primary and secondary hi-res screens, and other information.

It is a copyable program, although if you want a DOS 3.3 copy you will have to Muffin the 3.2 version.

Creative Computing SOFTWARE PROFILE

Name: Sight 'n Sound
Type: Graphic/sound utility
System: 48K Apple II; cassette recorder or stereo required
Format: Disk
Language: Basic and assembly
Summary: Animate your programs to music
Price: $26.95
Manufacturer:
Compugraphics Software
6 White Plains Dr.
St. Louis, MO 63017

Kaleidoscope

There are two formats for *Sight 'n Sound* shows. One is a kaleidoscope using shapes stored on the disk. You can use a standard drawing program to make the shape, then save it under an SH designation. Any of nine shapes can be saved and inserted into the kaleidoscope.

The program divides the screen into four sections. Enter the coordinates at which the four shapes should begin, and the color in which the shapes should be drawn.

When you begin playing music or voice through the Apple, the frequency makes the shapes move away from the center in the appropriate direction. The higher the frequency, the farther the movement. Treble will affect movement, but volume has nothing to do with it.

You can select five parameters for the kaleidoscope. First is the length of time the program monitors frequencies before putting a display on the screen. Higher numbers give greater displacement but less synchronization.

Second is scale. Each increase or decrease of 1 doubles or halves the displacement.

Next is density. This adjusts the number of complete shapes that can be on screen at any time.

There is also a wraparound option for use when the frequencies shoot the shapes offscreen; and the kaleidoscope option. If this is ON you can use the kaleidoscope effect, and also change shapes.

A background for the kaleidoscope can be added by LOADing, DRAWing, or HPLOTing to a secondary screen. This is explained in a sample progam that is included in the instructions.

Line Format

It is the line format section of the program that interests me, however. Set the kaleidoscope option to OFF, and the line format begins to operate.

With this one, you enter a series of points, each with its own direction (or instructions to remain stationary) and color. Each point automatically connects to the previous one with a line.

When you play sound through the machine, each point reacts to its individual instructions. The first three parameters used in the kaleidoscope section are also here in effect. Each point stands still, or moves in the direction you have chosen for it and st-r-e-t-c-h-es the line with it.

I plotted the points for a pair of lips, for example. When I played music through it, the lips moved in time.

Sight 'n Sound design line with no sound.

(Once again, I selected Groucho's "Lydia The Tattooed Lady" as my subject matter. "For two bits she will do a mazurka in jazz, with a view of Grand Canyon that nobody has . . . And on a clear day, you can see Alcatraz. You can learn a lot from Lydia.")

The menu allows you to load or save data. It will run the data in memory; most important it will allow you to create new data.

Get Omni quality for as little as $1.99... even if all you want is a 10 pack.

Call toll-free for great savings on Omni's complete line of 5¼" and 8" premium disks. Each is certified error-free at a minimum of twice the error threshold of your system. Each is rated for more than 12 million passes without disk-related errors or significant wear. And each is precision fabricated to exceed all ANSI specifications with such standard features as reinforced hub rings and Tyvec sleeves. Get next day shipment and an unconditional, no hassle money-back guarantee.

ARCHIVE

152 Boston Turnpike
Shrewsbury, MA 01545
(800) 343-0314;
In Mass:
(617) 756-2960

...ow;
...mplete line
... 8" and 5¼"
...ks, including
... TPI and
...ecial format.

Call toll free (800) 343-0314
In Mass: (617) 756-2960

Call if you're not sure which disk is compatible with your system. Call for prices on 96 tpi and special formats. We offer an unconditional money-back warranty. We're here to help.

Be sure to indicate system/drive name and model # below.

	5¼" disks Cost per 10 pack	Quantity	8" disks Cost per 10 pack	Quantity	Total Cost
Single side/single density	$19.90		$24.90		$
Single side/double density	$23.90		$31.90		$
Double side/single density			$34.90		$
Double side/double density	$37.50		$37.50		$
Flip-Floppy reversible	$39.90		$39.90		$
Plastic library case (an item of little storage box)	$ 2.99		$ 3.49		$
Shipping and handling ($5.50 min @ pack, 40¢ additional 5¼" packs, $1.50 ea...)					$
5% sales tax (Mass only)					$
				Total	$

☐ Check ☐ COD ☐ MasterCard ☐ VISA

Card # _____ Exp _____ Name _____

System/drive model # _____ Address _____

Tel _____

CIRCLE 114 ON READER SERVICE CARD

Sight 'n Sound design line with sound. Ends are stationary: top line moves up; bottom line moves down.

You can display the various points in memory at any time in text. This gives you the hi-res X,Y coordinates, the direction the point will move, and the color. The color is determined by the following point. That is, if point 3 is blue, the line from point 2 to point 3 will be blue.

It is possible to plot a color black1 or black2 which will not be visible when the program is operating.

Improvements

Sight 'n Sound needs stronger error-trapping, however. You can work on only one shape at a time. If, when you are finished with the shape, you accidentally hit number 4, Create New Data, instead of 3, Run Data in Memory, you lose everything you have created. Save the data on disk, and to add on more points you are forced to insert each one singly.

Your kaleidoscopic shape could be the guest of honor's name, age, or whatever.

There should be an Add Points on the menu along with the Change, Insert, and Delete a Point. I would like to be able to see what a shape looks like, then be able to jump back to continue working on it. It would also be handy to be able to print out the data in memory.

Even with its flaws, this is a novel program that could be useful for commercial applications of some kind. You might also enjoy trotting it out at a birthday party, for example. Your kaleidoscopic shape could be the guest of honor's name, age, or whatever.

Like all good utilities, *Sight 'n Sound* offers a great deal of scope for the user's imagination.

If You Liked Donkey Kong, You'll Love JUMPMAN!

JUMPMAN. THE COMPUTER ACTION GAME.

If you liked jumping over barrels and climbing ladders to save damsels in distress, you'll love the blazing excitement of JUMPMAN. Your incredible speed and jet boosters let you leap from girder to girder, scale ladders and ropes to disarm the bombs planted in Jupiter Headquarters. But it's not easy and there are thirty levels of difficulty. You'll have to dodge missiles, killer robots, flying saucers, crumbling girders and vanishing escape Routes. In the heat of battle, JUMPMAN must keep a cool head.

epyx

The Award-Winning Computer Games

Epyx, 1043 Kiel Court, Sunnyvale, California 94086

CIRCLE 176 ON READER SERVICE CARD

JUMPMAN Designed by Randy Glover.
DONKEY KONG is a trademark of Nintendo of America Inc.

A deceptively simple solution to your word processing dilemma.

If you're serious about word processing on your Apple®IIe, you may be bewildered by the sheer number of programs available. And a tad perplexed by their claims and promises. After all, a glamorous package that says "easy to use," may not even be easy to open.

The dilemma is real. And Quark is happy to provide the solution.

A proven program for serious word processing.

Quark's new Word Juggler IIe turns your computer into a dedicated word processor. You get the extraordinary ease of use, sophisticated capabilities and straightforward documentation that make our original Word Juggler a best seller on the Apple III.

For example, there's virtually nothing to memorize. Because principal editing functions are identified on a unique keyboard template — and nineteen, easy-to-install, replacement keycaps.

Changing keys is quick and simple, too. Just slide our special keycap remover over the key — twist — and pull. Your new keycaps can be in place in less than two minutes.

A flexible tool to increase your productivity.

But don't be deceived by Word Juggler IIe's disarming simplicity. The program packs the powerful features you need to quickly perform the most complex editing tasks.

Characters, words, even entire paragraphs can be deleted with a single keystroke. There are search and replace keys. Block move and copy keys. And you always have instant control over page length, margins and any other formatting parameters.

Document display and print out are easy, also. One keystroke displays your document on the screen. Another prints it. And whether

Word Juggler™ IIe.

you need to print only specific pages, multiple copies, or even documents too large to fit in memory, Word Juggler IIe can easily accommodate you.

A clever way to foil Mr. Murphy.

Even the best of us occasionally forgets when "i" does not come before "e" — and even the most agile fingers can press the wrong key. So you should also give serious consideration to Quark's new Lexicheck™ IIe — a spelling checker with a highly compressed, 50,000 word dictionary.

Accessed from within the word processor, this program lets you virtually eliminate typographical errors and common misspellings. Lexicheck IIe will scan your document at up to 8,000 wpm — then highlight, in context, the first occurrence of any word it does not recognize.

If the word is correct, as in the case of industry jargon or abbreviations, you can simply add it to your personal dictionary. If the word is actually misspelled, you can swiftly correct it.

Apple® is a registered trademark of Apple Computer, Inc.
Quark, Word Juggler and Lexicheck are trademarks of Quark, Incorporated, Denver, Colorado.

A lot more.

These are only some of the ways Word Juggler IIe and Lexicheck IIe can help solve your word processing dilemma. Your Quark dealer has even more details, as well as complete information on our line of office automation tools for the Apple III.

Ask for a demonstration today.

Quark INCORPORATED
Office Automation Tools
2525 West Evans Avenue
Suite 220
Denver, CO 80219

Word Juggler IIe $239 sug. U.S. retail price
Lexicheck IIe $189 sug. U.S. retail price

CIRCLE 249 ON READER SERVICE CARD

Broderbund Presents An Arcade Adventure

A.E.

A.E.'s, produced by an industrial giant to control pollution on Earth have stopped quietly control. They attack relentlessly in waves from his fury. Your mission: to drive them farther and farther into space. With each successful defense, you are transported to another, then another more distant 3-D environment. With these progressively difficult scenes, A.E. delivers the ultimate challenge.

Never has a computer game required such precision, such timing. You'll be hooked from the very start. A.E. (it means stingray in Japanese) provides such enduring satisfaction on every level that it will become your personal standard of excellence in computer gaming.

Now available for Apple II, II+, IIe and Atari 400/800†

†Apple and Atari are registered trademarks of Apple Computer, Inc. and Atari, Inc. respectively.

Broderbund Software

Broderbund Software, Inc. 1938 Fourth Street San Rafael, CA 94901 (415) 456-6424

CIRCLE 123 ON READER SERVICE CARD

creative computing software evaluation

Making Music With Your Vic

Shelby Goldstein

Whether you're a music pro, a computer whiz, or an amateur dabbling for the first time in either field, you can make great music with the Commodore Vic 20. The Vic comes with four-voice, music making capability built in, and now there are three software programs available that can help you take advantage of that capability.

Piper

Piper from Abacus Software enables you to compose and play one-voice music with ease. Music is entered into the computer much as you would write a Basic program, although you need not be a programmer to use *Piper*.

Notes are indicated by their letter names, which makes it quick and easy. For example, the note C is played simply by typing C, not POKE 36876,195. Note values are specified by adding a number after the letter name. C/4, for example, indicates the note C played as a quarter note. To enter a half note C, you type C/2.

The Vic has a five-octave range. With *Piper*, you indicate the octave that you desire by inserting its number between the letter name and the note value. For example, a quarter note C in the fifth octave would read C5/4.

Piper *is easy to use and fast.*

Sharps or flats are added by entering their sign next to the letter name C#5/4. Rests are inserted by typing R. A quarter note rest, for example, would read R/4.

The following is a sample program that plays a D major scale:

```
1 RUN "<CLR>"
10 TEO
20 D4/4 E4/4 F#4/4 G4/4 A5/4 B5/4 C#5/4 D5/4
30 END
```

Line 10 sets the tempo, which can vary from 15 to 255. In addition, phrases can be repeated, and volume can be controlled. You can also display the lyrics as the music moves along. *Piper* even allows you to control certain elements while the music is playing. For example, you can instruct the computer to skip a subroutine, repeat it, or go to a different subroutine.

As you enter music into the computer, you can play it back immediately to check yourself, or you can enter the

creative computing
SOFTWARE PROFILE

Name: Piper

Type: Music composer

System: 5K Vic 20

Format: Cassette, disk

Language: Hybrid

Summary: Quick and easy to use, for a single voice.

Price: $19.95 cassette, $22.95 disk

Manufacturer:
Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510
(616) 241-5510

Shelby Goldstein, 328 E. 66th St., Apt. #2, New York, NY 10021.

entire composition and then play back and edit. Music can also be saved to disk or tape for replaying at a later time.

Piper is easy to use and fast. Keep in mind, though, that you can enter and play only one voice at a time.

Vic Music Composer

If you need a program that enables you to compose two- or three-voice music and play all voices simultaneously, then you should consider *Vic Music Composer* from Thorn EMI.

Vic Music Composer by Martin G. Taylor allows you to play as many as three voices simultaneously. However, you can enter only one voice of music at a time.

As with *Piper*, you can stop at any time and edit or play back to check yourself and edit. Once you finish one voice of your composition, you can play it back, add a second or third voice, and save it all on tape or disk.

Music is entered into the computer by placing notes on a graphic representation of a musical staff. You first choose the key, time signature, and voice in which you wish to compose. You then use cursor controls to select the note value and move it to the chosen place on the staff. Rests are located in the same manner. Once a note is in place, a sharp or flat can be added by pressing certain keys. Bar lines are inserted by simply pressing the B key.

While not as fast as *Piper*, this method of entering music has a couple of advantages. Using it, a non-musician can create music on the Vic simply by copying notes from sheet music and putting them in their proper places on the staff. In addition, this method of composing is more common among professional musicians, who tend to think of and write music as notes on a staff rather than as letter names.

Other features of *Vic Music Composer* include ease of editing with cursor-controlled deletion and insertion. Also, volume can be changed within the piece as often as you wish simply by entering a number from 1 to 6 beneath the staff. A variety of tempos can be used by choosing various numbers from 1 to 9.

As you play back your composition, you can choose which voice you wish to have displayed. Unfortunately, you can display only one voice at a time even though you may be hearing two or three. There also doesn't seem to be a way to listen to only one voice if you have composed a two- or three-voice piece; you must always listen to all three.

One other disturbing omission is the ability to hear repeated attacks of the same tone. For example, if you enter four quarter note Gs, they will be heard as one whole note G. This can change the sound and feel of many tunes significantly.

In spite of these disadvantages, *Vic Music Composer* is a superb program. It allows you to compose, store, and play back as many as three voices simultaneously, using standard music notation. Entering and editing music is fairly fast

creative computing
SOFTWARE PROFILE

Name: Vic Music Composer

Type: Music composer

System: 16K Vic 20

Format: Cartridge

Language: Machine

Summary: Some trade-offs, but three-voice capability.

Price: $39.95

Manufacturer:
Thorn EMI
1370 Ave. of the Americas
New York, NY 10019
(212) 977-8990

COMSTAR

INTRODUCING SOMETHING NEW AND USEFUL
THE ALOG PAGEWRITER
FOR ATARI 800/400

A Fast, Simple, Easy To Use and Inexpensive
WORD PROCESSOR

- Average Time To Master — 5 min
- Full Page Display Guide
- Help Screen With Command Summary
- Uses Standard ATARI Editing Keys
- Visible Adjustable Margins
- Stores Ten Pages on a Disc with No Swapping

Other Features include:
Centering of Text • Set Tabs • Right Justification • Easy Text Insertion • Accepts Printer Control Commands

Requires at least 32k of memory and a 80 column printer.

List price, 39.95. Introductory price **$34.00**. Manual included.

DEALER INQUIRIES INVITED

COMSTAR P.O. BOX 1730 GOLETA, CA 93116 (805) 964-4660

AIR* SHIPPING WITHIN 2 DAYS

ATARI

48K RAM (FOR 400)	$115
64K RAM (FOR 400)	135
ALIEN GROUP VOICE BOX (D.T)	119
S.A.M. (D) 8K	48
BIT 3 80 COL. BOARD	289
TECHNICAL NOTES	25
BOX OF DISKS (10)	19
PROWRITER PRINTER	419
8 KEY 400 (KEYBOARD)	99
NEWPORT PROSTICK	27
MICROBITS MODEM	159
PRINTER INTERFACE	89
THE ATARI ASSEMBLER (BOOK)	12
VAL FORTH (D) 24K	45
PREPPIE (D,T) 16K	19
EASTERN FRONT (D,T) 16K	24
MINER 2049ER (C)	35
STARBOWL FOOTBALL (D,T) 24K	25
PILOT (C)	59
BASIC A + WITH OS/A + (D)32K	80
ASTRO CHASE (D) 32K	24
BAJA BUGGIES (D,T) 16K	23
JUMP MAN (D) 32K	29
CHOPLIFTER (C)	32
ZAXXON (D,T)	29

VIC-20

CARDBOARD (3 SLOT EXP.)	$ 33
VIDEOPAK WITH 16K (40/80 COL)	250
VIDEOPAK WITH 64K (40/80 COL)	319
PRINTER INTERFACE (PARALLEL)	55
KIDS AND THE VIC (BOOK)	17
16K RAM	85
8K RAM	55
HES MON (ASSEMBLER) (C)	29
HES WRITER (WORD PROC.) (C)	29
TURTLE GRAPHICS (C)	29
VIC FORTH (C)	49
QUICK BROWN FOX (WORD PROC.) (C)	54
SHAMUS (C)	29
PROTECTOR (C)	33
CHOPLIFTER (C)	34
APPLE PANIC (C)	34
VIC RABBIT (C)	35
UNWORD PROCESSOR (T) 5K	19
STARFIGHTER JOYSTICK	14
CARDETTE (CASS. INTERFACE)	33
CRUSH, CRUMBLE & CHOMP (T)21K	24
SWORD OF FARGOAL (T) 21K	23
VICAT (T) 8K	20
DEADLY DUCK (C)	28
TOTL MAIL LIST (T) 13K	19

HEAR ATARI SOUNDS THROUGH YOUR STEREO SPEAKERS WITH
STEREODAPTER — FOR ATARI 800
• NO ASSEMBLY REQUIRED • CAN USE STEREO HEADPHONES
• SHIELDED CABLE • ADJUST TONE & VOLUME WITH STEREO CONTROLS
STEREODAPTER WITH 18 FT CABLE $8 — WITH 28 FT CABLE $10
DEALER INQUIRIES INVITED

C CARTRIDGE D DISK T CASSETTE * MOST ITEMS

ORDERS ONLY: CALL TOLL FREE 800-558-8803
IN CALIF. (805) 964-4660 or send check, money order or credit card number and exp. date. Include $2.00 for shipping. Add 3% for Visa or MC (except Calif.). Calif. add 6% tax. There is a $2.50 charge for COD. Please include type of computer. (Checks—10 days to clear.)

AFTER YOUR FIRST DRIVE GO WITH AMDISK.

The AMDISK-I Micro-floppy disk system is an engineering breakthrough in disk size, storage capacity, media protection and user convenience. It's fully compatible with your Apple II* and Apple IIe and is furnished with an interconnect cable. Enjoy a full 286K storage† capability and the extra convenience of the new 3" hard plastic encased diskette. Packed 10 per box, the disk cartridge fits into a shirt pocket and is easy to mail.

Suggested Retail Price . . . . $299 (3" cartridge $6.99 ea.)

The Amdisk Single Drive system is ruggedly constructed for years of trouble-free operation and is backed with our 90 day warranty on parts and labor.

Just circle the reader service number for complete specifications.

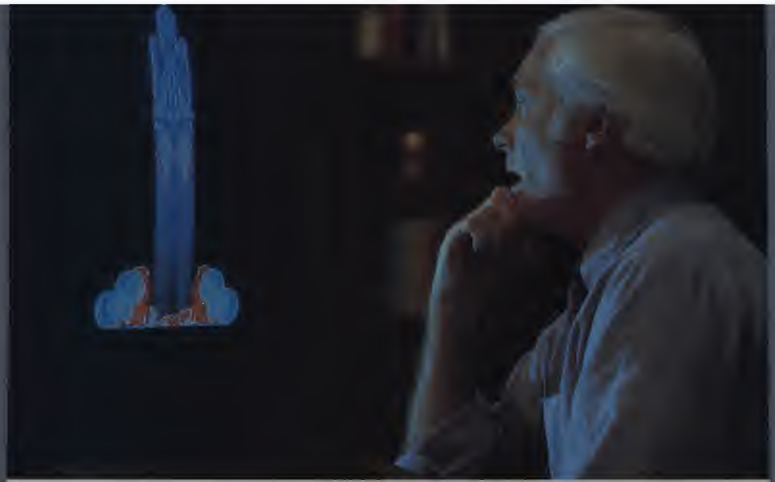
* Apple II is a registered trademark of Apple Computer Inc
† Requires recording on both sides

2201 Lively Blvd • Elk Grove Village IL 60007
(312) 364 1180 TLX 25-4786
REGIONAL OFFICES Calif (714) 662-3949 • Texas (817) 498-2334

AMDEK CORP

Amdek your guide to innovative computing!

CIRCLE 111 ON READER SERVICE CARD



THE GRAPHIC SOLUTION

Solve your toughest communication problems with the Graphic Solution™, a sophisticated, new graphics package from Accent Software.

With precise, multi-speed ANIMATION create captivating sales presentations and product demonstrations that will both intrigue and inform your clients and customers. Watch their reactions; you'll see your messages getting through.

Develop educational materials and training aids that MIX TEXT AND GRAPHICS on the screen, breathing new life into abstract, hard-to-grasp concepts. Mix programs too. Images can be displayed on backgrounds loaded from any of your other programs. Construct custom TYPEFACES AND TYPESIZES to balance the visual elements.

Tired of run-of-the-mill business graphics? Change standard charts and graphs into colorful THREE DIMENSIONAL PERSPECTIVES. Add text and animate the data to show the relative rates of change for your most important information. Like cash flow projections. Or revenue estimates.

Plot flowcharts, time and motion studies, industrial process flows with COLOR-CODED ELEMENTS highlighting critical paths. Animate the sequences to show how flows actually progress.

Work with live action? Prepare film and videotape storyboards using the unique FRAME-BY-FRAME graphic sequencer that lets you create and animate a video story before shooting.

Whatever your graphic communication demands—in the business world, the arts, industry, education—The Graphic Solution™ at $149.95 has the answer. Take a hard look at The Graphic Solution. You'll like what you see.

The Graphic Solution requires a 48K Apple II with ROM Applesoft and DOS 3.3.

See your local dealer or send $10.00 for a demonstration diskette to:

ACCENT SOFTWARE, INC.

3750 Wright Place, Palo Alto, Calif. 94306 Telephone 415-856-6505

Apple is a registered trademark of Apple Computer, Inc.

and easy. The program comes in a convenient ROM cartridge and, like *Piper*, requires no memory expansion.

Synthesound

However, if you are more interested in creating a variety of sounds than in using musical notation and saving compositions, *Synthesound* from HES may be for you.

Synthesound, by T. Dachsel and D. Hassinger, turns your Vic 20 into an exciting music synthesizer. Like the other two programs, it helps if you know something about music, but it is not necessary. Even a novice can create many different sounds and special effects by fooling around with this program.

Synthesound uses three voices within a four and one-half octave range. Using attack, decay, sustain, and release controls over the three-voice oscillators, you can create a variety of sounds, from bagpipes to a piano to a police siren.

There are two parts to the program: player mode and programmer mode. In player mode, your Vic keyboard becomes a musical keyboard. By pressing certain keys, you produce notes of the scale, songs, or some pretty wild sound effects, all depending on what controls you have set in programmer mode.

Programmer mode is the part of the program in which you control the ADSR envelopes (attack, decay, sustain, release) of the three voltage controlled oscillators, your three voices. Basically, the way you set the ADSR of the three voices determines whether your tone will sound like a violin or like a trumpet. While there are other factors involved in the production of a sound (such as low frequency oscillators), and while it does require quite a bit of musical knowledge to understand music synthesis fully, most people can have a great deal of fun creating a wide variety of different sounds with this program.

Other features of *Synthesound* include an optional illuminated keyboard in player mode and a four-voice sequencer for repeating musical or rhythmic patterns. The only really disturbing drawback of *Synthesound* is the inability to save the sounds you create. Once you turn off the machine, that's it. This can be very frustrating if you have spent hours finding just the right kind of sound and there is no way to recall it during future sessions.

When questioned about this missing feature, a representative of HES explained that it would have required twice as much memory to incorporate this feature, and the retail price would then have doubled as well. One wonders if it wouldn't be worth the extra money, and also if there isn't a way to incorporate that feature without using so much extra memory.

At any rate, *Synthesound* is an excellent program. It, along with *Piper* and *Vic Music Composer*, now offers a variety of ways with which to create music on your Vic computer. If you haven't tried any of them, you are really in for a treat.

creative computing
SOFTWARE PROFILE

Name: Synthesound

Type: Music composer

System: 5K Vic 20

Format: ROM cartridge

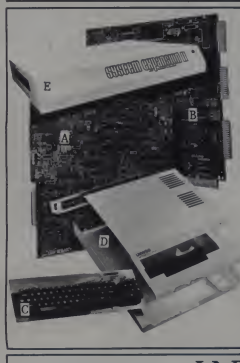
Language: Machine

Summary: Excellent program with many capabilities.

Price: $59.95

Manufacturer:
HES
71 Park Lane
Brisbane, CA 94005
(415) 468-4110

COMPUTER KITS – FROM $69.95



LNW SEMI-KITS can save you hundreds of dollars. By obtaining your own parts at the lowest possible cost and assembling the **LNW SEMI-KITS**, you can have the most highly acclaimed microcomputer in the industry – the **LNW80**. The **LNW SEMI-KITS** are affordable modules. You can start with a modest cassette system and expand to a full 4Mhz TRS-80 compatible system with 5 or 6 inch double density disks and color at any time.

A. LNW80 CPU – Made of high quality FR4 glass epoxy double sided circuit material, with plated-through holes and gold edge connector. It is fully solder-masked and silk screened. Here are just some of the outstanding features you will have when your **LNW80** CPU board is fully assembled: ● 16K RAM ● Color and black and white video ● 480 x 192 high resolution graphics ● 64 and 80 column video ● 4 Mhz Z80A CPU ● Upper and lower case display ● 500 and 1000 baud cassette I/O – **$89.95**

B. SYSTEM EXPANSION – Expand the **LNW80** computer board, **TRS-80** and **PMC-80** computer with the following features: ● 32K memory ● Serial RS232C and 20Ma port ● Real time clock ● Parallel printer port ● 5 inch single density disk controller ● Expansion bus (screen printer port) ● Onboard power supply ● Solder-masked and silk screened legend – **$69.95** (tin plated contacts) – **$84.95** (gold plated contacts)

C. KEYBOARD – 74 key expanded professional keyboard – includes 12 key numeric keypad. Fully assembled and tested. – **$99.95**

D. COMPUTER CASE – This stylish instrument-quality solid steel case and hardware kit gives your **LNW80** that professional factory-built appearance. – **$84.95**. Add $12.00 for shipping.

E. SYSTEM EXPANSION CASE – This stylish instrument-quality solid steel case and hardware kit gives your **SYSTEM EXPANSION** interface that professional factory-built appearance. – **$59.95**. Add $10.00 for shipping.

F. LNW80 CPU – HARD TO FIND PARTS KIT – **$82.00**

G. LNW80 VIDEO – HARD TO FIND PARTS KIT – **$31.00**

H. SYSTEM EXPANSION – HARD TO FIND PARTS KIT – **$27.50**

I. LEVEL II ROM set. (6 chip set) – **$120.00**

VISA and **MasterCard** accepted. Add $3.00 for shipping plus $1.00 for each additional item. All shipments via UPS surface. Add $2.00 for U.S. Mail. Shipments outside continental U.S.: funds must be U.S. dollars. Sufficient shipping costs must be included with payment.

ORDERS & INFORMATION – (714) 544-5744
SERVICE – (714) 841-6850

LNW Research Corp.
2620 WALNUT Tustin, CA. 92680

creative computing software evaluation

Geap Dot Writer

R. W. Steur

I had read with envy the reviews of the GEAP graphics editor and programmer package distributed by RCM Computers. But having a printer without block graphics capabilities (the original Epson MX-100), I found myself out in the cold. So I was pleased to find that a new expansion module for GEAP permitted the MX-100 to print block graphics, albeit slowly.

At the same time I made an even more exciting discovery—the new *Dot Writer* package from the same firm. *Dot Writer* is part of the GEAP family and works hand and glove with it and with your word processor to open a whole new world of word processing possibilities.

Dot Writer version 1.5 is available for the Epson MX series printers with either the Graftrax 80 or Plus ROMs. A new version has just become available for the C. Itoh 8510 series and the NEC 8023A printer. *Dot Writer* is available only on disk and appears compatible with most DOSes.

There are really three major parts to the *Dot Writer* package. The first part is Dotprint, which is the print module used to print an ASCII text file prepared with any word processor producing such a format, including *Newscript, Scripsit, Electric Pencil II* and *Lazywriter.* The text is typed in as usual, imbedding the special Dotprint commands, and the file is saved. At print time the Dotprint program formats the text.

The second part is the Dotwrite editor, which permits creating, test-printing and saving to disk of everything you create or modify. When you use this editor, you also have available all the editing power of GEAP as well as the specialized high-resolution commands of Dotwrite. Anything created with GEAP/Dotwrite can be printed using the Dotprint module.

The third portion of *Dot Writer* is the character font library. Twelve different fonts come with the package. These can be expanded, magnified, and reversed by Dotprint commands.

One additional program included in the *Dot Writer* package is a Basic subroutine which can be included in your own programs to bring high-resolution graphics created with Dotwrite. The manual cautions that programming experience is required.

Documentation

Speaking of the manual, it is very good. Everything is clearly explained, including a section on file management for various disk configurations. Good examples of the various commands and functions assist in understanding and using them quickly. A helpful touch is the use of different colored pages as flags to find the various sections.

The Dotprint Module

The Dotprint module can serve as the scripting or formatting module for any word processor producing an ASCII file, but *Newscript* is a particularly logical choice (and recommended by RCM computers) since the Dotprint command format and structure follow that of

creative computing
SOFTWARE PROFILE

Name: GEAP Dot Writer Version 1.5

Type: Character and font generator

System: TRS-80 Models I and III, Epson MX, C. Itoh 8510 series and NEC 8023A printers

Format: Disk

Language: Machine language

Summary: A flexible, easy to use utility for word processing.

Price: $99.95, Accessory font disks: $29.95

Manufacturer:
RCM Computers
221 Hirschfield Dr.
Williamsville, NY 14221

R.W. Steur, 265 Culpepper Rd., Williamsville, NY 14221.

APPLE ☐ EAGLE ☐ IBM, PC ☐ NORTHSTAR ☐ TRS-80 II 8" ☐ OSBORNE ☐ FRANKLIN ☐ STANDARD CP/M 8"

XEROX 820 ☐ GAMES ☐ COMPILERS ☐ UTILITIES ☐ BUSINESS ☐ ACCOUNTING ☐ SPREAD SHEETS ☐ MEDICAL ☐ DENTAL ☐ PAYROLL ☐ GENERAL LEDGER

HEATH/ZENITH 89 8" ☐ INVENTORIES ☐ STOCK MARKET ☐ TAXES ☐ REAL ESTATE ☐ COMMUNICATIONS ☐ SPELLING ☐ MAILING ☐ ACCOUNTS PAYABLE

RENT SOFTWARE BEFORE YOU BUY!

from our

SOFTWARE RENTAL LIBRARY

You can now RENT the most popular software available for just 20-25%* of Manufacturers' Retail Price

- Eliminate the risk—rent first!
- 100% of rental fee applies toward purchase
- All purchases are 20% Off of Manufacturer's Suggested List
- Rentals are for 7-days (plus 3 days grace for return shipping)

SPECIAL INTRODUCTORY OFFER

There are now 2 different plans to choose from:

Join the **Game Group,** $25.00 per year and rent as many games as you like for only 20-25% of Mfrs. Sugg. Retail Price.* Minimum order, 3 game rentals	Join the **Business Group,** $50.00 per year and rent as many business application programs as you like for only 20-25% of Mfrs. Sugg. Retail Price.*

REMEMBER, THESE ARE NOT DEMOS, BUT ORIGINAL UNRESTRICTED SOFTWARE PROGRAMS

(complete with manuals in original manufacturers' packages)

To Immediately Order, or for more information:

UNITED COMPUTER CORP.
Software Rental Library
Culver City, California

Toll Free CALL 1-800 992-7777
In California CALL 1-800 992-8888
In L.A. County CALL 1-213 823-4400

Canadian Orders Welcome

MasterCard AMERICAN EXPRESS VISA

*Plus postage and handling

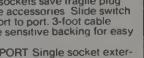
EDUCATIONAL ☐ ACCOUNTS RECEIVABLE ☐ WORD PROCESSORS ☐ DATA BASES ☐ LANGUAGES ☐ GRAPHICS

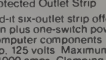
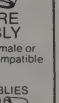
CIRCLE 277 ON READER SERVICE CARD

SCOOTER™
High Grade Electronic Components
AT YOUR FAVORITE COMPUTER STORE NOW!

Let the Ø-force be with you!
#ZFII
$34.95

SCOOTER Ø-FORCE TWIN-PORT
Two Ø-force sockets save fragile plug pins on game accessories. Slide switch to go from port to port. 3-foot cable and pressure sensitive backing for easy mounting.
Ø-FORCE X-PORT Single socket external game port.
(#ZFXP-3) $20.00

Centralize and protect your power!
#SSP-6
$47.95

SCOOTER GUARD-IT™ CONTROL CENTER
Surge Protected Outlet Strip
Scooter's Guard-it six-outlet strip offers surge protection plus one-switch power control of all computer components. Rated at 15 amp, 125 volts. Maximum spike current: 4000 amps. Clamping spike voltage: 350. Power indicator light. Push-to-reset protected circuit breaker. 6-foot grounded cord. UL listed.

Get the connection!
#DB25P-4S
$21.75

D-SUBMINIATURE CABLE ASSEMBLY
4-ft. cable with 25-pin male to male or male to female connectors. Compatible with serial printers.
#DB25P-4P: $19.95
CENTRONICS-TYPE ASSEMBLIES
4-ft cable (#CCAP4S) $29.80
6-ft cable (#CCAP6S) $32.95
4-ft (#CCAP4P) $29.80
6-ft (#CCAP6P) $32.95

Other SCOOTER products:
• cable assemblies • connectors
• semiconductors • switches
• integrated circuits & sockets
• electronic components & hardware

CC783
FREE SCOOTER™ T-SHIRT!
SEND proof of purchase (sales receipt) for Scooter merchandise
OR SEND the name of your computer dealer if he does not carry the Scooter™ High Grade Electronic Component line
WITH THIS COUPON and your name address and T-shirt size to
ohm/electronics
746 Vermont St., Palatine IL 60067

CIRCLE 210 ON READER SERVICE CARD

GEAP, continued...

Newscript plus some special commands of its own. Missing are the run-time options of *Newscript* but Dotprint does have the KE command for keyboard input during printing and, most important, the IMbed and APpend commands for disk files.

Probably the most significant feature of Dotprint is its ability to print in bit image mode the variety of lettersets in the font library. There are roughly 50 fonts available now, and the number is growing. A very limited cross section is shown in Figure 1. In addition, Dotprint supports the regular Epson font as an alternative.

Dotprint has been provided with a very useful and adaptable underlining function. The examples in Figure 2C show how either individual words or both words and intervening blanks can be underlined. The position of the underline can be adjusted to suit the various character sets, and multiple and/or thickened underlining is a breeze. Single or multiple thickened lines can be printed across the text space without text, as shown in Figure 2.

Small hi-res drawings as seen in part D of Figure 2, can be included within a text line as part of either the main font or the alternate font. To use larger drawings in the text, the hi-res drawing can be created using the Dotwrite editor, saved to disk as a bit-image file, then included in the text by use of the IMbed 'filename' command.

Letters and drawings can be magnified before printing by a simple command, with results such as those in Figure 2F. Two centering commands are available: the first is exactly like the *Newscript* command and is used for non-proportional printing; the second is used

BOLD ENHANCED ABCDEF abcdef
OLDE ENGLISH ABCDEF abcdef
MINI CUBES ABCDEFGHIJKL
MICROPRINT ABCDEF abcdef
PLAIN PLUS BLOCK GRAPHICS ABCDEF abcdef
SMALL ENHANCED ABCDEF abcdef
MEDIUM BOLD ABCDEF abcdef

A. Sampling of lettersets supplied with Dot Writer.

Chancery Medium ABCDEF abcdef
Computer Style ABCDEF abcdef
SHADED ABCDEFHIJKL
LETTER QUALITY ABCDEF abcdef
BROADWAY ABCDEFGH
Formal Script ABCDEF abcdef
ANTIQUE ABCDEF
SCREENED MESQUITE ABCDE abcde

B. Small sampling of additional fonts available.

Figure 1. Examples of the variety of lettersets available.

KNIGHTS OF THE DESERT™

Introducing SSI's simulation of the North African Campaign of World War II — for your APPLE®, ATARI® and TRS-80.

KNIGHTS OF THE DESERT
A pretty classy name for a classic wargame

In the year 1096, knights in shining armor set out on the First Crusade, marching across Asia Minor to reach the Holy City of Jerusalem and free it from the invading Turks.

Nearly a millenium later, in 1941, a similar scenario would be played out. This time, Crusader tanks of Great Britain rolled across the broiling sands of North Africa to repel invaders of a different sort — the armored forces of Nazi Germany.

KNIGHTS OF THE DESERT is the faithful recreation of this 20th century crusade. As Field Marshal Rommel, you must push your Panzer and infantry divisions eastward to take Alexandria. As the British commander, you must sweep Rommel back to El Aghelia and win the game.

This simulation has everything you've come to expect in an SSI wargame: historical accuracy and detail; complete morale and strength ratings for all units; innovative movement, rules and combat systems; two-player and solitaire modes; and best of all, maximum playability.

To see if you've got what it takes to meet this historical challenge, start off on a little crusade today — a quick trot to your nearest computer game store to free this game from the dealer. No fighting is necessary. Just $39.95.

SSI

If there are no convenient stores near you, VISA and Mastercard holders can order direct by calling 800-227-1617, ext. 335 (toll free). In California, call 800-772-3545, ext. 335.

To order by mail, send your check to: Strategic Simulations Inc. 883 Stierlin Road, Bldg. A-200, Mountain View CA 94043-1983. (California residents, add 6.5% sales tax.)

KNIGHTS OF THE DESERT is available on 48K disk for the Apple® II with Applesoft ROM card; 40K cassette or 40K disk for the Atari® 400/800; and 16K cassette for the TRS-80 Level II, Models I & III. When ordering, please specify computer and format.

WRITE FOR A FREE COLOR CATALOG OF ALL OUR GAMES

Apple® is a registered trademark of Apple Computer Inc. Atari® is a registered trademark of Atari Inc. TRS-80 is a registered trademark of the Tandy Corporation.

CIRCLE 260 ON READER SERVICE CARD

WE STICK OUR G
THE SUN D

RAPHICS WHERE ON'T SHINE.

You'll never see Infocom's graphics on any computer screen. Because there's never been a computer built by man that could handle the images we produce. And, there never will be.

We draw our graphics from the limitless imagery of your imagination—a technology so powerful, it makes any picture that's ever come out of a screen look like graffiti by comparison.

And nobody knows how to unleash your imagination like Infocom.

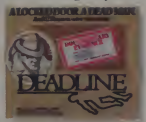
Through our prose, your imagination makes you part of our stories, in control of what you do and where you go—yet unable to predict or control the course of events.

You're confronted with situations and logical puzzles the like of which you won't find elsewhere. And you're immersed in rich environments alive with personalities as real as any you'll meet in the flesh—yet all the more vivid because they're perceived directly by your mind's eye, not through your external senses. The method to this magic? We've found the way to plug our prose right into your psyche, and catapult you into a whole new dimension.

Take some tough critics' words about our words. SOFTALK, for example, called ZORK® III's prose "far more graphic than any depiction yet achieved by an adventure with graphics." And the NEW YORK TIMES saw fit to print that our DEADLINE™ is "an amazing feat of programming." Even a journal as video-oriented as ELECTRONIC GAMES found Infocom prose to be such an eye-opener they named one of our games their Best Adventure of 1983.

Better still, bring an Infocom game home with you. Discover firsthand why thousands upon thousands of discriminating game players keep turning everything we write into instantaneous bestsellers.

Step up to Infocom. All words. No graffiti. The secret reaches of your mind are beckoning. A whole new dimension is in there waiting for you.



INFOCOM™

The next dimension.

Infocom, Inc., 55 Wheeler St., Cambridge, MA 02138

For your Apple II, Atari, Commodore 64, CPM 8" DEC Rainbow, DEC RT II, IBM, NEC APC, NEC PC 8000, Osborne 1, TI Professional, TRS-80 Model I, TRS-80 Model III.

CIRCLE 181 ON READER SERVICE CARD

This used to be the only way to get a student to practice math after school!

NOW... There's MASTER MATH™

Motivation is the key.

Master Math is more than just a comprehensive software package for teaching grades 8-12 math. It's specifically designed to build and hold interest and enthusiasm so students can learn faster . . . retain more . . . and be proud and confident enough to show it.

Regardless of the student's starting level, Master Math will help develop math proficiency with: • Easy to use operation. • Success orientation. • One-on-one instruction. • Clear, concise concepts. • High resolution color graphics. • Imaginative games. • Self-paced learning. • High student interaction.

Master Math was developed by a professional math educator in the U.K. where it has been approved as a learning aide. Also, it has been tested in public and private schools in the U.S. It's received highly favorable reviews in both countries.

Master Math runs on Apple II/+/E, Commodore PET and CBM 8032. It's comprised of 6 independent discs or tapes with over 50 individual subjects. Coverage includes Algebra, Trigonometry, Geometry, Statistics and Basic Accounting. Teacher's support materials complete this valuable learning package.

To find out what motivation can mean to your math classes, fill out the coupon and mail it along with $150 for your 10 day trial. Or you can order one for only $30. But no matter which way you choose to review Master Math, if you are not thoroughly satisfied with its performance or results, return it to us for a full and cheerful refund. Telephone orders are gladly accepted. Call (207) 336-2500.

I'd like to put Master Math to work in my class. Please send me the indicated discs.

Name _____ Title _____

School _____ Phone _____

Street _____

City _____ State _____ Zip _____

P.O. number _____ Visa _____ Master Card _____ Exp. Date _____

Checks or money orders may be made out to FMI, Inc.

Please indicate which discs for single orders.

☐ 4 programs on Numbers, Logs, and Antilogs. $30
☐ 7 programs on Algebra and sets. $30 ☐ 8 programs on areas and volumes. $30 ☐ Test problems. 12 programs. 26 topics. Factors, Interest, Statistics, Trig., Calculus, Percents, Bases and Exponents. $30 ☐ Test problems. 12 programs. 33 topics. Algebra, Calculus, Geometry, Statistics, ratios and exponents. $30 ☐ Test problems. 7 programs. 20 topics. Geometry, LCM, mappings, Fractions, Algebra, Currency. $30 COMPLETE PACKAGE $150.00

Check hardware

☐ CBM 8032™ ☐ Apple II/+/E™ ☐ Commodore PET™

Dealer inquiries invited

CIRCLE 214 ON READER SERVICE CARD

only when the proportional printing option is in effect.

Did I say proportional printing? Yes I did—but I have an Epson printer, which doesn't have a proportional font. But I said it and Dotprint does it with Dot Writer Letterset fonts, though not with the regular Epson fonts. Figure 3 demonstrates both the versatility and the effectiveness of the proportional printing function.

The Dotprint SDn controls the dot spacing between letters whether in mono or proportional spacing, while SWn controls the minimum width of blank spaces when in proportional spacing mode. The effects of these commands are illustrated in Figure 3.

Use of the proportional print option provides a printout that is very professional looking. Control of both the inter-character and inter-word spacing allows variation of not only the appearance of the text but the amount of space required as well. It should be noted that the current version of Dotprint does not support proportional printing of very large letter fonts which cannot be held completely in RAM, but it is hoped that future versions will overcome this restriction.

There are several more features of Dotprint worth mentioning. The IGnore command provides a means for including non-printed comments within the text file but, in addition, also permits some debugging of the imbedded commands in your text file without actually printing out the complete text using the *Dot Writer* fonts. This can save considerable time.

A darkness control, DA n, controls

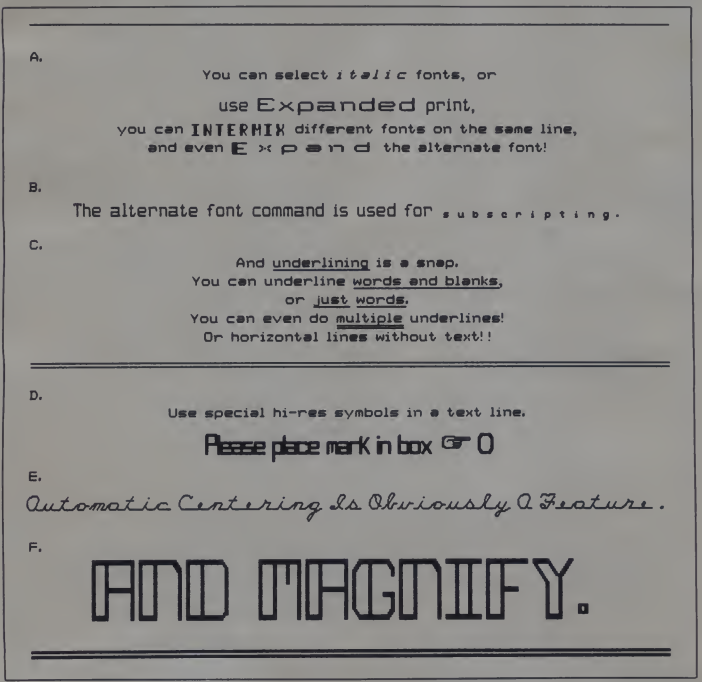


Figure 2. Some Dotprint features.

double strike while EM on/off is for emphasized print mode; the two can be used at the same time for a very solid black printout.

The MF n command magnifies the resident font by a factor of n, both vertically and horizontally. Thus, it is not the same as the double width function. Excessive magnification does result in somewhat ragged characters, however.

I mentioned that I was pleased to find that GEAP could print block graphics on my Epson MX-100. I was even happier with the ability of Dotprint to utilize block graphics as part of a text file. The block graphics set is included in the font supplied as part of the *Dot Writer* package. The lo-res graphics file is imbedded in the text file and printed as part of the file, as seen in Figure 4A, while in Figure 4B the corresponding hi-res figure in bit image format has been printed.

Surely this must be the answer to all our word processing formatting problems, right? Wrong. We haven't quite reached perfection yet. The primary limitation of the capabilities of Dotprint is speed. First, almost all of the *Dot Writer* lettersets require two passes (two lines, eight dots high) to print. Next, bit image printing in the Epson and NEC printers must be unidirectional to maintain precise vertical alignment within characters. Further, total printing time is increased by the use of frequent font changes, with resulting disk accesses. An elaborate document could take a while to print out using Dotprint, but the result can be well worth the wait.

The Dotwrite Module

Now let's take a look at the Dotwrite portion of *Dot Writer*. This is actually a pair of GEAP expansion modules and can be used only in conjunction with GEAP vers. 2.1. Programming bit-image graphics for printers with this capability is an involved and tedious task. The GEAP Dotwrite program was designed to do all of the bit-image graphics programming for you.

Dotwrite has three purposes:

- Printing *Dot Writer* lettersets in text form.
- Creating lettersets and modifying existing ones.
- Creating hi-res graphics.

You use the TRS-80 screen as a sketch pad to draw letters or artwork. As you progress you can send your work out to the printer to see how it looks in bit-image form. Then when you are satisfied with the result, the program converts the screen image into bit-image format and stores it on disk.

There is also a Dotread module supplied which is a stand-alone Basic program to print a file created by the Dotwrite "output to disk" option. This can be merged into your Basic application program to provide individual and outstanding printouts for your programs.

The ability to print text directly from Dotwrite is useful for creating posters, notices, etc. Text can be entered from the keyboard or loaded from a disk file, using a previously created printer setup file or creating a new one.

If you were starting from scratch, you would first load the letterset you want to use, then a command is given to allow the program to determine the screen limits, based on your answers to a series of questions which appear on the screen. After this, a vertical line appears on the screen. This represents the limit of the characters which will fit on the paper.

Key in your text, within the screen window, and when you are through, you go to the print mode. At this point you have several printing options from which to choose.

As I mentioned, there are many letter fonts available. But suppose none of them quite fits your needs or wants. Then create your own or modify an existing one. Block graphic pixels are used to draw the letters on the screen and represent the dots in the bit image format.

Letterset Manipulation Utility

During preparation of this review a

These paragraphs were prepared using the 960 dot/line (8 inch line) resolution PLAIN font, with true proportional letter and word spacing, and right justification. One command (.SD n) allows the intercharacter spacing to be changed, as in the following examples:

Proportional letter spacing control. (.SD 1)
Proportional letter spacing control. (.SD 3)
Proportional letter spacing control. (.SD 5)

A separate and independent command (.SW n) permits the width of the blank space between words to be adjusted as a fraction of letter width. The result is shown in the lines below:

Proportional word spacing control. (.SW .3)
Proportional word spacing control. (.SW .5)
Proportional word spacing control. (.SW .8)

The above text was printed using an Epson MX-100 printer with GRAFTRAX Plus. As a final example, the first line below was printed with proportional spacing, the second with normal spacing.

Proportional print test.
Proportional print test.

Figure 3. Proportional printing with an Epson printer.

ONLY ATARI® GIVES YOU COMPUTERS THAT DO SO MUCH, AND THE "HELP LINE" SO YOU CAN DO MORE.

Our Help Line could be the most useful innovation ever in home computers: it's someone to talk to.

Someone to help you diagnose problems when things don't seem to work right.

Someone to help you debug the programs that you're writing yourself.

Someone who knows the answers to your questions about what ATARI® Home Computers can do, and how to do it.

Call the ATARI Help Line toll-free: 1-800-538-8543.* And find out how helpful ATARI SERVICE™ can be, even when nothing is wrong.

ATARI SERVICE
FACTORY AUTHORIZED NETWORK

WE ANSWER YOUR CALL FOR HELP.

*California: 1-800-672-1404

© 1983 Atari, Inc. All Rights Reserved. ® A Warner Communications Company

CIRCLE 116 ON READER SERVICE CARD

CENTURY MICRO PRODUCTS

*****ALL PRICES 20% TO 40% BELOW RETAIL*****

Apple Educational Software

	RETAIL	OUR PRICE
COMPUTER ADVANCED IDEAS		
Game Show	39.95	31.50
4 Additional Subject Diskettes ea.	19.95	15.95
Tic Tac Show	39.95	31.50
4 Additional Subject Diskettes ea	19.95	15.95
EDU-WARE		
Compu-Read	29.95	22.00
Spelling Bee w/Rdg. Primer	39.95	30.00
Compu-Math/Arith. Skills	49.95	35.00
PROGRAM DESIGN (PDI)		
Pre-School IQ Builder	23.95	17.95
LEARNING CO		
(NEW-LOWER RETAIL PRICES!!)		
Juggles Rainbow	29.95	23.95
Bumbia Games	39.95	31.95
Bumble Plot	39.95	31.95
Gertrude's Puzzles	44.95	35.95
Gertrude's Secrets	44.95	35.95
Rocky's Boots	49.95	39.95
SPINNAKER		
Snooper Troops 1 or 2	44.95	32.00
Story Machine	34.95	25.00
Face Maker	34.95	25.00
Kindercomp	34.95	25.95
Delta Drawing	59.95	44.50
Rhymes and Riddles	29.95	22.50
Hey Diddle Diddle	29.95	22.50
The Most Amazing Thing	39.95	29.95
XEROX EDUCATION PUBLICATIONS		
Stickybear ABC	39.95	29.95
Stickybear Numbers	39.95	29.95
Stickybear Bop	39.95	29.95
Old Ironsides	39.95	29.95
BUSINESS SOFTWARE		
PFS File (II or IIe)	125.00	88.00
PFS Report (II or IIe)	125.00	88.00
PFS Graph (II or IIe)	125.00	88.00
PFS File/Report/Graph	375.00	265.95
DB Master	229.00	155.00
ScreenWriter II	179.00	85.00
General Manager II	229.95	161.00
Home Accountant	74.95	49.95
1st Class Mail/Form Letter	99.95	69.00
SuperCalc (CP/M)	295.00	180.00
Microsoft Multiplen (DOS or CP/M)	275.00	189.00
GAMES		
Zaxxon	39.95	29.95
Miner 2049er	39.95	29.95
Choplifter	34.95	24.00
Arcade Machine	54.95	40.00
Zork I, II or III	39.95	29.00
Deadline	49.95	35.00
Starcross	39.95	29.00
Castle Wolfenstein	29.95	21.00
Frogger	34.95	24.00
Ultima II	59.95	42.00
Dark Crystal	39.95	29.95
Computer Ambush (2nd ed.)	58.95	44.95
Wizardry-Proving Grounds	49.95	37.50
Knight of Diamonds	34.95	26.25
Aztec	39.95	29.95
ACCESSORIES		
Kraft Joystick	64.95	49.00
T G Joystick	59.95	45.00
T G Game Paddles	39.95	30.00
T G Trackball	64.95	48.75
Wico Trackball	79.95	59.95
Kensington System Saver Fan	89.95	69.00
Hayes Micromodem II w/Term. Prog.	479.00	296.95
Amdek Color I Monitor	399.00	319.95
Amdek Color I Plus (NEW!!)	429.00	339.95
Amdek Color II Monitor	799.00	639.95
C. Itoh Prowriter 8510AP	495.00	395.95
Okidata ML92	699.00	552.00

MANY MORE PRODUCTS AVAILABLE FOR APPLE, IBM P/C, CP/M, ATARI, COMMODORE 64 & VIC 20, TI, & TRS-80.

Write or call for FREE CATALOG

TO ORDER: CALL 1-714-951-5596

8:00 A.M. - 8:00 P.M. PST, Mon.-Fri.
9:00 A.M. - 5:00 P.M. PST, Sat.

or send check or credit card no., signature & exp. date to

CENTURY MICRO PRODUCTS
P.O. BOX 2520
Mission Viejo, CA 92690

Visa / Mastercard add 3% Personal checks allow 2 weeks to clear. CA residents add 6% sales tax. Shipping and handling, add $3.00 (hardware extra). Prices subject to change.

CIRCLE 180 ON READER SERVICE CARD

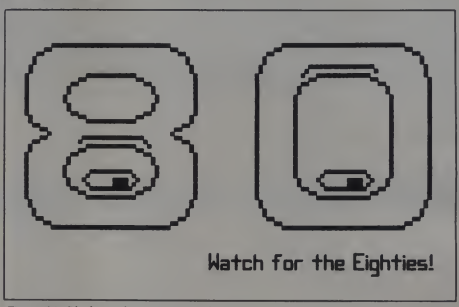


Figure 4A. Block graphics printing with Dotprint.

new Dot Writer module became available. The Manipulation Utility module consists of a group of routines which were developed originally to assist in the creation of lettersets by the author of GEAP. It is intended for use by those familiar, if not proficient, with the GEAP and Dot Writer programs. A variety of routines is provided for the manipulation of individual characters or complete lettersets. I have found certain ones particularly useful to me.

For example, suppose you have created the capital letters of a letterset and don't want lowercase. To avoid the problem of an unshifted (lowercase) letter in the text file, simply use the copy between lettersets utility to copy the uppercase letters into lowercase positions as well. Shifted or not, you'll get the uppercase you want.

You want to print a small hi-res figure as part of your text; what's the simplest way to accomplish that? Well, if there were a blank spot in the letterset you were using, it could be put right in there. And how do you find the blanks? Why, option 4 of the Manipulation utility will do it for you and list them to the printer.

A move routine permits you to move a letter or series of letters within the frame, and/or center or justify the letter(s). There are other options, for magnification and for special effects like adding "wiggles" to a letter, but they are icing on the cake.

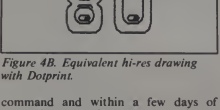


Figure 4B. Equivalent hi-res drawing with Dotprint.

Program Support

One aspect of software that most of us are quite sensitive about is the support provided by the manufacturer. My own experience with RCM Computers has been reassuring in this respect. For example, I found a bug in the IGnore command and within a few days of contacting RCM Computers I received a patch which took care of the problem. The company is quite responsive to users' comments and suggestions. Further, their update and upgrade policies and pricing are very reasonable. They are developing a User Library to which users can contribute and so share their talents with others around the country.

Conclusions

What lies ahead for this program? I expect that it will be adapted to more bit-image printers, certainly. The GEAP family of programs has expanded so rapidly that I would be very much surprised if new versions with increased flexibility, utility and ease of use were not forthcoming in the near future.

The *Dot Writer* programs have expanded the word processing capabilities of the TRS-80 Models I and III to an extent not imaginable, at least by me, as late as the end of 1981. In conjunction with a powerful text editor such as *Newscript*, *Dot Writer* provides the TRS-80 user with almost limitless word processing possibilities in business and recreation applications. This is a best buy if you are involved in word processing and have or plan to buy an appropriate Epson, C. Itoh, or NEC printer. □

Hello, We're Adventure International

And we're publishers of some of the finest microcomputer software programs available.
If you can write a **top-quality** program, or can convert some of our best-sellers to other computers, we want to hear from you — Now.
We have the advertising, international distribution, manufacturing and marketing know-how to send top-quality programs to the top of the charts.
If your program **is top quality** — give us a call, or write for our Adventure International Author Information Kit.

Copyright © 1983

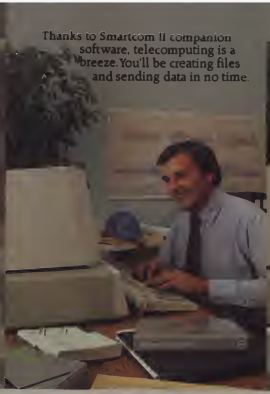
Adventure INTERNATIONAL

Box 3435
Longwood, Florida 32750
Telephone: (305) 862-6917
Ask for Author Assistance

We are publishers of the top-selling Scott Adams Adventure Series and other fine Entertainment and Applications Programs.

CIRCLE 103 ON READER SERVICE CARD

Thanks to Smartcom II companion software, telecomputing is a breeze. You'll be creating files and sending data in no time.



Need important information from the main office...today? Get it quickly, efficiently, accurately. From their computer to yours.

Hayes

Your computer's telephone.

Hayes is still leading the way with new telecomputing products. And now combining every bit of sophisticated technology into one communications package for your IBM* PC. Smartmodem 1200B and Smartcom II™ software. Everything you need. And more.

Whether you're receiving updates from the field, placing orders with suppliers a thousand miles away, or taking advantage of the diverse resources offered by networks and information services. Let Hayes provide the communications link. With our popular 1200 bps Smartmodem. Now available as a convenient plug-in board for the IBM PC. And packaged with our own communications software.

Smartmodem 1200B. Your computer's telephone. That's really what it is. A telephone that allows your computer to communicate over ordinary phone lines at up to 1200 bits per second. For speedy, economical transmission of data to any Bell 212A or Bell 103 type modem. And it's the one peripheral that vastly expands the usefulness of your computer.

Our single board Smartmodem 1200B can be installed by your computer dealer in minutes. It connects directly to your phone jack, operating with rotary dial, Touch-Tone** and key-set systems. Smartmodem 1200B will dial, answer and disconnect all of your calls automatically. It will even redial your last number upon command.

Smartmodem 1200B also features an automatic speed selector, that detects incoming transmission speeds. Along with screen displays to show you its current operating status. And, unlike some 1200 baud modems, Smartmodem 1200B operates at full or half duplex, for compatibility with most time-sharing systems.

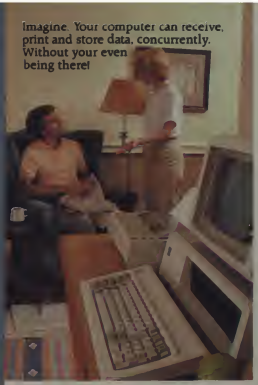
For those who enjoy designing their own programs, Smartmodem 1200B is controllable using *any* programming language. But none of that is necessary. Thanks to Smartcom II. The communications program designed by Hayes, specifically for Smartmodem!

Smartcom II companion software. Maximizes Smartmodem's capabilities. Minimizes your effort. The first time out, you'll be creating messages, sending, printing and storing them to disk. Simultaneously.

And when you're on the receiving end, your IBM PC will do all the work, completely unattended!

But that's just part of Smartcom II's innovative story. For instance, before you communicate with another system,

Hayes*



Imagine. Your computer can receive, print and store data, concurrently. Without your even being there!

you need to "set up" your computer to match the way the remote system transmits data. With Smartcom II, you do this only once. After that, parameters are stored in a directory on Smartcom II. Calling or answering a system listed in the directory requires just a few quick keystrokes.

You can store lengthy log-on sequences the same way. Press one key, and Smartcom II automatically connects you to a utility or information service.

And if you need it, there's always "help." One of several special functions assigned to your IBM function keys, this feature explains prompts, messages, etc. to make communicating even easier.

Smartcom II also provides a directory of the files stored on your disk. Letting you create, display, list, name, re-name or erase any file right from the screen.

Like all our products, Smartcom II and Smartmodem 1200B are backed by excellent documentation, a limited two-year warranty, and full support. From us to your dealer to you.

So, see your dealer today. Link up to the exciting world of telecomputing. With Hayes complete plug-in communications package for your IBM PC.

Hayes Microcomputer Products, Inc., 5923 Peachtree Industrial Blvd., Norcross, Georgia 30092. 404/449-8791.

A complete plug-in communications package for the IBM PC.

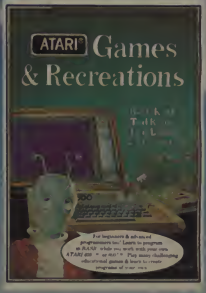
Smartmodem 1200B. (Includes telephone cable.)

Smartcom II communications software.

Requires an IBM PC with minimum 96K bytes of memory; IBM DOS 1.10 or 1.00; one disk drive; and 80-column display. No serial card or separate power source is needed.

Smartcom II is a registered trademark of Hayes Microcomputer Products, Inc.
*IBM is a registered trademark of International Business Machines Corp.
**TM of American Telephone and Telegraph
©1981 Hayes Microcomputer Products, Inc.
Sold only in the U.S.A.

CIRCLE 177 ON READER SERVICE CARD



RESTON CAN HELP MAKE YOUR COMPUTER FLY.

These three easy-to-read books from Reston can help turn any beginner into a creative programmer. You can learn how to play music, create colorful moving pictures and whiz through math problems—quickly and easily. Atari™ PILOT for Beginners, by Jim Conlan and Tracy Deliman, introduces you to the new PILOT computer language, designed to do important things quickly, with fewer commands. Atari™ PILOT Activities and Games, by Herb Kohl, Ted Kahn, and Dale Disharoon, takes you up into the world of advanced PILOT programming. And Atari™ Games and Recreation, by Herb Kohl, Ted Kahn, and Len Lindsay with Pat Cleland, will have you programming your own games instead of just playing someone else's. With Restan, you can rocket right to the top.

Reston Publishing Company™
A Prentice-Hall Company
11480 Sunset Hills Rd.
Reston, VA 22090

Available at your local bookstore and computer retailer or call us at (800) 336-0338.

Atari is a registered trademark of Atari, Inc.

CIRCLE 231 ON READER SERVICE CARD

Hello, my name is 420724-7091

...and Sweden's central data banks know everything about me

Chris Mosey

Allow me to introduce myself. I am 420724-7091. My wife is 480930-7343 and our seven-month-old baby daughter is 810130-0443. We live in Sweden, where our lives are numbered.

Of course, you would be far more interested in 451115-9305, 450425-4931, 461216-0038, and 500405-2444. I understand they've sold a lot of records in the States.

Why, during the last administration they even visited the White House on one of their tours. Except for 500405-2444, who was indisposed.

Everyone in Sweden has a Person Number. Of course we also have names just like you. My wife's is Lola, our daughter's, Nina Suzanne.

And the numbers in the second paragraph refer to (in the order mentioned): Annifrid Lyngstad, Björn Ulvaeus, Benny Anderson, and Agnetha Fältskog, members of the pop group Abba, one of Sweden's most successful exports.

The Person Number is allotted to you by the government as soon as you settle in Sweden. Even foreign correspondents staying for a limited time have one.

It is on your ID-card, your driver's license, tax declaration form, and all official documents relating to you.

The first part is your date of birth. I was born in (19)42, on July (07) the 24th. Hence: 420724. The number after the dash is chosen at random, except for the penultimate digit. If it is odd you are male; if it is even (including zero), female.

Sometimes the Person Number system can seem a trifle sinister. If you are stopped by the police, your number is fed via walkie-talkie into a computer at headquarters. Within minutes the cop on the beat will know all there is to know about you—more specifically if you are on the wanted list or have previous convictions.

Sometimes it can make life easier, however. If you want credit, you give your Person Number and within a remarkably short time information is released from a central data bank which gives the company evidence of your creditworthiness (or lack of it). The data bank has to inform you about all such inquiries.

Swedes like the Person Number because it is efficient. They register amazement that anyone should find it Brave New World-ish. 480930-7343, for example, does not go around saying how glad she is to be a 480930-7343 but she *is* glad that it expedites the children's benefit that the state pays for 810130-0443.

There is a danger that it could all go too far, however.

The national social welfare board this month came up with a revolutionary scheme to lessen the burden of the welfare state by an estimated 4 million kronor ($800,000).

This is the amount it loses each year because people mislay their false teeth.

The board is now calling for a law stipulating that all sets of false teeth be stamped with the owner's Person Number so that when they are found they can be returned, avoiding the need to make a new set.

It is a very Swedish solution and it is as true as my number is 420724-7091...even if it is a little hard to swallow. □

Reprinted by permission from *The Christian Science Monitor*, © 1981 The Christian Science Publishing Society. All rights reserved.

creative computing software evaluation

Bytes, Camera, Action

John J. Anderson

Let's consider the generation of colorful, animated microcomputer graphics. Sure, you can talk about Basic, and Forth, and Pascal, and (gasp) machine language. You may even raise the issues of bit-mapping and shape tables. But let's face it. There resides in an area frequently and euphemistically referred to as the "real world," a group of artistically inclined people, interested in the prospects of expressing themselves through colorful, microcomputer-generated graphics, who are not crack computer programmers, nor will they ever be. To reach that goal, they need better, friendlier tools.

Better, friendlier tools are beginning to appear, and *TGS* is one of them.

I did not want to rush into a review of *The Graphic Solution*, or *TGS* as its makers call it. I wanted to take the time to familiarize myself with the product, learn its various techniques and features, and report my findings only when I had acquired a bit of dexterity with the tools it provided.

After having logged at least six hours or so of "flight time" with *TGS*, the time has come to report my findings. Although there are many maneuvers I have not yet mastered, I can do quite a bit more with an Apple using *TGS* now, than was previously possible for me from Basic, machine language, or any other graphics package. Besides, if I waited until I could do everything I wanted with it before I reviewed *TGS*, the review would never have happened.

To call *TGS* a graphics package is not incorrect, nor is it the whole truth. It is in fact a graphics *animation* package, with sophisticated capabilities to create and animate multiple, color shape tables on the screen. By developing sequences of "frames," the user is able to create his own animated "movie" programs on the Apple. The program and documentation use those very words to describe the animation process.

A preliminary caveat: while the program and documentation are well-designed and executed, *TGS* is the kind of package that demands a real commitment from the user in order to obtain real results. You must take the time, as I did, both to learn the tricks of the system, and then to manipulate those features effectively to create animated sequences. Unless you have the time and inclination to do so, *TGS* may disappoint you.

If on the other hand you do have both the time and the inclination, you will be well-rewarded. *TGS* is among the most powerful animation tools currently available for the Apple computer. After you have learned to use it, creating smooth, colorful animated graphics is, if not exactly easy, at least *possible* for those of us who have yet to master machine language.

In that respect, it is probably one of the programs you may have been waiting for: a system that will allow you to develop and store multiple shapes, then move them around the video screen according to your whim. The method it uses is straightforward yet ingenious. The main shape editing is done in lo-res, then transferred as a block to the point you choose on a hi-res screen. By fitting

The Small Computer Book Club

a division of the Library of Computer and Information Sciences

Please accept my application for trial membership and send me the *NEW* ENCYCLOPEDIA OF COMPUTER SCIENCE AND ENGINEERING (44904) billing me only $2.95. I agree to purchase at least three additional Selections or Alternates over the next 12 months. Savings range up to 30% and occasionally even more. My membership is cancelable any time after I buy these three books. A shipping and handling charge is added to all shipments.

No-Risk Guarantee: If you are not satisfied—for any reason—you may return the ENCYCLOPEDIA within 10 days and your membership will be canceled and you will owe nothing.

Y-AC2

Name_____

Name of firm_____
(if you want subscription sent to your office)

Address_____

City_____

State_____ Zip_____
(Offer good in Continental U.S. and Canada only. Prices slightly higher in Canada.)

Creative Computing 7/83

The Small Computer Book Club

a division of the Library of Computer and Information Sciences

Please accept my application for trial membership and send me the *NEW* ENCYCLOPEDIA OF COMPUTER SCIENCE AND ENGINEERING (44904) billing me only $2.95. I agree to purchase at least three additional Selections or Alternates over the next 12 months. Savings range up to 30% and occasionally even more. My membership is cancelable any time after I buy these three books. A shipping and handling charge is added to all shipments.

No-Risk Guarantee: If you are not satisfied—for any reason—you may return the ENCYCLOPEDIA within 10 days and your membership will be canceled and you will owe nothing.

Y-AC2

Name_____

Name of firm_____
(if you want subscription sent to your office)

Address_____

City_____

State_____ Zip_____
(Offer good in Continental U.S. and Canada only. Prices slightly higher in Canada.)

Creative Computing 7/83

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 230 RIVERSIDE, N J

POSTAGE WILL BE PAID BY ADDRESSEE

The Small Computer Book Club
Riverside, New Jersey 08075

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 230 RIVERSIDE, N J

POSTAGE WILL BE PAID BY ADDRESSEE

The Small Computer Book Club
Riverside, New Jersey 08075

TAKE THE *NEW* ENCYCLOPEDIA OF COMPUTER SCIENCE AND ENGINEERING (AN $87.50 VALUE) FOR $2.95!

When you join the **Small Computer Book Club.** You simply agree to buy 3 more books—at handsome discounts—within the next 12 months.

Just published, the ENCYCLOPEDIA OF COMPUTER SCIENCE AND ENGINEERING is the most complete computer information resource available. Indispensable to consultants, business people and data processing professionals, it is a veritable data base of information on:

- Artificial Intelligence
- Computer-assisted Instruction
- Computer Chess, Music
- Computer Graphics
- Database Management
- Hardware
- Microprocessors and Microcomputers
- Operating Systems
- Progamming Techniques
- Software

...and more

The Encyclopedia is organized to make finding and using its wealth of information an ease. The clear and expanded appendices include abbreviations, acronyms, special notation and terminology, as well as numerical tables, the mainstay of applied technologies. A complete 5,000-term index contains references to sub-categories, doubles as a computer science dictionary, and is an invaluable tool for locating specific information.

Praise For the First Edition:
Called "Impressive . . . comprehensive . . . well done" by *Datamation*, the new Second Edition promises to eclipse *Computer Management's* statement on the original of

This up-to-date Second Edition contains:

- **Over 1,670 pages of revised, expanded, and updated text**
- **550 articles on virtually every aspect of the computer sciences**
- **Written by 301 distinguished authorities**
- **Profusely illustrated with over 500 photos, and over 250 diagrams, graphs and charts**

"There isn't another book like it."

Send for your *free* 10-day trial look today.

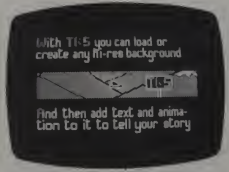
The Small Computer Book Club is for the serious microcomputer user: the person who wants a complete record of his personal finances a command key away . . . the small businessman who uses a computer to organize his day-to-day operations . . . the financial planner looking to improve his analytical and forecasting abilities . . . and every one eager to maximize his system's word-processing potential.

The Small Computer Book Club will put you in touch with the major advances and applications in the data processing industry. It will keep you informed of exciting new developments in every specialty —accounting . . . time-sharing and communicating with larger systems . . . new programming languages, techniques (and shortcuts) . . . the growing multi-purpose uses of small computers for household management . . . and much more.

4 Good Reasons to Join

1. The Finest Books. Of the hundreds of books submitted to us each year, only the very finest are selected and offered. Moreover, our books are always of equal quality to publishers' editions, never economy editions.
2. Big Savings. In addition to getting the ENCYCLOPEDIA OF COMPUTER SCIENCE AND ENGINEERING for $2.95 when you join, you keep saving substantially—up to 30% and occasionally even more. (For example, your total savings as a trial member—including this introductory offer—can easily be over 50%. That's like getting every other book free!)
3. Bonus Books. Also, you will immediately become eligible to participate in our Bonus Book Plan, with savings up to 70% off the publishers' prices.
4. Convenient Service. At 3-4 week intervals (16 times per year) you will receive the Book Club News, describing the Main Selection and Alternate Selections, together with a dated reply card. If you want the Main Selection do nothing and it will be sent to you automatically. If you prefer another selection, or no book at all, simply indicate your choice on the card, and return it by the date specified. You will have at least 10 days to decide. If, because of late mail delivery of the News, you should receive a book you do not want, we guarantee return postage.

If the reply card has been removed, please write to:
The Small Computer Book Club
Dept. V-M 2 , Riverside, N.J. 08075
to obtain membership information and an application



shapes together like a mosaic, you can create backgrounds, or animated images larger than the small hi-res window.

Drawing In Lo-Res

Drawing in the lo-res mode is extremely simple. The A key moves the cursor left, W moves it up, D moves it right, and X moves it down. The REPT key can be activated for quick-cursor movement. Depending on the mode of the cursor, which is controlled by the space bar, you can draw, erase, or move the cursor around a picture without changing it in any way. Other commands allow for erasing an entire block and cursor centering.

Type H, and you move from the lo-res to the hi-res mode. Instead of moving the cursor now, the movement keys move the entire hi-res window around the screen. A quick movement option can be invoked to get the hi-res window where you want it, then an incremental mode used to fine-tune movement. The text window at the bottom of the screen can be toggled off with the F key, freeing the entire screen area for graphics.

Here is where things start to happen. After positioning the hi-res window, typing P will copy the image in the lo-res screen to the hi-res window. You can choose whether to drop the contents of the window while retaining or erasing whatever is under the window position at the time. Thus, the user can create patterns of images from the window anywhere he wishes on the hi-res screen. This, combined with the capability of *TGS* to "snap frames" of screens and show them in quick succession, forms the essence of its bit-mapped animation.

After moving the window in various ways about the screen for a while, the user will without doubt come to appreciate the potential to create *macros* within screen development. This means that repeated commands can be invoked by a single keystroke. Let's say you are moving a square from the lower left of the screen to the upper right. This calls for moving the window right, then up, then dropping the lo-res screen to hi-res, then repeating the process. Press CONTROL-R to signify the construction of a macro. Then move the window right, and up, and copy the window image. Press CONTROL-R again to end the macro. Now press R to execute the macro repeatedly, automatically moving and copying the picture. Although *TGS* allows definition of only one macro, that macro can contain up to 255 keystrokes, which is more than you will ever need. Thoughtful use of macros can save an immense amount of time and bother, and is heartily recommended.

By placing the hi-res window anywhere on the screen, the contents of the window can be copied to lo-res. This means that window shapes need not necessarily be formed from the lo-res mode. Conversely, alterations in hi-res screens can be made by dropping portions into lo-res windows, altering, then replacing them.

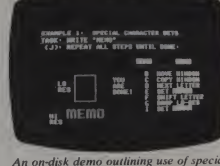
Hi-Res Shapes

And I haven't even begun to get to the good stuff. Multiple hi-res window shapes can be saved to memory, then recalled as desired. This is the preferred means by which to save backgrounds (though whole screens can be saved through an alternative, memory-hungry method), and more importantly, constitutes an important animation tool. With the command +, *TGS* automatically creates tables for multiple user shapes, which can then be plotted on the screen by positioning the window and pressing the ; key (on the Apple a lowercase +). Plotting shapes in this way is much faster than dropping screens from lo-res, as described above. And *TGS* can store *dozens* of shapes.

None of this would be worth a heck of a lot without the ability to put "frames" of graphics together, and this is where the real power of *TGS* lies. By typing CONTROL-Z, you "shoot a frame" consisting of the current hi-res screen. The documentation actively uses the analogy of making a film through the process of amassing frames.

For simple animation, you don't need to know much more. Using the commands described above, you can create simple shapes and move them smoothly around the screen. To view them from within the *TGS* editor, hit the spacebar

The lo-res drawing mode.



An on-disk demo outlining use of special character sets.

creative computing

SOFTWARE PROFILE

Name: The Graphic Solution
Type: Animation graphics package
System: 48K Apple II
Format: Disk
Language: Machine
Summary: Complex but powerful graphics animation package.
Price: $149.95
Manufacturer:
Accent Software Inc.
3750 Wright Pl.
Palo Alto, CA 94306
(415) 856-6505

Keep your Hardware on the FAS-TRACK by entering our

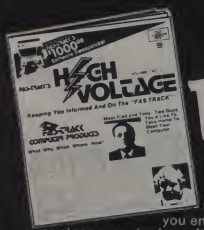
SOFTWARE SWEEPSTAKES!

DON'T WAIT! COMPLETE THE ENTRY BLANK BELOW TO ENTER THE FABULOUS

$1000.00 Software Sweepstakes

Absolutely no hitch! You can win Megabucks in fabulous FAS-TRACK software of *YOUR CHOICE* just by entering! We have loads of the newest software applications available for Apple, Atari, IBM PC, and Commodore!! So send us your entry form today!

1st prize-$600.00 in software
2nd prize-$300.00 in software
3rd prize-$100.00 in software



Free! MONTHLY CATALOG AND NEWSLETTER

All we need to mail you a **FREE** monthly **HIGH VOLTAGE** newsletter is your name and address. When you enter our $1000.00 Software Sweepstake or place an order for software packages, you will automatically receive the most informative literature ever. A complete catalog of our updated software inventory, software and hardware news updates, innovative applications, programming tips and much more!

RULES AND REGULATIONS

NO PURCHASE NECESSARY. Limit one entry per household where prohibited by law. FAS-TRACK COMPUTER PRODUCTS is not responsible for software packages not available to us. All entries must be postmarked by midnight August 31, 1983. Employees of this magazine FAS-TRACK COMPUTER PRODUCTS, its advertising agency and their families are excluded. Drawing to be held September 7, 1983. Winners will be notified by mail. 1st prize drawing awarded $600.00 in software. 2nd prize drawing awarded $300.00 in software. 3rd prize drawing awarded $100.00 in software.

OFFICIAL SOFTWARE SWEEPSTAKE ENTRY FORM

Complete, clip and insert this form in an envelope or write your name address and computer brand on a separate sheet of paper and mail your entry today!

Name_____
Please Print

Address_____

City_____ State_____ Zip_____

Computer Brand_____

Mail To: FAS-TRACK COMPUTER PRODUCTS
Box 456-D
Columbus, Ohio 43216

FAS-TRACK COMPUTER PRODUCTS

Box 456 • Columbus, Ohio 43216 • 24-HOUR PHONE ORDERS (614) 863-1699 or

TOLL FREE (OUTSIDE OHIO) 1-800-272-1600

Apple, Atari, Commodore & IBM are trademarks or registered trademarks of Apple Computer Inc., Atari Inc., Commodore Int. & International Business Machines Corp. respectively.

CIRCLE 165 ON HEADER SERVICE CARD

to enter the "show mode." From there, you can view your "film" as many times as you like by pressing the M key. Pressing any key during a show stops projection, which can then be advanced by the single frame in either direction. In this way you can inspect your work as closely as you wish. You can even tag frames with the command CONTROL-K, for later tune-up or modification, or to project the film from that specific point.

The rate of projection affects the speed with which animated objects appear to move. Using the speed command (S), the timing value for a segment of *TGS* animation can be easily set. All the user needs to do is reset the timing values wherever necessary, and *TGS* will remember to project each sequence at its assigned speed.

The only hitch with this feature is that timing values must be entered in *hexadecimal* increments of eight. This may be a bit bothersome at first, but is not too difficult to master.

Once you have a sequence you want to hold on to, you back-up to the program menu and select option 3 to save. To erase sequences, the three keys SHIFT, CONTROL, and @ must be pressed simultaneously, twice. It is therefore unlikely that you will delete anything accidentally.

The actual pixels used in Apple lo-res and hi-res differ in shape, so images created in lo-res seem compressed horizontally when viewed in hi-res. Elongation and compression commands are included in *TGS* to overcome this. Using them, lo-res images can be stretched or shortened—altered horizontally or vertically, using the keys B and V. These editing capabilities can do more than mere correction of lo-res to hi-res pixel distortion, of course. They can lengthen or shorten character sets and other graphic material.

Commands are available to allow drawing directly onto the hi-res screen, and to draw perfect circles without fuss or muss.

Likewise, entire shapes can be scrolled horizontally or vertically in the hi-res window. This capability is exploited to create smooth animation of shapes smaller than the hi-res window. In addition, you can create mirror images with the command CONTROL-F. This is handy for creating symmetrical shapes.

Commands are also available to allow drawing directly onto the hi-res screen, and to draw perfect circles without fuss or muss.

Text

TGS can put text on the screen in two distinct ways. By using CONTROL-T to enter the text mode, a hybrid (and improved) version of the standard Apple character set is at your disposal. Just position the cursor, then type. Inverse video is also available. To animate text, capture it as shapes in the hi-res window. Then animate as you would any other shapes. This method can also be used to display and animate "super" character sets (see photos). A special character set is included along with demonstration sequences in the *TGS* package. As stated above, elongation and compression commands can be used to customize character sets.

Okay. Let's say you have created a sequence to use as an audio-visual aid at a business meeting. You need to save your sequences and a customized *projector* menu to a disk. You have the blessing of Accent Software, makers of *TGS*, to

Apple™ users: Buy Transend 1™ for only $89. And get a valuable subscription offer from THE SOURCE.℠

For just $89. Transend 1 software can make your Apple communicate with any computer or information service over the telephone lines. And, for a limited time, you can take advantage of a valuable subscription offer from THE SOURCE, AMERICA'S INFORMATION UTILITY℠—your connection to up-to-the-minute business and UPI news; stock prices; information and shopping services—virtually unlimited uses.

Right now, SSM's complete line of Transend communication software includes this subscription offer. For details, ask your local dealer about Transend. For the name of a local SSM dealer, please call: 800-227-2400, ext 912 (or 800-772-2666, ext 912 in California).

Offer expires June 30, 1984

Apple is a trademark of Apple Computer, Inc. Transend is a trademark of SSM Microcomputer Products, Inc.
THE SOURCE and AMERICA'S INFORMATION UTILITY is a servicemark of Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc.

SSM

Transend it.
SSM Microcomputer Products Inc.
2190 Paragon Drive, San Jose, CA 95131

CIRCLE 276 ON READER SERVICE CARD

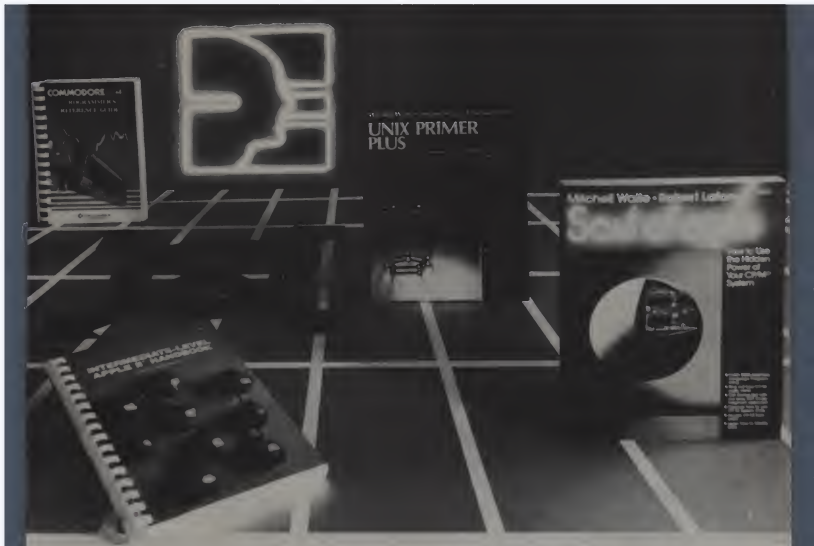


CHART A NEW COURSE WITH SAMS.

Get your hands on these Sams Books and get the know-how you need to further your career in computer programming. Sams Books not only help you program today's popular computers, but also help you control tomorrow's robots.

Find out about UNIX™ with Sams UNIX PRIMER PLUS, written by computer-expert Mitchell Waite. It's the only clearly-written, fully-illustrated introduction to the powerful UNIX operating system currently used for personal-size and large computers. Excellent for self-study. No. 22028, $19.95.

Let Sams lead you through the innerworkings of CP/M® with another new Sams/Waite book, SOUL OF CP/M: HOW TO USE THE HIDDEN POWER OF YOUR CP/M SYSTEM. Learn how to modify BIOS, use CP/M system calls in your own programs, and more. No. 22030, $14.95.

Become an expert on the IBM® PC with 8088 ASSEMBLER LANGUAGE PROGRAMMING: THE IBM PC. It tells you everything you need to know about the 8088 microprocessor—how it works and how you can use it for assembler-language programming. No. 22024, $15.95.

Continue your study of popular computers with INTERMEDIATE-LEVEL APPLE II® HANDBOOK. This hands-on guide explores the entire internal firmware of the Apple II as it shows you how to use its 6502 microprocessor for machine- and assembler-language programming. No. 21889, $16.95.

COMMODORE 64™ PROGRAMMER'S REFERENCE GUIDE is packed with professional tips and special information to help you get the most from your Commodore 64. It includes a complete, detailed dictionary of Commodore BASIC commands, statements and functions with examples showing how each item works. No. 22056, $19.95.

Explore the growing field of robotics with MICROPROCESSOR-BASED ROBOTICS. It's a fascinating introduction to the theory, design and construction of robotics covering everything from the mechanics to computer control. It even shows you how you can operate a robot system with a personal computer. No. 22050, $19.95.

Let Sams help you move your career in a new direction. To order or to get the name of your local Sams retailer, call 800-428-3696 or 317-298-5566 and ask for Operator 395.

SAMS BOOKS AND SOFTWARE

HOWARD W SAMS & CO., INC.
4300 West 62nd Street, PO Box 7092, Indianapolis, IN 46206

Offer good in USA only and expires 10/31/83 Prices subject to change without notice In Canada, contact Lenbrook Electronics, Markham, Ontario

UNIX is a trademark of Bell Laboratories CP/M is a registered trademark of Digital Research, Inc IBM is a registered trademark of International Business Machines, Inc Apple II is a registered trademark of Apple Computer, Inc Commodore 64 is a trademark of Commodore Business Machines, Inc

CIRCLE 242 ON READER SERVICE CARD

AD395

make as many disks as you like for your own *noncommercial* purposes. If you wish to sell a disk that uses *TGS* techniques, however, you must have a special licensing agreement.

The documentation shows you how to create disks that will make *TGS* sequences autorun, and interface with Basic. Although you must have some knowledge of Basic to create sophisticated interfaces to *TGS* graphics (such as interactive tutorials and the like) extensive examples are provided in the documentation to lead the novice user through the process. In many simpler cases the programs can be entered with very little modification.

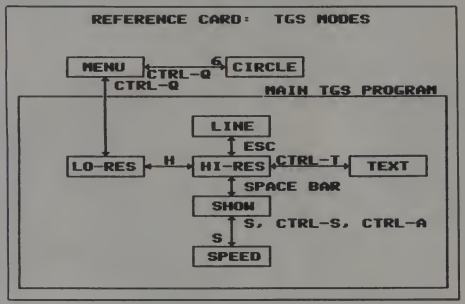


Figure 1. Program organization of TGS.

TGS does not have one of the simplest user interfaces you will find in an Apple graphics package. I'm sure that some folks will find it a bit too much for them—to learn cryptic command codes, create and effectively manage elaborate macros, manipulate machine language data files from Applesoft, and the like. The novice should be forewarned that *TGS* will pose a challenge. At the same time, dramatic results can be achieved with relatively little work, once the basic framework and concepts of the program are understood. The documentation is thorough, light-hearted, and includes reinforcement exercises at the end of each chapter. It makes the process of learning the *TGS* system much less tedious than it might otherwise be.

Advanced animation, using multiple shapes, colored backgrounds, shapes that cross each other, and complicated moving shapes, are the most challenging aspects of the *TGS* system. This is the area I am still working with now. I have come to realize that these kinds of advanced results will come only after I have spent more time with *TGS*. Though it is not the tool to bring animated graphics power to the masses, it is a substantial step in the right direction. As such I heartily recommend it. □

Marymac INDUSTRIES, INC.

In Texas Orders Questions & Answers 1-713-392-0747

22511 Katy Freeway Katy (Houston) Texas 77450

To Order 1-800-231-3680 800-231-3681

SAVE BIG DOLLARS ON ALL TRS-80® HARDWARE & SOFTWARE

TRS-80* BY RADIO SHACK. Brand new in cartons delivered. Save state sales tax. Texas residents add only 5% sales tax. Open Mon.-Fri. 9-6, Sat. 9-1. We pay freight and insurance. Come by and see us. Call us for a reference in or near your city. Ref: Farmers State Bank, Brookshire, Texas.

WE OFFER ON REQUEST

- Federal Express (Overnight Delivery) ☑
- Houston Intercontinental Airport Delivery (Same Day) ☑
- U.P.S. BLUE (Every Day) ☑
- References from people who have bought computers from us probably in your city. We have thousands of satisfied customers. WE WILL NOT BE UNDERSOLD! ☑

ED McMANUS

No Tax on Out of Texas Shipments!

Save 10% 15% OR MORE

Telex 77-4132 (Fleks Hou)

* TRS-80 is a Registered Trademark of Tandy Corp

WE ALWAYS OFFER

- ☑ We accept Master Card, Visa and American Express
- ☑ We use Direct Freight Lines. No long waits.
- ☑ We always pay the freight and insurance
- ☑ Toll free order number
- ☑ Our capability to go to the giant TRS-80® Computer warehouse 5 hours away, in Ft. Worth, Texas, to keep *you* in stock.

JOE McMANUS

The Choice of

DEALERS WE BUY EXCESS INVENTORIES

Computer Exchange — The Supply Center for the IBM-PC or XT

SOFTWARE for the IBM PC or XT.

BUSINESS

		OUR
ASHTON-TATE dBase II requires CP/M-80	$ 700	$439
dBase III requires PC DOS 2.10+	$ 700	$439
Fact-ical Spreadsheet	NEW! $ 195	$129
dBase II Interface for Software Arts	$ 39	$ 25
APPLIED SOFTWARE TECHNOLOGY Fact-ical	$ 195	$129
CONTINENTAL Accountant Plus	$ 1200	$ 719
FCP Time & Billing	NEW! $ 495	$329
Property Management	NEW! $ 495	$329
DATAMOST Real Estate Investment Plus	$ 130	$ 99
Version 2.0	NEW! $ 150	$ 99
EAGLE SOFTWARE IBM Accounting	$ 795	$595
HOWARDSOFT Real Estate Analyzer	$ 250	$149
INFORMATION UNLIMITED Electronic Mail	$ 175	$129
Easywriter II (requires 2 drives)	$ 595	$395
Easywriter (UNIX)	$ 495	$329
INNOVATIVE SOFTWARE T/Maker	$ 495	$395
* INSOFT Data Design-a-powerful entry to use DBASE	Insoft	$ 95
DM Mail Package	$ 50	$ 39
LOTUS 1-2-3	$ 495	$329
MICROCRAFT Requiem CP/M-86	$ 595	$469
Accounting, Billing & Time Keeping - Modest	$ 995	$469
Accounting, Billing & Time Keeping - Extensive	$ 2500	$1199
* MICRO LAB The Tutor Manager	$ 495	$399
MICROPRO WordStar plus free Mailmerge Training Manual	$ 350	$175
Mail Merge	$ 250	$175
SpellStar	$ 250	$175
3 Pak Word & Mail & Spell above 3	$ 695	$449
4 Pak WordStar SpellStar	$ 845	$549
Mail Merge	NEW! $ 350	$199
InfoStar	NEW! $ 350	$199
MICROSOFT Multiplan - in MSDOS	$ 250	$159
NORTH AMERICAN BUS SYSTEM The Answer	$ 1495	$1199
PBI COMPUTER Personal Investor	$ 595	$399
PEACHTREE SOFTWARE Peach-Pak 4 (GL, AR & AP)	$ 995	$699
PERFECT SOFTWARE Perfect Writer	$ 389	$219
Perfect Speller	$ 189	$129
SELECT INFO. Select v3.0	$ 700	$299
SOFTWARE PUBLISHING PFS: File	NEW! $ 140	$ 85
PFS: Report	NEW! $ 125	$ 85
SORCIM ISA SuperCalc	$ 295	$199
SuperWriter	$ 395	$299
SpellguardI	$ 195	$129
STC The Controller	NEW! $ 300	$195
SYNAPSE File Manager	NEW! $ 150	$ 89
SYNERGISTIC Data Reporter	NEW! $ 250	$159
* VISICORP VisiCalc 256K	$ 250	$179
VisiDex or VisiSchedule each	$ 250	$119
VisiTrend Plot	$ 300	$219
VisiTrio or Desktop Plan I each	$ 300	$239

UTILITY

1983 CE SOFTWARE AWARD:

"Copy II PC by Central Point Software is the best CE software buy of 1983. It will copy more copy protected software and faster than any other backup system. Unlike other copiers it makes an exact duplicate of your original and it does 100% verification of copy. Documentation is excellent."

* CENTRAL POINT Copy II PC Backup and Utility	NEW! $ 40	$ 29
* Cumulx Fast-ak RAM Disk emulator and printer spooler program		
Works on any PC DOS version or RAM Card		
Mem/Drive	NEW! $ 100	$ 89
DIGITAL RESEARCH Concurrent CP/M-86	$ 350	$225
CBASIC-86	$ 200	$135
CP/M-86	$ 60	$ 49
HAYES Hayes Terminal Program	$ 100	$ 65
Smartcom II	$ 100	Call
MICROCOM Microcomal	$ 195	$129
MICROSTUF Crosstalk	$ 195	$129
NORELL DATA System Backup	$ 40	$ 29
NORTON Norton Utilities 3.0 (requires 2nd drive)	$ 175	$129

HOME & EDUCATIONAL

EPYX Apventure/Temple of Apshai	$ 40	$ 29
Oil Barons	NEW! $ 100	$ 75
BRODERBUND Apple Panic	$ 30	$ 23
CONTINENTAL The Home Accountant Plus	$ 150	$112
DATAMOST Pig Pen or Space Strike each	$ 35	$ 25
DAVIDSON The Speed Reader	$ 75	$ 55
INFOCOM Deadline	$ 60	$ 49
Zork I or Zork II or Zork III each	$ 40	$ 29
* INSOFT WordTree	NEW! $ 95	$ 79
QuizTree	NEW! $ 35	$ 29
MICROSOFT Flight Simulator (by Sub-Logic)	$ 50	$ 39
SIERRA ON-LINE Golf Challenge	NEW! $ 25	$ 19
Mystery & The Golden Fleece	$ 35	$ 29
PBI, CORP. Personal Investor	$ 145	$ 89
SENTIENT Colony	$ 30	$ 25
SIRIUS Conquest or Call to Arms each	$ 30	$ 25
TECH Alt-Ability Scanners #1	$ 30	$ 25
SPINNAKER Snooper Troops #1 or #2 each	$ 45	$ 39
Story Machine or Face Maker each	$ 40	$ 29
STRATEGIC The Warp Factor	$ 40	$ 29

Portland, Oregon Cash & Carry Outlet, 11937-B S.W. Pacific Highway, Tarrow Shopping Center. Portland, Oregon. Over-the-counter sales only. 10-9 PM between Route 217 and Interstate 5. Open Monday through Saturday 10-6. Call 245-1858.

★ Means a BEST buy

AD #970

IBM is a trademark of IBM Corporation

IBM-PC

System Includes
Two 320K Disk Drives
90 Day Warranty By Us
Call For Details And
Configurations

HARDWARE for the IBM PC or XT

MEMORY CHIP KITS

		OUR
		PRICE
16K set (add 8 to your memory card)	$ 100	$ 49
Compact Plus 64K w/ serial/clock	$ 495	$ 395
Above Compact Plus 128K	$ 595	$ 475
Above Combo Plus 192K	$ 695	$ 525
Above Combo Plus 256K	$ 695	$ 525

ComX	192K RAM Card with Fast-ak ™ RAM disk emulator/ spooler/printer spooler software 2 Year Warranty	$ 675	$ 519
CORTEX PC Packet Modem		$ 80	$ 59
9-Pak Cables for IBM Asynchronous (add-on) to 9-5-1		$ 50	$ 29
MICROSOFT	128K RAM Card w/ Parity	$ 525	$ 395
	128K RAM Card w/ Parity	$ 675	$ 425
MBI	Monte Carlo 64K Fast Function de 1000's	$ 625	$ 395
QCS	Big Blue 280 CPU plus five functions	$ 595	$ 449
QUADRAM CORPORATION			
Quadboard 64K expandable to 256K, 4 function board		$ 395	$ 295
Quadboard 128K, expandable to 256K, 4 function board		$ 495	$ 349
Quadboard+ 192K, expandable to 256K, 4 function board		$ 525	$ 395
Quadboard 256K, four function board		$ 595	$ 429
Quad 512 + 64K plus serial port		$ 325	$ 279
Quad 512 + 256K plus serial port		$ 525	$ 395
Quad 512 + 512k plus serial port		$ 695	$ 575
Microfazer + Copy Par/Par 64K #MP5-e Power Supply		$ 319	$ 219
Microfazer + Copy Par/Par 64K #MP5-e Power Supply		$ 229	$ 159
Microfazer + Copy Par/Par 128K #MP5-e Power Supply		$ 445	$ 349
Microfazer Snap on 8K Par/Par Epson, #MES-e Power Supply		$ 159	$ 109
Microfazer Snap-on, 64K Par/Par Epson, #MES-e Power Supply		$ 319	$ 219
All Microfazers are expandable to copy 5¼"S 2K - Snap-on to 64K			
Tecmar Inc.	ALL in ONE Board, 128K	$ 369	$ 299
	ALL in ONE Board, 256K	$ 469	$ 349
	ALL in ONE Board, 256K	$ 595	$ 449
TG PRODUCTS Joystick		$ 95	$ 49

DRIVES

AMDEK 5.7 Dual Floppy Drive 160K, PC Compatible	$ 599	$ 775

ControlData OR Tandon

DSD DRIVES Double Sided 360K, 320K Same as now supported

1 each	$ 529	$ 239
2 or more	$ 529	$ 229

DAVONG INTERNAL Hard Disk, Up-to-Power Supply, and Controller Card, etc.

5-4MB	$1895	$1395
10-13MB	$2795	$1995
15-19MB	$3795	$2695
21-27MB	$4795	$3495
32-46MB	$5895	$3995

DSD Power Supply (for order PC) $ 200 $ 159
Tape Backup Unit Call Call
Other Davong HD Products in Stock

HAYWARD Floppy Drive Controller Board for up to 4 drives, same with Serial Port $ 185 $ 165
Serial Port Add-On $ 275 $ 239

PRINTERS AND ACCESSORIES

	CALL	CALL
EPSON MX or FX PRINTERS	$ 695	$ 495
NEC Spinwriter 8023 Printer II	$ 1795	$1495
* STAR MICRONICS 9x9 Dot Matrix 100cps 2 Yr. Gemini 10	$ 499	$ 349
9x9 Dot Matrix 160cps 2 Yr. Gemini 15	$ 649	$ 499
ANADEX DP9500 Dot Matrix, 120cps Serial & Cent Para I/F	Special	$ 995
9501 PC to Epson or Star Micronics Cable	$ 60	$ 35
Apple Interface and Cable for Epson or Gemini	$ 95	$ 59
Grappler + by Orange Micro specify printer	$ 165	$ 99
Apple Graftrax Plus Package - Printer Interface & Cable	$ 15	$ 9
MICROTEK Apple Dumpling GX Cable	$ 249	$ 199
Apple Dumpling GX Buffered 64K Spooler & Cable	$ 349	$ 239

LETTER QUALITY - DAISY WHEEL PRINTERS		
COMREX Comrex CR-1 I/F 2000 Serial	$1199	$ 849
Comrex Tractor Feed for CR	$ 118	$ 89
SMITH-CORONA Daisy Wheel printer serial or parallel I/F	$ 899	$ 579
TPI Tractor Feed	$ 149	$ 129

SUPPLIES Ribbons, Paper, Diskettes, Heads, Dump Daisy Wheels and Ribbons

ORDERING INFORMATION AND TERMS:

All Mail: P.O. Box 23086, Portland, OR 97223, include telephone number

Shipping: Most orders shipped same day as received. Add 3% for shipping and handling (C.O.D. orders add $3.00 minimum). UPS ground is standard so add 3% more for UPS Blue with $10 minimum. Add 12% for S&H for US Postal, APO and FPO with $15 minimum. For Hawaii, Alaska, UPS Blue same areas only, all others are the same as call, write, or specify Postal. Foreign orders accept Canada for 5-1/4 add 18% or $25 minimum except for monitors add 30% or $50 minimum. Prices subject to change and typo errors, so call to verify. All goods are new, include warranty and are guaranteed to be as represented. Defective merchandise will be replaced with same or like item. Returns must be authorized. ORDER DESK HOURS 8 to 5 PST Monday through Friday and 10 to 4 Saturday (Pacific time). Returns must be authorized with in 15 days. 1.5% charge will be added to returned checks.

Terms: VISA, MC, COD, Net 15 with approved credit, 2% 10 Net 30 for cash

OUR REFERENCES: We have been a computer dealer since 1978 and in mail order since 1980. Banks: 1st Interstate Bank, (503) 643-4678 We belong to the Chamber of Commerce (503) 644-0123, or call Dunn and Bradstreet if you are a subscriber. Computer Exchange is a division of G Tech Group, Inc.

Fastrak ™ and Generik ™ are trademarks of ComX Corporation

8" CP/M-80

BUSINESS & SYSTEM SOFTWARE – PARTIAL LIST, CALL

		LIST PRICE	OUR PRICE
ASHTON-TATE dBase II		$ 700	$ 439
dBase II User's Guide by Software Banc		$ 30	$ 28
INFOCOM Zork I or Zork II or Zork III or Starcross each		$ 50	$ 39
MICROCRAFT Accounting & Time Keeping - Vendex		$ 995	$ 469
Accounting & Time Keeping - Bellsouper		$ 995	$ 469
MICROPRO WordStar plus free WordStar Training Manual		$ 495	$ 359
Mail Merge		$ 250	$ 159
SpellStar		$ 250	$ 159
3 Pak Word & Mail & Spell		$ 695	$ 449
4 Pak WordStar SpellStar		$ 845	$ 549
Mail Merge	NEW!	$ 350	$ 199
InfoStar	NEW!	$ 350	$ 199
MICROSOFT Multiplan - in MSDOS		$ 250	$ 159
NORTH AMERICAN BUS SYSTEM The Answer		$ 1495	$ 1199
PBI, CORP. Personal Investor		$ 595	$ 399
PEACHTREE SOFTWARE Peach-Pak 4 (GL, AR & AP)		$ 995	$ 699
PERFECT SOFTWARE Perfect Writer		$ 389	$ 219
Perfect Speller		$ 189	$ 129
SELECT INFO. Select v3.0		$ 700	$ 299
SOFTWARE PUBLISHING PFS: File	NEW!	$ 140	$ 85
PFS: Report	NEW!	$ 125	$ 85
SORCIM ISA SuperCalc		$ 295	$ 199
SuperWriter		$ 395	$ 299
Spellguard		$ 195	$ 129
STC The Controller	NEW!	$ 300	$ 195
SYNAPSE File Manager	NEW!	$ 150	$ 89
SYNERGISTIC Data Reporter	NEW!	$ 250	$ 159
* VISICORP VisiCalc 256K		$ 250	$ 179
VisiDex or VisiSchedule each		$ 250	$ 119
VisiTrend Plot		$ 300	$ 219
VisiTrio or Desktop Plan I each		$ 300	$ 239

MONITORS

AMDEK 300 Hi-Res	$ 795	$ 629
Color I Monitor 310/311	$ 345	$ 159
Monitor 12/12M	$ 450	$ 349
VIEW LINE Monitor 12 Amber/Green	$ 299	$ 229
VIEW LINE Monitor 12 Amber	$ 200	$ 139
SANYO 9" Green Screen VM-9101C	$ 179	$ 129
12" Green, Model DM6013	$ 199	$ 159
12" Color Composite Model DM6013	$ 470	$ 349
ZENITH 12 Green Model ZVM-121	$ 150	$ 99
AMDEK 12" Green #300	$ 200	$ 169
12" Amber #300A	$ 215	$ 159
12" Color I #300C	$ 449	$ 359
13" Color II RGB Hi-Res (Ap II, II + IIIE PC)	$ 595	$ 479
13" Color III RGB, Commodore (Ap II III)	$ 569	$ 489
D/M Color II or III to Apple II interface	$ 199	$ 175

MODEMS

ASLON Datatrans 1000 Hand Held Communications Terminal	$ 399	$ 299
HAYES Micromodem II for Apple II	$ 339	$ 249
IBM or Apple Terminal Program for Micromodem II	$ 100	$ 49
Stack Communicator (RS-232)	$ 249	$ 199
Stack Smartmodem (RS-232)	$ 289	$ 229
Smartcom II (RS-232)	$ 100	$ 65
Micromodem 100 (5 1/4 disk)	$ 369	$ 279
Micromodem 100 (5 1/8 disk)	$ 369	$ 279
IBM-PC to Modem Cable	$ 75	$ 59
MICROCOM Micro Courier for Apple II	$ 80	$ 69
Micro Telegram for Apple II	$ 99	$ 79
NOVATION Applecat II Modem	$ 359	$ 299
212 Apple Cat	$ 750	$ 599
SIGNALMAN Modem MKII (RS-232)	$ 89	$ 79
SSM Telemail for Apple II or Data Comm	$ 99	$ 79
ModemCard for the Apple II	$ 299	$ 258

CORVUS SYSTEMS

★ 5 Meg Hard Disk, w/ e Interface	$2395	$1899
★ 10 Meg Hard Disk, w/ e Interface	$3195	$2695
★ 20 Meg Hard Disk, w/ e Interface	$4195	$3495
Omni Plus Interface (IBM-PC) Main, Manual & Cable	$ 300	$ 239
Mirror built in for easy backup	$ 300	$ 239
Apple Interface, Manual & Cable	(Special) $ 995	$ 495
Omni One Server for Apple II		
Omni Interfaces, Omni Net Centralization Mirror All in Stock		

H P 75C Portable Computer 48K, add to 184K	$ 995	$ 795
H P 7470A Graphics Plotter	$1550	$1195
H P 41C Calculator	$ 450	$ 349
H P 41CV Calculator with 2.7K Memory	$ 275	$ 219

Full time on H P 75C and HP41 accessories and software, Call.

DISKETTES

CONTROL DATA CORPORATION Certified Top of the Line Diskettes

CDC 10 each 5-1/4 soft-ring, SS, DD, 48T (Apple, IBM etc.)	$ 55	$ 39
10 each 5-1/4, with ring, SS, DD 48T (Apple, IBM etc.)	$ 75	$ 39
10 each 5-1/4, with ring, DS, DD 48T (Apple, IBM etc.)	$ 75	$ 49
DYSAN 10 each 5-1/4 SS, DD 48T (Apple, IBM, H/P, etc.)	$ 88	$ 49
10 each 5-1/4, DS, DD, 48T (IBM, H/P, etc.)	$ 88	$ 49
MAXELL 10 each 5-1/4 MD-1 SS, SD or DS, DD	$ 39	$ 29

DISKETTES — THE BEST!

With jackets, no statics, produced by a top of the line manufacturer. 60 day warranty for up to 1000 each SS, SD

100 each SS, SD	$ 415	$ 139
1000 each SS, SD	$2200	$1099
100 each DS, DD	$ 575	$ 149
1000 each DS, DD	$4500	$1399

Complete Personal Accountant: we've made the best much more friendly.

If you have any doubts that we offer the best and most complete personal financial package available, look over the features listed below. Now we have the only package with **full screen editing** for Atari 400/800* TRS-80 COLOR, Commodore 64* and VIC-20: the ability to move the cursor in any direction makes our accountant-designed package even more friendly than before. No one else offers all of these:

1. CHECKBOOK MAINTENANCE—automatically balances your checkbook with each entry; manages checks, charges, deposits, and interest quickly and accurately.
2. CHART OF ACCOUNTS—maximum of user flexibility with up to 99 accounts plus 9 subcategories may be defined.
3. CHECK SEARCH—multi-reference; tracks items on every field including tax deductibles.
4. NET WORTH/INCOME/EXPENSE STATEMENT—know-exactly-where-you-stand program generates statements with the touch of a key.
5. DETAIL & SUMMARY BUDGET ANALYSIS—an absolute necessity in financial planning.
6. CHECK WRITER—prints personalized checks.**
7. PAYMENTS/APPOINTMENTS CALENDAR—monthly displays of up to 250 bills and 200 appointments.
8. COLOR GRAPH DESIGN PACKAGE—graphs all monthly files.
9. MAILING LIST—maintains all records, sorts by name or zip, allows add/change/delete.
10. FRIENDLY USER MANUAL—complete with indexing, flow charts and diagrams; the most thorough documentation on the market.

This all adds up to the finest personal financial system available—comprehensive enough for a small business. Less than one hour of data input per month will allow this **menu-driven package** to help you handle your finances with a lot more fun than drudgery. Plus, ours is the only expandable system; purchase the package in sections and add on as your financial needs grow. Features 1, 2, 3 and 6: $39.95 diskette, $36.95 cassette; Features 4 and 5: $29.95 diskette, $26.95 cassette; Features 7, 8 and 9: $29.95 diskette, $26.95 cassette; **or save $19.90 or $15.90 respectively by buying the entire system for $79.95 diskette, $74.95 cassette.**

Prices subject to change without notice. See your local dealer or order direct. New catalog available. Add $3.00 for postage and handling. Credit card orders call toll free:

1-800-334-SOFT

DEALER INQUIRIES INVITED

programmer's institute

a division of **future**house

p.o. box 3470, dept. A, chapel hill, north carolina 27514, 919-967-0861

CIRCLE 217 ON READER SERVICE CARD

Professionals™

LOW PRICES TO PROFESSIONALS WHO KNOW WHAT THEY WANT AND KNOW HOW TO USE IT.

DEALERS WE BUY EXCESS INVENTORIES

apple II+/IIe supply center

APPLE IIe 64K, 40 COLUMN $1,175
APPLE IIe 128K, 80 COLUMN $1,365
APPLE IIe, STARTER SYSTEM BY APPLE (System A)
64K and 80 column
1 Disk II with controller
Apple Monitor III
Monitor Stand $1,750
APPLE IIe STARTER SYSTEM BY COMPUTER EXCHANGE
(SYSTEM B) Includes 64K 80 Col. Card by Apple or CommX.
128K and 80 column
1 Micro-Sci Drive with controller
Filer, Utility and DOS 3.3 Diskette
Sanyo 9" Green Monitor
RF Modulator (for color TV)
Game Paddles
Game with color graphics and sound $1,875
WARRANTY is 100% Parts & Labor for 90 days by us on all above
To substitute or delete drive on System B, subtract $245 and add drive price.
To add Micro-Sci A2 Drive to above, add $245.
To substitute or delete monitor on System B, subtract $130 and add other monitor price (System M).

DISK DRIVES for APPLE II+/IIe

		LIST PRICE	OUR PRICE
MICRO-SCI	A2 5-1/4" 143K Disk Drive Controller Card for A2 Drive	$ 100	$ 79
	A40 5-1/4" 160K Disk Drive	$ 449	$ 339
	A70 5-1/4" 286K Disk Drive	$ 599	$ 399
	Controller for A40 or A70	$ 100	$ 79
	Four Disk Utility Software	$ 20	$ 15
VISTA	Slim 5" 143K Disk Drive Slot Height	$ 300	$ 249
	Dual 5" Double Sided, 320K Half Height	$ 400	$ 329
	Quintet 5.25" Drives Side by Side or Stacked Cabinet	$ 713	$ 575
	Controller Card	$ 89	$ 75
	V1000 Dual 8" Slot Format w Controller. Complete	$2185	$1499
	V1200 8" 8MB Disk Pack System	$1549	$1188
TEAC	143K Disk Drive 1/2 Hgh	$ 379	$ 279
	Controller Card	$ 89	$ 69

C.P. SOFTWARE Filer Utility and DOS 3.3 $ 20 $ 15

HARDWARE

for Apple II

RAM EXPANSION

		LIST PRICE	OUR PRICE
	Cont'd. for the .80 col. 64K Adder		
★ Apple	RAM Card 2-Yr Wty 16K	$ 175	$ 30
★ Microsoft	RAM Card 16K	$ 150	$ 79
★ Saturn Systems	RAM Card 32K	$ 249	$169
	RAM Card 64K	$ 425	$319
	RAM Card 128K	$ 599	$459
★ Axiom	RAM Disk System 320K	$1395	$995

VIDEO CARDS

★ ALS	Smartrem II	$ 179	$130
	Do Cheap Video, 64-col	$ 89	$ 49
	Cont'd. for the .80 col. 64K Adder		
Videx	Videoterm 80 col	$ 345	$229
	Ultra Term	$ 379	$295
	Soft Video Switch	$ 35	$ 25
	Enhancer II	$ 149	$ 89
	Function Strip	$ 79	$ 59
	Ultra Term	$ 379	$375
	Full Video Line Call Up to 30% off		
Vista	Vision 80	$ 299	$149

MISCELLANEOUS

ALS	The CP Mt Card	$ 399	$299
	Z Card	$ 199	$125
	CCS II	$ 179	$139
ASTAR	RF Modulator	$ 35	$ 25
CCS	Serial Interface 7710A	$ 150	$129
Dan Paymar	Lower Case Chip	$ 50	$ 30
Don't Ask	DAC/DISS A Mouth	$ 125	$ 85
★ Eastside	Hot Cad	$ 130	$ 99
Kensington	System Saver	$ 50	$ 40
Kraft	Joystick (Apl II +)	$ 65	$ 49
	Paddle (Apl II +)	$ 50	$ 39
M&R	Sup-R-Term	$ 50	$ 39
★ Microsoft	Z80 SoftCard	$ 345	$249
	Softcard Premium Pack	$ 695	$549
	Z80 Softcard Plus	$ 645	$450
MicroTek	Dumpling 64, Buffered 64K Spooler	$ 349	$239
★ Orange Micro	Grappler Plus	$ 180	$119
	Practical Peripherals.		
	MBS 8K Serial (Epson)	$ 198	$129
	MBP 16K Para (Epson)	$ 198	$129
	Microbuffer II 16K (Apple)	$ 258	$209
	Microbuffer II 32K (Apple)	$ 299	$229
★ PCPI	Appli-Card, 14 features 4 MHz	$ 295	$235
	6 MHz	$ 375	$295
RH Electronics	Super Fan II	$ 75	$ 59
★ Saturn Systems	Accelerator II	$ 349	$249
SSM	A16 II Serial/ Para Interface	$ 225	$169
TG Products	Game Paddles (8)	$ 60	$ 45
	Joystick (II)	$ 60	$ 45
	Select-A-Port (II)	$ 60	$ 45
	Trial Ball (II)	$ 65	$ 44
Videx	PSIO, Para Ser Interface	$ 229	$169
WICO	Trackball (Apl II II +)	$ 60	$ 55

SOFTWARE

on disk for Apple II-II + -IIE

BUSINESS

			LIST PRICE	OUR PRICE
Apple Computer, Inc				
	Apple Writer II		$ 150	$119
	Apple Pascal		$ 250	$169
	12"+ offer Apple Inc. software		Call	
Applied Soft Tech.	VersaForm		$ 389	$265
Attach Manufacturing	Modem II	NEW!	$ 150	$ 89
Ashton-Tate	dBase II (CP M)		$ 700	$439
	Financial Planner		$ 700	$419
	User s Guide by Software Banc		$ 30	$ 29
Brederbund	Bank Street Writer		$ 70	$ 49
Continental	GL, AR, AP or PR ea		$ 250	$169
	Tax Cross Mate		$ 75	$ 49
	Home Accountant		$ 75	$ 49
	TIM II FILE CAT MAIL		$ 100	$ 59
Hayden	Pie Writer (Specify brd)		$ 170	$ 65
Howard Soft.	Real Estate Analyzer II		$ 195	$125
	Tax Preparer		$ 225	$145
Info. Unlim.	Easywriter (PRO)		$ 175	$115
	Mail Call Mailer		$ 150	$ 99
★ Micro Craft	7780 Card)			
	Professional Bkkeeper		$ 995	$469
	Vardact (Legal Billing)		$ 995	$469
★ Micro Lab	Tax Manager		$ 180	$119
Micro Pro	(all CP M)			
	WordStar		$ 495	$336
	Report Star *		$ 350	$180
	MailStar * - Training Manual		$ 495	$336
	MailMerge *		$ 250	$129
	SpellStar *		$ 250	$129
	3 Pak Word - Mail - Spell 3 above		$ 845	$446
	WordStar * - MailMerge * 3 Pak		$ 845	$549
	Data Star *		$ 295	$159
Microsoft	Multi-Plan (CP M)		$ 275	$169
	Multi-Plan (Apple DOS)		$ 275	$169
On-Line	Screen Writer II		$ 70	$ 49
	The Dictionary	NEW!	$ 100	$ 99
	General Manager II	NEW!	$ 250	$150
Osborne C.P. Soft	(Disk and Book)			
	Some Common Basic Programs			
	75 Business Statistics and Math programs for the Apple II		$ 100	$ 49
	Practical Basic Programs			
	40 more very valuable programs beyond Some Com Bas Prog		$ 100	$ 49
Peachtree	Receivables (CP M & MBasic 40 columns)		$ 595	$395
	Series 400 GL 9 AR 9 AP all 3		$ 595	$395
	Series 400w GP Pay, each		$ 400	$275
	Series 8 Tem & Spell 8 Mail all 3		$ 595	$395
Portact	Perfect Writer		$ 495	$219
	Perfect Speller		$ 295	$129
	Perfect Writer Speller 2 Pak		$ 695	$299
	Perfect Filer		$ 595	$250

			LIST PRICE	OUR PRICE
	Quality, GBS & Spec. (a DBMS)		$ 950	$395
Sensible	Sirius System specify		$ 125	$ 89
★ Silicon Valley	Word Handler		$ 250	$119
Soft Sys.	Executive Secretary		$ 250	$169
	Executive Speller		$ 75	$ 59
Stoneham Plus, Software Dimensions				
	Acctg. Plus, General Ledger		$ 425	$295
	Acctg. Plus - GL, AP and A R		$ 995	$595
	Acctg. Plus, above + Inventory		$1395	$775
Software Publishing	PFS: File		$ 125	$ 85
	PFS: Report		$ 125	$ 85
	PFS: Graph		$ 125	$ 85
Southeastern	Data Capture, call to specify			
Stoneware	CB Master		$ 229	$155
	CB Utility for II		$ 69	$ 49
Videx				
	Apprentice II prebook disk		$ 20	$ 15
	Vascalc 80 col. prebook disk		$ 50	$ 39
	Vascalc 40 col. 128K disk		$ 50	$ 39
	Videoterm Utilities Disk		$ 37	$ 29
VisiCorp	Personal Software.			
	Visicalc 3.3		$ 250	$179
	Visiplot / VisiTrex each		$ 250	$179

UTILITY & DEVELOPMENT

Beagle	Utility City		$ 30	$ 22
	DOS Boss		$ 24	$ 18
	Apple Mechanic		$ 30	$ 22
Central Point Software				
	Fixer DOS Utility		$ 20	$ 15
★	Copy II Plus (Ed copier)		$ 40	$ 29
Epson	Graphics Dump		$ 18	$ 9
Howard	SUPERTYPE by Paul Lutus		$ 75	$ 59
Microsoft.				
	M-D-S		$ 125	$ 75
	BASIC Compiler		$ 285	$299
	Cobol 80		$ 750	$559
	Fortran 80		$ 195	$149
	TASC Compiler		$ 175	$150
★ Omega	Lockamith (bit copier)		$ 100	$ 75
Penguin	Comp. Graphics Sys	NEW!	$ 80	$ 59
	Graphics Magician	NEW!	$ 60	$ 41
Phoenix	Zoom Grafix	NEW!	$ 40	$ 29
Quality	Bag of Tricks	NEW!	$ 40	$ 29
Saturn Systems	VC-Expand	NEW!	$ 125	$ 89
	VC-Expand 80		$ 125	$ 89
Sensible	Back It Up (bit copier)		$ 80	$ 49

HOME & EDUCATION

Broderbund	Choplifter	$ 30	$ 26
Budgeco	Pinball Construc. Set	$ 40	$ 27
Continental	Home Accountant	$ 75	$ 49
Dataworld	Aztec or Datsun each	$ 40	$ 27
Infocom	Zork I or II each	$ 40	$ 27
	Deadline	$ 50	$ 34
	Lightning Wizardry	$ 40	$ 27
Micro Lab	Mine Shifter	$ 30	$ 23
Muse	Castle Wolfenstein	$ 30	$ 23
Sierra On-Line	Ultima II	$ 60	$ 45
	Softporn (X Rated)	$ 35	$ 22
Sir-Tech	Wizardry	$ 50	$ 39
Sub Logic	Flight Simul	$ 34	$ 25

OTHER BRANDS AND PROGRAMS IN STOCK. CALL.

WHILE THEY LAST
● OVERSTOCK SPECIALS ●

FOR APPLE II/II + /IIe

★ CommX	16K RAM Card, 2-Yr Warranty	$ 179	$ 34
	Mountain CPS Multifunction	$ 238	$ 119
	Microsoft 16K RAM Card	$ 150	$ 69
	Saturn Systems 32K RAM Card	$ 249	$ 169
	M&R Sup/Term 80 col	$ 150	$ 109
	Videx Videoterm 80 column card	$ 345	$ 229
	CCS Serial Interface 7710A	$ 150	$ 129
	Cavendar Clock 7424A	$ 120	$ 85
	MicroCare Micro Cavalry	$ 250	$ 175
	Micro Teargrip	$ 250	$ 125
	Anadex DP9500 Par Printer	$ 995	$ 695
	ALS Supergrafx - Supercalc - Condor	$ 749	$ 499

SYSCOM 2

Syscom 2 64K / Apple II + Computer ; $ 899 $ 699
Syscom 2 64K Starter System (same as Apple IIe System B above except 64K, 40 columns) $1810 $1199
Note: Substitutions and deletions same as System B apply. Syscom 2 is Syscom 1 w/ software and hardware companies to the Apple II +

AXLON The Leader in Axiom Add-ons

Ramplexer 128K System (80Ch	$ 475	$ 350
Ramplexer 48K Module (for 40D	$ 185	$ 136
Ramplexer 32K (40Col 80D	$ 149	$ 89
Ramexan Diagnostic Disk-ette	$ 15	$ 12

★ Means a BEST buy.

AD #970

VISA

master charge

THE WORLD'S LARGEST COMPUTER MAIL ORDER FIRM

Computer Exchange™

ALL MAIL: P.O. Box 23068, Portland, OR 97223
SHOWROOM AT 11507D SW PACIFIC HWY., PORTLAND, OR, OPEN M-SAT 10-5

CIRCLE 135 ON READER SERVICE CARD

NATIONAL ORDER DESK **TOLL FREE (800) 547-1289**

All Other Orders Including Portland 245-6200

Oregon TOLL FREE	Hot Line For Information
(800) 451-5151	On Your Order
	(503) 246-7404

creative computing software evaluation

Warfare In The Atlantic

A desperate chase to find and destroy a deadly Nazi pocket battleship that is preying on Britain's South Atlantic shipping lifeline is the subject of a new Strategic Simulations wargame, *Pursuit of the Graf Spee* is a direct descendant of, and improvement on, SSI's original and classic wargame, *Computer Bismarck*.

This new game, created by Joel Billings (who assisted in the creation of *Computer*

creative computing

SOFTWARE PROFILE

Name: Pursuit of the Graf Spee

Type: Warfare simulation

System: 48K Apple II with Applesoft ROM card or Apple II+, disk drive

Format: Disk

Language: Applesoft

Summary: Realistic, playable war game

Price: $59.95

Manufacturer:
Strategic Simulations Inc.
465 Fairchild Dr., Suite 108
Mountain View, CA 94043

Brian J. Murphy, 133 Post Road, Fairfield, CT 06430.

Brian J. Murphy

Bismarck), is substantially better than the earlier wargame, offering more excitement, more action and greater playability.

The situation at the beginning of the game is as follows: It is December 1939, and the German pocket battleship Graf Spee and her auxiliary supply ship, Altmark, are in the South Atlantic, poised to strike at Allied merchant shipping off the coasts of West Africa and South America. The mission of the German player is simply to keep Graf Spee afloat, sinking British shipping and avoiding a fleet of Allied cruisers which are scouring the seas in search of her.

For the British player the situation is more difficult. The task is to locate and destroy the Graf Spee. Simple enough, but it could be hiding in any one of 232 sea squares on the hi-res color mapboard. On the first move each player knows the locations of the other's ships, but the Graf Spee will only be found again if a British ship winds up in the same square, or if it is sighted by a merchantman.

The British player has twelve ships with which to search, but their capabilities are limited. Primarily the problem is fuel. The ships use up to one fuel point for a day move and three for a night move. If you send your ships after Graf Spee in a hurry, it will cost a lot of fuel. Once you have expended your fuel points, your ship is restricted to daytime movement only.

In the meantime the German player, though in the dark about the exact locations of the Allied ships, has a much freer hand. When he runs low on oil, he can simply rendezvous with the Altmark and fill right up again. The British ships must head for one of five friendly ports to refuel, and only one of those ports is on the South American side of the map. In short, the German player has a big advantage which greatly enhances his mobility, speed and ability to dodge searchers. It is the same advantage that the real-life commander of the Graf Spee, captain Hans Langdorf, enjoyed.

While the British player sends his ships to and fro searching, the German sends Graf Spee into the shipping lanes—marked on the hi-res screen by white dots—where he will encounter Allied merchant ships if he hovers around in the patrol mode. When Graf Spee finds a merchant ship to sink, the computer automatically scores it as destroyed and awards victory points to the German player. A British merchantman can be worth up to 15 victory points. A German merchant ship—and there are a few on the board—is automatically sunk once sighted and 10 points are awarded to the British. At the end of the game the points are counted to determine the winner.

When opposing units find each other,

COM-STAR F/T

Tractor Friction Printer

only $279

• Lowest price quality tractor friction printer in the U.S.A. • Fast 80 characters per second
• 40, 46, 66, 80, 96, or 132 characters per line spacing • Prints labels, letters, graphs, and tables
• List your programs • Print out data from modem services

Deluxe
COMSTAR F/T
PRINTER — $279.00

The Comstar is an excellent addition to any micro-computer system. (Interfaces are available for Apple, VIC-20, Commodore-64, Pet, Atari 400 and 800, and Hewlett Packard) At only $279. the Comstar gives you print quality and features found only on printers costing twice as much. Compare these features.

• **BI-DIRECTIONAL PRINTING** with a LOGIC SEEKING CARRIAGE CONTROL for higher through-put in actual text printing. 80 characters per second.

• **PRINTING VERSATILITY:** standard 96 ASCII character set plus block graphics and international scripts. An EPROM character generator includes up to 224 characters.

• **INTERFACE FLEXIBILITY:** Centronics is standard. Options include EIA RS232C, 20mA Current Loop. (Add $20.00 for RS232)

• **LONG LIFE PRINT HEAD:** 100 million character life expectancy.

• **THREE SELECTABLE CHARACTER PITCHES:** • 10, 12 or 16.5 characters per inch. 132 columns maximum. Double-width font also is standard for each character pitch.

• **THREE SELECTABLE LINE SPACINGS:** 6, 8 or 12 lines per inch.

• **PROGRAMMABLE LINE FEED:** programmable length from 1/144 to 255/144 inches.

• **VERTICAL FORMAT CONTROL:** programmable form length up to 127 lines, useful for short or over-sized preprinted forms.

• **FRICTION AND TRACTOR FEED:** will accept single sheet paper.

• **224 TOTAL CHARACTERS**

• **USES STANDARD SIZE PAPER**

If you want more try —

Premium Quality
COMSTAR F/T SUPER-10"
PRINTER — $329.00
More Features Than MX-80
For $250 Less

For $329.00 you get all of the features of the Comstar plus 10" carriage, 100 cps, 9 x 9 dot matrix with double strike capability for 18 x 18 dotmatrix. High resolution bit image (120 x 144 dot matrix), underlining, backspacing, 2.3K buffer, left and right margin settings, true lower descenders, with super and subscripts, and prints standard, Italic, Block Graphics, special characters, plus 2K of user definable characters. For the ultimate in price performance the Comstar F/T Super 10" leads the pack!

80 COLUMN PRINTER $199

Super silent operation, 80 CPS, prints Hi-resolution graphics and block graphics, expended character set, exceptionally clear characters, fantastic print quality, uses inexpensive thermal roll paper!

Double
Immediate Replacement
Warranty

We have doubled the normal 90 day warranty to 180 days. Therefore if your printer fails within "180 days" from the date of purchase you simply send your printer to us via United Percel Service, prepaid. We will IMMEDIATELY send you a replacement printer at no charge via United Parcel Service, prepaid. This warranty, once again, proves that WE LOVE OUR CUSTOMERS!

15 DAY FREE TRIAL

OTHER OPTIONS

Extra Ribbons	$ 5.95
Roll Paper Holder	32.95
Roll Paper	4.95
5000 Labels	19.95
1100 Sheets Fan Fold Peper	13.95

Add $20.00 shipping, handling and insurance. Illinois residents please add 6% tax. Add $40.00 for CANADA, PUERTO RICO, HAWAII, ALASKA orders. WE DO NOT EXPORT TO OTHER COUNTRIES. Enclose cashiers check, money order or personal check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail available!! Canada orders must be in U.S. dollers.

PROTECTO
ENTERPRIZES (WE LOVE OUR CUSTOMERS)
BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

COMSTAR F/T

```
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijk
lmn opqrstuvwxyz 1234567890
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
```

SUPER-10"

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890
```

CIRCLE 219 ON READER SERVICE CARD

the game goes into the tactical mode. The hi-res color map disappears, and you see a black screen. Letter codes for the ships are all that is displayed, with a G for Graf Spee always in the center. As you move the ships, the letters for the British ships will move, indicating their positions relative to Graf Spee. Below is a text window where information on range and course for the various ships is displayed and commands are entered.

In the tactical mode, players may maneuver ships, aim fore and aft turrets independently and fire torpedoes. The results of firing are displayed after both sides have entered their moves. If the ships wander out of range of each other (this is determined by visibility factors) then the ships are declared disengaged by the computer and the search resumes on the hi-res map. If the ships inflict damage on each other but do not sink prior to disengagement, then victory points are awarded for the damage.

Some care has been taken to make this game realistic, although some of the detail which made *Computer Bismarck* so realistic has apparently been sacrificed to make room on the disk for a tactical combat phase.

In taking hits, the Graf Spee has the advantage. At long range, when the computer Graf Spee is pounding the British effectively, shells hitting her tend to explode harmlessly on the deck plate or on the armor belt girdling the hull. Still, a lucky hit could disable one of Graf Spee's turrets or her rudder, but the British player risks losing a cruiser and from 40 to 100 victory points.

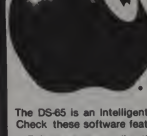
It is not easy, but the British player can win by accurately guessing the next German move and sending strong forces, especially Cumberland and Renown, after the Graf Spee. Once they find her, the best chance of winning in combat is to, again, try to anticipate Graf Spee's maneuvers and to attack her from two or more sides, if you have enough ships.

The game is heavily weighted in favor of the German player.

The game is heavily weighted in favor of the German player; almost any strategy will work for him. Good ideas are to keep Altmark handy and hidden. Refuel from her, but not in a neutral port. That automatically tips off the British, and you risk the possibility of the computer deciding, during your first visit, to scuttle your ship. Avoid points where the British are likely to wait for you. Hit the shipping lanes and run for it.

Options for play offered in *Pursuit of the Graf Spee* include scenarios beginning on December 1, 1939 and on December 13, the day a squadron of British cruisers found the Graf Spee off Montevideo harbor. The second scenario picks up the game in the tactical mode, with the Graf Spee squaring off for combat with Exeter, Ajax, and Achilles. If you prefer, you can resolve combat off-line, using naval miniatures, then input the results into the computer. You can play *Graf Spee* with another wargamer or against the computer.

In summary, *Pursuit of the Graf Spee* is a realistic simulation of a World War II naval campaign. It offers plenty of options to allow you to tailor the game to your own taste. It is not a game for someone who has never played a warfare simulation before, but for those who have had even minimal experience and who like a challenge, *Pursuit of the Graf Spee* is a good bet. □



LET YOUR APPLE SEE THE WORLD!

The DS-65 Digisector® opens up a whole new world for your Apple II. Your computer can now be a part of the action, taking pictures to amuse your friends, watching your house while you're away, taking computer portraits . . . the applications abound! The DS-65 is a random access video digitizer. It converts a TV camera's output into digital information your computer can process. The DS-65 features:

- **High Resolution —** a 256 × 256 picture element scan
- **Precision —** 64 levels of grey scale
- **Versatility —** Accepts either NTSC or industrial video input
- **Economy —** A professional tool priced for the hobbyist

HI-RES PICTURE USING THE DS-65 AND PICTURE SCANNER SOFTWARE

The DS-65 is an intelligent peripheral card with on-board software in 2708 EPROM. Check these software features:

- Full screen scans directly to Apple Hi-Res screen
- Easy random access digitizing by Basic programs
- Line-scan digitizing for reading charts or tracking objects
- Utility functions for clearing and copying the HI-Res screen

Use the DS-65 for precision security systems; computer portraiture; robotics; fast to slow scan conversion; moving target indicators; reading UPC codes, musical scores and paper tape and more! **GIVE YOUR APPLE THE GIFT OF SIGHT!** DS-65 Price: $349.95 / FSII Camera Price: $299.00 / Combination Price: $599.00

ADDITIONAL SOFTWARE FOR THE DS-65

—Picture Scanner: Provides a variety of different dithering algorithms for compressing the digitized image into the Hi-Res screen. Available on 13-sector disk. Price: $39.95

—Superscan: Enables you to enhance the DS-65's HI-Res pictures with colors! Choose from 21 different colors and assign them to grey scale values, modify pictures, zoom, enhance contrast, etc. Print routines for the Anadex and Paper Tiger* are provided. Comes on a 13-sector disk. Written for The Micro Works by Magna Soft. Price: $79.95

—Portrait System Software: This program includes captions and a credit line, reverse printing for T-shirt application and the option to save portraits on disk. Specifically for use with a Malibu 165 printer. Call or write for more information.

*Paper Tiger is a trademark of Integral Data Systems, Inc.

THE MICRO WORKS

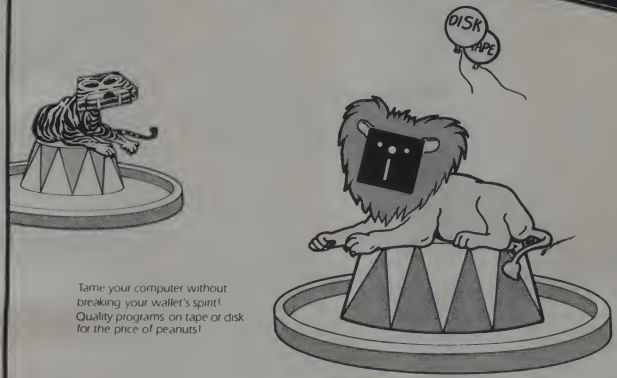
MasterCharge/Visa Accepted

P.O. BOX 1110 DEL MAR, CA 92014 714-942-2400

CIRCLE 222 ON READER SERVICE CARD

THE GREATEST SOFTWARE DEAL ON EARTH!

Radio Shack Color Computer TDP System 100



Tame your computer without breaking your wallet's spirit! Quality programs on tape or disk for the price of peanuts!

A subscription to **Chromasette Magazine** consists of 6 to 8 ready-to-load useful, practical, and fun programs delivered by First Class Mail every month. Programs like Curve Fit, Diggem, Graph Text, List Mod, Robot Run, House Adventure, and Keep Text.

Treat yourself to a great show — get a subscription to **Chromasette Magazine.** Or catch a single act and try a back issue. You'll be delighted by the tricks your computer will do!

The Bottom Line:

	Tape	Disk
1 year (12 issues)	$50.00	$95.00
6 months (6 issues)	$30.00	$55.00
Single Copies	$ 6.00	$11.00

Calif. residents add 6% to single copies. North America — First Class postage included. Overseas — add $10 to subscriptions and $1 to single copies. Sent AO rate.

The Fine Print: All issues from July 1981 available — ask for list. Programs are for the Extended BASIC model and occasionally for disks.

Chromasette MAGAZINE

P.O. Box 1087 Santa Barbara, CA 93102 (805) 963-1066 MasterCard/Visa

CIRCLE 288 ON READER SERVICE CARD

If you have a Radio Shack TRS-80 Model I or III there is Cload Magazine with programs on tape or disk especially tailored for your system.

P.O. Box 1448, Santa Barbara, CA 93102 (805) 962-6271

CLOAD MAGAZINE INC.

CIRCLE 130 ON READER SERVICE CARD

creative computing software evaluation

Rapid Random Record Retrieval

C. A. Johnson

Practically everyone has a need for a good indexing program with efficient random searching capabilities at one time or another. There have been many times when I had a desperate requirement for such a program but did not have the time to write the program myself. My solution had been to build a text file with my word processing program and do my search and retrieval with the FIND command. It worked, but the limitations were severe, and it generally required that the data be entered manually from the keyboard.

When I encountered *Newtrieve* recently, I had mixed emotions. I was overjoyed that such a program was available and at the same time, skeptical of its flexibility. I now have several applications using it and I am just overjoyed.

Newtrieve is delivered on a single, 35-track disk, with no operating system. It consists of the demonstration program, NT/DEM; an enhancement subprogram, ENHAN/BAS; and two indexes, INDEXA/LM and INDEXB/LM. The hardware specified is a 48K TRS-80 Model I or III with one disk drive. The manual makes the point that two drives greatly expand the capability of the program, but it does not tell you how to copy the programs onto a disk with an operating system if you are using TRSDOS and one drive.

Minor modifications must be made to the demonstration program to make it compatible with the operating systems for Model I TRSDOS, Model III TRSDOS, or NEWDOS/80. All of the statements needed are already in the program, but are REM statements. The proper statements are made active by editing out the REM portion of those statements.

Although it does not purport to do everything, *Newtrieve* is an indexing algorithm with sufficient flexibility to enable it to handle a multitude of different applications.

As delivered, *Newtrieve* consists of two parts, the index and a Basic demonstration program which references the index by USR routines. The index provided is preformatted to 500 strings of 40 characters each. Other indexes are available from the manufacturer.

To get the most from the package, you need a knowledge of one of the operating systems and Basic programming. *Newtrieve* is designed as a programming tool, making it the basis of program development, but it can be used as delivered. The demonstration program is menu driven, but does not demonstrate the full capability of *Newtrieve*. The use of alternate indexes and alternate Basic programs is not included in the demonstration program. However, the documentation describes their use and gives some clues for expanding the system accordingly.

Included is a subprogram to enhance the demonstration program. The enhancement adds the ability to add a new search string immediately if a match is not found and to add data into the key string to further limit the search. It appears that the enhancement program was not included as much for actual enhancement as to provide an example for those who wish to make modifications of their own.

Using The Indexes

Indexes can be created interactively, from the keyboard, or loaded from an existing data file, using a modification of one of the subroutines included in the demonstration program.

Once an index has been created, it may be modified by selecting the line to be changed and entering the new data.

Searching the index is both simple and

C. A. Johnson, 3619 Sugarhill Dr., San Antonio, TX 78230

creative computing

SOFTWARE PROFILE

Name: Newtrieve

Type: Index retrieval database

System: TRS-80 Model I, III, 48K

Format: Disk

Summary: An innovative approach to index searching

Price: $75

Manufacturer:
Unique Printing & Stationery
11 Maiden Lane
New York, NY 10038

Lee McFadden makes learning to use your computer and its programs an easy, rewarding experience.

Mastering a new system or even a new program is not easy. It takes a lot of study, a lot of trial and error, a lot of back-and-forth between dense manuals and your computer. Wouldn't it all be so much easier if you had a knowledgeable friend sitting by your side?

Lee McFadden is that friend. He's been producing widely acclaimed teaching tapes for over ten years. He knows what information you need, and exactly when you need it. Team his skill with the know-how of technical experts, and you get a faster, easier way to master your computer and all its power.

Patented Audio Cassettes

Lee guides you patiently, step-by-step, while you're sitting at your keyboard. No connection between the computer and your cassette player is necessary. You learn by doing, instead of by reading. And even the tapes are special—a patented FlipTrack system lets you go at your own pace, covering as much or as little detail as you want.

Ideal for Training

Use the courses over and over again. Share them with friends, family, students and staff. Make "computer literacy" a reality in your local schools. Bring a new employee "up to speed" in just hours, instead of weeks. The fully indexed Guide included with each course is, by itself, an invaluable, on-going reference.

Moneyback Guarantee

You may order any of the FlipTrack courses from us on a 15-day "right of return" basis. Try a lesson or two yourself. Share them with others. If you're not delighted at how quickly and easily you begin to learn, simply return the program in its original condition for a full refund. No questions asked.

How to Order

Drop by your local dealer for a demonstration. Or Visa and MasterCard holders may add $2.50 shipping and handling to the prices, and order toll-free:

1-800-227-1617, Ext. 439

(In California, call 1-800-772-3545, Ext. 439.)

Choose from these rewarding courses:

How to Operate the Apple II ® (specify "e" or "Plus")
3 audio cassettes & Operator's Guide . . . $49.95

How to Operate the Apple/// ®
4 audio cassettes, 1 diskette & Operator's Guide . $95.00

How to Operate the IBM PC ®
3 audio cassettes & Operator's Guide . . . $49.95

How to Operate Your Computer Under CP/M ®
3 audio cassettes & Operator's Guide . . . $49.95

How to Use VisiCalc ®
4 audio cassettes & Lesson Summary . . . $65.00

How to Use WordStar ®
3 audio cassettes & User's Guide . . . $49.95

Learn by listening to a friend.

FlipTrack®
Learning Systems

A Division of Mosaic Media, Inc.
526 N. Main St., Dept. CT-B
Post Office Box 711
Glen Ellyn, IL 60137
312-790-1117

FlipTrack is a registered trademark property of Mosaic Media Inc.
IBM Personal Computer is a registered trademark of IBM Corp. Apple][is a registered trademark of Apple Computer Inc.
VisiCalc is a registered trademark of VisiCorp. WordStar is a registered trademark of MicroPro International Corp.

CIRCLE 178 ON READER SERVICE CARD

Newtrieve, continued...

rapid. Enter the string or a subset of the string (key string) and *Newtrieve* will display all strings which contain the key entered. For example, STE will locate occurrences of SYSTEM, MASTER, and STERILE. By your choice it will display all occurrences at once, the first occurrence, or, if you have added the program which enhances the demonstration, one at a time as you press the ENTER key. Searching the entire index of 20,000 characters takes about one second.

If a search string returns too many data entries, it can be further limited with the Exclude feature. Entering E sets the exclusion flag and causes the program to request a string to be used to exclude strings. For example, STE with the exclusion of MA would return SYSTEM and STERILE in the example above, excluding MASTER.

Another feature provided is the ability to "browse" through the index. You may start at any index entry and browse in either direction, stop when you wish, change direction, continue, or return to the menu.

Included in the menu is the option to divide the index into two equal parts. Either half may then be searched individually. This is a nice feature which allows the inclusion of two short indexes or of two indexes which may be conceptually linked, as in an inventory system in which the first part of the index might be used to determine the part number from a description and the second part of the index to provide the number of items on hand, minimum quantity before ordering, wholesale cost, and retail price.

The program is exited by entering a 0.

Indexes can be created interactively, from the keyboard, or loaded from an existing data file.

If any changes have been made to the index being used, the program reminds you and asks if you wish to save the index. If you do, you select the proper option and the program branches to the "dump" routine. The one thing I found in *Newtrieve* which did not work on my machine was the "dump" routine. However, keying a suggested sequence under DOS accomplished a successful copy of the new index to replace the old one.

The documentation is, in general, very well done. The beginner may find much of it a bit too technical, but he will find enough that he can use immediately that he will probably not feel left out. As he gains experience with his computer, operating system, and Basic programming, he will appreciate the ability to use *Newtrieve* to expand his use of his system.

Spelling Errors

I do not understand why a software publisher will strive to produce a quality program and not take the time or trouble to eliminate spelling errors. The *Newtrieve* documentation has quite a few such errors, both in its internal documentation and in the printed manual. Such carelessness makes me uneasy with the program until I have satisfied myself that the same carelessness does not permeate the program as well.

I have not as yet pushed *Newtrieve* to the limit of its capability, but I am impressed with what I have seen and I have several more applications already planned for it. It is definitely an innovative concept worthy of extensive exploration.

CIRCLE 402 ON READER SERVICE CARD

apple®

BEAGLE BROS.		ON LINE	
Dos Boss	$17	Screenwriter	$89
Alpha Plot	$28	Time Zone	$65
Utility City	$21	Screenwriter Prof.	$135
Tip Disk #1	$15	Frogger	$23
Apple Mechanic	$21	QUALITY	
Pronto Dos	$21	Bag of Tricks	$27
Flex Text	$21	SIRTECH	
Frame Up	$21	Wizardry	$35
Type Faces	$14	Knight of Dia	$24
BRODERBUND		SOFTWARE PUBLISH.	
Choplifter	$23	PFS: Report	$85
CONTINENTAL		PFS: Filing	$87
Home Accountant	$52	PFS: Graph	$87
EDUWARE		STRATEGIC SIM.	
Spelling Bee w/Read	$27	Computer Baseball	$27
Alg. 1, 2 or 3	$27	Guadalcanal	$42
INFOCOM		MISCELLANEOUS	
Zork I, II or III	$27	Multiplan	$190
Starcross	$27	Gamewr(DAC)	$83
Deadline	$34	Graphic Magician	$42
INSOFT		Comp. Graphics Sys.	$49
Graforth II	$50	Time Is w/Einstein	$20
Electric Duet	$20		

PRINTERS

CITOH		NEC	
Prowriter	$368	8023 A-C	$445
Prowriter II	$649	3510	$1375
Starwriter	$1325	3520	$1595
Printmaster	$1599	3550 (IBM)	$1829
GEMINI 10 .. $319		7710/7730	$2319
GEMINI 15 .. $485		SMITHCORONA	
		AXIOM GP-100	$269

MONITORS

NEC		AMDEK	
12" GRN (JB1260)	$115	300 GRN	$139
12" GRN (JB1201M)	$155	V310 (GRN IBM)	$189
12" Color Composite	$329	V310-A (Amber-IBM)	$199
12" Color RGB	$689	COLOR I	$298
USI (Amber)	$169	COLOR II	$650

MODEMS

HAYES		NOVATION	
Micromodem II	$269	Apple-Cat II	$299
Stack Smartmodem	$215	212 Apple-Cat	$589
Smartmodem 1200	$499	D-Cat	$155

ATARI®

800 (48K)	$479.95
NEW 64K ATARI 1200	CALL
810 DISK DRIVE $419	32K RAM (Mosaic) $99
410 RECORDER $74	32K RAM (Intec) $69
850 INTERFACE $164	64K (Intec/400) $129
400 COMPUTER $219	48K (Intec/400) $95
Entertainer $66	Educator $112

PERCOM

RAMDISK (128K)	$378
SIT 3 - SD CDL BOARD	$249
SDDOKEEPER KIT	$169
Single Density Master	$389
Single Density Dual	$639
Double Density Master	$515
Double Density Dual	$859
Dbl Sided Dbl Density Master	$639
Dbl Sided Dbl Density Dual	$949

ADVENTURE INT'L		INFOCOM	
Adv 1-12 each (C)	$18	Zork I, II or III (D)	$27
Preppie (C/D)	$20	Deadline (D)	$34
Diskey (D)	$33	LJK	
APX		Letter Perfect (D)	$104
Eastern Front (C/D)	$23	Data Perfect (D)	$74
747 Land Sim. (C/D)	$17	ON-LINE	
ATARI INC.		Frogger (C/D)	$23
Galaxian	$32	Ultima II (D)	$42
Defender	$32	OPTIMIZED SYSTEMS	
Microsoft Basic (D)	$65	Max-65 (D)	$58
Macro Ass. & Edit (D)	$65	Basic A+ (D)	$58
Assembler Editor (R)	$45	ROKLAN	
ET	$36	Wizard of Wor (D)	$27
Pac Man (R)	$32	Wizard of Wor (R)	$30
Centipede (R)	$32	SYNAPSE SOFTWARE	
Caverns of Mars (D)	$28	File Mngr 800 +	$65
AUTOMATED SIMUL.		Protector II (D) $23 (R) $29	
Temple of Apsh (C/D)	$28	Shamus (D) $23 (R) $29	
Star Warrior (C/D)	$28	MISCELLANEOUS	
BRODERBUND		Miner 2049er (R)	$34
Star Blazer	$22	Galactic Gladiator (D)	$27
Choplifter (D) $23 (R) $29		Cytron Masters (D)	$27
DATA SOFT		Way Out (D)	$27
Zaxxon (C/D)	$27	B-1 Nuc. Bomber (C)	$12

commodore

VIC 64	CALL		
1541 DISK DRIVE	CALL	1530 RECORDER	$64
1525 PRINTER	CALL	1600 MODEM	$87
VIC 20	CALL	16K RAM	$88
VIC 1701 Color Monitor			$259

IBM®

IBM P/C COMPATIBLES — CALL

Lotus 1,2,3	CALL	Data Reporter	$159
Visicalc (256K)	$169	Visitrend/Plot	$199
Easywriter II	$209	Visidex	$169
Home Acct Plus	$95	Visifile	$199
1st Class Mail	$85	Visischedule	$199
Wordstar	$299	Peachtree 4	CALL
Mail Merge	$159	Zork I, II, III	$27
Spellstar	$159	Starcross	$27
Deadline Plan I	$199	Deadline	$34
Frogger	$23	Temple of Apshai	$27
Snooper Troop I	$29	Multiplan	$179

COSMIC COMPUTERS

228 N. PROSPECTORS RD.

DIAMOND BAR, CA 91765

(714) 861-1265

Add $2.00 Shipping per software order anywhere in U.S. Add $5.00 Shipping per software for non-U.S. orders. P.O. Box or FPO-APO. Call for cost of Hardware shipping. Calif. residents add 6½% sales tax. Cashiers Checks or Money Orders filled same day. Personal checks require 4 weeks to clear. **Master Card and Visa OK for software only, add 3% surcharge.** Include card no. / expiration date and signature. Prices subject to change.

CIRCLE 146 ON READER SERVICE CARD

SNAVE SYSTEMS

FRANKLIN COMPUTER CORPORATION

ACE 1000

- Apple II compatible
- 64K of RAM
- Upper and lower case
- Typewriter-style keyboard
- 12-key numeric pad
- Alpha lock key
- VisiCalc® keys
- 50-watt power supply
- Built-in fan
- W/Color

ACE 1200

- Color
- 128K of RAM
- Upper and lower case
- Serial and parallel interfaces
- Cursor key pad
- Numeric key pad
- Alpha lock key
- VisiCalc® and CP/M keys
- 50-watt power supply
- Built-in fan

Bring us your best price, and we'll **BEAT IT!**
And, we take trade-ins. **CALL. .**

apple

We Have APPLES

APPLE IIe Starter System Includes:

Apple IIe
disk drive & cont.
Apple III monitor
80 col. Card
Stand
4 - Month Replacement Warrantee

Low
Low Low Lower
Low **Price** Lowered
Low Low Lowest
Low

~~RETAIL 1895~~

CALL for our price

We'll Ship Anywhere.
Won't Be Undersold.
Fully Tested - If Desired.

Yes, we take trade-ins!

Awesome Prices on:

Printers	Monitors
C-Itoh	Amdek
NEC	Sanyo
Okidata	NEC
Smith Corona	Taxan
Gemini	USI
	Electrohome

Modems	Disk Drives
Hayes	Micro-Sci
Novation	Rana
Anchor	Vista
	Corona

And 100's More - **Just Call!**

We Carry Everything for Apple and Franklin. (others too)

JUST ASK

And Remember. . . . . .
Bring us your best price and we'll **BEAT IT.**

SAVE up to 50% off

- Lowest Prices
- Fast Service
- Best Selection

*If you find any lower prices we'll ***beat*** them.

Questions people ask.

Q: Can anybody buy from Snave?
A: Anyone who wants to save money.
Q: How can you give such Great prices?
A: Volume and Friendly Dependable Service.
Q: Does Snave back-up what they sell?
A: Always.
Q: Is it true you will beat anyones price?
A:

YES !

The Hotest little printers in the world.

Prowriter $393

Gemini 10 $359

Interfaces:
Grappler + $144
Pkaso $149
Tymac $97 w/printer

Fly Board Interface $130	System Saver $59.95
Kraft Joystick $39.95	Ultima II $36.95
Microsci 2nd Drive $282	Word Scrambler $17.95

Crossword Magic $24.95

SNAVE SYSTEMS
Post Office Box 957
Niles, Illinois 60648-0957

312/966-4505

VISA® MasterCard

We accept VISA and MASTERCARD (Include card # and exp. date). Money Order, Certified Check, Personal Check (allow 10 days clearance). Add Only $2 for delivery, (hardware and foreign extra). Illinois residents add 6% sales tax (except on software). Prices and policies subject to change.

FREE Catalog

Apple, Apple IIe, Apple III, and Franklin are Registered Trademarks

CIRCLE 248 ON READER SERVICE CARD

Kraft Quik-Vis

creative computing
SOFTWARE PROFILE
Name: Quik-Vis
Type: Utility
System: Apple, joystick
Format: Disk
Summary: Moves VisiCalc cursor with a joystick
Price: $22.95
Manufacturer:
Kraft Systems Co.
450 W. California Ave.
Vista, CA 92083

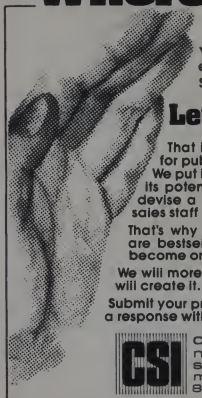
David H. Ahl

Quik-Vis is a subroutine for use with the Apple computer and *VisiCalc* software package which allows the user to move the cursor around the screen with a joystick. There is not much more to say than that. Anyone who uses *VisiCalc* extensively on the Apple is probably fed up with the arrow/spacebar keypress combinations that have to be used for cursor movement. I certainly was, in fact, so much so that I quit using the Apple for *VisiCalc* and switched all of my *VisiCalc* work to a TRS-80 Model III.

Quik-Vis is booted prior to loading *VisiCalc*. Once loaded, you simply move the joystick handle in the direction you want the cursor to move. In addition, Button 0 moves the cursor immediately back to A-1, and Button 1 gives you extra-fast cursor speed.

For $22.95, no one who owns an Apple and *VisiCalc* should be without this handy product. □

Where's the Applause?



You're creative, original, competent.
You've written programs that entertain, educate, organize, analyze.
So where's the applause?

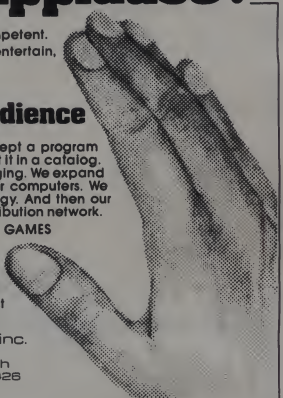
Let us find your audience

That is our business. When we accept a program for publication, we do more than list it in a catalog. We put it in the most effective packaging. We expand its potential with translations for other computers. We devise a competitive marketing strategy. And then our sales staff runs it through a national distribution network.

That's why our programs such as EARLY GAMES are bestsellers. That's how yours could become one.

We will more than find your audience, we will create it. And you'll love the applause.

Submit your programs for review and expect a response within ten business days.



CSI
counterpoint software inc.
new products editor
suite 140 shelard plaza north
minneapolis minnesota 55426
800 • 328 • 1223

IF PERSONAL COMPUTERS ARE FOR EVERYBODY, HOW COME THEY'RE PRICED FOR NOBODY?

A personal computer is supposed to be a computer for persons. Not just wealthy persons. Or whiz-kid persons. Or privileged persons.

But person persons.

In other words, all the persons whom Apple, IBM, and Radio Shack seem to have forgotten about (including, most likely, you).

But that's okay. Because now you can get a high-powered home computer without taking out a second mortgage on your home.

It's the Commodore 64. We're not talking about a low-priced computer that can barely retain a phone number. We're talking about a memory of 64K. Which means it can perform tasks most other home computers can't. Including some of those that cost a lot more. (Take another look at the three computers above.)

$1395* APPLE® IIe 64K

$999* TRS-80® III 16K

$1355* IBM® PC 64K

By itself, the Commodore 64 is all the computer you'll ever need. Yet, if you do want to expand its capabilities some day, you can do so by adding a full complement of Commodore peripherals. Such as disk drives. Modems. And printers.

You can also play terrific games on the Commodore 64. Many of which will be far more challenging than those you could ever play on a game machine alone.

And as great as all this sounds, what's even greater-sounding is the price. It's hundreds of dollars less than that of our nearest competitor.

So while other companies are trying to take advantage of the computer revolution, it seems to us they're really taking advantage of something else:

Their customers.

*Manufacturers' suggested list prices as of March 20, 1983. Monitor included with TRS-80 III only. Commodore Business Machines, P.O. Box 500R, Conshohocken, PA 19428; Canada--3370 Pharmacy Avenue, Agincourt, Ont., Can. M1W 2K4

commodore COMPUTER

Apple is a registered trademark of Apple Computer, Inc.
TRS-80 is a registered trademark of Tandy Corp. IBM is a registered trademark of International Business Machines Corp.

THE COMMODORE 64. UNDER $600.

You can't buy a better computer at twice the price.

CIRCLE 140 ON READER SERVICE CARD

Apple*, Commodore*, Timex/Sinclair* . . .

by William B. Sanders

We make them elementary.

DATAMOST

8943 Fullbright Ave., Chatsworth, Ca. 91311. (213) 709-1202.

VISA/MASTERCHARGE accepted. $2.00 shipping/handling charge. (California residents add 6½% sales tax)

*Apple, Commodore 64, and Timex/Sinclair are trademarks respectively of Apple Computer, Inc., Commodore Business Machines, Inc. and Timex Computer Corp. Copyright 1983 Datamost Inc.

The idea of getting your own computer sounded wonderful. But now that you have it you're a little scared . . . you think it sounds so technical. Well, take heart. Relax. Help is here. William B. Sanders has written individual books about the Apple, the Commodore 64, and the Timex/Sinclair computers. When you select the one which matches your computer you can breathe easy because it'll be like having your all-time favorite teacher at your side . . . gently guiding you, explaining, and showing.

THE ELEMENTARY series sweeps away the confusion and explains your Apple, Commodore 64 or Timex/Sinclair in down to earth terms, coupled with enjoyable cartoons. It shows you how to hook it up, how to use the keyboard and work on the screen—all the unique things your computer can do so you can make use of it right away! And it also answers those questions you'll have about how to write your own simple programs, about graphics, utility programs, and various hardware options.

You'll see your ELEMENTARY book contains a lot of information. And, you'll also see that not one paragraph or chapter is dull or difficult to follow. Prove it yourself. Visit your computer store. Open the book. Read a page of the introduction, then flip to any page and read a paragraph or so. You'll find it's as understandable, as helpful and as marvelous as we say.

creative computing software evaluation

The Transparent Sort

David H. Ahl

The Transparent Sort is an on-screen demonstration of the Shell/Metzner sort, an especially efficient sorting routine.

If you have read any of the articles in *Creative Computing* about sorting techniques, the Shell/Metzner sort has probably caught your eye as being fast and efficient. It is, but it is not all that easy to understand exactly how the speed and efficiency are achieved. *The Transparent Sort* will help.

The 26 letters of the alphabet are shown across the bottom of the screen in one of five orders which you choose from a menu (in order, reversed, scrambled, random, or select your own order). Two lists appear above the alphabet; the one on the left shows the value of each variable in the program, while the other shows running statistics (statements executed, number of comparisons, etc.). Also shown is the current line of the program being executed and an explanation of the line.

When you start the program, two arrows, which point to the two values (letters) which the program is currently comparing, appear below the alphabet. A third "progress pointer" shows how far into the list the sort has progressed.

The program can be run at any of nine speeds by pressing a number key. Slow speeds are useful at first when you want to read the explanation of each statement, but the faster speeds are useful to demonstrate vividly how the list is progressively being brought into the sorted order.

For the most part, the 16-page manual is excellent, except for one exceptionally nasty mistake. In particular, the most important statement of the flowchart (the comparison of the two current values) has the "yes" and "no" reversed on the output arrows. A minor nit is that the authors use a rectangle symbol for a comparison, whereas a diamond is correct.

Given that the TRS-80 Model I is no longer on the market, we think that TRS-80 disk software packages should boot up on both the Models I and III. This one doesn't; to run it on a Model III, it must be converted. This is not a horribly onerous job, except that after conversion the on-screen arrows become right and left brackets which destroys some of the visual effect.

The program has a non-transparent mode of operation to demonstrate the speed of the Shell/Metzner sort. Unfortunately, the fact that it will sort a mixed up alphabet in 8.3 seconds is a bit meaningless without another figure with which to compare it. We think the authors should have included a common bubble sort program on the disk or in the manual to better make the point on speed.

Despite our criticisms, we feel *The Transparent Sort* is an excellent introduction to a fast, efficient sorting technique. We hope that it will encourage more people to use the Shell/Metzner approach in their programs. □

creative computing

SOFTWARE PROFILE

Name: The Transparent Sort
Type: Educational demonstration
System: TRS-80 Models I, III
Format: Cassette or disk
Summary: Watch a sort in progress
Price: Cassette $14.95, Disk $19.95
Manufacturer:
Pulse Software Co.
P.O. Box 1086
Freehold Twp., NJ 07728

Electronic Communications Made simple for The Apple®:

Transpaks™ From SSM.

SSM Transpaks give you all the modem hardware and Transend™ software you need to connect your Apple II/*IIe*® to the world of electronic communications.

Public information services. Transend Software lets your Apple do the walking.

Transpak 1 connects your Apple to other Apples, to mainframe systems, or to public information networks. In fact, all Transpaks include valuable subscription offers to three time-saving information services: THE SOURCE℠, Dow Jones News/Retrieval®, and DIALOG's Knowledge Index℠.

THE SOURCE provides instant access to SourceMail business and UPI world news, stock reports, government activity, and private newsletters—even shopping at discount prices.

Dow Jones News/Retrieval keeps you current with the latest corporate news, stock prices, sports statistics, economic surveys, and exclusive news and information from *The Wall Street Journal, Barron's,* and *The Dow Jones News Service.*

The Knowledge Index instantly locates articles, reports or books from an electronic library of over 10,000 journals. You can request information on practically any topic, and in seconds the Knowledge Index will direct you to pertinent articles.

SSM Transpaks will help you do more:

Electronic mail. Transend software gets it there in seconds.

Transpak 2 insures that information you exchange with other Apples will arrive intact. You can send and receive important documents or files of any size over any distance with complete confidence.

With Transpak 3 and a clock card, your unattended Apple can send electronic mail *automatically* to up to *100* other unattended Apples anywhere in the world, at any hour. You'll save time and phone costs by exchanging information at night when rates are lowest.

Each Transpak includes the SSM 300-baud Apple-Modem Card™ with convenient auto-dial/auto-answer capabilities. For the fastest communication available on the Apple, SSM's Transpak 2+ or Transpak 3+ features the SSM TransModem 1200—a 300/1200-baud stand-alone modem.

Choose your Transpak and get started today.

Each Transpak includes all the communications software and hardware you need in one simple package. Your SSM dealer can help you select the Transpak that's right for you. SSM guarantees your satisfaction or your money back.

	Software	Hardware
Transpak 1	Transend 1 Terminal Emulator	300-baud Modem Card
Transpak 2	Transend 2 Electonic File Transfer	300-baud Modem Card
Transpak 3	Transend 3 Unattended Electronic Mail	300-baud Modem Card
Transpak 2+	Transend 2	TransModem 1200 with serial interface and cable
Transpak 3+	Transend 3	TransModem 1200 with serial interface and cable

Apple and Apple*II/IIe* are registered trademarks of Apple Computer Corporation. Transend, Transpak, AppleModem and TransModem 1200 are trademarks of SSM Microcomputer Products, Inc. THE SOURCE is a service mark of Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc. Dow Jones News Retrieval is a registered trademark of Dow Jones & Company, Inc. Knowledge Index is a service mark of DIALOG Information Services

Transend it.

SSM Microcomputer Products Inc
2190 Paragon Drive, San Jose, CA 95131
408/946-7400

CIRCLE 284 ON READER SERVICE CARD

Lo-Res Sort Display

David G. Schwaegler

The program presented here is a visual aid to understanding various algorithms for sorting lists into rank order. The user may see the operation of the infamous Bubble Sort and the much more efficent Shell Sort in action. A place was left open in the menu to encourage the inclusion of other sorting routines. The low-resolution graphics capabilities of Applesoft are used, but the program could be adapted to machines without graphics by using PRINT, VTAB amd TAB statements in place of the PLOT statements.

David Schwaegler, Route 3, Box 362, Solon, IA 52333.

Program Operation

The program is generously REMarked to explain the specific line functions. Line 100 begins the routine which chooses data points. Each of the 40 points of the Apple screen horizontal (X) axis is assigned a vertical axis (Y) value. Line 130 checks to make certain that no two of these values are alike.

The job of the sorting algorithm is to rearrange those Y values so that they increase in value as the X values increase. Each interchange is shown on the screen using the subroutine at 40 for the Bubble Sort and at 45 for the Shell Sort. The SCRN (X,Y) statement in Applesoft returns the color of the square plotted by the coordinates in the argument. By using SCRN just before the plotting subroutines are called, the colors are preserved and assigned to the data points as they are placed in their new positions. This color coding of the points helps the viewer follow the action. The differences in speed and strategy of sorting routines are much clearer after viewing them while they work.

Lo-Res sort demo.

```
5  REM  REMOVE REMARKS FOR FASTER PROGRAM

10  REM  LOWRES SORT DEMO

20  REM    by DAVID SCHWAEGLER   9/7/82

29  REM   CTRL-C LEADS TO MENU
30  ONERR  GOTO 60
35  GOTO 50

39  REM  COMMON SUBS NEAR TOP FOR BETTER SPEED
40  FOR Z = 0 TO 1: COLOR= CLX(Z): PLOT X + Z,SX(X + Z):
    NEXT : FOR Z = 1 TO TIME: NEXT : RETURN
45  COLOR= CLX(0): PLOT I,SX(I): COLOR= CLX(1): PLOT
    L,SX(L): FOR T = 1 TO TIME: NEXT : RETURN

49  REM  INITIALIZE
50  DIM CX(39),SX(39),TCX(1):CLX(1)
60  TEXT : HOME : VTAB 5: PRINT "THIS PROGRAM PROVIDES A
    SLOW MOTION": PRINT : PRINT "DISPLAY OF THE
    OPERATION": PRINT : PRINT "OF COMMON SORTING
    ALGORITHMS.": VTAB 12: PRINT "PRESS A KEY TO CONTINUE.
70  PRINT "PRESS 'ESC' TO END.": GET D$: IF D$ =  CHR$ (27)
    THEN  END
```

It's the same old Apple II.

For years, people have been trying to build a better Apple® II.

It finally happened.

Meet the Apple IIe, an impressive new version of a most impressive machine.

The "e" means enhanced. Which means a bundle of new features:

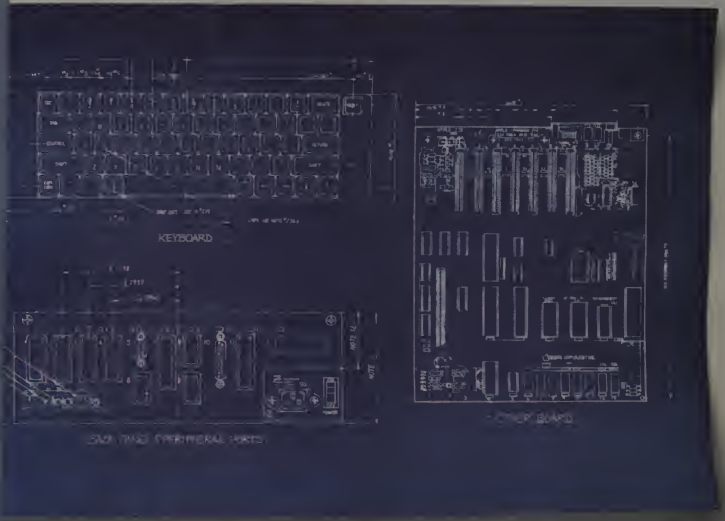
A standard memory of 64K (versus 48K) that's easily expandable. So you can create fatter files and crunch larger numbers of numbers.

A new, improved keyboard, with a complete set of ASCII standard characters. Plus full cursor controls, programmable function keys, and a rapid auto-repeat feature built into every key on the board.

Both upper and lower case characters. (And if you want to see more of them on the screen at one time, a low cost 80-column text card is available.)

Improved peripheral ports. Which make it a lot easier to connect and disconnect game controllers, printers and all those other wonderful things that go with an Apple Personal Computer.

Except for the front, back and inside.



Self-diagnostics. That's a special feature that makes it easy to give your computer a thorough check-up.

Plus an even more reliable design. Achieved by reducing the number of components—which is to say, the number of things that could go wrong.

And bear in mind, the IIe still has all those other virtues that made the Apple II so very popular. Including access to more accessories, peripheral devices and software than any other personal computer you can buy.

So visit any of our over 1300 authorized dealers, and see the newest Apple for yourself.

Like the original, it's rather extraordinary. But then some things never change.

apple

The most personal computer.

Call (800) 538-9696 for the location of the authorized Apple dealer nearest you, or for information regarding corporate purchases through our National Account Program. In California (800) 662-9238. Or write Apple Computer Inc., Advertising and Promotion Dept., 20525 Mariani Ave., Cupertino, CA 95014. ©1983 Apple Computer Inc.

CIRCLE 113 ON READER SERVICE CARD

BASIC vs. JRT PASCAL:

A NO-HOLDS-BARRED COMPARISON.

EASE-OF-USE By dividing programs into modules, JRT Pascal makes even very complex programs—of nearly any size—a breeze to manage. Pascal code is *self-documenting*; program sections are identified by meaningful names, not line numbers. Error messages are verbal, not number codes. JRT offers *12 data types* (to Basic's 2 or 3), and it has both regular and hex numbers.

POWER For power—the ability to write better, clearer programs, faster—Pascal is the run-away winner. Example: JRT simplifies programming by accomplishing complicated operations (for Basic) with one command:

Basic	JRT Pascal
IF A$ = "V" OR A$ = "W" OR A$ = "X" OR A$ = "Y" OR A$ = "Z" THEN...	IF A IN ['V'..'Z'] THEN...

FLEXIBILITY JRT's wide variety of data types reduces programming restrictions. And the data types are not all fixed in size. There are *3 looping statements* (Basic has 1). With JRT, very large programs can be created and run, because program modules can be spread over many diskettes. Common modules can be used for several programs. Basic generally limits strings to 255 bytes; *JRT strings go up to 64K.*

Here's the real shocker!

Features	Basic	JRT Pascal
Structured programs	No	Yes
Separate compiled modules	"Chaining"	Structured procedures with auto-loading & purging
Arithmetic precision	Usually 6 or 7 digits	14 digits
Indexed files	No	Yes
Maximum string size	255 characters	64,000 characters
Loop statements	1	3
Data types	Usually 2 or 3	12
CASE statement	No	Yes
Introduced	1965	1980
Price	???	$29.95!

EFFICIENCY Whereas Basic relies on a static, inefficient memory map to allocate storage, JRT's *dynamic storage* fills every available main storage area; there's no waste. With Basic, sub-routine modules must be linked together; with JRT, they can be linked—but don't have to be. JRT's more powerful commands run faster; typically, you'll *write Pascal programs 3 to 10 times faster* than in Basic. *Exclusive:* JRT lets you directly access the CP/M® operating system for better total system control.

NOW! Consider our copy policy. (If you want to make copies, it's OK with us—so long as they're not for re-sale.) Check our astounding price: **$29.95!**—and *satisfaction is guaranteed—or your money back.* Basic versus JRT Pascal: which comes out on top? Right! The coupon below is for your convenience. Or call. Today.

Full support for indexed files

CRT screen formatting & full cursor control

Facilities for formatting printed reports

File variables & GET/PUT

Dynamic arrays

SEARCH procedures for fast table look-up

Extended CASE statements

Random files to 8 megabytes with variable length records

64K dynamic strings

Activity analyzer prints program usa histogram

14 digit BCD FLOATING POINT arithmetic

True dynamic storage

Advanced assembly interface

Fast one-step compiler; no link needed

Efficient compiler needs only 85K diskette space

Maximum program size: more than 200,000 lines

More than 200 verbal error messages

Separate compilation of auto-loading external procedures

No limits on procedure size, nesting or recursion

175-page user manual with 3-ring protective plastic binder & 5¼" or 8" diskettes

Handy JRT Pascal reference card

Graphing procedures

Statistic procedures

THE COMPLETE PASCAL FOR CP/M.

$29.95!

JRT PASCAL 3.0

Send to **JRT Systems, Inc.** **45 Camino Alto/E2** **Mill Valley, CA 94941** or phone **415/388-0530**

Yes!—I want to take you up on your amazing offer. Here's my $29.95; please send me JRT Pascal. I understand that I must be completely satisfied, or I can return it within 30 days—with the sealed diskettes unopened—for a full refund.

I need the 5¼" diskettes for

- ☐ Apple CP/M
- ☐ Heath, Hard Sector
- ☐ Heath, Soft Sector
- ☐ Kaypro
- ☐ Northstar
- ☐ Osborne
- ☐ Superbrain
- ☐ Televideo
- ☐ Xerox 820

I need the ☐ 8" SSSD **diskette.**

Name _____

Address _____

City _____ State _____ Zip _____

☐ Check ☐ C.O.D. ☐ Mastercard ☐ VISA

(California residents add Sales Tax. Postage paid within North America outside North America: please add $15 for airmail, or $5 for surface mail. Checks must be in U.S. funds and drawn on a U.S. bank.)

Card # _____ Exp. _____

Signature _____

A 50K CP/M system is required. ®CP/M is a Digital Research TM

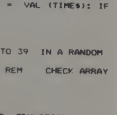
CIRCLE 199 ON READER SERVICE CARD

Lo-Res Sort, continued...

```
 80  HOME : VTAB 5: PRINT "FIRST, POINTS WILL BE PLOTTED":
     PRINT : PRINT "IN A RANDOM ORDER.": PRINT : PRINT :
     PRINT "THEN THEY WILL BE SORTED TO FORM": PRINT :
     PRINT "A DIAGONAL LINE.
 85  PRINT : PRINT : PRINT "CHOOSE THE SPEED.  ENTER A
     NUMBER FROM": PRINT : PRINT "1 TO 1000 ( 1=FASTEST;
     1000=SLOWEST)": PRINT TIME$:TIME =  VAL (TIME$): IF
     TIME  1 OR TIME  1000 THEN 80
 90  GR

 99  REM  GENERATE ALL NUMBERS FROM 0 TO 39  IN A RANDOM
     ORDER
100  FOR X = 0 TO 39:C%(X) = 0: NEXT : REM     CHECK ARRAY
110  X = 0
120  DX =  INT ( RND (1) * 40)

129  REM  IF THIS POINT IS ALREADY USED, TRY AGAIN
130  IF C%(DX) = 1 THEN 120

139  REM  FOUND A WINNER
140  C%(DX) = 1:S%(X) = DX

149  REM      PICK A COLOR LINKED TO THE SIZE OF THE 'Y AXIS'
     VALUE AND PLOT THE POINT
150  CL% = DX / 4 + 1: COLOR= CL%: PLOT X,S%(X)

159  REM      CLEAR AWAY THE PREVIOUS MESS (PRINT SPC(40)
     WILL WORK INSTEAD OF THE CALL)
160  VTAB 22: HTAB 1: CALL  - 868

169  REM  REPORT ON PROGRESS
170  VTAB 22: PRINT "X AXIS ";X,"Y AXIS ";S%(X)
180  VTAB 23: PRINT "WORKING ON NUMBER ";X + 1
182  VTAB 24: CALL  - 868
185  VTAB 24: PRINT "COLOR=";CL%

189  REM  GO BACK FOR ANOTHER
190  X = X + 1: IF X  40 THEN 120

194  REM  LAST X NOT USED
195  X = X  1

199  REM  ALLOW USER TO CHOOSE SORT
200  HOME : VTAB 21: PRINT "CHOOSE SORT ALGORITHM": PRINT
210  INVERSE : PRINT "B";: NORMAL : PRINT "UBBLE";: INVERSE
     : PRINT "S";: NORMAL : PRINT "HELL ;": INVERSE : PRINT
     "Y";: NORMAL : PRINT "OURS
215  INVERSE : PRINT "O";: NORMAL : PRINT "UIT"
220  GET O$: IF O$ = "B" THEN  GOSUB 300: GOTO 60
230  IF O$ = "S" THEN  GOSUB 400: GOTO 60

239  REM  AFTER ANOTHER ROUTINE IS ADDED, CHANGE THE 'GOTO'
     IN LINE 240 TO 'GOTO 60'
240  IF O$ = "Y" THEN  GOSUB 600: GOTO 200
250  IF O$ = "O" THEN  TEXT : HOME : END
260  GOTO 200

299  REM  BUBBLE SORT
300  HOME : VTAB 21: PRINT "BUBBLE SORT": PRINT "IF YOU
     BECOME IMPATIENT": PRINT "PRESS CTRL-C TO END
310  FOR Y =  TO 79: FOR X =  TO 38
320  IF S%(X)  S%(X + 1) THEN 360

339  REM      RE-ARRANGEMENT NEEDED SO SAVE COLORS OF POINTS
     AND ERASE OLD POSITION
350  FOR Z =  TO 1:TC%(Z) =  SCRN( X + Z,S%(X + Z)): NEXT
355  FOR Z =  TO 1:COLOR= Z: PLOT X + Z,S%(X + Z): NEXT
     ERASE WITH BLACK

359  REM  SWITCH
360  TEMP% = S%(X):S%(X) = S%(X + 1),S%(X + 1) = TEMP%

369  REM  PLOT NEW POSITION
370  CL%(0) = TC%(1):CL%(1) = TC%(0): GOSUB 40: REM
     RESTORE COLOR TO POINTS IN NEW POSITIONS
380  NEXT
390  NEXT

399  REM  SIGNAL COMPLETION
400  HOME : PRINT  CHR$ (7): VTAB 22: PRINT "PRESS KEY TO
     RETURN TO MENU"
```


ATARI ATARI ATARI ATARI

INTRODUCING...



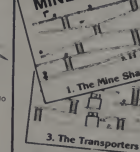
The most user-friendly mail maintenance program available! Here are a few of the outstanding features.

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

Let "Super Mailer" speed your mail!

New!
from Big Five

MINER 2049er



- 16K Cartridge
- 10 Screens
- Great Graphics

Reg. $49.95
$44.90

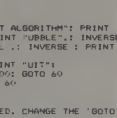
FREE CATALOG
► WITH ANY ORDER ... OR SEND $1.00 (Refundable with Order)

★ **OVER 1000 items for your ATARI!**
Including product descriptions.

- MOSAIC PERCOM
- BRODERBUND APX
- ROKLAN ON-LINE
- DATASOFT ATARI·
- ADVENTURE INT'L
- SYNAPSE VISICALC Much More

★ **We handle only ATARI compatible hardware & software . . . so we know what works best! CALL US FIRST!!!**

ZAXXON
play The Arcade Game at home



- **Non-Stop, 3-D Scrolling Action**

by Datasoft
Reg $39.95 **$35.10**

Protect Your Investment
DUST COVERS

- Durable Brown Vinyl
- 410 400 800 810

Please Specify **$8.95** ea.

★ **Top-Ten Games** ★

1.	Miner 2049er (C-$44.90)	6.	Choplifter (D-$31.50, C-$39.50)
2.	Zaxxon (D,T-$35.10)	7.	Galahad & Holy Grail (D-$29.95)
3.	Shamus (D,T-$31.50 C-$39.50)	8.	Frogger (D,T-$31.50)
4.	Astro Chase (D,T-$26.90)	9.	Football (D,T-$28.90)
5.	Defender (C-$39.50)	10.	Qix (C-$39.50)

NOTE: D = Disk T = Tape C = Cartridge

CREDIT CARD ORDERS - TOLL FREE 1-800-452-8013
(ORDERS ONLY - For Information (503) 683-5361)
• Master Card • American Express • Visa

Shipping & Handling: UPS or PARCEL POST $2.00
UPS Air (48 hr. Delivery!) $3.90

Royal Software (503)683-5361
2160 W. 11th Avenue • Eugene, Oregon 97402

CIRCLE 239 ON READER SERVICE CARD

ADVERTISEMENT

Growing computer industry expands authors' choices

The rapidly expanding personal computer industry offers greater opportunities for the software programmer and author in search of a publisher.

Yet the growth poses its own problem - the choice of a publisher.

Here is a list of questions to consider when looking for the publisher best-suited for your product:

-How large is the publisher's distribution network? A publisher with international connections can offer more exposure than companies limited to regional or national sales.

-How will your product be marketed and advertised? No matter how good the program is, if people don't know about it, it won't sell. Look for a publisher with a marketing budget large enough to give individual attention to the program.

-Does the publisher market programs for more than one computer? The days of limited selection in hardware are long gone. Limiting programs to one or two computers can limit sales and profits. Authors can increase their share of the marketplace by looking for a publisher devoted to converting programs to a variety of popular computers.

-Does the publishing house lend technical support to authors? Some publishers only accept programs ready for the marketplace. A lot of good ideas are lost in the long run. The publisher that offers assistance invests a greater stake in the product, the author and the success of the product.

-Does the publisher offer complete product support to consumers? In these times of consumer awareness, the company that has established a network to answer customer questions about its products fares better than those who do not offer this support.

Each of these services leads to greater sales which in turn lead to greater profits for the individual programmer.

Sierra On-Line, Inc. is committed to paving the way for an author's success.

Sierra On-Line's product line is distributed worldwide with production facilities in the United States, Japan, Australia, the United Kingdom and South Africa.

Sierra On-Line employs a well-financed, in-house marketing and advertising staff with a knack for creating tailor-made campaigns for products.

Each program is evaluated by experts, who may suggest enhancements to improve the product and to increase its appeal to customers.

Further, Sierra On-Line isn't limited to a single computer. The company closely monitors computer trends and makes existing products available for the most popular lines - all to the author's benefit.

A packet for authors with more information about the software submission process and our company is available by writing Sierra On-Line, Inc., Sierra On-Line Building, Coarsegold, CA 93614, or by contacting David Siri or Howard Luthy by phone at (209) 683-6858.

CIRCLE 245 ON READER SERVICE CARD

Lo-Res Sort, continued...

```
390  GET C$: RETURN

399  REM  SHELL SORT
400 M = X: HOME : VTAB 22: PRINT "SHELL SORT": PRINT "IF
     YOU BECOME IMPATIENT": PRINT "PRESS CTRL-C TO END"
410 M =  INT (M / 2)
415  IF M = 0 THEN 540: REM   FINISHED
420 K = X - M
430 J = 0
435 I = J
440 L = I + M
450  IF SX(I) <  = SX(L) THEN 510

459  REM   SWITCH NEEDED.  SAVE COLORS OF POINTS
460 TCX(0) =  SCRN( I,SX(I)):TCX(I) =  SCRN( L,SX(L)): FOR
     Z = 0 TO 1:CLX(Z) = 0: NEXT : GOSUB 45: REM    SAVE
     COLORS AND ERASE WITH BLACK
470 TEMPX = SX(I):SX(I) = SX(L):SX(L) = TEMPX
480 CLX(0) = TCX(I):CLX(1) = TCX(0): GOSUB 45: REM   PLOT
     NEW POINT
490 I = I - M
500  IF I >  = 0 THEN 440
510 J = J + 1
520  IF J > K THEN 410
530  GOTO 435

539  REM   SIGNAL COMPLETION
540 HOME : PRINT  CHR$ (7): VTAB 22: PRINT "PRESS A KEY TO
     RETURN TO MENU"
550  GET Q$: RETURN

599  REM  PLACE FOR ANOTHER
610 HOME : VTAB 22: PRINT "NO SORT INSTALLED HERE YET"
620  PRINT "PRESS ANY KEY TO RETURN TO MENU"
630  GET Q$: RETURN

1000  REM   VARIABLE ATLAS

1001  REM    CX(ARRAY) = CHECK ARRAY FOR RANDOM NUMBER!0 =
     UNUSED!1 = USED

1002  REM   SX(ARRAY) = THE DATA  FOR SORTING; ALSO USED TO
     DETERMINE THE 'Y AXIS'

1003  REM   CLX AND CLX(ARRAY) = COLORS FOR  PLOTTING

1004  REM   TCX(ARRAY) = TEMPORARY COLOR .  USED TO SAVE
     THE COLOR OF THE POINT WHILE IT IS MOVED

1005  REM  X='X AXIS'

1006  REM   OTHER VARIABLES ARE SCRATCH VARIABLES

1007  REM  CODING AND VARIBLES TAKE LESS THAN 4K OF RAM
```

"We need someone who'll go to the users' group meetings to break some pirates' knuckles."

THE CAVERNS OF FREITAG™

For Apple II+ and Apple II e

ANYONE CAN ENTER, BUT ONLY THE MOST SKILLED WILL COME OUT ALIVE.

MUSE®
SOFTWARE

347 N. CHARLES STREET, BALTIMORE, MD 21201/(301) 659-7212

Apple is a registered trademark of Apple, Inc.

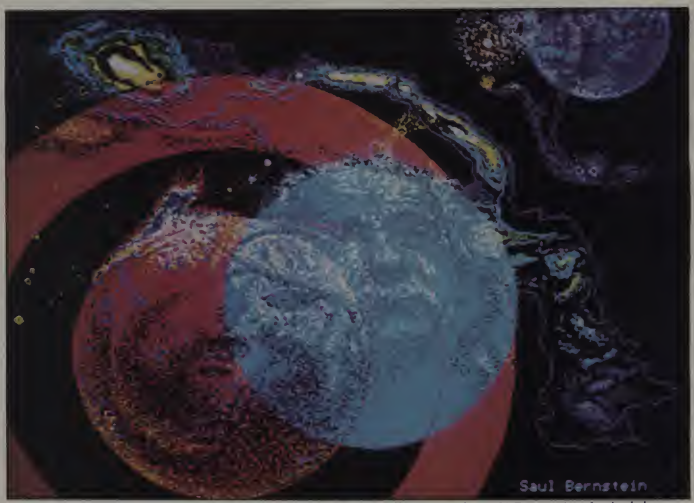
CIRCLE 200 ON READER SERVICE CARD

Saul Bernstein: Pixel Picasso

John J. Anderson

Saul Bernstein is without a doubt the top microcomputer artist in the country today. He has gained nationwide notoriety and acclaim, and won an Emmy for his efforts in microcomputerized animation. Though it is less well known, he is also one of the most eloquent voices speaking for microcomputers in education that you are apt to hear.

When the Royal Family visited Silicon Valley a few months ago, it was Saul who was commissioned by Hewlett-Packard to do portraits of Queen Elizabeth and Prince Phillip. They were so striking that the Queen thought the computer images had somehow been produced photographically, until she was told Bernstein works



From the realm of the microcomputer: an image at once cosmic yet human. When viewed on a CRT, evocative of stained glass.

Universal's
Hot as a firecracker
deals for July!

APPLE II & IIe

TITLE	RETAIL	COST
Hi-Res Computer Golf	$ 34.95	$ 25.95
Choplifter	34.95	25.95
Bank Street Writer	69.95	52.95
A.E.	34.95	25.95
Gumball (New)	29.95	21.95
Home Accountant	74.95	54.95
R.E.I.P. (Real Estate)	129.95	96.95
Property Manager	295.00	221.95
Market Technician (New)	195.00	144.95
GL W/Payables	495.00	369.95
Payroll	395.00	289.95
Receivables (New)	395.00	289.95
Hands on Basic (New)	79.00	58.95
Algebra 5 & 6 (New)	49.95	36.95
SAT	49.95	36.95
PSAT	49.95	36.95
MasterType	39.95	29.95
Supertext Professional	175.00	129.95
Castle Wolfenstein	29.95	21.95
Caverns of Freitag (New)	29.95	21.95
Wayout	39.95	29.95
Repton	39.95	29.95
Wizardry	49.95	36.95
Knight of Diamonds	34.95	25.95
Police Artist (New)	39.95	29.95
Battle Cry (New)	32.95	23.95
Temple of Apshai	39.95	29.95
Zork 1	39.95	29.95
Zork 2	39.95	29.95
Zork 3	39.95	29.95
Deadline	49.95	36.95
Starcross	39.95	29.95
Suspended (New)	49.95	36.95
Sherwood Forest	34.95	25.95
SuperCalc 2	295.00	221.95

ATARI

TITLE	RETAIL	COST
Preppie 2 (T/D)	34.95	25.95
Choplifter(Rom Cart)	44.95	33.95
Serpentine (Rom Cart)	44.95	33.95
A.E. (New) (D)	34.95	25.95
Bank Street Writer (New)(D)	69.95	52.95
Air Strike (T)	39.95	29.95
Teletalk (D)	49.95	36.95
Basic Compiler (D)	99.95	74.95
Text Wizard (D)	99.95	74.95
Spell Wizard (D)	79.95	59.95
Zaxxon (T/D)	39.95	29.95
Temple of Apshai (T/D)	39.95	29.95
Jumpman (New) (T/D)	39.95	29.95
Starbowl Football (T/D)	32.95	24.95
Zork 1 (D)	39.95	29.95
Zork 2 (D)	39.95	29.95
Zork 3 (D)	39.95	29.95
Deadline (D)	49.95	36.95
Starcross (D)	39.95	29.95
Suspended (New) (D)	49.95	36.95
MasterType (D)	39.95	29.95
Castle Wolfenstein (D)	29.95	21.95
Wizard of Wor (C)	44.95	33.95
Repton (D)	39.95	29.95
Twerps (New) (D)	34.95	25.95
Blade of Blackpool (New)(D)	39.95	29.95
Necro Mancer (T/D)	34.95	25.95
Survivor (T/D)	34.95	25.95
Fort Apocalypse (T/D)	34.95	25.95
Pharoh's Curse (New)(T/D)	34.95	25.95
Shamus 2 (New) (T/D)	34.95	25.95

VIC-20

TITLE	RETAIL	COST
Martian Raider (New) (T)	19.95	14.95
Shark Trap (New) (T)	19.95	14.95
Choplifter (SAVE!!!) (C)	44.95	29.95
Rat Hotel (New) (C)	39.95	29.95
Trashman (SAVE!!!) (C)	44.95	29.95
Home/Office (T)	29.95	21.95
Sword of Fargoal (T)	29.95	21.95
Rescue at Rigel (T)	29.95	21.95
HES Writer (C)	39.95	29.95
VIC Forth (C)	59.95	44.95
Exterminator (T)	24.95	18.95
Krazy Kong (T)	12.95	9.95
Quick Brown Fox (C)	65.00	48.95
Deadly Duck (C)	34.95	25.95
Touch Typing Tutor (T)	19.95	14.95
Annihilator (T)	19.95	14.95
Kongo Kong (T)	19.95	14.95
Trek (T)	19.95	14.95
Flash 'N Math Addition (T)	15.95	11.95
Flash 'N Spell (T)	15.95	11.95
Serpentine (SAVE!!!) (C)	44.95	29.95

COMMODORE 64

TITLE	RETAIL	COST
Home Accountant (D)	74.95	54.95
Temple of Apshai (D)	39.95	29.95
Upper Reaches of Apshai (D)	19.95	14.95
Curse of Ra (D)	19.95	14.95
Jumpman (New...GREAT!)(D)	39.95	29.95
Coco (D)	49.95	36.95
Gridrunner (C)	39.95	29.95
HES Writer (C)	44.95	34.95
Retro Ball (C)	39.95	29.95
HES Mon 64 (C)	39.95	29.95
Zork 1 (D)	39.95	29.95
Zork 2 (D)	39.95	29.95
Zork 3 (D)	39.95	29.95
Deadline (D)	49.95	36.95
Starcross (D)	39.95	29.95
Suspended (New) (D)	49.95	36.95
Weather War II (T)	19.95	14.95
Medicine Man (T)	21.95	16.95
3D 64 Man (T)	19.95	14.95
Krazy Kong (T)	19.95	14.95
Quick Brown Fox (C)	65.00	49.95
Color Craft (T)	29.95	21.95
Color Craft (D)	34.95	25.95
Meteor Madness (New) (T)	24.95	18.95
Meteor Madness (New) (D)	29.95	21.95
Fast Eddie (D)	34.95	26.95
Turmoil (D)	34.95	26.95
Squash 'Um (New) (D)	34.95	26.95
Type Attack (D)	39.95	29.95
Robbers of the Lost Tomb (D/T)	24.95	18.95
Wall Street (D/T)	24.95	18.95
Money Manager (D/T)	24.95	18.95
Data Manager (D/T)	24.95	18.95
Adventure Pack 1 (T)	19.95	14.95
Adventure Pack 2 (T)	19.95	14.95
Grave Robbers (T)	19.95	14.95
Trek-64 (T)	15.95	12.95
Annihilator (T)	21.95	15.95
Kongo Kong (T)	24.95	18.95

TIMEX-SINCLAIR

TITLE	RETAIL	COST
Budget Master (T)	15.95	12.95
Reversi (T)	15.95	12.95
2K Trek (T)	15.95	12.95
Sabotage (T)	15.95	12.95
2K Fun Pack (T)	15.95	12.95
Gulper (T)	15.95	12.95
Astro 100-0 (T)	15.95	12.95
Cosmic Invaders (T)	15.95	12.95
Robbers of the Lost Tomb (T)	14.95	11.95
Wall Street (T)	16.95	13.95
Electronic Checkbook (T)	16.95	13.95
Data Master (T)	14.95	11.95

BOOKS

TITLE	RETAIL	COST
Adventure Hint Book	7.95	6.25
Apple Book of Software 1983	19.95	14.95
Apple Graphics & Arcade Design Book	19.95	14.95
Kids & the Apple	19.95	14.95
Elementary Apple	14.95	11.95
Games Apples Play	14.95	11.95
Kids & the Atari	19.95	14.95
Atari Book of Software 1983	19.95	14.95
Kids & the VIC-20	19.95	14.95
Elementary Commodore 64	14.95	11.95
Apple Connection	12.95	10.95
Doing Business with VisiCalc	12.95	9.95
Intro to Wordstar	11.95	9.95
Mastering VisiCalc	11.95	9.95

FOR FAST DELIVERY, send certified checks, money orders, or use your Master Charge or Visa and call **1-800-343-8019.** From inside New Hampshire call **1-542-6175.** Personal or company checks require two to three weeks to clear. All prices are subject to change without notice. Please include $2.00 per package for postage and handling.

OPEN MONDAY THRU SATURDAY • 8:00 AM to 10:00 PM E.D.T.

CALL NOW
1-800-343-8019
UNIVERSAL SOFTWARE
The Best Software for Less
P. O. Box 955
Claremont, NH 03743

CIRCLE 278 ON READER SERVICE CARD

NEW UP TO 2MB ON A SINGLE CARD!

STATE OF THE ART MEMORY SYSTEMS

512KB SINGLE BOARD IBM MEMORY W/RS232-C PORT

- Addressable as a contiguous block in 64KB increments thru 1 megabyte.
- On board parity with interrupt on parity error.

SINGLE QTY. PRICE: $795.00

MEMDISK 1 Allows memory to emulate disks. Increases system performance!! FREE with purchase of memory.

64KB SINGLE BOARD EXORCISER I, II, AND ROCKWELL SYSTEMS 65 MEMORY

- Parity checker on board.
- Addressable as a contiguous block in 4K increments with respect to VXA or VUA.
- Pin to Pin compatibility.

SINGLE QTY. PRICE: $250.00

NEW

512MB TO 2MB SINGLE BOARD MULTIBUS MEMORY

- Pin to Pin MULTIBUS compatibility for both 8 bit and 16 bit systems.
- On board parity with selectable interrupt on parity ERROR.
- Addressable up to 16 megabytes.

SINGLE QTY. PRICE:

512KB	**$ 895.00**
1MB	**$4495.00**
2MB	**$8700.00**

64KB SINGLE BOARD S100 MEMORY

- Addressable as a contiguous block in 4K word increments.
- Battery back-up capability.
- Functions with on-board refresh.

SINGLE QTY. PRICE: $250.00

NEW

256KB TO 1 MB SINGLE BOARD LSI 11 MEMORY

- On board parity generator checker.
- Addressable as contiguous block in 256KB increments through 4 megabytes.
- Battery back-up mode.

SINGLE QTY. PRICE:

256KB	**$ 595.00**
512KB	**$2650.00**
1MB	**$3995.00**

DON'T ASK WHY WE CHARGE SO LITTLE, ASK WHY THEY CHARGE SO MUCH.

Chrislin Industries, Inc.

31352 Via Colinas • Westlake Village, CA 91362 • 213-991-2254

TWX 910-494-1253 (CHRISLIN WKVG)

CIRCLE 136 ON READER SERVICE CARD

Her Majesty the Queen.

using a stylus on a graphics tablet. Some of his results grace our cover this month, through his unbridled generosity.

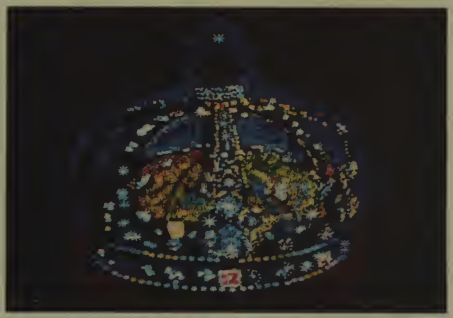
I managed to catch Bernstein between a speech in Chicago and a flight to Comdex in Atlanta, and got him to talk about what he does, and why and how he does it. I found him an extremely engaging subject.

Creative Computing: How did you get started with microcomputer art, and what equipment did you have?

Bernstein: I got started with an Apple II back around Christmas of '78. The desire was simply to be able to paint into a television set.

Creative: You had been painting in conventional media.

Bernstein: Right. In the early '60s I had what you might call a normal fine arts career, but got tired of the—what would you call it—the elitism of the so-called fine arts. I wanted to communicate more strongly with a larger piece of society. So, after a long discussion with my wife, I decided the illustration field was the place



A crowning accomplishment.

Galactic Einstein: he would have loved micros.

Andres Segovia: illumination from within.

to go. So I began doing straight illustration: oil painting, watercolors, and the like for the NFL, Westway magazine, and stuff like that. And I liked it; the money was good, but what was even better were the phone calls I received from people I knew and people I didn't know—people who saw the stuff after it was printed. I thought, "gee this is wonderful, because it gives me real feedback."

Creative: You developed a forum.

Bernstein: Yes, and beyond that of the fine arts college professor.

Creative: Were had you been teaching?

Bernstein: I teach at California State University of Northridge.

Creative: Then what?

Bernstein: Then I managed to get involved in video—I guess because I wanted to be a better teacher. This was around the time of the campus riots in the late '60s. I remember one woman carrying a placard that said "Make our educations relevant." I thought that made some sense. I had some introspective moments—I realized that the content of what I was saying was good, but I was nevertheless teaching it the same way it had been taught in the 17th century. So I thought about new ways to teach art, and of course television presented itself. I proceeded to build a black and white TV studio in my art studio, and went out and interviewed people in the field. All of a sudden my enrollment grew. The administration of the college was happy with it and supported me.

I remember one woman carrying a placard that said "Make our educations relevant."

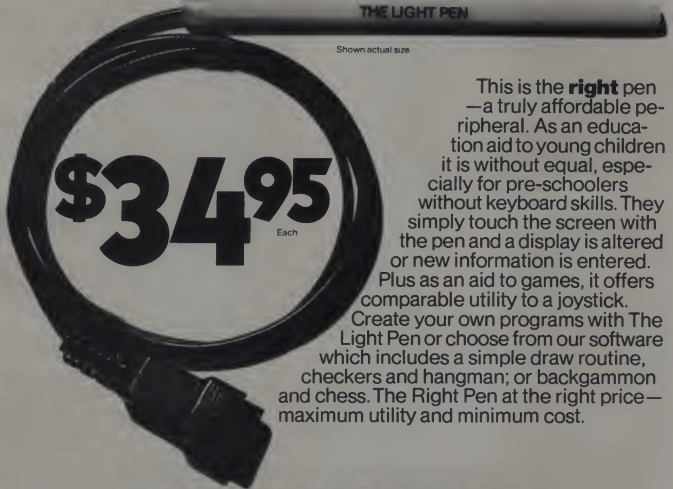
I became fairly comfortable with electronics over this time. I was the engineer, I was the writer, I was the director, I was the interviewer: this gave me valuable experience. I found that industry was largely supportive as well. They were trying to make the bridge to education at that time, which was pretty hard to do, as no ties existed back then. So we got our cameras in there.

You know our society is more or less a vertical one. Everyone is concerned with their own homes and their own jobs, and there's very little lateral communication. That's what I was trying to do, but it was hard to find a vehicle. The video thing, I think, led me to that fateful night I dreamt I could paint into a television set.

Creative: You literally dreamt that you were painting with light on a TV.

Bernstein: Yes. And of course I didn't

The Light Pen at the Right Price:



This is the **right** pen —a truly affordable peripheral. As an education aid to young children it is without equal, especially for pre-schoolers without keyboard skills. They simply touch the screen with the pen and a display is altered or new information is entered. Plus as an aid to games, it offers comparable utility to a joystick. Create your own programs with The Light Pen or choose from our software which includes a simple draw routine, checkers and hangman; or backgammon and chess. The Right Pen at the right price— maximum utility and minimum cost.

Prices subject to change without notice. See your local dealer or order direct. New catalog available.
Add $3.00 for postage and handling. Credit card orders call toll free:

1-800-334-SOFT

DEALER INQUIRIES INVITED

programmer's institute

a division of futurehouse

p.o. box 3470, dept. A, chapel hill, north carolina 27514 919-967-0861

CIRCLE 216 ON READER SERVICE CARD

AARDVARK — THE ADVENTURE PLACE

TRS-80 COLOR COMMODORE 24 VIC-20 SINCLAIR/TIMEX TI99

WE CARRY MORE THAN ADVENTURES!!

MAXI-PROS WORD PROCESSING NEW

The easiest to use word processor that I know of. Has all the features of a major word processor (right and left margin justification, page numbering, global and line adding, single, double, triple spacing, text centering, etc.) at a very cheap price because we wrote it in BASIC. Includes 40 page manual and learning guide. Easily modified to handle almost any printer combination. Available on disk or tape for VIC20, COMMODORE64, and TRS-80 COLOR computer. Requires 13k RAM on Vic, 16k EXTENDED on TRS-80 COLOR. ... $19.95 on tape $24.95 on disk.

GENERAL LEDGER NEW — Complete bookkeeping for a small business. Disk required. For Vic20 (13k), Commodore64, TRS-80 COLOR (16k EXTENDED). $69.95 (Send $1.00 for manual before ordering.)

LABYRINTH — 16K EXTENDED COLOR BASIC — With amazing 3D graphics, you fight your way through a maza facing real time monsters. The graphics are real enough to cause claustrophobia.

Similar game for Timex/Sinclair 16k - hunting treasure instead of monsters $14.95.

ADVENTURE WRITING/DEATHSHIP by **Rodger Olsen** — This is a data sheet showing how we do it. It is about 14 pages of detailed instructions how to write your own adventures. It contains the entire text of Deathship. Data sheet - $3.95. NOTE: Owners of TI99, TRS-80, TRS-80 Color, and Vic 20 computers can also get Deathship on tape for an additional $5.00.

Dealers – We have the best deal going for you. Good discounts, axchange programs, and factory support. Send for Dealar Information.

Authors – Aardvark pays the highest commissions in the industry and gives programs the widest possible advertising coverage. Send a Self Addressed Stamped Envelope for our Authors Information Package.

ADVENTURES — Adventures are a unique form of computer game. They let you spend 30 to 70 hours exploring and conquering a world you have never seen before. There is little or no luck in Adventuring. The rewards are for creative thinking, courage, and wise gambling – not fast reflexes.

In Adventuring, the computer speaks and listens to plain English. No prior knowledge of computers, special controls, or games is required so everyone enjoys them – even people who do not like computers.

Except for Quest, itself unique among Adventure games, Adventures are non-graphic. Adventures are more like reading a comic book or arcade game. It is like reading a particular exciting book where you are the main character.

All of the Adventures in this ad are in Basic. They are full featured, fully plotted adventures that will take a minimum of thirty hours (in several sittings) to play.

Adventuring requires 16k on Sinclair, TRS-80, and TRS-80 Color. They require 8k on OSI and 13k on VIC-20. Sinclair requires extended BASIC. Now available for TI99.

TREK ADVENTURE by Bob Ratella — This one takes place aboard a familiar starship and is a must for trekkies. The problem is a familiar one — The ship is in a "decaying orbit" (the Captain never could learn to park!) and the engines are out (You would think that in all those years, they would have learned to build some that didn't die once a week). Your options are to start the engine, save the ship, get off the ship, or die. Good Luck.

Authors note to players – I wrote this one with a conception in hand. It is very accurate – and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

DERELICT by Rodger Olsen and Bob Anderson — For Wealth and Glory, you have to ransack a thousand year old space ship. You'll have to learn to speak their language and operate the machinary they left behind. The hardest problem of all is to live through it.

Authors note to players — This adventure is the new winner in the "Toughest Adventure at Aardvark" competition. Our most difficult problem in writing tha advanture was to keep it logical and realistic. There are no irrational traps and sudden senseless deaths in Derelict. This ship was designed to be perfectly safe for its' builders. It just happens to be deadly to alian invaders like you.

Dungeons of Death — Just for the 16k TRS-80 COLOR, this is tha first D&D type game good enough to qualify at Aardvark. This is sarious D&D that allows 1 to 6 players to go on a Dragon Hunting, Monster Killing, Dungeon Exploring Quast. Playad on an on-screen map, you get a choice of race and character (Human, Dwarf, Soldier, Wizard, etc.), a chance to grow from game to game, and a 15 page manual. At the normal price for an Advanture ($14.95 tape, $19.95 disk), this is a giveaway.

PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

MARS by Rodger Olsen — Your ship crashed on tha Red Planet and you have to get home. You will have to explore a Martian city, repair your ship and deal with possibly hostile aliens to get home again.

Authors note to players — This is highly recommended as a first adventure. It is in no way simple – playing time normally runs from 30 to 50 hours — but it is constructed in a more "open" manner to let you try out adventuring and get used to the game before you hit the really tough problems.

QUEST by Bob Ratella and Rodger Olsen — THIS IS DIFFERENT FROM ALL THE OTHER GAMES OF ADVENTURE!!!! It is played on a computer generated map of Alasia. You lead a small band of adventurers on a mission to conquer the Citadel of Moorlock. You have to build an army and then arm and feed them by combat, bargaining, exploration of ruins and temples, and outright banditry. The game takes 2 to 5 hours to play and is different each time. The TRS-80 Color version has nice visual effects and sound. Not available on OSI. This is the most popular game we have ever published.

32K TRS 80 COLOR Version $24.95.

Adds a second leval with dungeons and more Questing.

PRICE AND AVAILABILITY:

All adventures are $14.95 on tape. Disk versions are available on VIC/COMMODORE and TRS-80 Color for $2.00 additional. $2.00 shipping charge on each order.

Please specify system on all orders

ALSO FROM AARDVARK — This is only a partial list of what we carry. We have a lot of othar games (particularly for tha TRS-80 Color and OSI), business programs, blank tapes and disks and hardware. Send $1.00 for our complete catalog.

AARDVARK

VISA **2352 S. Commerce, Walled Lake, MI 48088 / (313) 669-3110** master charge

Phone Orders Accepted 8:00 a.m. to 4:00 p.m. EST. Mon.-Fri.

TRS-80 COLOR TIMEX/SINCLAIR COMMODORE 64 VIC-20

$2.00 shipping on each order

CIRCLE 101 ON READER SERVICE CARD

Bonnie Prince Charlie.

know how to do it, but from that moment on I wanted to. I talked to people with greater knowledge about those things, and they told me I needed a computer. They also told me I'd have to learn to program. I said "no, I don't think I want to do *that*." I was too old to go back to college as a freshman in computer science. But it did get me thinking about computers.

I went into a couple of stores to see the TRS-80 (Model I) machine in '76 and '77, but nobody could ever get the damned thing to work. I remained suspicious.

Then I saw the Apple. All the fellow could do at that particular store was run the color bar demo and a primitive version of *Breakout*. But when I saw the color bars on the screen, I said "if he can do that, I can paint." And that was how it all started.

To show you how good I am, it took me three months after getting the thing home to get it to save a sentence, and the manual was gibberish to me.

Creative: It was 20 mimeographed pages back then.

Bernstein: It was for programmers. I couldn't understand a word of it. It was tough enough trying to save to cassette, which was the only means of storage back then. I'd hear that "beep beep beep" and I wouldn't know what in the world was going on.

But I kept working at it, almost as an obsession. Then I met a fellow named Rod Mansfield, who has turned out to be one of my best friends in the industry. The first night we met, I asked him how I could paint on an Apple computer. He introduced me to the then-prototype of the graphics tablet. He wrote some primitive software for me, something on a par with an Etch-a-Sketch—no fills, no vector capability. But I was painting on the screen. He also introduced me to the disk drive. I was still working on a television set, too. Color monitors came later.

After about a week, I had a bunch of pictures, including the one of Einstein, which became so popular. Rod came over, and just stood there with his mouth open. "You think I could have copies of these," he asked? I said, "if you know how to make copies, be my guest." I was still quite a novice.

I had no idea what he meant to do with the disk. But I soon found out. I got a call from Mike Markkula at Apple, asking me to come up for a visit, so I did. They asked me if I wanted to visit New York in June (for the NCC). I said "well sure," not knowing what for. I didn't quite know it then, but I had become a part of Apple's marketing. As they say, fools go where angels fear to tread. But I had a great time in New York, despite the fact I knew nothing about conventions or graphics tablets or software. I did have suggestions, and have always enjoyed talking to people, and I had a wonderful time.

Creative: That probably made you the perfect person for Apple to wheel around back then—the fact that you were an artist as opposed to a programmer, nor were you much interested in the hacker aspects.

Bernstein: I've worked on many machines, some of them very sophisticated. Yet I have never cared much about what's in the box. I would rather discover the limitations for myself, in my own way.

Creative: The less you know the better?

Bernstein: Something like that. Show me how to boot it up, then leave me alone to play. You might call it "disciplined play." I really believe in the power of play. Can you imagine the fun the person had, who invented the bathtub? I

would like to have seen that first automobile get rolling. What did Orville Wright really *feel* when the wheels left the ground?

Creative: Or the astronauts appreciating the view from the Columbia.

Bernstein: No one has bothered to ask Shepard or Glenn how it really felt to be up there for the first time. And here I was with wonderful brand new boxes and the time to explore. Give me the box, and I'll draw some pictures. That's my mode of operation. And people have turned around and liked the pictures.

Creative: Somehow the Einstein thing really seemed to touch people. It was so fitting, you know.

Bernstein: Well I thank you. I'm just so pleased. You know I really don't look at graphics computers as something frivolous—as merely games machines. They are a modern indicator that conventional forms of education have become outmoded and antique.

Creative: Can you elaborate on that point?

Bernstein: Yes. America started out as an agrarian society, then became an industrial one, and now is being transformed into a technological one. And yet our schools are still being run as if we lived in an agrarian society! That's why they let the kids out at 3:00—to tend the farm.

Creative: Why are we still following such antiquated schedules?

Bernstein: Well school boards will tell you first off that it's budgetary. They just can't afford to keep the business of education up any longer. I don't know about that. I think the (micro)computer industry would be more than happy to donate machines to schools, which could really help the situation.

Creative: In fact some companies, like Apple, have already offered to do so.

Bernstein: And they are having a hard time. Education is frightened to death that industry will make money from that kind of proposition. Well, I want them to make money. I want Apple to make millions of dollars. I want IBM to make millions of dollars. I want all of them to make billions of dollars, if they get our kids interested in learning.

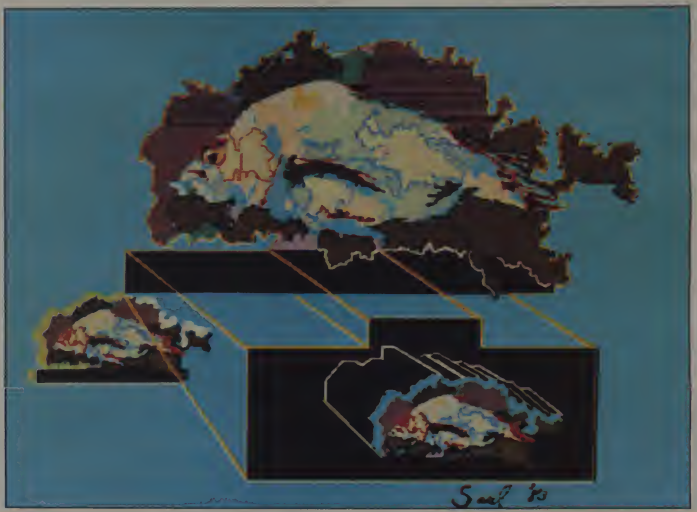
Right now this country is turning out 11,000 engineering students a year. In the Soviet Union, the number is closer to 50,000 a year. Now it doesn't take much to realize that even though we'll soon have a battleship in every backyard to protect us, we're going to be a third-rate power in short order. The only answer to that kind of problem is an investment in youth.

The President says that our Social Security problems are solved until the year 2000. That's wonderful. That's great. But what about underwriting education? I'm old enough to remember the GI bill for education. It made the difference for kids who went into the service as meat-packers in '41 and became doctors after they got out. The difference in their taxes was enough to make it a winning investment.

Creative: And you see computers as a means to this end in education today.

Bernstein: As a splendid means.

Creative: Let me go back to a point you touched on earlier: you talked about a vertical trend in today's society. Many people see computers as contributive to



An interplay of textures creates an interplay in ways of seeing.

wabash® diskettes for as low as $1.39 each!

Now...Get High Quality at a Low Price

Wabash means quality products that you can depend on. For over 16 years, Wabash has been making high quality computer products. Wabash diskettes are made to provide error-free performance on your computer system. Every Wabash diskette is individually tested and is 100% certified to insure premium performance.

Why Wabash is Special

The quality of Wabash diskettes is stressed throughout the entire manufacturing process. After coating, all Wabash diskettes go through a unique burnishing process that gives each diskette a mirror-smooth appearance. Wabash then carefully applies a lubricant that is specially formulated to increase diskette life. This saves you money, since your discs may last longer. It also assists your disk drives in maintaining constant speed which can reduce read and write errors.

Special Seal...Helps Prevent Contamination

To keep out foreign particles, a unique heat seal bonds the jacket and liner together. A special thermal seal which avoids contamination from adhesives, is then used to fold and seal the jacket. This results in outstanding performance and true reliability. Wabash then packages each diskette, (except bulk pack) in a super strong and tear resistant Tyvek® evelope. The final Wabash product is then shrink-wrapped to insure cleanliness and reduce contamination during shipment.

Each Diskette is 100% Critically Tested

Since each step in the Wabash diskette manufacturing process is subject to strict quality control procedures, you can be sure Wabash diskettes will perform for you. And every Wabash diskette meets the ultra-high standards of ANSI, ECMA, IBM and ISO in addition to the many critical quality control tests performed by Wabash. Wabash does all of this testing to provide you with consistently high quality diskettes. Reliability and data integrity -- that's what Wabash quality is all about.

Flexible Disc Quantity Discounts Available

Wabash diskettes are packed 10 discs to a carton and 10 cartons to a case. The economy bulk pack is packaged 100 discs to a case without envelopes or labels. Please order only in increments of 100 units for quantity 100 pricing. With the exception of bulk pack, we are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. **Quantity discounts** are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Wabash diskettes are immediately available from CE. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the Wabash diskette compatibility hotline. Dial toll-free 800-323-9868 and ask for your compatibility representative. In Illinois or outside the United States dial 312-593-6363 between 9 AM to 4 PM Central Time.

SAVE ON WABASH DISKETTES Product Description	Part #	CE quant. 100 price per disc ($)
8" SSSD IBM Compatible (128 B/S, 26 Sectors)	F111	1.99
8" Same as above, but bulk pack w/o envelope	F111B	1.79
8" SSSD Shugart Compatible, 32 Hard Sector	F31A	1.99
8" SSDD IBM Compatible (128 B/S, 28 Sectors)	F131	2.49
8" DSDD Soft Sector (Unformatted)	F14A	3.19
8" DSDD Soft Sector (256 B/S, 26 Sectors)	F144	3.19
8" DSDD Soft Sector (512 B/S, 15 Sectors)	F145	3.19
8" DSDD Soft Sector (1024 B/S, 8 Sectors)	F147	3.19
5¼" SSSD Soft Sector w/Hub Ring	M11A	1.59
5¼" Same as above, but bulk pack w/o envelope	M11AB	1.39
5¼" SSSD 10 Hard Sector w/Hub Ring	M41A	1.59
5¼" SSSD 18 Hard Sector w/Hub Ring	M51A	1.59
5¼" SSDD Lanier No-problem compatible	M51F	2.99
5¼" SSDD Soft Sector w/Hub Ring	M13A	1.89
5¼" Same as above, but bulk pack w/o envelope	M13AB	1.69
5¼" SSDD Soft Sector Flippy Disk (use both sides)	M18A	2.79
5¼" SSDD 10 Hard Sector w/Hub Ring	M43A	1.69
5¼" SSDD 16 Hard Sector w/Hub Ring	M53A	1.69
5¼" DSDD Soft Sector w/Hub Ring	M14A	2.79
5¼" DSDD 10 Hard Sector w/Hub Ring	M44A	2.79
5¼" DSDD 16 Hard Sector w/Hub Ring	M54A	2.79
5¼" SSQD Soft Sector w/Hub Ring (96 TPI)	M15A	2.69
5¼" DSQD Soft Sector w/Hub Ring (96 TPI)	M16A	3.79

SSSD = Single Sided Single Density; SSDD = Single Sided Double Density; DSDD = Double Sided Double Density; SSQD = Single Sided Quad Density; DSQD = Double Sided Quad Density; TPI = Tracks per inch.

Buy with Confidence

To get the fastest delivery from CE of your Wabash computer products, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Minimum *prepaid* order $50.00. Minimum *purchase* order $200.00. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

For **shipping charges** add $8.00 per case or partial-case of 100 8-inch discs or $6.00 per case or partial-case of 100 5¼-inch mini-discs for U.P.S. ground shipping and handling in the continental United States.

Mail orders to: Communications Electronics, Box 1002, Ann Arbor, Michigan 48106 U.S.A. If you have a Master Card or Visa card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. Order your Wabash diskettes from Communications Electronics today.

Copyright ' 1982 Communications Electronics™

Ad # 110582

MasterCard VISA MEMBER DIRECT MAIL MARKETING ASSOCIATION

Order Toll-Free! 800-521-4414
In Michigan 313-994-4444

wabash error-free diskettes

COMMUNICATIONS ELECTRONICS™

Computer Products Division

854 Phoenix ☐ Box 1002 ☐ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

CIRCLE 132 ON READER SERVICE CARD

computer mail order

computer mail order west

PRINTERS
SMITH CORONA

Call on $50.00 Factory Rebate*	
TP 1	$499.00
Tractor Feed	$129.00
Ultrasonic I Typewriter	$439.00
C.ITOH(TEC)	
CE 100	$309.00
Prowriter 8510P	$379.00
Prowriter 8510S	$579.00
Prowriter 1550P	$869.00
Prowriter 1550S	$749.00
Starwriter F10-40	$1299.00
Starwriter F10-55	$1849.00
OKIDATA	
92A	CALL
93A	CALL
84 (Parallel)	CALL
84 (Serial)	CALL
92	CALL
93	CALL
IDS	
MicroPrism	$649.00
480 (Fully Configured)	$1599.00
80 (Fully Configured)	$1399.00
Call for other configurations	
STAR	
Gemini 10	$349.00
Gemini 15	$469.00
Serial Board	$75.00
DAISYWRITER	
2000 (Letter Quality)	$1049.00
Tractor Feed	$109.00
DIABLO	
920	$999.00
630	$1799.00

TeleVideo

TERMINALS

910	$459.00
912C	$699.00
920C	$739.00
925C	$719.00
950	$929.00

COMPUTERS

800A	$1259.00
802	$2649.00
802H	$4995.00
806/20	$4649.00
816/40	$8999.00
802	$1349.00
1603G	$2399.00
1603	CALL

NEC

COMPUTERS

8000	CALL
8001A	$719.00
8031	$719.00
8012	$549.00

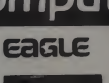
PRINTERS

8023	$419.00
7710-7730	$2249.00
3510-3530	$1549.00

MONITORS

JB 1260	$119.00
JB 1301	$149.00
JC 1212	$299.00
JC 1203	$299.00
JC 1203	$369.00

EAGLE



Call on Eagle 8 Bit & 16 Bit Computers & Software

MODEMS
HAYES

Smart	$219.00
Smart 1200 (1200 Baud)	$469.00
Chronograph	$199.00
Micromodem 100	$309.00
Micromodem II	$279.00
Micromodem II(with term)	$399.00

NOVATION

J-Cat	$119.00
Cat	$144.00
D-Cat	$189.00
103 Smart Cat	$189.00
Apple Cat II	$279.00
103/212 Smart Cat	$419.00
212 Apple Cat II	$609.00
Apple Cat II 212 Upgrade	$309.00

ANCHOR

Mark I (RS-232)	$79.00
Mark II (Atari)	$79.00
Mark III (64 / 128)	$109.00
Mark IV (CBM PET)	$125.00
Mark V (Osborne)	$85.00
Mark VI (IBM PC)	$179.00
Mark VII (Auto) (Ans. Auto Dial)	$129.00
TRS-80 Color Computer	$85.00
9 Volt Power Supply	$9.00
Mark VIII	CALL

MONITORS
AMDEK

300G	$139.00
300A	$199.00
310G	$179.00
310A	$199.00
Color I	$399.00
Color II	$399.00
Color III	$569.00
Color IV	$799.00
Color III	$349.00

SMC

12AU 12" Green	$79.99
1401 12" Color (Med Res)	$369.00
9191 U 12" Composite	$329.00

TAXAN

RGB 1 (Hi-Res)	$299.00
210 Color	$499.00
12 N Green	$119.00
12 A Amber	$125.00

ZENITH

ZVM 121	$89.00
ZT 1 Terminal	$369.00

U.B.I.

Pi 1 9" Green	$89.00
Pi 2 12 Green	$119.00
Pi 3 12 Amber	$159.00
Pi 4 9" Amber	$139.00
1400C 14" Color	$299.00

PANASONIC

JR200U 32K Para. Computer	$309.00

MONITORS

TR 12013" Hi-Res Green	$159.00
CT 1801D" Dual Mode Color	$299.00
DT 1900 13" RGB	$349.00
DT 01300 13" RGB/Composite	$429.00

IBM

NEC
3550 PRINTER ... $1599

PERCOM/TANDON
DRIVES

5¼" 180K Disk Drive	$249.00
5¼" 320K Disk Drive	$299.00

AMDEK

210A Amber Monitor	$195.00
310G Green Monitor	$179.00
Amdisk (3¼" Drive)	$879.00
EY Plotter	$649.00
Color II	$599.00

AST

Combo Card 64K	$439.00

QUBIE

PC Keyboard	$219.00

SOFTWARE

MicroPro WordStar-MailMerge-	$349.00
I U S Easywriter II	$249.00
I U S Easyspeller	$139.00
Peach Package (CLA/P/AR)	$419.00

PROFESSIONAL SOFTWARE

IBM PC Word Processing	$319.00

CONTINENTAL SOFTWARE

1st Class Mail / Form Letter	$85.00
The Home Accountant Plus	$109.00

SYNAPSE

File Manager	$119.00

IMMS

Prowcode Phone	$239.00

READY FORMS

1 3/7" Address Labels(Tract Feed)	$9.95
1/2 Report Paper(Tract Feed)	$24.95
8½" Sht. Wht. Paper(Tract Feed)	$19.95
8½ Sht. Envl.(Tract Feed)	$14.95

SANYO

MB1000 Computer	$1599.00
INCLUDES FREE SOFTWARE!	
MicroPro: WordStar, Calcstar,	
Mail Merge & Report Star	
MB 150 Add on Drive	$529.00
1500 Letter Quality Printer	$699.00

TIMEX SINCLAIR 1000

$64.95

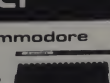
Call on Timex Rebate*

16K Memory Module	$44.95
Vu-Calc	$17.95
Checs Book Manager	$13.95
The Organizer	$14.95
The Budgeter	$12.95
Stock Option	$14.95
Loan & Mortgage Amortizer	$12.95
Musicwriter Printer	$105.00

GREYTTE SOFTWARE

Graphics	$12.99
Home Budgeter	$12.99
Home Inventory	$12.99
Income Tax	$14.99
Mega Mind	$15.99
Salvo	$12.99
The Quiz	$12.99
Words	$12.99

commodore



CBM 64
$399

VIC 20
$99.

4064	$999.00
12540	$849.00
12580	$749.00
8023	$1039.00
4032	$739.00
8096 Upgrade KR	$349.00
9000	$1499.00
2031	$449.00
4040	$649.00
5050	$1279.00
8250	$1939.00
8050 (5 Meg HD)	$1999.00
8050 (7.5 Meg HD)	$2199.00
4023	$399.00
1526	$999.00
1600 Letter Quality Printer	CALL
Spell Master	$99.00
Z Ram adds CP/M® & 64K	$549.00
Access Office	$749.00
Calc Result	$159.00
The Manager	$309.00
The Soft Rom	$139.00
Jmsm	CALL
ADA 1600 CBM to Parl Int	$89.00
ADA 1450 CBM to Serial Int	$99.00

PROFESSIONAL SOFTWARE

Power	$79.00
Into Pro	$219.00
Word Pro 2 Plus	$199.00
Word Pro 3 Plus	$199.00
Word Pro 4 Plus	$299.00
Word Pro 5 Plus	$299.00
Administrator	$379.00
Word Pro 64	$79.95

CARDCO
VIC 20/CBM 64

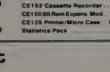
Light Pen	$32.00
Cassette Interface	$29.00
Parallel Printer Interface	$64.00
3Slot Expans Interface(70cm)	$32.00
6Slot Expans Interface(30cm)	$79.00

HES

Shamus (ROM)	$29.00
Protector (ROM)	$32.00
Robot Panic (ROM)	$29.00
Protec (ROM)	$29.00
HES Writer (ROM)	$29.00

Call on our Large Selection of VIC 20 & CBM 64 Software, such as: EPYX, Microspec and Kansas City Software.

SHARP



PC-1500
POCKET COMPUTER
$169.
PC1250.... $89.00

CE150 Printer, Plotter and Cassette Interface Unit	$172.00
CE152 Cassette Recorder	$62.00
CE155 8K Ram Expans Mod	$94.00
CE126 Printer/Micro Case	$139.00
Statistics Pack	$49.00

computer mail order west

800-648-3311

IN PA. CALL (717)327-8578

DEPT. 808, 477 E. THIRD ST., WILLIAMSPORT, PA 17701

No risk, no deposit on C.O.D. orders. Pre-paid orders receive free shipping within the UPS Continental United States with no waiting period for certified checks or money orders. Add 3% (minimum $3.00) shipping and handling on all C.O.D. and credit card orders. Larger shipments may require additional charges. NY and PA residents add sales tax. All items subject to availability and price change. NOTE: We stock manufacturer's and third party software for most all computers on the market. Call today for our new catalog.

computer mail order

FRANKLIN

Call for price and information on the NEW FRANKLIN Computers!
Disk Drives, Software and System Specials
ALSO AVAILABLE!

MICRO-SCI
DISK DRIVES FOR APPLE & FRANKLIN

A2	$349.00
A40	$349.00
A70	$459.00
C2 Controller	$79.00
C47 Controller	$69.00

RANA DISK DRIVES

Elite 1 plus (Apple/Franklin) ... CALL
1000 (Atari) ... $349.00

SYSCOM
48K Color Computer
APPLE COMPATIBLE
$599.

VISICORP

For Apple,IBM & Franklin

Visidex	$185.00
Visifile	$185.00
Visiplot	$175.00
Visiterm	$85.00
Visitrend/Plot	$225.00
VisiSchedule	$225.00
Desktop Plan	$185.00
VisicalcApple/Ll,C64/IBM	$175.00

Visicorp prices for IBM may vary slightly.

RRODERSUND

Apple Panic	$23.00
David's Magic	$27.00
Star Blazer	$25.00
Arcade Machine	$34.00
Choplifter	$27.00
Serpentine	$27.00

INFOCOM

Deadline(Apple /IBM, Atari)	$35.00
Star Cross	$29.00
Zork I, II or III	$29.00

MPC

Buddies (128K Non Volatile) ... $640.00

AXLON

Apple/Franklin 128K Ram	$399.00
Apple/Franklin Ram Disk	$999.00

KRAFT

Apple Joystick	$44.00

CONTINENTAL
SOFTWARE

Tax Advantage (Apple/Atari)	$45.00
Home Accnt. (Apple/Atari)	$59.00
1stCl Mail/Form Letter(Apple)	$79.00
The Book of Apple	$14.95
The Book of Atari	$14.95
The Book of Apple Graphics	$14.95

PERCOM

DISK DRIVES FOR ATARI

ATB8 SS	$399.00
ATB8 A1	$299.00
ATB8 S2	$649.00
RFD 40-S1	$549.00
RFD 40-A1	$349.00
RFD 40-S2	$899.00
RFD 44 S1	$679.00
RFD 44 S2	$999.00

FLOPPY DISKS
MAXELL

MD I(Box of 10)	$32.00
MD II(Box of 10)	$44.00
FD I (8")	$40.00
FD II (8" DD)	$50.00

VERBATUM

5¼" SS SD	$26.00
5¼" DS DD	$36.00

ELEPHANT

5¼" SS SD	$19.99
5¼" DS SD	$24.99
5¼" DS DD	$29.99

HEAD

Disk Head Cleaner	$14.95

SIRIUS

Bandits (Apple)	$28.00
Beer Run (Apple)	$24.00
Free Fall (Atari)	$24.00
Snoobers (Apple)	$24.00
Snake Byte (Apple)	$24.00
Fast Eddie (Atari)	$21.00
Turmoil (Atari)	$21.00
Deadly Duck (VIC)	$21.00

INTERFACES & ACCESSORIES

80 Column Apple Card	$159.00
Apple Parall. Printer Interface	$60.00
Atari 850 to Paral. Printer Cable	$29.00
RS232 RS232 Cables	$29.00
Centronics Paral. -Paral Cables	$29.00
Call on IBM, Osborne, Kaypro, Atari, Commodore, Apple and Franklin Interface Cards, Cables and Accessories	

HEWLETT PACKARD

41CV
$209

HP75...$749.

HP 41C	$148.00
HP 10C	$59.00
HP 11C	$72.00
HP 12C	$89.00
HP 15C	$99.00
HP 16C	$99.00

For HP41/41CV

HPIL Module	$99.00
HPIL Cassette or Printer	$359.00
Card Reader	$144.00
Extended Functions Module	$64.00
Time Module	$64.00
Mathematics Pac.	$25.50
Real Estate Pac.	$40.00

HOME COMPUTERS

ATARI

ATARI 800
48K
$489.

CALL ON ATARI 1200 MANUFACTURER'S $100.00 REBATE!

ATARI 600-16K
$199.

ATARI 1200-64K
NOW IN STOCK!

810 Disk Drive	$425.00
Inhome Keyboard-Atari 400	$85.00
1010 Program Recorder	$74.00
1030-40 Column Print/Plot	$369.00
1025 80 Column Printer	$489.00
1027 Letter Quality Printer	$289.00
1050 Double Density Drive	$375.00
830 Acoustic Modem	$159.00
850 Interface Module	$189.00
C400 Pair Joysticks	$15.00
CE418 Home Manager KR.	$49.00
CE415 Bookkeeper KR	$169.00
CE492 Educator Kit	$125.00
CE483 Programmer Kit	$54.00
CE488 Communicator KR.	$229.00
CE7101 Entertainer Kit	$89.00
Invitation to Programming I	$15.00
Invitation to Programming II	$20.00
Invitation to Programming III	$20.00
4003 Basic Language	$42.00
4003 Assembler Editor	$47.00
5131 Micro Assembler	$69.00
5126 Micro Soft	$85.00
805 Print Drv ( )*	$54.00
801 8 Print (Homo)	$72.00
8038 Atari Writer	$75.00
404 Word Processor	$115.00
3056 Visicalc	$159.00

ATARI

Pacman	$23.00
Centipede	$32.00
Defender	$32.00
Galaxian	$32.00
Missile Command	$29.00
Star Raiders	$23.00
Caverns of Mars	$32.00
Dig Dug	$33.00
Donkey Kong	CALL
E.T. Phone Home	$25.00
Eastern Front (1941)	$36.00
QIX	$33.00
Superman III	$25.00
Star Trec	$33.00
Asteroids	$25.00
Basketball	$25.00
Computer Chess	$25.00
Juggles House	$23.00
My First Alphabet	$25.00

APX

Text Formatter	$15.50
Family Budgetor	$19.50
Eastern Front	$24.00
Family Cash	$18.50
Junebox	$13.50
Datestuff	$18.50
Outlaw	$18.50
Holy Grail	$24.00
Player Piano	$18.50
Assembler/Editor	$18.50
Number Blast	$13.50
Frogmaster	$19.50
747 Land Simulator	$19.50
Bumper Pool	$13.50

ON-LINE

Jawbreaker	$37.00
Softporn	$27.00
Wizard and Princess	$29.00
The Next Step	$34.00
Mission Asteroid	$22.00
Mouskattack	$31.00
Frogger	$31.00
Cross Fire (ROM)	$39.00

Some ON LINE Products are also available for Apple II 128 Call for information!

SYNAPRE

File Manager 800 plus	$85.00
Chicken (ROM)	$34.00
Picnic Paranoia (ROM)	$34.00
Claim Jumper (ROM)	$34.00
Slime (ROM)	$34.00
Shamus (ROM)	$34.00
Protector (ROM)	$34.00
Dodge Racer (C/D)	$29.00
Nautilus (C/D)	$25.00
Shadow World (C/D)	$29.00
Summer (C/D)	$29.00
Chicks (C/D)	$29.00
Necromancer (C/D)	$29.00
Pharoh's Curse (C/D)	$28.00
Fort Apocalypse (C/D)	$28.00
Page 6	$15.00
Assembler	$30.00
Disk Manager	$24.00

DATASOFT

Pacific Coast Highway	$25.00
Canyon Climber	$25.00
Tumble Bugs	$25.00
Shooting Arcade	$25.00
Clowns and Balloons	$25.00
Graphic Master	$30.00
Graphic Generator	$13.00
Micro Painter	$25.00
Text Wizard	$75.00
Spell Wizard	$64.00
Bishop's Square	$25.00
Sands of Egypt	$25.00
Moon Shuttle	$25.00
Zaxxon	$29.00

ALIEN

Atari Vaca Bas	$115.00
Apple Vaca Bas	$145.00

MEMORY

Axlon 32K Ram	$85.00
Axlon 48K Ram	$129.00
Axlon 128K Ram	$299.00
Intec 32K Board	$75.00
Intec 48K Board	$99.00
Intec 64K Board (400 only)	$145.00

WICO

Joystick	$24.95
Famous Red Ball	$28.95
Apple Trackball	$59.00
Atari/VIC Trackball	$55.00
Apple Adaptor	$15.00

ATARI 400

16K	$149.00
32K	$224.00
48K	$249.00
64K	$309.00

Prices reflect $50.00 Rebate
**Non Atari Ram

CBS

K razy Shoot Out	$32.00
K razy Kritters	$32.00
K razy Antics	$32.00
K star Patrol	$32.00
Stick Stand	$5.99

EPYX

Crush, Crumble & Champ	$24.00
Crypt of the Undead	$24.00
Curse of Ra	$15.00
Datestones & Ryn	$15.00
Invasion Orion	$15.00
Ring Arthur's Heir	$24.00
Starfox a Tunnel	$15.00
Rescue at Rigel	$24.00
Rocket Pat	$15.00
Star Warrior	$25.00
Temple of Apshai	$25.00
Upper Reaches of Apshai	$15.00

SPINNAKER

Snooper Troops # 1	$34.00
Snooper Troops # 2	$34.00
Face Maker	$24.00
Story Machine	$34.00
Delta Drawing	$45.00
Rhymes and Riddles	$21.00
Kindercomp	$21.00

ROKLAN

Wizard of War (ROM)	$34.00
Deluxe Invader (ROM)	$25.00
Gorf (ROM)	$34.00

FIRST STAR

Astro Chase	$25.00

RIG 5

Miner 49er	$35.00

GAMESTAR

Baja Buggies	$24.95
Football	$24.95

SUDSECO

Reactor Blaster	$24.95

L.J.K.

Letter Perfect 40/80 Col Disk	$108.00
Letter Perfect 40 Col ROM	$178.00
Letter Perfect 80 Col ROM	$178.00
Data Perfect 40/80 Col Disk	$99.00
Mail Merge	$21.55

CALL FOR APPLE/LJK PRODUCTS

RIT 3

80 Col Card for Atari 800	$375.00

INTEC

Real Time Clock	$35.00

We also stock software by: Adventure International, Edu-wares, Creative Software, Dorsett Educational, IDSI, Romox and Artworx. Call for details and prices

computer mail order east

800-233-8950

IN NV. CALL (702)588-5654

DEPT. 808, P.O. BOX 6689, STATELINE, NV. 89449

INTERNATIONAL ORDERS: All shipments outside the Continental United States must be pre-paid by certified check only. Include 3% (minimum $3.00) shipping and handling. EDUCATIONAL DISCOUNTS: Additional discounts are available from both Computer Mail Order locations to qualified Educational Institutions. APO & FPO: Add minimum $5.00 shipping and handling.

CIRCLE 138 ON READER SERVICE CARD

computer mail order west

24 HR ORDER LINE

SYSTEMS IV, LTD

24 HR ORDER LINE

NOW SUPPORTS THE **IBM PC**

1204 Greer's Trail Peachtree City, GA 30269

1-404-487-7538

APPLE SPECIALS

SPECIAL!	SPECIAL!
APPLE-CAT - Novation	
SMARTMODEM - Hayes	$CALL
1200 BAUD SMARTMODEM - Hayes	
16K RAM CARD - for Apple II	$CALL
Z-80 CPU CARD - for Apple II	$CALL
APPLE DISK DRIVE - Fourth Dimension	

Penguin Software	
Complete Graphics II	990.00
3D Drawing System	34.95
100 Color Drawing System	24.95
Special Effects	29.95
The Graphics Magician	49.00
Additional Fonts & Sets	19.00
Bit-Tech	
Wizardry	537.90
Software Publishing Corp.	
PFS	983.95
PFS REPORT	70.00
PFS Graph	83.95

IBM Personal Computer

STB Systems Super RIO BOARD		D BASE II	$425
AST MEGAPLUS BOARD		HOME ACT.	$99
		WORDSTAR	$279
$CALL	$CALL SPECIAL!	VISICALC	$189

OKIDATA 92A	$CALL	AMDEK 300A	$ SPECIAL!
OKIDATA 93A		AMDEK 310A	$
SPINWRITER 3530	$1690	AMDEK COLOR II	$675
NEC PC8023	$ 475	AMDEK COLOR III	$429
C-ITOH Prowriter P/S	$490/590	AMDEK COLOR IV	$1129
ANADEX		TAXAN 12" Hires RGB II	$CALL
132/220 COL W/Graphics	$1449	TAXAN 12" Med Res RGB	$369

CALL US TODAY WHATEVER YOUR NEED OUR PRICE IS BEST!

PRICE
SELECTION
FAST DELIVERY

THANK YOU!

Prices are Subject To Change. Dealer Inquires Are Invited

All Prices U.S.
No C.O.D.S
GA. Residents 4%

We Accept
- Checks
- Visa
- Master Card
- Money Orders
- American Express

24 HR. BULLETIN BOARD 1-404-487-6129

CIRCLE 266 ON READER SERVICE CARD

that very problem. Parents worry about the kids sitting in their little cocoons, playing Pac-Man instead of learning to relate with others, or even programming as opposed to interacting with other students in a classroom.

Bernstein: What I'm talking about is computers as a supplement to transactive education—not a substitute for it. I'm not saying that you can educate a kid solely with a computer. But from 3:00 until 5:00 in the afternoon, give him a room with a computer and let him learn about solitary meditation. He'll still have plenty of time to interact.

In the future America will resemble its old agrarian self once again. Both parents will stay home with the kids. It will have a positive impact on the concept of the family—we could create a kind of tight-knit family that would be the envy of the world.

Creative: What about the concept of "community"?

Bernstein: The first thing many Americans do when they have a bit of money is head out to the suburbs, buy a plot of land, and put a fence around it. They don't want to talk to their neighbors. Well today I think we can use technology to help us interact. We're all going to have dishes on our roofs, and interactive cable TV, and intelligent phone systems.

Creative: In an electronic community there is a sort of democracy—only my thoughts are transmitted—not my religion

There have been only two art forms in the whole history of man in which color is on the attack: stained glass windows and television—everything else is ambient light.

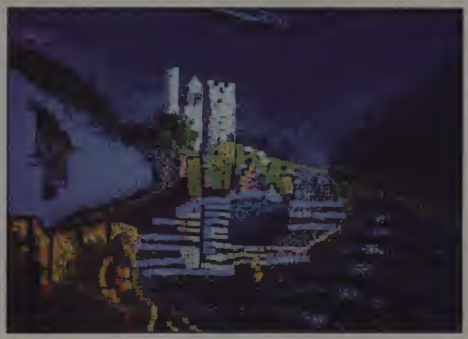
or my race or my speech patterns or anything else that may affect your opinion of me unduly.

Bernstein: I think what you are really bringing up is a kind of new equality. What better way to break down all the "isms" that we have so we can treat each other as human beings. It could change the world. If form really does follow function, then if a function in our society is to become more equal, then our form will follow. That would be great, huh?

Have you ever been to a user's group meeting?

Creative: Talk about community.

Bernstein: There's proof enough: these people may live in the suburbs, they may be from the inner city, minority group members, kids, whatever. And all the barriers are gone once they start talking about Applesoft or some new program. I believe in that kind of power. That may very well be the reason why Pac-Man lives, so to speak.



Bernstein dares to fail, and in doing so, opens new realms of success.

As I've said over and over again, there have been only two art forms in the whole history of man in which color is on the attack: stained glass windows and television—everything else is ambient light. The subliminal attraction of video games is akin to that of the windows in a cathedral.

Creative: Let's talk just a little bit about the hardware. What are the tools you have been working with lately?

Bernstein: Well I started with the Apple II, and now I have an Apple III. Then I have an Intelligence Graphics System with one of the most marvellous color terminals around. Then the HP-2700 from Hewlett-Packard—boy that's a nice machine. It has a resolution of 512 x 512 in 16 colors, but what they do is allow you primary, secondary, and terciary colors, and you can actually mix them on an electronic pallette.

Creative: All these machines use a tablet for input.

Bernstein: Yes, though I find myself using the keyboard more and more often with the IGS for total control of each dot.

Creative: The HP-2700 was the machine you used to draw the Queen?

Bernstein: Yes. And I really must give Hewlett-Packard an immense amount of credit for a wonderful system. They created a superb piece of hardware and a superb piece of software to drive it.

I have an animation videodeck, which allows me to create moving images on videotape. I also have several different kinds of cameras: among them is one called a "kinecamera," which hooks up to the Apple III directly. I have a batch of printers, too—black and white and color.

Creative: Haven't Abel Associates or III or MAGI or NYIT tried to snap you up?

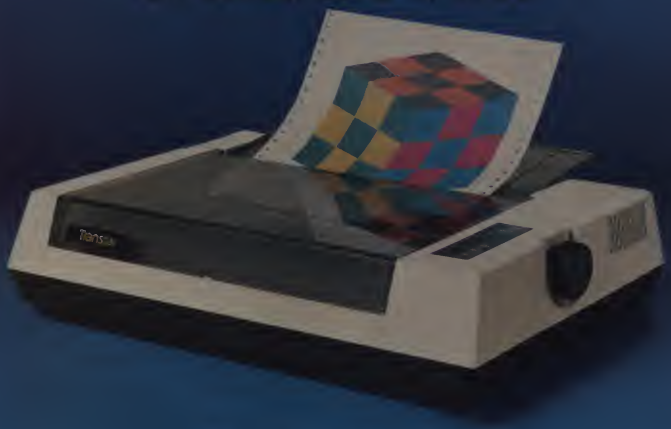
Bernstein: Nope. I have a friend who is a banker, and oversees a prestigious committee of financial advisors. Each, over a period of years, has had about 85% success in predicting economic trends. But when you put them together, their combined success rate is something in the low '30s. You just can't do much in a committee.

If I have an idea, I'll be up at 3:00 in the morning doing it. I want to contribute to society, but I want that contribution to be wholly mine. And that may mean holding on to something for a long time, until I am pleased with it. I couldn't do that if I was working for a large company. The other thing with large organizations is that they don't afford you the opportunity to *fail*. And I put much stock in the word "failure."

Creative: Certainly it is something an artist must be free to do.

Bernstein: Success is not a great learning experience, but failure is. You have to take the chance: to dare, to go beyond, to push the outer limits—until you get that error message. Then you can go back and do something productive. □

Color for the Price of Black and White



Transtar 315
Color Printer for only $599

- New technology four-hammer print head
- Unique diagonal ribbon provides simpler and more reliable operation
- Prints 7 colors plus more than 30 shades
- All colors and shades are printed in a single pass of the print head
- Built by Seikosha, the oldest manufacturing company of the famous Seiko group—providing precision products since 1892.

Transtar · Box C-96975 Bellevue, Washington 98009

CIRCLE 273 ON READER SERVICE CARD

Computers Make Music

Patricia Smith

In a living room in Oakland, CA, Tim Perkis, John Bischoff and Jim Horton of the League of Automatic Music Composers connect their microcomputers. Each composer has programmed his computer with different musical elements. The computers, which constitute a band, perform. Interacting with each other, they create music.

The sounds from each computer affect the sounds produced by the other two computers. One computer selects melodic patterns. Another calculates which harmonies to play, and the harmony influences rhythmic patterns, Horton explained.

Because the sounds of one computer affect the sounds of another, the musical results are unpredictable. As the Sunday afternoon work session begins, the music is loud, turbulent, and dissonant. But the music changes, sometimes gradually, sometimes suddenly. For a while, the music is eery. At times, it is rhythmic and lively, sounding like jazz. Sometimes it is lighter and gay, sounding almost as if it came from a calliope.

"We're composers, not performers. The sound of what is pleasing is worked out when we are composing. The computers are doing the performing. In a concert, we're listening," Horton said.

At a recent concert at the Mills College Center for Contemporary Music (CCM) in Oakland, David Rosenboom sits down behind the Touché, a computerized instrument he and Don Buchla designed. At times, he stands up or raises and swings his arms as he moves the levers that control the output of continuous, rich melodic sounds. Once, he jumps up and moves over to the piano. Accompanying the Touché, he plays jazzlike rhythms wildly. He returns to the Touché; but before the piece, "Nova Wind," is over, he gets up again and plays the violin.

"Nova Wind," composed in 1981, is one piece from his recently released album "Future Travel" (from Street Records). This album contains "the most elaborate use of live performance, computerized instruments that I have done to date in terms of the complexity of the sound generating process," he said.

At a college lecture, computer designer and composer Andy Moorer talks about synthesizing sounds for musical purposes. Moorer works with a large computer at Stanford's Center for Computer Research in Music and Acoustics (CCRMA).

His demonstration tape illustrates his techniques. In "Perfect Days," there are three distinct sounds: Charles Shere's voice as he reads the Richard Brautigan poem, the sound of a flute played by Tim Weisberg, and a modified sound that is part speech and part flute, that has the vocal qualities of speech, but the pitch of the flute.

Current Trends

There is no typical style or sound in

Photo by Edward W. Souza.

In the computer room at CCRMA: from left, music grad students David Jaffe and John Gordon, director John Chowning, and Music Department alum Bill Schottstaedt.

Patricia Smith, 355 Fair Oaks St., San Francisco, CA 94110.

computer music. Composers who use computers draw from varying musical traditions and produce very different kinds of compositions. The League of Automatic Music Composers' music, in which microcomputers interact with each other in an improvisatory way, differs from complex ensemble compositions and synthesized musical poems.

Using computers to create sounds is one trend in contemporary music. "It isn't reasonable to think electronic music will replace traditional music. It's simply another medium," CCM program assistant Larry Polansky said.

It isn't reasonable to think electronic music will replace traditional music.

Although most of the music at Stanford has been produced on the University's large, specially designed computer, other Bay Area composers use small computers, which are attached to synthesizers, keyboards, or other sound-producing devices. These composers, who often construct their own computer instruments, write musical instructions which tell the computer to act in certain ways.

Composer and music system designer Paul De Marinas recently built a computer music exhibit for San Francisco's Exploratorium. In collaboration with New York composer and designer, David Behrman, De Marinas designed six touch-sensitive guitar models. He attached the guitar models to a single-board computer, an Apple computer, and three Casio keyboards. Exploratorium visitors who touch the guitars activate the single-board computer, which activates the Apple. Depending on which keys on which guitars are touched, the Apple figures out what harmonies and rhythms to play on the keyboards.

De Marinas is interested in harmonies and said his pieces are tonal. He designed the Exploratorium piece so that "whatever is played by six kids who intuitively know harmony is immediately successful."

In all of his pieces, De Marinas said, he "aims to make systems that I could play or others could play beautifully, where walks could be taken spontaneously."

De Marinas, who obtained an MFA from Mills College and has taught at San Francisco State, believes the aesthetics of instrumental and electronic music are the same. "Basic musical things are beautiful. An identifiable phrase repeated over itself is capable of becoming beautiful," he said.

Other computer music composers agree that the aesthetic qualities of what makes good music are the same for all musical genres. "We're sometimes dealing with very different compositional procedures or live performance set-ups, but I don't find the aesthetics different," Rosenboom said.

Antecedents

"Electronic music has been around for 30 or 40 years, and there have been composers of tremendous importance," Polansky explained.

One is John Cage. Horton, who was doing graduate work in philosophy in the mid-sixties, was influenced by Cage. Cage's music "was startling, exciting, and beautiful," Horton said.

Center for Contemporary Music.

Photo by Arnel Thomas.

"Cage was in the first generation," Mills graduate student Phil Stone explained, adding he was inspired by Alvin Lucier, who was in the second generation. "I started out at Wesleyan wanting to be a lawyer, but got interested and caught up in music through Lucier."

"Lucier was called a physicist. He explored things about the nature of sound. The pieces he composed are beautiful. They're elegantly simple from complex processes. That was inspiring."

Rosenboom became interested in electronic music at the University of Illinois in the mid-sixties and worked with Lejaren Hiller, whom he describes as a pioneer in computer composition.

"Most people were making tape pieces at that time, but I was particularly interested in live performances because of the potential to somehow manifest processes which we normally think of as compositional, precompositional, or perceptual in real time, that is, in bringing some of the composing activity into live performance," Rosenboom said.

Brain Wave Music

During the 1970's, Rosenboom went to York University in Toronto where he was one of the founders of the New Music Department, built the Laboratory of Experimental Aesthetics, and composed and recorded his "brain wave" music.

In these pieces, Rosenboom used a computer to analyze neurological signals in musical perception and then generated music from the results. In his piece "On Being Invisible, " electrodes are attached to the head of a person who is the solo performer. The signals are recorded on standard electroencephalographic equipment. A computer analyzes the signals according to a model of how people divide groups of musical phrases into temporal segments, and this analysis determines what sounds are produced on a synthesizer.

"Everything the computer outputs is tested against the model to see if it can determine what are potentially, significant landmarks," Rosenboom said. If the computer determines some structural events are significant to the listener/performer, "it will make it more likely that the kinds of changes that are causing the response will occur again. If the prediction is false as determined by the lack of evoked response, it will tend to cause the sound patterns to change in some way."

Electrodes are attached to the head of a person who is the solo performer.

Although Rosenboom has plans for more brain wave pieces, he hasn't composed any since coming to Mills College in 1979. "I decided I needed a little break. Also, I wanted to work on some other kinds of music and I got involved with Don Buchla in the development of a digital keyboard instrument," he said.

During his recent concert at Mills College, Rosenboom performed some of his other music—selections from "Future Travel" and a piece in which he used a harmonic and rhythmic computer language to create a composition for four cellos, percussion, and a trombone.

"David has been in the forefront of designing performance, computer controlled instruments and is one of the leading composers in the country."

"You'll find my KoalaPad Touch Tablet, and KoalaWare software a natural profit builder."

Introducing the KoalaPad.™ At less than $125 – with software – it's the friendliest, least expensive graphics pad on the market.

Your Atari,® Commodore,® Apple,® and IBM® customers will love it. They'll find it faster than paddle controllers. More flexible than joysticks. And much easier to use than a keyboard.

Plus it's compatible with most of their game and educational software. And most KoalaPad sets come with a graphics program called Micro-Illustrator.™ The most exciting way yet to create colorful, high resolution computer graphics. At the touch of a finger.

There are KoalaWare programs for computer fans of all ages. Dancing Bear,™ the funny, furry computer cabaret. Spider Eater,™ the lively music learning adventure. And Spellicopter,™ the action-packed spelling game.

Selling Koala products is as easy as falling out of a tree. Particularly with our 5% co-op allowance, color p.o.p. materials, and traffic-building promotions. Not to mention our extensive national advertising featuring, ahem, yours truly.

For the name of your nearest Koala distributor, call toll free 800-227-6703, (in California, 800-632-7979). Or write to Koala Technologies Corporation, 4962 El Camino Real, Los Altos, CA 94022.

Koala Technologies Corporation

We make computing more personal.™

Trademarks: KoalaPad, KoalaWare, Spider Eater and Dancing Bear are trademarks of Koala Technologies Corp. Micro-Illustrator is a trademark of Island Graphics, and Spellicopter is a trademark of DesignWare Inc.

CIRCLE 187 ON READER SERVICE CARD

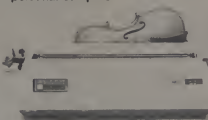
THE PERSONAL PRINTER BUILT LIKE A SHERMAN TANK PERFORMS LIKE A STRADIVARIUS.

A Tough Act To Follow. Frankly, an Okidata printer is the best printer on the market today. Why? We pack more performance features per dollar into our dot matrix printers than anybody. Bar none. Data processing at speeds from 80 to an incredible 350 characters per second. Exceptional letter quality printing at three times the speed of most daisywheels. Draft and color printing. High resolution all points addressable graphics for charts, graphs, illustrations and photos. Even alternate character sets for self-designed typefaces and symbols. (Print a G-clef, if you like.)

Long-Term Engagement. Our high performers are the most reliable printers available, with rugged steel frames, laser-welded parts, and a print head (the most vital part of all) so strong we guarantee it for up to one full year. No wonder our warranty claim rate leads the industry at less than ½%.

Perfect Harmony With Your Computer. Every Okidata printer works in concert with the major names in personal computers. Better and faster, in fact, than the major computer name printers. (Which, by the way, aren't even made by the major computer companies.)

Best Selection. Right Price. Nobody offers you a better choice. There are eight Okidata printers in all, ranging in price from $449 to $2995, suggested retail. Suggest you call 1-800-OKIDATA (in NJ, 609-235-2600) to find the dealer nearest you. You'll get more for your money from your personal printer. Not to mention your personal computer.



OKIDATA

Mt. Laurel NJ 08054

A subsidiary of Oki Electric Industry Company Ltd

CIRCLE 212 ON READER SERVICE CARD

Polansky said of his colleague.

Composer John Chowning first started working with computer music at Stanford in the 1960's. He read an article about Max Matthews and J.R. Pierce, who were doing acoustical research at Bell Laboratories, and then went to Bell Laboratories to see Matthews.

"John came back and started implementing new ideas," CCRMA administrative assistant Patty Wood explained. Chowning began initially working with a large computer in the off-campus facilities of the artificial intelligence division of the computer science department. When the artificial intelligence group moved back to campus, CCRMA acquired more space, as well as their own new, large computer and synthesizer.

Composers who use Stanford's computer music system define parameters of sound (i.e., pitch, tone) with numbers and commands which the computer can read and interpret. At a recent CCRMA demonstration, composer-in-residence Janis Mattox explained that the computer interprets the commands and sends them to the synthesizer, which produces sound.

Using Real Sounds

Many people at Stanford, as well as places like Bell Laboratories and the Institut de Recherche et Coordination Acoustique/Musique in Paris, have been doing research into the dynamics of real sound and what makes sound interesting. "It turns out that real sounds are extremely complex, and this is what makes them easy to listen to as opposed to what most people think of as electronic sound," Mattox explained.

With a large computer, composers can analyze real sounds. "We figure if we can get close enough to duplicating real sounds that we can control—not that we want to duplicate the actual sounds—our sounds can be as rich and interesting," Mattox said.

"We can do just about everything an original violin can do; but to have a computer play something exactly like a violin would play it would be pointless and probably impossible," Stanford DMA candidate David Jaffe explained.

For the second movement of "Shaman," Mattox wanted a sound that was intense and primal to go along with a belly dancer's gestures. "I wanted a real ambiguity between an instrument and a voice. I wanted something that sounded like either and shifted back and forth, and I think I got pretty close to that. I'm accompanying it now with some very low drum sounds. It's going to be quite rhythmic," she said.

In another piece based on a Richard Brautigan poem, Moorer took the voice reading the poem and changed some of the dynamics of the speech, for example, by adding some reverberation to portions of it.

In his piece "Silicon Valley Breakdown," Jaffe has synthesized new sounds from guitar sounds. He also played with tempos, speeding them up and slowing them down, and brought voices together and apart at different times.

Mattox wanted a sound that was intense and primal to go along with a belly dancer's gestures.

"With a computer, we can do interesting things like slowing sound down without changing the pitch or changing the pitch without changing the speed," Mattox explained.

For many composers, the expense of a large computer like Stanford's is prohibitive and microcomputers are the only alternative.

In 1976, Horton responded to an advertisement for a computer for $250 with a coupon. "They sent a wonderful computer," he said.

Horton read the instruction books and started building electronics for the computer, learning on his own and from people he knew.

A significant difference between composing for the computer and composing for traditional instruments is that computer music composers don't have to read music. But, somewhere along the line, like Horton, they usually learn something about electronics and programming.

"When the microcomputer came along, people interested in it got together—for a long time, at regular Sunday open houses at the East Bay Center for the Performing Arts. We (The League of Automatic Music Composers) have been working together since 1978," Horton said.

In the Oakland living room, Perkis, Bischoff, and Horton's computers sit on separate, but adjoining tables. Wires connect the computers to each other, to mixers, and to control boxes.

"My computer is playing equal tempered melodies and Tim's is playing harmonies. Now his computer is tracking to mine," Horton says.

While Horton explains interactions of the computers, Bischoff and Perkis sit intently in front of their computers, moving nobs and levers. Perkis is calm. At times, Bischoff smiles. At one point, Horton's eyes shut and he hums along with his computer.

"Some of the sounds are wonderful," he says. □

Materials Generation — **Robert Cavey**

WE ARE TUNED TO YOUR NEEDS AND WE BRING YOU THE BEST FOR LESS

ASK FOR OUR NEW IBM PC LINE

SPECIALS

APPLE

System Saver	62.95
16K Ram Card	49.95
Disk Drive	224.95
Miner 2049er	25.95
New TG Joy Stick	43.95

APPLE & ATARI

Zork I, II, & III	25.95
Deadline	32.95
Starcross	25.95
Datalife Diskettes SSDD	25.95
Head Cleaning Kit	9.95

ATARI

Shamus	24.50
Choplifter	24.50
Frogger	24.50
Atari Track Ball	44.95
Ultima II	39.95

APPLE GAMES

	Retail Price	Your Price
Automated Simulations		
Temple of Apshai	39 95	27 95
Star Warrior	39 95	27 95
Crush, Crumble & Chomp	29 95	20 95
Oil Barons	99 95	68 95
Tuesday Morning Quarterback	29 95	20 95
Avant-Garde Creations		
Hi-Res Computer Golf II	39 95	27 95
Beagle Brothers		
Beagle Bag	29 95	20 95
Broderbund		
Arcade Machine	59 95	41 95
Apple Panic	29 95	20 95
Choplifter	34 95	24 50
Serpentine	34 95	24 50
A.E.	29 95	20 95
BudgeCo		
Pinball Construction Set	39 95	27 95
Data Most		
Snack Attack	29 95	20 95
Thief	29 95	20 95
Swashbucker	34 95	24 50
Aztec Adventure	39 95	27 95
Datasoft		
Zaxxon	39 95	27 95
Hayden Software		
Sargon II	34 95	24 50
Edu-Wars		
Terrorist	29 95	20 95
The Prisoner II	32 95	23 50
Empire I: World Builders	32 95	23 50
Empire II: Interstellar Sharks	32 95	23 50
Empire III: Armageddon	32 95	23 50
Rendezvous	39 95	27 95
Muse		
Three Mile Island	39 95	27 95
Castle Wolfenstein	29 95	20 95
Caverns of Freitag	29 95	20 95
Penguin Software		
Pie Man	19 95	15 95
Transylvania	19 95	15 95
Crime Wave	19 95	15 95
Quality Software		
Beneath Apple Manor	29 95	20 95
Ali Baba & the 40 Thieves	32 95	23 50
Sierra On-Line		
Hi-Res Adv #5 Timezone	99 95	69 95
Hi-Res Adv #6 Dark Crystal	39 95	27 95
Ultima II	59 95	41 95
Frogger	34 95	24 50
Lunar Leeper	29 95	20 95
Cannonball Blitz	34 95	24 50
Sirius		
Beer Run	29 95	20 95
Blade of Black Pool	39 95	27 95
Repton	39 95	27 95
SirTech		
Wizardry: Proving Grounds	49 95	34 95
Wizardry: Knights of Diamonds	34 95	24 50
Wizardry: Legacy of Llylgamyn	39 95	27 95
Star Maze	34 95	24 50
Galatic Attack	29 95	20 95
Strategic Simulation		
Galactic Adventures	59 95	41 95
Germany 1985	59 95	41 95
Battle of Normandy	39 95	27 95
Guadalcanal Campaign	59 95	41 95
Galactic Gladiators	39 95	27 95
Cosmic Balance	39 95	27 95
Computer Baseball	39 95	27 95
Southern Command	59 95	41 95
Bomb Alley	59 95	41 95
Tigers in the Snow	39 95	27 95
Sublogic		
Flight Simulator	33 50	23 95
Synergistic Software		
Crisis Mountain	34 95	24 50
Microbe	44 95	31 50
Bolo	29 95	20 95
UltraSoft		
Mask of the Sun	39 95	27 95
The Serpent's Star	39 95	27 95

APPLE BUSINESS

Ashton-Tate		
dBase II	699 95	489 95
Broderbund		
Payroll	394 95	276 50
General Ledger/Payable	494 95	346 50
Accounts Receivables	394 95	276 50
Bank Street Writer	69 95	49 95
Continental		
The Home Accountant	74 95	52 50
FMC	99 95	69 95
MicroPro		
Wordstar (CP/M)	494 95	346 50
Spell-Star	249 95	174 95
Calc-Star	144 95	101 50
Data-Star	294 95	206 50
Infostar	494 95	346 50
Microsoft		
Multiplan (Apple DOS)	274 95	192 50
Muse		
Super Text Professional	99 00	69 95
Sensible Software		
Sensible Speller	124 95	94 95
Sierra On-Line		
Screenwriter II	129 95	90 95
General Manager II	229 95	160 95
Silicon Valley Systems		
Word Handler	199 95	139 95
List Handler	89 95	62 95
Software Publishing		
PFS: Report	139 95	87 50
PFS: File	139 95	87 50
PFS: Graph	139 95	87 50

APPLE UTILITIES

Beagle Brothers		
Alpha Plot	29 95	27 95
Apple Mechanic	29 95	20 95
DOS Boss	23 95	19 50
Tip Disk 51	19 95	15 95
Utility City	29 95	20 95
Flex Tex	29 95	20 95
Prontto DOS	29 95	20 95
Double Take	34 95	24 50
Penguin Software		
Complete Graphics System II	89 95	46 95
The Graphics Magician	59 95	41 95
Special Effects	39 95	27 95
Phoenix Software		
Zoom Grafix	39 95	27 95
Quality Software		
Bag of Tricks	39 95	27 95
Sensible Software		
Back-it-Up II	59 95	41 95
Image Printer	39 95	27 95
Southwestern Data Systems		
ASCII Express	79 95	55 95
ASCII Express Pro	149 95	104 95
Munch-a-Bug	49 95	34 95
Merlin	64 95	45 50
Printographer	49 95	34 95
Assembly Lines	19 95	15 95

APPLE HARDWARE

Advanced Logic Systems		
CP M Card	399 95	338 95
Z Card II	169 95	142 95
Smarterm II	179 95	151 95
Hayes Microcomputer Products		
Micromodem II with Terminal Program	408 95	306 95
Micromax		
Viemax-80 Column Board	219 95	179 95
Parallel Card	79 95	63 95
Paymar		
Lower Case Adapter (Rev 7)	27 50	19 95
Prometheus		
APPLEsource	125 00	100 00
TG Products		
Paddle	39 95	27 95
Select-a-Port	59 95	41 95
USI		
Amber Monitor (12")	249 00	189 00

ATARI DISC(d)/CASSETTE(c)

Preppie (c/d)	29 95	22 50
Apple Panic (c/d)	29 95	22 50
David's Midnight Magic (d)	34 95	26 50
Raster Blaster (d)	29 95	22 50
Canyon Climber (c/d)	29 95	22 50
Clowns & Balloons (c/d)	29 95	22 50
Pacific Coast Highway (c/d)	29 95	22 50
Sands of Egypt (d)	39 95	29 95
Zaxxon (c/d)	39 95	29 95
Crush, Crumble & Chomp(c/d)	29 95	22 50
Temple of Apshai (c/d)	39 95	29 95
Castle Wolfenstein (d)	29 95	22 50
Jeepers Creepers (d)	29 95	22 50
Lunar Leeper (d)	29 95	22 50
Jawbreaker (c/d)	29 95	22 50
Ultima I (d)	39 95	29 95
Wayout (d)	39 95	29 95
Pinball (c/d)	29 95	22 50
Claim Jumper (c/d)	34 95	26 50
Chicken (c/d)	34 95	26 50
Slime (c/d)	34 95	26 50
Protector II (c/d)	34 95	26 50
Dodge Racer (c/d)	34 95	26 50
Picnic Paranoia (c/d)	34 95	26 50
Reptilian (c/d)	34 95	26 50
File Manager 800 (d)	98 95	73 75

for mail orders:
With your selection(s), please include name, address and phone number along with your check, money order, or credit card number and expiration date. Please include $3.00 for shipping and handling (foreign orders/hardware extra). California residents add 6½% sales tax

800-942-2058 **(415) 237-4406**

California, Alaska & Hawaii/Foreign Orders

VISA MasterCard AMERICAN EXPRESS

NONAGON SOFTWARE • P.O. BOX 1486 • EL CERRITO, CA 94530

CIRCLE 208 ON READER SERVICE CARD

Translingo

Hinrich Murken

What is Translingo?

Translingo is an artificial language that serves to convert abstract symbols into letters, letters that may be assembled into proper words that we can pronounce and speak. It is, therefore, well suited to use by computers.

Translingo consists of several different levels. This article deals with TRA 2 or second-level Translingo, which deals with music. (TRA 1 deals with mathematics, TRA 3 with geometry.)

I consider Translingo to be a sub-set of the English language. It is the word-forming principle; the words produced are not Translingo but English.

We are now speaking of music and thus second-level Translingo:

The first letter of any Translingo term can be a capital letter, small letter, or an underlined letter. If the first letter is a capital letter, you are instructed to use your right hand to execute the musical instructions to follow. If the first letter is underlined, you are instructed to use one or both feet to execute instructions to follow.

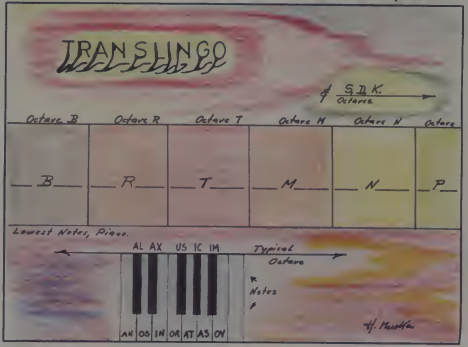
A capital letter commonly is followed by melody instructions. A small letter is commonly followed by bass instructions, and the underlined letter defines the use of pedals—piano and/or organ.

Hinrich Murken, 285 King St., West, Apt. 18, Hamilton, Ontario, Canada L8P 1B2.

The first letter is called the octave letter and serves to define to which octave a certain sound belongs. The following are the octave letters. (B is the lowest octave):

1 - B	4 - M	7 - S
2 - R	5 - N	8 - D
3 - T	6 - P	9 - K.

If the octave letter is a capital, use the



We don't care which computer you own. We'll help you get the most out of it.

CompuServe puts a world of information, communications, and entertainment at your fingertips.

CompuServe is the versatile, easy to use interactive videotex service designed especially for the personal computer user. It's dynamic, growing and changing daily to satisfy its subscribers' needs. It's an industry leader, created and managed by the same communications professionals who provide business information and network services to over one fourth of the FORTUNE 500 companies.

From current events to current assets, CompuServe offers a wealth of useful, profitable or just plain interesting information. Electronic magazines and national news wires plus worldwide weather, current movie reviews, electronic banking and shop at home services, and some of the most sophisticated financial information available are all offered to current subscribers.

From words to music. CompuServe offers a communications network that gives special interest groups from hardware enthusiasts to computer composers a chance to get together. There's a bulletin board for selling, swapping, and personal notices and a CB simulator for real-time communications between subscribers. There's electronic mail, the fastest, surest, way to communicate with other users across the street or across the country, plus file retention and editing, and lots, lots more.

Fun and games are expected whenever computer users interact, and CompuServe has the best. Games you can play alone or with other CompuServe subscribers anywhere in the country. Classic puzzlers, sports and adventure games, and fantastic space games featuring MegaWars, the "ultimate computer conflict."

But, that's just the tip of the chip. CompuServe offers a menu of thousands of items that make subscribing educational, fun and sometimes downright profitable. If you'd like to know more about CompuServe, call toll free, 800-848-8199 to receive an illustrated guide to the CompuServe Information Service. A videotex service for you no matter which computer you own.

CompuServe

Consumer Information Service
2180 Wilson Rd. Columbus, Ohio 43228

800-848-8199

In Ohio Call 614-457-8650

An H&R Block Company

CIRCLE 142 ON READER SERVICE CARD

NOAH WEBSTER, MEET YOUR MATCH.

A few months ago, Jennifer would rather have gone to the dentist than do her spelling homework.

Then Mom bought Crypto Cube™ by DesignWare™. Now Jennifer has become a word fiend. In fact, she spends hours paging through the dictionary to find words that will stump her sisters. And, to the door, she builds her word grills.

Crypto Cube, like all DesignWare software products, contains computer game fun with sound educational principles.

THE THREE DIMENSIONAL COMPUTER WORD PUZZLE

Five minutes after Jennifer sat down at the computer with Crypto Cube, she was hooked. For a she worked her way through the wiggly word puzzles that come with the game. Then her parents typed her spelling homework into new puzzles.

Then Jennifer started making puzzles for her parents!

So now, Crypto Cube is the favorite family game in Jennifer's home.

As Jennifer would say, "incredibly."

DESIGNWARE MAKES LEARNING COME ALIVE.

If you have an Apple 8 plus, Apple IIe IBM PC, Atari 400, 800, or 1200XL with a disk drive, you should take a close look at all the DesignWare software.

And the "word game, Spellscopter" from action-packed spelling game. You'll fly per dous mission through crowded skies and [illegible] to [illegible] words. And you'll want to keep an eye out for our new pack and [illegible] Say your [illegible] call DesignWare at [illegible] in California [illegible] for [illegible] free [illegible] catalog. You'll be delighted with the way your kids will learn with DesignWare.

And they'll be glaring for the [illegible]

DesignWare™

LEARNING COMES ALIVE

CIRCLE 152 ON READER SERVICE CARD

right hand to play (melody). If the octave letter is a small letter, use the left hand to play (bass). If the octave letter is underlined, use the foot pedals.

The second letter is called the volume letter and defines how loud or quiet a sound is to be. We have the following letters:

U - very quiet
E - quiet
I - normal volume
A - loud
O - very loud
Y - your choice of volume

The octave letter and the volume letter are always linked in a syllable.

The third letter of a Translingo term defines the duration of sound we want. The following letters define durations of sounds:

B - Whole note
R - $\frac{3}{4}$ note
T - $\frac{3}{8}$ note
M- $\frac{1}{2}$ note
N- $\frac{3}{4}$ note
P - $\frac{1}{4}$ note
S - $\frac{1}{8}$ note
D - $\frac{1}{16}$ note
K - $\frac{1}{32}$ note
L - $\frac{1}{64}$ note

Accordingly we may create words. Ram, for example means: Use right hand; place right hand near second octave of keyboard; prepare for volume A (loud); and the musical sounds are to be of $\frac{1}{8}$ note duration.

The first three Translingo term-letters define octaves of sound, volume of sound and duration of sound, and which hand to use. If the first three letters are followed by a dash, all notes to come are to be played at once, constituting a chord. The following are the note-letters:

An - C	In - E	Ic - G#
Al - C#	Or - F	As - A
Os - D	Us - F#	Im - A#
Ax - D#	At - G	Ov - B.

Therefore, Ram-axanos means right hand chord; volume, loud; duration, $\frac{1}{2}$ note; second octave; D#;C;D.

Ramaxanos means right hand notes; volume, loud; duration, $\frac{1}{2}$ note; second octave; D#; C;D.

Observe that the note-letters are written in the way you are to finger the keyboard—they define the order of fingering.

We write right hand instructions above left hand instructions as shown in Figure 1.

Note: The first three letters defining octave, volume, and duration do not need to be repeated or mentioned unless a change in octave, volume, or duration is desired.

Right Hand	X	Samaxan, axan, axan, axan, (Melody)
Left Hand	X	bemaxan, axan, axan, axan, (Bass)

Figure 1.

Attack	*Sustain*	*Speed*	*Vibrato*	*Tremolo*	*Reverb*	
Cha	Da	Can	Tas	San	Nax	Very light
Che	De	Cen	Tes	Sen	Nex	Light
Chi	Di	Cin	Tis	Sin	Nix	Natural
Cho	Do	Con	Tos	Son	Nox	Heavy
Chu	Du	Cun	Tus	Sun	Nux	Very Heavy

Figure 2.

Letters above the term line indicate lead-in notes, and letters beneath the term line indicate lead-out notes:

Samaxanim$^{lm}_{ov}$ Samaxanim$^{ov}_{lm}$

(Lead-in) (Lead-out)

Dots above letters indicate staccato:

Samäxänöv

Use the comma to indicate measures and the period to end musical statements. Use long straight lines and underline all musical notes and measures which go together.

The letters la mean "repeat the foregoing once." Le means "repeat twice." Li indicates three times; lo, four times; and lu, five times.

Ton means last note. Pin means last chord, das means last measure, and ros means last bar. Bos means "from the beginning." You can combine repeat letters and repeat specifications into single words. Repeat instructions always follow Translingo terms:

Sam-äxänöv laton

Durations of silence are written thus:

By - Whole note rest
Ry - $\frac{3}{4}$ note rest
Ty - $\frac{3}{8}$ note rest
My - $\frac{1}{2}$ note rest
Ny - $\frac{3}{8}$ note rest
Py - $\frac{1}{4}$ note rest
Sy - $\frac{1}{8}$ note rest
Dy - $\frac{1}{16}$ note rest
Chy - Pause

The Percussion letters are shown in Figure 2.

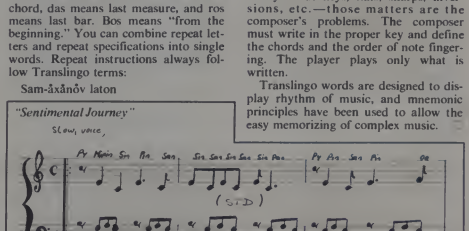
Percussion letters are made into single words which precede Translingo terms:

Chaditos sannox: Sam-äxänöv laton

(Percussion): (Function) (Repeat)

The player plays according to what is written, and since each note is fully and individually defined, he does not have to worry about keys, flats, sharps, inversions, etc.—those matters are the composer's problems. The composer must write in the proper key and define the chords and the order of note fingering. The player plays only what is written.

Translingo words are designed to display rhythm of music, and mnemonic principles have been used to allow the easy memorizing of complex music.



Variable Speech

Herb Friedman

Like the computer, the human brain can assimilate information much faster than information can be fed in. In fact, when listening to speech, the brain works at about one-half to one-third of capacity and it gets bored, often causing the listener to lose track of what is going on. Experiments have shown that the brain works most efficiently if the information rate through the ears—via speech—is the "average" reading rate, which is about 200-300 wpm (words per minute), yet the average rate of speech is in the neighborhood of 100-150 wpm.

In short, the brain works at about one-half of its assimilation capacity when listening to speech; whether it is a classroom lecture, an educational cassette tape, or even a TV show. Experiments have also shown that the brain tends to wander when working well under its capacity, so the listener often ends up tuning out altogether.

Speed Increases Understanding

Comprehension is not only increased if we speed up the rate of speech, but we can assimilate two or three times the amount of information in the same time. Instead of listening to an educational tape for one hour, by doubling the speech rate—which is called "speech compression"—we could hear the same information in only 30 minutes, and the brain would comprehend more because it wasn't watching the clouds drift by.

In fact, this is exactly what is done in some TV commercials and by many large companies such as IBM and Sperry, who use "speech compression" in their training tapes. Their trainees spend 50 percent or less of the normally expected time listening to tapes. For example, they actually spend less than 30 minutes listening to tapes it took an educator 60 minutes to record. In the case of TV commercials, speech compression allows the sponsor to almost double the size of the sales pitch he can throw at you: in effect, he is broadcasting two commercials for the price of one.

Herb Friedman, c/o Tridec Electronics Corp., 588 Hewlett St., Franklin Square, NY 11010.

A VSC system can be built within a portable cassette recorder. In this model from the VSC Corp., a linear slider control, similar to the volume control, adjusts the VSC rate from 0.6 to 2.5—which allows the user to either expand or compress the speech.

You might expect that speech compression, which is technically termed VSC, for Variable Speech Control, can be done by simply increasing the playback speed of a tape recording perhaps two or three times. But when you do this, the recorded frequencies and the "rate of speech" are increased proportionately to the increase in tape speed. If the tape speed is doubled, the rate of speech and frequency response is doubled, producing the "Donald Duck" effect in which the voice gets so high-pitched and rapid it becomes impossible to comprehend. Increasing the playback speed, therefore, is not the way to compress speech.

Trimming Information

The way to effect VSC without affecting either the frequency response or the rate of speech is actually to remove small sections—snippets—of information. Research has shown that if minute bits of information are *randomly* removed from a string of words, the brain achieves from full to 80 percent comprehension—the exact degree of comprehension determined by the amount of information removed. In fact, early experimenters in speech compression *physically* removed the snippets when running their experiments. They would record a string of words on tape and edit random snippets with a razor blade.

the ACCESS UNLIMITED MICRO SHOPPING CENTER

WE SELL AND SUPPORT **"TI", "ATARI", "COMMODORE", "IBM", "XITEX", "PERCOM", "ZENITH", "iBEX", "TRS-80", "EPSON", "OSBORNE", "SANYO". WE SUPPORT "APPLE."**

NEW "PC-POWER PACK"™ FOR "IBM-PC"

Two microcomputer industry leaders, Digital Research Inc. and Percom Data Corp. have agreed to produce "PC-POWER PACK"™, a complete package consisting of a Percom Data Winchester 5¼" Hard Disk Drive, a 192K RAM board and controller, and Digital Research's Concurrent CP/M-86™, the single-user, multitasking operating system. The PHD™ System provides plug-in compatibility to the "IBM-PC", and speed and accuracy many times that of floppy systems.

5MB — **$2995.00**
10MB — **$3995.00**

Your present system too small?

Take advantage of the iBEX company business system and stand alone word processing systems —

iBEX Model 7202 Regular retail $13,000.00 with software
Now for a limited time only — while supply lasts **$2595.00** plus freight

Look what you get for $2595:

- Z80 - CP/M compatible
- 64 kilobyte RAM
- Dual 8" floppies (total 2.4 Mbytes)
- Switchable to IBM 3740 format
- 12" green phosphor monitor (80 x 24 characters)
- Centronics compatible printer interface
- Serial interface
- Full function keyboard
- Clock timer and calendar w/battery
- **Free software:** CP/M Operating System, M/Basic Interpreter

"Perfect" Software & CP/M For "IBM-PC"

"Perfect Writer" Reg. Retail $495.00	Sale **$299.90**
"Perfect Filer" Reg. Retail $595.00	Sale **$309.90**
"Perfect Calc" Reg. Retail $295.00	Sale **$159.90**
"Perfect Speller" Reg. Retail $295.00	Sale **$159.90**

All Four Fully Integrated Reg. Retail $1680.00 Sale **$849.00**

Access Unlimited Hard Disk Drives For "TRS-80", "IBM-PC", "APPLE II"

Limited Offer From $1395.00 (5MB) For TRS-80

- 5, 10 Megabyte and larger drive units.
- Lets controller handle up to 4 drives.
- Works along with existing floppy disk drives.
- Includes host system support software.

- ***Specials Of Month!*** —
- **NEW "Star Gemini" Printer With Graphics**
  Dot Matrix Model 10 Serial Interface – Reg. $499.00 **$409.00**
  100 CPS Model 15 Serial Interface – Reg. $699.00 **$499.00**
  Serial Interface Card — Only **$79.95**
- **New "C-ITOH F-10 Starwriter" Printer**
  40 CPS Reg. Retail $2295.00 Sale **$1495.00**
  Forms Tractor **$199.95**
- **"Brother" HR1 Daisywheel Printer**
  Affordable/Letter Quality/17 CPS
  Serial — New Low Price **$799.00**
  Parallel — New Low Price **$745.00**

- **EZ Tax & CP/M For "IBM-PC"** — **$69.95**
  Beautiful Oak Finish Computer Furniture
  50" Split-Level **Desk $249.00** Matching Printer Stand **$89.00**
  Head Cleaning Kits — Your Price **$19.95**
  Library Cases — Holds 10 Diskettes — Only **$2.95**

Bare Drives for "IBM-PC" — Internal

Single Head 160K —	$277.00
Dual Head 320K —	$354.00

"Percom" Drives For "IBM-PC" External

Includes Case & Power Supply

Single Head 160K —	$415.00
Dual Head 320K —	$510.00

Drives for "ATARI"

Access single density drives. 102k storage but much cooler, quieter and more efficient than the 810! Our flexible drives let you cable your first-drive system directly into your computer. Or go through an 810 drive. And our Access controllers automatically handle single- and double-density drives in the same system.

ATAR88-1	First drive single density	**$475.00**
ATAR88-A1	Add on drive single density	**$339.00**
ATAR40-1	First drive double density	**$559.00**
ATAR40-A1	Add on drive double density	**$349.00**
ATARISEP	Data Separator	**$ 24.95**

MEDIA FOR LESS — Save $$

SENTINAL complete with hub rings & one year limited warranty.

Single sided Single density 5¼"	**$18.70** bx of 10
Single sided Double density 5¼"	**$20.70** bx of 10
Double sided Double density 5¼"	**$27.80** bx of 10
Buy Diskettes in Bulk: SS/SD 5¼"	Only **$150.00** case of 100

BASF Limited...Lifetime Warranty

Double sided Double density 5¼"	**$34.95** bx of 10
Double sided Double density 8"	**$49.95** bx of 10

MAXELL Limited...Lifetime Warranty

Single sided Double density 5¼"	**$36.95** bx of 10
Double sided Double density 5¼"	**$49.95** bx of 10

Reg. Trademarks • Limited Time Offer, Limited Quantities • Prices subject to change without notice • Prices do not include state taxes

VISA **1 (800) 527-3475**

Order by phone or by mail. We accept Visa MasterCard cashier's checks certified checks and money orders. With personal checks, allow additional time for bank clearance. Your bankcard will not be charged until your order is shipped. On orders over $1,000, we pay freight (surface only) and insurance; please add $3.00 shipping and handling under 50 lbs. Over 50 lbs., add $5.00 for orders under $1,000.00. Texas residents add 5% sales tax. Allow 2 to 4 weeks for delivery.

☐ Please send me a FREE catalog. I'm not ready to order at this time.

Name _____
Company Name _____
Address _____
City _____ State _____ Zip _____
Phone Number (_____) _____

Quantity	Item	Unit Price	Subtotal

Check one: State Sales Tax (Texas residents only) _____
☐ payment enclosed handling charge _____
☐ Visa ☐ MasterCard* Total _____

*If Master Card, numbers above name: Expiration Date: ___ - ___

Authorized signature, if charged

ACCESS UNLIMITED

DEPT. L3/401 N. Central Expwy., Richardson, Texas 75080
Tel. 1-800-527-3475 214/340-5366
214/690-8207 — Sat. and Evenings Only

CIRCLE 104 ON READER SERVICE CARD

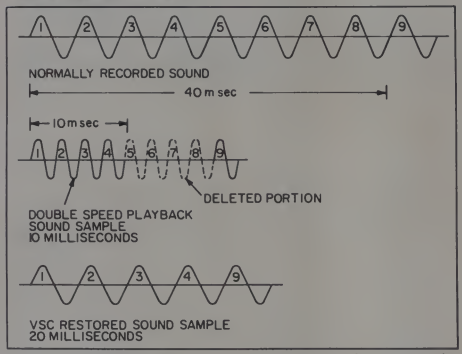


Figure 1. VSC electronically removes part of the input signal in order to compress the signal. As shown, the input signal consists of 9 cycles in 40 msec. A X2 tape playback doubles the frequency and the VSC removes half of the signal, leaving only 10 msec. of information and a 10 msec. gap. The VSC then electronically stretches the signal to fill the gap, restoring the original input signal frequency, but now only 20 msec. is required for the input signal.

Now if snippets—no matter how small—are removed from the recording, the total length of time is reduced. If the snippets add up to 50 percent of the original tape length, the amount of time required to hear the edited tape is reduced by 50 percent, yet there is no apparent increase either in the rate of speech or the frequency range.

Even though the speech compression is 50 percent, the playback sounds natural to the listener. On the other hand, if we had attained 50 percent compression by *doubling* the playback speed of the original tape recording, the reproduction would sound like a chattering chipmunk.

In fact, VSC is so effective that it can be used for other things besides speech. As example, JVC uses the technique in their Vidstar model 6700 video cassette recorder (VCR) for a fast scan of the TV picture. Though the tape is running at a fast-wind speed the user can view a reasonable facsimile of the picture, rather than a "hash" of color streaks.

How It Works

Obviously, no one is editing every tape with a razor blade to make a VSC recording—certainly not video tape. Using digital technology and large scale integrated circuits, VSC is done electronically, and at a budget price. A complete VSC system can be packaged on a small printed circuit board, as shown in the photographs. In fact, a VSC system can be integrated within the cabinet of an ordinary portable cassette recorder, and the entire device can be retail priced at less than $200.

The first thing that is done to electronically reduce the playback time is to reproduce the cassette recording at a higher speed than it was recorded.

Let's assume that twice the speed is an X2 factor that doubles the pitch (frequency) of everything recorded on the tape. Next, we feed the X2 playback through a preamplifier and on to a VSC controller that removes snippets of the signal as shown in the chart diagram.

Note that for illustration we show cycles (from recorded tone) originally recorded in 40 milliseconds. On playback the eight cycles reproduce in 20 msec. The VSC controller electronically removes four of the eight cycles, leaving us with an electrical signal (still within the VSC) of four cycles, and a four cycle space, all utilizing 10 msec.

If we were to feed this signal out of a speaker it would sound like someone was strangling a chipmunk. Before the signal leaves the VSC, however, it is passed through a BBD, bucket brigade device that serves as a time delay which literally stretches the 10 msec. signal out to 20 msec. Whatever is left of the signal gets stretched back to its original frequency but the reproduction time now is only 20 msec., one-half the original recording time of 40 msec. The "stretch" fills in most of the gap between cycles four and nine; the remaining gap is extremely small and is not noticeable if the compression rate is 50 percent or less.

Now this might appear complex, or even incorrect at first reading, but if you re-read the foregoing while referring frequently to Figure 1, you will see that we have taken a signal that originated in 40

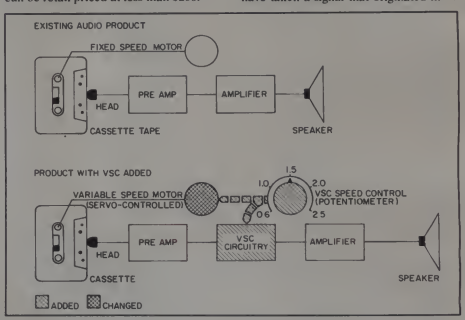


Figure 2. In a complete cassette VSC system a single control adjusts both the VSC controller electronics and the tape drive motor's speed, insuring that the compressed speech will reproduce naturally. When the VSC restoration is not in sync with the tape drive speed the voice pitch can be adjusted to be bass, normal, or high pitched.

"NIGHT MISSION" PINBALL by Bruce Artwick

"...a classic -- the arcade pinball game. It's the new state of the art against which all the others must be measured." *Electronic Fun*, April '83: "...an exceptionally impressive simulation..." *Creative Computing*, August '82, "fantastic." *Softalk*, May '82: "...a programmer's tour de force, asserting Artwick's claim as a master code manipulator." *Softline*, May '82. Best Computer Audio-Visual Effects, *Electronic Games*, 1983 Arcade Awards, Jan. '83. Available for the Apple II ($34.95 disk), Atari 400/800 ($29.95 disk or cassette), and IBM PC ($39.95 disk).

FLIGHT SIMULATOR by Bruce Artwick

Our best selling program for over three years now. **Flight Simulator** combines the flight characteristics of a 1917 Sopwith Camel with a true 3D out-the-window view for maximum realism and excitement. Included also is a "British Ace" 3D aerial combat game. Available for the Apple II, and TRS-80 Model I and Model III ($25.00 cassette, 33.50 on disk).

A2-3D1 GRAPHICS FAMILY

Professional 3D graphics for professional applications. Define 3D or 2D wire-frame objects in any size and orientation, then manipulate your eye to view these objects from any perspective. Features include selectable resolution, full color capability, and independent object call functions. Create and save animated graphic displays, add 3D or 2D text directly with your presentation, or record individual scenes for future playback. For use in scientific, business, educational, or general applications involving graphic communications. For the Apple II ($119.85, two disks).

SPACE VIKINGS

A highly-detailed tactical 3D adventure/simulation set in deep space. You command a Federation Starship and a crew of Viking troops. Twenty rebel star systems await your attack, each an adventure in itself. Will the planet have an orbiting defense ship? Do you have enough troops to launch a successful ground attack? Discover for yourself why **Space Vikings** has become one of our most popular programs ever. Requires color monitor and joystick controller. For the Apple II ($49.95 disk).

SATURN NAVIGATOR

Challenge your intellect with this hi-res simulated spaceflight from earth to Saturn. Maneuver your spacecraft into an optimal approach trajectory, place the ship in orbit, and rendezvous with the orbiting Saturn space station. Sophisticated 3D graphics provide an out-the-window view of the ringed planet during your approach. For the Apple II ($34.95 disk).

WHOLE BRAIN SPELLING

This program has received widespread critical acclaim for its educationally sound approach to the development of improved spelling skills. **Whole Brain Spelling** uses the graphic color capabilities of the Apple II to provide positive user feedback and to emphasize visual aspects of the learning process. Available in six categories: **General** (ages 8-adult), **A Child's Garden of Words** (preschool-8), **Fairy Tale**, **Medical**, **Scientific**, and **Secretarial**. For the Apple II ($34.95 disk).

FOREST FIRE DISPATCHER

A realistic simulation that places you in charge of a forest district in southeastern Kentucky. Your objective is to save the maximum possible acreage from fire at the least possible cost. Many variables make for a complex, thoroughly enjoyable strategy game. For the TRS-80 Model I and Model III ($24.95 cassette, $29.95 on disk).

CHECK ALL OF THE ABOVE...

then see your dealer!

or write or call for more information. For direct orders please add $1.50 for shipping and specify UPS or first class mail delivery. Illinois residents add 5% sales tax. Visa, MasterCard, Diner's Club, and American Express accepted.

Order Line: 800 / 637-4983

MUSIC MAKER

Unsurpassed sound quality and ease of use. Create and play 4-voice music on your Apple II with no additional hardware requirements. And you don't have to be a musician to use **Music Maker** well. A complete tutorial manual will lead you through every step in the development and playback of stand alone song modules. For the Apple II ($39.95 disk).

ZENDAR

An economic-defense simulation for strategy game enthusiasts. You have been given absolute ruling power over one country on the continent of Zendar for a period of ten years. You must allocate aid and resources, annex other countries, make trade agreements, and defend your borders from enemy attack. Many variables make for an infinite variety of strategic possibilities. For the Apple II and Atari 400/800 ($29.95 disk).

ROADBLOCK

An arcade-strategy original with fast action hi-res graphics. You, as county sheriff, dispatch your patrol cars to surround and capture a fleeing bank robber. Since his getaway car is faster than your pursuit vehicles, you'll have to think ahead and develop an envelopment strategy if you want to keep your job (and improve your score). For the Apple II ($29.95 disk).

FRONTLINE

A fast-paced battle of wits and strategy for one or two players. Enemy forces are trying to break through one of your frontline sectors: defend them with the troops, tanks, and planes at your command. Then press your attack and attempt to penetrate the enemy line. **Frontline** requires quick offensive and defensive tactical maneuvering. For the Apple II ($29.95 disk).

subLOGIC Corporation
713 Edgebrook Drive
Champaign IL 61820
(217) 359-8482 Telex: 206995

CIRCLE 263 ON READER SERVICE CARD

CAN A COMPUTER MAKE YOU CRY?

Right now, no one knows. This is partly because many would consider the very idea frivolous. But it's also because whoever successfully answers this question must first have answered several others.

Why do we cry? Why do we laugh, or love, or smile? What are the touchstones of our emotions?

Until now, the people who asked such questions tended not to be the same people who ran software companies. Instead, they were writers, filmmakers, painters, musicians. They were, in the traditional sense, artists.

We're about to change that tradition. The name of our company is Electronic Arts.

SOFTWARE WORTHY OF THE MINDS THAT USE IT. We are a new association of electronic artists united by a common goal – to fulfill the enormous potential of the personal computer.

In the short term, this means transcending its present use as a facilitator of unimaginative tasks and a medium for blasting aliens. In the long term, however, we can expect a great deal more.

These are wondrous machines we have created, and in them can be seen a bit of their makers. It is as if we had invested them with the image of our minds. And through them, we are learning more and more about ourselves.

We learn, for instance, that we are more entertained by the involvement of our imaginations than by passive viewing and listening. We learn that we are better taught by experience than by memorization. And we learn that the traditional distinctions – the ones that are made between art and entertainment and education – don't always apply.

TOWARD A LANGUAGE OF DREAMS. In short, we are finding that the computer can be more than just a processor of data.

It is a communications medium: an interactive tool that can bring people's thoughts and feelings closer together, perhaps closer than ever before. And while fifty years from now, its creation may seem no more important than the advent of motion pictures or television, there is a chance it will mean something more.

Something along the lines of a universal language of ideas and emotions. Something like a smile.

The first publications of Electronic Arts are now available. We suspect you'll be hearing a lot about them. Some of them are games like you've never seen before, that get more out of your computer than other games ever have. Others are harder to categorize – and we like that.

WATCH US. We're providing a special environment for talented, independent software artists. It's a supportive environment, in which big ideas are given room to grow. And some of America's most respected software artists are beginning to take notice.

We think our current work reflects this very special commitment. And though we are few in number today and apart from the mainstream of the mass software marketplace, we are confident that both time and vision are on our side.

Join us.

We see farther.

ELECTRONIC ARTS

CIRCLE 161 ON READER SERVICE CARD

SOFTWARE ARTISTS? I'm not so sure there *are* any software artists yet, says Bill Budge. "We've got to earn that title." Pictured here are a few people who have come as close to earning it as anyone we know.

That's Mr. Budge himself, creator of PINBALL CONSTRUCTION SET, at the upper right. To his left are Anne Westfall and Jon Freeman who, along with their colleagues at Free Fall Associates, created ARCHON and MURDER ON THE ZINDERNEUF.

Left of them is Dan Bunten of Ozark Softscape, the firm that wrote M.U.L.E. To Dan's left are Mike Abbot (top) and Matt Alexander (bottom), authors of HARD HAT MACK. In the center is John Field, creator of AXIS ASSASSIN and THE LAST GLADIATOR. David Maynard, lower right, is the man responsible for WORMS?

When you see what they've accomplished, we think you'll agree with us that they can call themselves whatever they want.

The IS PipeLine™ makes printing a

COMMAND PERFORMANCE

YOU are in command with the IS PipeLine™ Random Access Printing Buffer

Now you can "orchestrate" a masterpiece with your favorite computer programs . . "play" all your software together.

The PipeLine is a printing processor which connects your computer or terminal to your printer. It teaches your favorite soloists (your word processor program, spreadsheet program, or graphics program) to print together. At last, you don't need scissors and paste to compose a printed masterpiece.

The PipeLine also gives you "variations on a theme" . Insert pictures, graphics, text or spreadsheet data into reports; insert different names and addresses on form letters; save paragraphs or pictures for printing later—in any order—any number of times.

Of course, the PipeLine also handles old "standards" such as FIFO buffering, first in—first out, (what other buffers call "intelligent") as well as Bypass printing (quick access to your printer at any time during long-term buffer operations).

You can easily expand the PipeLine from 8K to 128K Bytes. Of course, PipeLine compresses your data, so you'll need less memory than your might expect.

A simple erase feature clears the buffer. An automatic duplication capability lets you print the exact number of copies you want.

The IS PipeLine is universal—it works with any parallel (Centronics* standard) computer/printer combination. It is a self-contained unit with its own power supply and comes complete with operating manual and cables.

Get the best performance from your computer, your printer, your software and your time—Get the IS PipeLine Random Access Printing Buffer!

For more information, send for our free 1983 Catalog

Interactive Structures Inc.
146 Montgomery Avenue
Bala Cynwyd, PA 19004
Telephone: (215) 667-1713

The IS PipeLine is Patent Pending.

*Centronics is a trademark of Centronics Data Computer Corp.

CIRCLE 182 ON READER SERVICE CARD

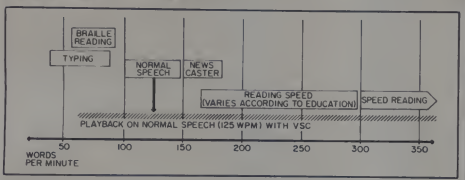


Figure 3. The above diagram compares the speeds of some common communication activities. VSC gives speech new flexibility by permitting slow down to match transcribing speeds or speed up to listen as fast as the average reading rate.

msec. and reproduced it at the same frequency in only 20 msec.

Imagine if you will an entire speech processed through the VSC. It too would be reproduced in half the time at the same rate of speech. No Donald Ducks, no chipmunks; just twice the information in half the time. Only if VSC is attempted at a factor greater than X2.5 would the speech become choppy, with a loss of comprehension.

Just as VSC can be used to compress speech, so too can it expand speech, up to 100 percent. In other words, if a speech takes 60 seconds to record, VSC can take up to 120 seconds to reproduce it. This time, instead of speeding up the tape, creating a gap, and then tightening up the gap, the tape is placed at, say, one-half speed, thereby *halving* the recorded frequencies. The VSC unit then eliminates half of each sample, creating a gap while restoring the original frequency.

At this point we have a restoration of the original waveform with gaps in between. The VSC then repeats the same waveform in the gap: in essence, everything is being repeated. The ear hears the original at the original speech rate, but now it takes twice as long to listen from beginning to end. Of what value is expanded speech? We'll get to that soon.

Servo Control

It should be obvious that the electronic frequency restoration of the VSC must in some way be tied to the increase (or decrease) in tape playback speed. After all, if the tape has been set for a X1.5 speed increase and the VSC is restoring the playback frequency at a X2.0 ratio the output sound is going to be very bassy. The problem is eliminated by simply tying the tape speed to the VSC restoration controller through a servo or "tachometer" cassette drive motor, similar to those used for high fidelity speed-controlled turntables. The motor has a built-in tachometer that sends a feedback signal to the VSC electronics.

The VSC compares the tacho feedback with its control signal to the drive motor and makes the necessary correction to insure the frequency restoration is directly proportional to the tape speed. If, for example, you are using a VSC Corp. Speech Controller cassette recorder, you will find a single control calibrated for a VSC rate of 0.6 to 2.5 sets both the cassette and decoder rates, which are interlocked. If one drifts slightly the other drifts the same amount, thereby maintaining frequency stability of the output sound (± 1%).

Talking Books

Earlier, we mentioned a use for expanded speech, which implies other uses than simply listening to an educational tape or a talking book. The same principle of voice expansion and compression can be used to change the pitch of an input signal, say to make it easier to understand the speaker.

For example, VSC can be used simply to lower or raise the pitch of a voice. This is easily accomplished by opening the servo lock between the drive motor of the recorder and the VSC. Then the controller of the VSC is used to move the sound up or down in frequency because the motor speed will not change as the VSC is adjusted.

Among the other uses for VSC are: film and video editing (for comprehensible audio during high speed scanning); high speed transmission of signals through limited bandwidth circuits (the signal can be "pushed" or moved into the most effective frequency range); time-compression of radio and TV announcements; movement of incoming sounds into an intelligible range for persons with frequency-selective hearing loss...and, well, the uses of VSC are limited only by your imagination.

For additional information on VSC products and a complete PC board assembly suitable for experimentation write to The Variable Speech Control Corp., 185 Berry St., San Francisco, CA 94107. □

Micro Sense
Software and Accessories
— At Bargain Prices —

	Retail	Our Price
Magic Pack by Anisci	$ 225.00 ea	$ 169.75 ea
Prowriter Printer (parallel #8510)	$ 495.00 ea	$ 399.00 ea
Magicalc by Anisci	$ 149.00 ea	$ 109.00 ea
The General Manager by Sierra On-Line	$ 229.00 ea	$ 179.50 ea
Elephant Diskettes SW SS/SD (box of 10 hub ringed)	$ 39.00 ea	$ 19.25 ea

And Much More

Above Prices Plus Shipping
Calif. Residents add Sales Tax
Order Toll Free
800-982-6352
714-383-FAST
(California Residents)
Or Write
Micro Sense
P.O. Box 6273
San Bernardino, Ca. 92412-6273
— Ask for our Free Catalog —
APPLE - IBM - IRS-80 - COMMODORE 64
VIC-20 - FRANKLIN

CIRCLE 197 ON READER SERVICE CARD

TACTICAL
DESIGN

HIGH PERFORMANCE ATARI™ JOYSTICK

- HIGH SPEED TACTILE RESPONSE
- HIGH-TECH CONDUCTIVE ELASTOMER SWITCHES WITH 24K GOLD CONTACTS
- PATENTED VELCRO ® ELASTIC LEG BELT FREES HANDS TO OPERATE JOYSTICK (NOT HOLD IT)

$27.95 HIGH SPEED TACTICAL JOYSTICK

$9.95 TACTICAL HIGH SPEED SWITCH KIT

TACTICAL ADVANTAGE GUARANTEED
SEND CHECK OR MONEY ORDER TO
TACTICAL DESIGN 270 SCIENTIFIC DRIVE SUITE 1
NORCROSS, GEORGIA 30092
DEALER INQUIRY INVITED

CIRCLE 268 ON READER SERVICE CARD

A Layman's Guide To Disk Protection

Phillip Tubb

My company, ALF Products, is one of the few copying services in the U.S. for Apple-compatible floppy disks. Since I started this service, I have talked to several companies about the advantages and disadvantages of "copy-protected" or "copy-resistant" disk formats. And since ALF started advertising the copying service, mentioning our ability to copy disks with modified formats, several people have called asking if we can make back-up copies of copy resistant disks for them.

Our service is primarily mass duplication (at least 50 and up to several thousand of each disk) for software houses and peripheral manufacturers, so we can't help these individuals; but in talking with them I have picked up quite a bit of information.

I think we are all familiar with the customer's desire for software that can be backed up, thus providing him with lifetime access to the software. And we are equally familiar with the software companies' desire for software that isn't so easy to pirate.

So I'd like to touch on two other aspects of copy-resistant disks: the technical side, and some future marketing aspects. Since I am familiar only with disks compatible with the Apple computer, keep in mind that only some of this information will apply to other systems.

Technical Background

The Apple computer is well suited to copy-resistant disk formats. Those who aren't familiar with disk technology ask "If my Apple can read the disk, why can't my Apple Copy program copy it?"

The Apple disk drive design is rather simple, with most of the work being done by the software. The hardware allows a program to write a byte (eight bits) of data onto the disk, to read a byte from the disk, to turn the motor on and off, to position the read/write head at various places on the disk, and to select Drive 1 or Drive 2.

Because of certain technical aspects of magnetic recording, all bytes written to or read from the disk have a most significant bit of one, and no byte can have two or more zeros in a row with the 13-sector controller or three or more zeros in a row with the 16-sector controller.

Bytes are written to and read from the disk at a set rate which is hardware controlled and thus unchangeable (with one small exception). Since the disk makes one full rotation in 1/5th of a second (give or take some for motor speed variations), only a certain number of bytes can be written on a track (a track is one circle around the disk during which the read/write head remains the same distance from the center). Within these capabilities/limitations, the task of the software is to take a certain number of data bytes, normal bytes in which the most significant bit may be either a zero or a one and in which there may be up to eight zeros in a row, and write them onto the disk using the special bytes just described in such a fashion that they can later be read off the disk and reassembled in the original bytes.

Obviously, there are many, many ways to do this. The copy program Apple supplies with its disk drive is designed to work with one particular method. It will not copy disks which use any other method. Apple's drive controller card contains a small " boot-up" program in ROM which will read (and then run) a small program from a particular track on the disk if it is written in a particular fashion.

So, a certain number of bytes must be written onto this track in the Apple format or the disk will not boot. However, the small boot-up program on the disk can be any small program and still be compatible with the Apple ROM. Once loaded and running, this program can read the rest of the disk itself, and thus the remainder of the disk can be in any format.

If the Apple boot-up ROM can read this small program, so can any skilled programmer. He can then determine how it reads whatever it reads off the disk. Then he, too, can read whatever the program reads. By continuing to read and understand each program that is read off the disk, the programmer can eventually understand the entire disk format and know the data content of the disk.

Then he can modify the programs on the disk to function properly on a disk which is formatted in the standard way, thus creating a copy that can easily be copied. Or he can devise a program which will copy the entire disk, thus letting the programmer create as many copies as he desires, each of which is still as difficult to copy as the original. This

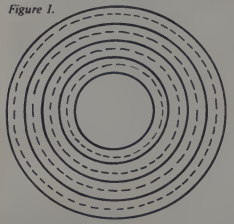
Phillip Tubb, ALF Products Inc., 1445 Estes, Denver, CO 80215

process can take much longer than it would take simply to write the program from scratch, or it may take only a few minutes.

Preferable would be a scheme to copy the disk without being concerned about how it is formatted or how programs work with the disk. It would seem that a "disk duplicator" could be built that would copy a disk as easily as a cassette tape duplicator seems to copy a tape. This never seems to work out. To understand why, let's consider a simple protection scheme.

On a standard Apple disk, data are written on 35 concentric circles called tracks; these tracks are numbered from 0 to 34 and are spaced about 1/48" apart.

Figure 1.



—data written
--possible head position

The solid lines in Figure 1 show a few of these tracks. Since the head positioning mechanism in the drive can position the read/write head in 1/96" increments, the dotted lines show possible track positions which are not used. (Attempting to use 1/96" track spacing would cause adjacent tracks to be erased or modified each time a track was written.) Positioning the head to these track positions is easy; the only difficulty is reading and reproducing the data on each track.

Drive Speed

Assuming the drive speed is exactly 300 rpm, there will be about 6378 bytes (special bytes, remember) of data. Now here is where the problems creep in.

When the disk to be copied is read, the number of bytes read will be the same as the number of bytes that were originally written. So if the drive was running, say, 1% fast when the disk was written there will be about 6314 bytes to read. Similarly, if it were running 1% slow, there would be 6442 bytes to read.

What then if the original drive was running 1% slow, and your drive is running 1% fast? How will you write 6442 bytes in 6314 bytes worth of time? You won't. Could the drive be adjusted to the same speed as the drive that wrote the original disk? No. To get the speeds within, say, one bit of each other would require an accuracy better than 0.002%, and drives normally vary more than ten times that amount from one revolution to the next, and well over 50 times that from one minute to the next, even under the best conditions.

The way this speed problem is overcome during normal copying is by varying the amount of unnecessary data scattered around the track and/or by putting a section of unnecessary data at one place on the track (where writing starts and stops). If the locations of these spots of data (or the location of one spot) are known, the drive speed is easily good enough to allow the track to be written while adding or removing only unnecessary data. In the Apple format, each of the 13 or 16 sectors is preceeded by a section of unnecessary data.

Since the object of easy copying is to eliminate the need to know anything about the contents of the particular disk being copied, the simplest programs written to copy copy-resistant disks are written on the assumption that certain "clues" will be available concerning the location of unnecessary data. In the vast majority of cases, these areas are easily found using simple program algorithms.

A hex byte of FF is almost universally used for such areas, due to technical aspects of disk reading. However, the situation is complicated by the fact that the 13-sector controller can also read and write an 8-bit byte followed by a single zero bit, and the 16-sector controller can read and write an 8-bit byte followed by one or two zero bits. These zero bits are not present when the disk is read, except as an almost undetectable difference in read-back speed.

Several techniques are used to make it difficult to find any of these key spots, or to mislead a copy program into treating a section as unnecessary when, in fact, it is part of the ordinary data. A more effective technique is to use a special copying program that reads each track (or perhaps only a few tracks) after the copy is made, then modifies the program on the disk. When the user runs the program, it can check to see if the number of bytes on each track is the same as when the disk was originally written. If not, the copy is illegal, and the program can erase the disk (and ask you to insert various other disks you have on hand, slyly erasing each one).

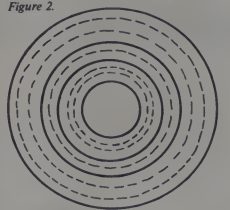
It is difficult, then, to copy a track. I am often asked if an analog system could be used to connect the read head from one drive to the write head of another. The speed problems still apply (to some degree even when using the single spindle, dual hub drives) as does the question of when to start and stop writing. (When writing is stopped, a small amount of magnetic garbage occurs.)

But the question is rendered meaningless due to shifts which occur in the magnetic data. The data read from a disk are not exactly the same as the data written on the disk. The controller is designed to process the data read from the disk until it looks like the data written on it. If this processing is not done, or is done improperly because the exact format of the track is not known, the shifting effect may become so large that the controller will not be able to read the copy.

Ways To Prevent Copying

Even assuming you could copy a track exactly, there are still ways to prevent copying. Figure 2 shows a popular scheme. You will notice that each track is still at least 1/48" away from every other track, but that they are not positioned at the same places as Apple tracks. Usually, fewer tracks are available on the disk when this scheme is used. Non-standard track spacings complicate copying disks even once you have a sufficiently versatile track-copying program running. However, it is obvious that the appropriate spacing can be deduced, or even found by trial and error.

Figure 2.

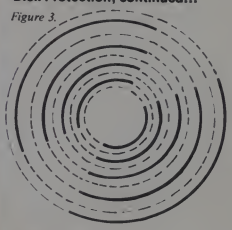


—data written
—possible head position

Now examine Figure 3. This is a scheme I have come up with to defeat the track spacing detectives. Each track is still 1/48" away from any other track at any given point. However, in any given circle around the disk there is a track less than 1/48" away. This format cannot be copied using a full-track copy program even if it has variable spacing capabilities. It has the disadvantage of a lower total storage capacity, like most track spacing schemes, and it is difficult to make in the first place.

By now you have realized that anyone who understands how the system works can, with a little imagination, come up

Figure 3.



—data written
--possible head position

with new ways to defeat general purpose copy programs. Due to the high data rates involved (and thus the small amount of processor time available), very small effects can be used. I see no end to the battle between copy-resistant formats and special copy programs to defeat them.

In a general sense, any format for which the master disk is the same as the copies produced can be copied—a program like the program that did the copying in the first place will do. However, if the copy is different in some way from the master, it may be that no program can copy the disk unless the program on the disk is understood. An example of this is the program that, when run, checks each track to determine what the disk speed was when the copy was produced. Each copy will be different, because the speed during copying will vary at each revolution; and each program will be modified to function with the exact speed that occurred.

To sum up, a key question is "Can a program be developed that defeats all formats?" My answer is "no." While such a program (or a special machine) may, in fact, be possible, it seems very unlikely today.

Future Marketing

I am suggesting that disks which the customer is unable to copy will continue to be possible. But will they remain practical? There is growing rebellion among consumers. Two factors strike me as important.

First, any program that can be written once can be written again. If you are annoyed that you can't copy *VisiCalc* (to pick just one example), so is someone else. And that someone else may be a programmer who sees writing *VisiCalc* as an afternoon's effort. Soon, WonderSoft is selling *Opticalc* which is not only copyable, but sells for $25 less! Are there big bucks to be made in writing programs (new programs, done from scratch) that have the same features as programs on copy-resistant disks, marketed on standard format disks? My guess is yes, and it is completely legal. Most people consider ethical as well, although some disagree.

Second, there is much talk about hard disks. In fact, there is much talk about several new storage devices. Many of these have fixed media but large capacity. If these become more popular, as many people are sure they will, floppy disks may increasingly be a convenient and inexpensive method for getting software from the vendor to the customer. But the customer will then want to transfer the program immediately to his MegaStore which is fast and convenient. How will the customer do this with copy-resistant disks? Probably by buying *Opticalc* from WonderSoft.

Records, cassettes, eight-tracks, radio and television broadcasts—all these are easily duplicated to the satisfaction of the listener/viewer. Yet these industries still exist, despite complaints that all are suffering greatly from illegal pirating. Perhaps it is time the software industry found out how they're doing it. □

$ $ $ MONEY SAVINGS SPECIALS $ $ $

FRANKLIN ACE 1000
With Color

ACE 1200
• 6502 & Z-80 Processors • Built-in Drive
• 128 K • 80 Columns
SALE

KAY COMP II
Z-80 64-K
Twin 5¼ Floppy Disk Drives • 9" Video (80 column) • RS-232 C • Parallel Printer Port
SOFTWARE INCLUDED: CP/M 2.2 • S Basic • Profit Plan • Perfect Writer W/P • Perfect Calc • Perfect Filer • Perfect Speller
LOW LOW PRICE

TELEVIDEO 802
• 64K • CPM • 2 Drives • Det. Keyboard • Monitor
$2645
NEW
TELEVIDEO 803 .... **$2295**

"PRINTER SPECIALS"

EPSON
MX 80 FT III ..... $
MX 100 FT III .....
FX 80 .....
ALL IN STOCK

CEMINI
10" $329
15" 509

CITOH
8510 Parallel $419
8510 ACD Serial 569
1550 Parallel 669
ALL IN STOCK

Letter Quality
Smith Corona TP-1 ..... $549
Comrex CRI 825

PRINTER INTERFACES
Parallel Interface ..... $ 59
Grappler + ... 124.95
Wizzard BPO
(Graphics + 16K Buf) ... 149

DRIVES & CARDS
Apple/Acemate-5¼" ... 249
Thinline-5¼" 279
Disk Contr. Card 65
Disk Contr. w/Diagnotics 95

CARDS
Smarterm 80 Column .. $145
Micro Soft CPM 239
16K RAM 75
Franklin Color Kit (no soldering) **39**

THE COMPUTER STORE (714)
869 Sandcastle • Corona del Mar, CA 92625 **662-1425**

Call or write for M.C. or VISA (3% charge include expiration date) or send check or money order. Add 3% shipping charge. CA res. add 6% tax. *ALL PRICES SUBJECT TO CHANGE*

CIRCLE 151 ON READER SERVICE CARD

WHAT HAS IMMEASURABLE FIREPOWER... ATTACKING RIGILLIANS... ALTERED PERSPECTIVE SCROLLING... AND NO MERCY?
SYNAPSE SOFTWARE
DIMENSION X
DIMENSION X, by Steve Hales, the [illegible] SYNAPSE SOFTWARE gives you a [illegible] 3-D graphics, a [illegible] sector map that's different every time, AND no margin for error.
DIMENSION X at software dealers everywhere, or AVAILABLE DIRECT FROM SYNAPSE ELITE. ONLY $34.95 plus $2 shipping and handling— SEND CHECK, MONEY ORDER OR VISA/MASTERCARD NUMBER TO SYNAPSE ELITE OR CALL (415) 527-7712.
synapse
5221 Central Avenue, Richmond, CA 94804 · (415) 527-7712
ON READER SERVICE CARD

Don't let price get in the way of owning a quality printer.

Adding a printer to your computer makes sense. But deciding which printer to add can be tricky. Do you settle for a printer with limited functions and an inexpensive price tag or buy a more versatile printer that costs more than your computer? Neither choice makes sense.

Here's a refreshing option—the new, compact STX-80 printer from Star Micronics. It's the under $200 printer that's whisper-quiet, prints 60 cps and is ready to run with most popular personal computers.

The STX-80 has deluxe features you would expect in higher priced models. It prints a full 80 columns of crisp, attractive characters with true descenders, foreign language characters and special symbols. It offers both finely detailed dot-addressable graphics and block graphics.

And, of course, the STX-80 comes with Star Micronics' 180 day warranty (90 days on the print element).

The STX-80 thermal printer from Star Micronics. It combines high performance with a very low price. So now, there is nothing in the way of owning a quality printer.

*Manufacturer's suggested retail price.

star™
micronics • inc

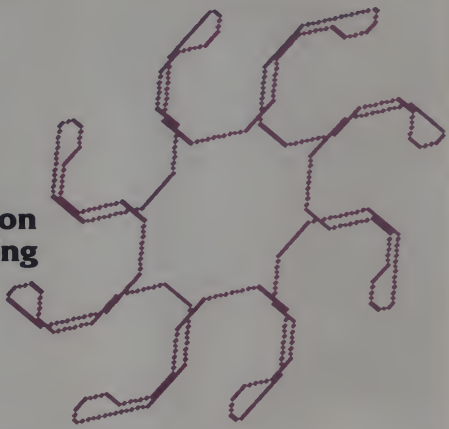
THE POWER BEHIND THE PRINTED WORD.

Computer Peripherals Division, 1120 Empire Central Place, Suite 216, Dallas, TX 75247 (214) 631-8660

CIRCLE 285 ON READER SERVICE CARD

The new STX-80 printer for only $199.*

Medium Resolution Line Printer Plotting



Kimball M. Rudeen

While I am usually perfectly satisfied with my TRS-80 Model III, I sometimes wish the graphics were a little better. There are times when I could do with a better aspect ratio or smaller pixels or a work space larger than 128 x 48. This article describes a method I have found for reaching these goals using a line printer with graphic character capacity.

As most people who have such a printer will know, it is simple to copy a screen display onto paper. I use a simple PEEK loop that reads the TRS-80 screen memory character by character and prints each character using the CHR$ function. My printer, an Okidata Microline 82A, has maximums of 16.5 characters per inch and 8 lines per inch. Given the 2 x 3 pixels per character of the TRS-80, this means a printed pixel of about .03" x .04". This is quite an improvement in aspect ratio and resolution, but there is still the 128 x 48 work space limit.

The PEEK loop I use to copy the screen picture suggested an interesting possibility. This loop treats the TRS-80 screen as a linear array in memory, with each entry containing a byte of data defining six pixel locations. A similar loop could be used to store a screen picture in a 2D array, or to reproduce a picture so stored.

Kimball M. Rudeen, 35 Lowell St., Lexington, MA 02173.

Consider an N x M array, with each entry able to contain a byte or more of data. Since TRS-80 graphic character codes can be stored in this array, it could also be thought of as a 2N x 3M pixel array. If N > 64 and M > 16, the work space provided by this array exceeds the TRS-80 screen space.

There are times when I could do with a better aspect ratio or smaller pixels or a work space larger than 128 x 48.

The method I have developed makes it possible to address single pixels directly in such an array. It enables a program to translate an x,y location and the character code that will turn the pixel matching that location on.

The best way to describe this method is to state the problems it must solve. Given an x,y location and a N x M array, it is necessary to:

- Determine which entry in the array contains the pixel corresponding to the x,y location.
- Determine the character code that will turn that pixel on in a printout.
- Load that character code into the array entry without disturbing any pixels already set.

The first problem can be solved very simply. Each entry in a row of N array entries contains two columns of pixels for a total of 2N columns. The x location of a pixel specifies the column containing it. If these columns are numbered 0 to 2N-1, then an integer division of x by 2, or INT(X/2), will generate a number from 0 to N-1. This number gives the entry in a row of N entries containing the pixel with the given x coordinate.

Similarly, the function INT(Y/3) will identify the entry in a column of M array entries that contains the pixel with a given y coordinate. So, given the N x M array and an x,y pixel location, the functions INT(X/2) and INT(Y/3) will specify the array entry containing the pixel.

The second problem is a bit more complex (pun intended). The basic TRS-80 graphics character code is 128 for a blank space with no pixels set. The six pixels in a character block are set by turning on bits 0 to 5 in addition to bit 7 (128 in binary). Figure 1 illustrates the binary values of the bit positions corresponding to each of the six pixels.

Medium-Res Plotting, continued...

The problem becomes one of converting an x,y location into the bit position for that pixel within its array entry. Consider again the value generated by INT(X/2). This gives the integer result of X divided by 2. The function X-2*INT(X/2) generates the missing remainder, which is 0 if X is a multiple of 2, or 1 if X=2P+1 for some integer P. But X is a multiple of 2 if X is in the first pixel column of some character position, and X=2P+1 for some P if X is in the second column. Similarly, the function Y-3*INT(Y/3) gives 0, 1 or 2 for Y in the top, middle, or bottom pixel row of a character position. Figure 1 illustrates this as well.

Let BX=X-2*INT(X/2) and BY=Y-3*INT(Y/3). Then the function BP=BX+2*BY will return the six values 0 to 5 when given the BX, BY coordinates of the six locations, and therefore specifies the bit position to turn that pixel on. This solves the second problem.

Now the third problem: given the array entry and the position of the bit to be set, set that bit without changing any other bit settings. Given an integer variable, a single bit in that variable can be set by the OR function. If the integer variable is ORed with another variable containing the proper power of 2, the chosen bit will be set. The quickest and most reliable way I have found to do this is to use an array containing the powers of 2 from 0 to 5, indexed by the function BP=BX+2*BY. The indexed entry can be ORed into the array entry to set the specified bit.

To sum up, given an x,y pixel location to be set in an M x N array:

- Use the functions PX=INT(X/2), PY=INT(Y/3) to locate the array entry containing the pixel.
- Use the functions BX=X-2*PX, BY=Y-3*PY, and BP=BX+2*BY to determine the bit position to be set to turn the pixel on.
- OR the PX,PY array entry with BP of an array containing the powers of 2 in the order illustrated in Figure 1.

Figure 1.

```
100 A=64:B=24:X=A:Y=B
110 LM=0:RM=128:TM=0:BM=48
120 INPUT "ENTER A STRING";N$:N=LEN(N$)
130 D1=1:D2=0:LM=1:CLS
140 FOR I=1 TO N
150 S=ABS(D1)+ABS(D2):T1=D1:T2=D2
160 IF MID$(N$,I,1)="R" THEN D1=(T1-T2)/S:D2=(T1+T2)/S
170 IF MID$(N$,I,1)="L" THEN D1=(T1+T2)/S:D2=(T2-T1)/S
180 FOR J=1 TO I
190 FOR K=1 TO LM
200 X=X+D1:Y=Y+D2
210 IF X)=LM AND X(RM AND Y)=TM AND Y(BM THEN SET(X,Y)
220 NEXT K:NEXT J
230 NEXT I
240 IF X=A AND Y=B THEN END
250 GOTO 140
```

Listing 1.

```
10 MX=127:MY=63                          ' SET WORK SPACE DIMENSIONS
20 DIM PT%(MX,MY),BIT%(5)                ' CREATE WORK SPACE, BIT ARRAYS
30 FOR I=0 TO 5:READ BIT%(I):NEXT        ' INITIALIZE BIT ARRAY
40 DATA 1,2,4,8,16,32
100 A=152:B=40:X=A:Y=B                   ' CHANGE INITIAL POSITION
110 LM=0:RM=255:TM=0:BM=191              ' CHANGE MARGINS
120 INPUT "ENTER A STRING";N$:N=LEN(N$)
130 D1=1:D2=0:LM=1
140 FOR I=1 TO N
150 S=ABS(D1)+ABS(D2):T1=D1:T2=D2
160 IF MID$(N$,I,1)="R" THEN D1=(T1-T2)/S:D2=(T1+T2)/S
170 IF MID$(N$,I,1)="L" THEN D1=(T1+T2)/S:D2=(T2-T1)/S
180 FOR J=1 TO I
190 FOR K=1 TO LM
200 X=X+D1:Y=Y+D2
210 IF X)=LM AND X(RM AND Y)=TM AND Y(BM THEN GOSUB 500 ' ***
220 NEXT K:NEXT J
230 NEXT I
240 IF X=A AND Y=B THEN GOSUB 1000: END                  ' ***
250 GOTO 140
490 ' PIXEL SETTING SUBROUTINE
500 PX=INT(X/2):PY=INT(Y/3):BX=X-2*PX:BY=Y-3*PY
510 PT%(PX,PY)=PT%(PX,PY) OR BIT%(BX+2*BY)
520 RETURN
990 ' PRINTOUT SUBROUTINE
1000 FOR DY=0 TO MY
1010 FOR DX=0 TO MX
1020 IF PT%(DX,DY)=0 THEN LPRINT CHR$(128);:GOTO 1040
1030 LPRINT CHR$(PT%(DX,DY)+128);:PT%(DX,DY)=0
1040 NEXT DX:LPRINT
1050 NEXT DY
1060 RETURN
```

Listing 2.

After all array entries have been set, the array can be printed out. In this method, the array is scanned left to right, top to bottom. If an entry is empty, it is added to 128 to create a graphics character code. The CHR$ function is then used to print out the character. This saves the trouble of initializing all array entries to 128.

The Programs

Listing 1 is a program for generating Sirpolateral figures, as described by Donald T. Piele in the March and April 1982 issues of *Creative Computing*. I found that the figures generated by this program were either too large to fit on my screen, or made no sense when displayed in TRS-80 low-resolution graphics.

Listing 2 is the same program with additions and modifications to plot into and display from an internal array. Lines 10-40 define the internal array PT% with a 256 x 192 pixel space, and initialize the pixel setting array BIT%. Lines 210 and 240 have been modified to call the pixel setting and printout subroutines. These subroutines are contained in lines 500-520 and 1000-1060 respectively. The original program was modified in only two places. The rest of the code was added.

Figure 2 is a Sirpolateral figure generated by this program from the input string RRRRRLLLRRRRR. This same plot was too large to fit on my TRS-80 screen when generated by the Listing 1 program.

Some readers may have noticed a major drawback to this method as implemented in Listing 2. The 128 x 64 integer array PT% requires more than 16K bytes of memory—too much for a 16K TRS-80. This is due to a very inefficient storage system. Only the first six bits of each 16 bit integer array entry are used to store data.

Death in the Caribbean
CONFIDENTIAL
OPEN ONLY IN
CASE OF MY
DEATH
ear cousin:
Alas, for when you read this letter you shall know-
perish the thought-that I have perished! You see, my bar-
rister holds instructions to forward this letter ONLY IN
THE EVENT OF MY UNFORTUNATE DEMISE!
Years ago, during my worldly travels, I chanced upon a
treasure map suggesting huge wealth buried on a little-
known tropic isle. Naturally, I pursued it, forthwith and
to wit, fully suspecting certain unspeakable dangers
inherent to the task. Unfortunately, they proved to be
dangers so vile, so terrible, so incredible, that no human
being should ever be forced to face. Yet, I faced this
force of evil and, as you may realize upon receipt of these
words, have indeed succoumbed in the attempt.
Though I may have failed, the challenge is passed along
to you! So accept the torch. Go! Seek it out, to wit and
forthwith. But hark, I warn you-stay alert, be ever on
your guard, and beware for your very life! Because each
step of the way you will face DEATH IN THE CARIBBEAN.
Your loving cousin,
PROFESSOR HERMAN Q. HEMMERDINGER
BS, BA, MS, PH.D., DINERS CLUB, BLUE CROSS
SCIENCE
The Professor fails the test
Page 27
OBITUARY
PROFESSOR HERMAN Q. HEMMERDINGER
DEATH IN THE CARIBBEAN
an outdoor adventure game!
microfun
CIRCLE 193 ON READER SERVICE CARD

Xerox Service Centers. The personal computer back-up system you've been looking for.

Unfortunately, most people find out the hard way that there's one question even a personal computer can't answer.

Where can you take it for service?

We have a suggestion. Come to one of our

new Xerox Service Centers. We have 82 nationwide. And we're multiplying faster than software programs.

Right now we're equipped to handle Osborne™ Computers, Epson™ MX Series Printers, Pied Piper™ Computers, Morrow Designs Micro Decision™ Computers, Corona Data Systems Computers, Enter Sweet Pea™ Color Plotters, Cameo Electronics Winchester Disk Drives, Okidata Microline™ and Pacemark,™ and Amdek™ products. In addition to a number of Xerox products like the 820 Personal Computer and Diablo™ Printers. But in the future, we'll be servicing even more brands of personal computers and related items.

Our service people have to undergo one of the toughest training programs in the industry. Including plenty of hands-on experience and intensive study of computer technology.

Then we put them through the specialized courses on other brands.

We've even provided a back-up system to our back-up system with a nationwide "hot line" to our Xerox Technical Support Centers. So in the unlikely event your bugaboo baffles our local whiz, there's extra help close at hand.

And we keep our parts departments well stocked. Which means your problem can be fixed a lot faster than you'd imagine.

But one of the best things about bringing* your equipment to us is that you get Xerox quality service at a very affordable price.

So come in and see us. Or contact the Xerox Five Star Service Dealer in your area for more information.

Because 82 new Xerox Service Centers are not only a nice step forward for us. They're a great system for you to fall back on.

Visa, MasterCard and American Express Cards accepted.

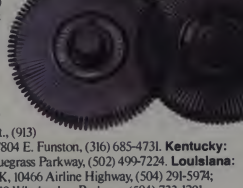
*Pick-up and delivery available.

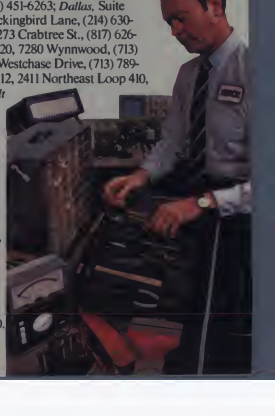
Xerox Service Centers.

Alabama: *Birmingham,* 167-A Citation Court, (205) 945-1280. **Arizona:** *Tempe,* Suite 101, 2109 S. 48th St., (602) 967-1922. **California:** *Alhambra,* 614 South Marengo, (213) 289-0174; *Anaheim,* 232 W. Cerritos Ave., (714) 776-8143; *Carson,* Suite E, 20630 Leapwood, (213) 516-6650; *Chatsworth,* 20802 Plummer St., (213) 709-0226; *Sacramento,* 4247 S. Market Court, (916) 920-2275; *San Diego,* Suite N, 7343 Ronson Rd., (619) 569-1212; *San Francisco,*

XEROX

Suite B, 1555 Burke Ave., (415) 821-7719; *San Leandro,* 1981 Adams, (415) 635-9300; *Sunnyvale,* #6, 540 Weddell Drive, (408) 734-2540. **Colorado:** *Denver,* Suite 201, 8200 E. Pacific Place, (303) 696-8966. **Connecticut:** *Hartford,* 593 Farmington Ave., (203) 236-2381. **Delaware Area:** *Westchester, Pa.,* 301 Willowbrook Lane, (215) 431-0533. **Florida:** *Altamonte Springs,* 716 North Lake Blvd., (305) 830-8109; *Ft. Lauderdale,* #502, 1500 N.W. 62nd St., (305) 491-3202; *Jacksonville,* Unit #4, 3035 Powers Ave., (904) 731-7218; *Miami,* 6908 N.W. 72nd Ave., (305) 887-2711; *Tampa,* Suite 6, 6201 Johns Rd., (813) 886-0779. **Georgia:** *Atlanta,* Suite 10, 2215 Perimeter Park Drive, (404) 458-1016. **Hawaii:** *Honolulu,* Suite 104, 627 South St., (808) 526-0885. **Illinois:** *Chicago,* 165 N. Canal St., (312) 559-9440; *Elk Grove Village,* 2216 Landmeier Rd., (312) 437-3180; *Lombard,* 436A Eisenhower Lane, (312) 953-1113; *Springfield,* 2036 S. MacArthur, (217) 523-1007. **Indiana:** *Indianapolis,* 5335 W. Minnesota St., (317) 241-2888. **Iowa:** *Des Moines,* 700 E. 4th St., (515) 282-8700. **Kansas:** *Overland Park,* 6383 W. 110 St., (913) 381-9819; *Wichita,* 7804 E. Funston, (316) 685-4731. **Kentucky:** *Louisville,* 10308 Bluegrass Parkway, (502) 499-7224. **Louisiana:** *Baton Rouge,* Suite K, 10466 Airline Highway, (504) 291-5974; *Harahan,* Suite F, 550 Wholesalers Parkway, (504) 733-1201. **Maryland:** *Hunt Valley,* 100 Lakefront Drive, (301) 667-8711; *Lanham,* 9730A-1 George Palmer Highway, (301) 459-3973; *Rockville,* 12288 H. Wilkens Ave., (301) 468-8870. **Massachusetts:** *Braintree,* 190 Forbes Rd., (617) 848-5750; *Woburn,* 248 W. Cummings Park, (617) 938-0845. **Michigan:** *Lansing,* Suite 7, 6810 South Cedar, (517) 694-3350; *Troy,* Suite 7, 1270 Rankin, (313) 583-2935. **Minnesota:** *Edina,* 3650 Hazelton Rd., (612) 920-4472. **Mississippi:** *Jackson,* 870 Foley St., (601) 948-6302. **Missouri:** *St. Louis,* 11984 Dorsett Rd., (314) 991-2106. **Nebraska:** *Omaha,* 11129 Mill Valley Rd., (402) 493-0387. **New Jersey:** *Lodi,* 300-1B Rt. 17, (201) 777-4441; *Monmouth Junction,* Bldg. 1, 248 U.S. Rt. 1, (201) 329-2050; *Whippany,* 145 Algonquin Parkway, (201) 428-1275. **New Mexico:** *Albuquerque,* Suite D, 5659 Kircher Blvd., (505) 344-3563. **New York:** *Albany,* Pine West Plaza One, Washington Ave Ext., (518) 869-9082; *Cheektowaga,* 198 Sugg Rd., (716) 634-2993; *Elmsford,* 5 Westchester Plaza, (914) 592-4454; *Lake Success,* Suite 1-E8, 3000 Marcus Ave., (516) 437-1134; *Liverpool,* 7150 Henry Clay Blvd., (315) 451-7420; *New York,* 405 Lexington Ave., (212) 697-2190; *Rochester,* 333 Metro Park, (716) 424-4010. **North Carolina:** *Charlotte,* 2838 G Interstate 85 S., Carolina Center, (704) 399-1523; *Raleigh,* 5225 North Blvd., #1 N. Commerce Center, (919) 876-1610. **Ohio:** *Akron,* 2650 S. Arlington Rd., (216) 644-3251; *Cincinnati,* 4814 Interstate Drive, (513) 874-0884; *Cleveland,* Technology Plaza, 5267 E. 98th St., (216) 587-1546; *Columbus,* 3711 Corporate Drive, (614) 895-3033. **Oklahoma:** *Oklahoma City,* 2122 South Meridian, (405) 682-5030; *Tulsa,* 4725A South Memorial Drive, (918) 665-0811. **Oregon:** *Tigard,* 10110 S.W. Nimbus Ave., B-9, (503) 684-1152. **Pennsylvania:** *Harrisburg,* 806 S. 29th St., (717) 564-2602; *King of Prussia,* Suite C, 1006 W. 8th Ave., (215) 337-4486; *Philadelphia,* Suite H&I, 9140 Academy Rd., (215) 331-0999; *Pittsburgh,* 601 Holiday Drive, (412) 921-8202. **Tennessee:** *Memphis,* Suite 143, 1835 Nonconnah Blvd., (901) 346-2211; *Nashville,* 1854 Airlane Drive, (615) 883-5102. **Texas:** *Austin,* #112, 7950 Anderson Square, (512) 451-6263; *Dallas,* Suite 104, 1625 W. Mockingbird Lane, (214) 630-6647; *Fort Worth,* 3273 Crabtree St., (817) 626-8243; *Houston,* Suite 220, 7280 Wynnwood, (713) 862-1784; *Houston,* 3642 Westchase Drive, (713) 789-3070; *San Antonio,* Suite 112, 2411 Northeast Loop 410, (512) 655-0085. **Utah:** *Salt Lake City,* 3697 W. 1987 S., (801) 973-7316. **Virginia:** *Fairfax,* 2731B Prosperity Ave., (703) 698-7477; *Richmond,* 8707 W. Broad St., (804) 747-0275; *Virginia Beach,* 1448 Air Rail Ave., (804) 464-4752. **Washington:** *Renton,* 266 S.W. 43rd St., (206) 251-9155. **West Virginia:** *Charleston,* 523 Central Ave., (304) 342-8015. **Wisconsin:** *New Berlin,* 2995 South Moreland, (414) 784-3690.





XEROX®, 820 and Diablo* are trademarks of XEROX CORPORATION.

CIRCLE 280 ON READER SERVICE CARD

DON'T GET LOCKED IN

Pascal
Basic
Cobol
Forth
Pilot
Fortran
Spread Sheet
Inventory
Logo
"C"

Data Base Management
Word Processor
Communication Utility
Accounts Receivable
Accounts Payable
Engineering Utility
General Ledger
Mailing List
Macro Assembler
Education

TRSDOS*

CP/M**

Open your doors to a world of SOFTWARE with LNW computers. You'll get **MORE PERFORMANCE**[1] than with the IBM PC[2] the Apple II[3] TRS80 MODEL II or TRS80 MODEL III[4] along with software support of TRSDOS or CP/M, the TWO MOST WIDELY USED OPERATING SYSTEMS. This means you, the user, can select from the largest base of business or personal software.

Standard Features: A serial RS232 communication port, parallel printer port, Hi-Resolution (480x192) B/W and COLOR graphics, an 80 character-per-line screen display along with Quad-density interface for 5" or 8" floppy disk storage offering immediate access to 3.5 million characters, or optional Hard disk interface to 5 or 10 million characters.

Standard Software: LNWBASIC and DOS PLUS operating system packages, commanding all the above features, are included.

The LNW computer will be the key to your success with the starting price at **$1695.00,** along with a full 6 month warranty.

Dealers: You too can open the door to a successful product. Call for our special dealer programs: (714) 544-5745.

LNW Computers
2620 Walnut Avenue
Tustin, California 92680
(714) 544-5744

CIRCLE 201 ON READER SERVICE CARD

*TRSDOS is a trademark of Tandy Corp
**CP/M is a trademark of Digital Research Corp
1 Performance is based on bench mark test in the JAN 1982 issue of BYTE magazine, pg. 54, with LNW80 II as the comparison
2 IBM PC is a trademark of IBM CORP
3 APPLE II is a trademark of APPLE COMPUTERS
4 TRS80 is a trademark of Tandy Corp.

International orders please inquire for pricing/shipping cost

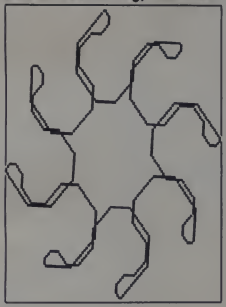


Figure 2.

```
10 MX=63:MY=63                          ' NEW WORK SPACE DIMENSIONS
20 DIM PTX(MX,MY),BITX(11)              ' CREATE WORK SPACE, BIT ARRAYS
30 FOR I=0 TO 11:READ BITX(I):NEXT      ' INITIALIZE BIT ARRAY
40 DATA 64,128,1,2,256,512,4,8,
   1024,2048,16,32
100 A=152:B=40:X=0:Y=B                  ' CHANGE INITIAL POSITION
110 LM=0:RM=255:TM=0:BM=191             ' CHANGE MARGINS
120 INPUT "ENTER A STRING";N$:N=LEN(N$)
130 D1=1:D2=0:LM=1
140 FOR I=1 TO N
150 S=ABS(D1)+ABS(D2):T1=D1:T2=D2
160 IF MID$(N$,I,1)="R" THEN D1=(T1-T2)/S:D2=(T1+T2)/S
170 IF MID$(N$,I,1)="L" THEN D1=(T1+T2)/S:D2=(T2-T1)/S
180 FOR J=1 TO I
190 FOR K=1 TO LM
200 X=X+D1:Y=Y+D2
210 IF X)=LM AND X(RM AND Y)=TM AND Y(BM THEN GOSUB 500  ' ***
220 NEXT K:NEXT J
230 NEXT I
240 IF X=A AND Y=B THEN GOSUB 1000 : END                 ' ***
250 GOTO 140
490 ' PIXEL SETTING SUBROUTINE                           ' ***
500 PX=INT(X/4):PY=INT(Y/3):BX=X-4*PX:BY=Y-3*PY
510 PTX(PX,PY)=PTX(PX,PY) OR BITX(BX+4*BY)
520 RETURN
990 ' PRINTOUT SUBROUTINE                                ' ***
1000 FOR DY=0 TO MY
1010 FOR DX=0 TO MX
1020 IF PTX(DX,DY)=0 THEN LPRINT CHR$(128)+CHR$(128);:
     GOTO 1060
1030 IF PTX(DX,DY) AND 4032 THEN PTX=INT(PTX(DX,DY)/64):
     LPRINT CHR$(PTX+128); ELSE LPRINT CHR$(128);
1040 IF PTX(DX,DY) AND 63 THEN
     PTX=PTX(DX,DY)-64*INT(PTX(DX,DY)/64):
     LPRINT CHR$(PTX+128); ELSE LPRINT CHR$(128);
1050 PTX(DX,DY)=0
1060 NEXT DX:LPRINT
1070 NEXT DY
1080 RETURN
```

Listing 3.

Fortunately there is a way to extend this method and double data storage. A second 2 x 3 pixel array can be stored in bits 6 to 11 of an integer array entry. An N x M integer array now becomes a 4N x 3M pixel array. Figure 3 illustrates the bit positions for this new coding. Notice that each entry in the left 2 x 3 pixel set is equal to the corresponding entry in the right pixel set *64, or shifted six bits to the left.

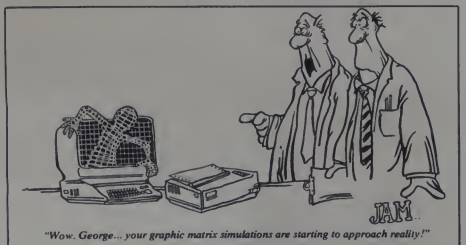
The coordinates of the array entry of a pixel at x,y are now given by PX=INT(X/4) and PY=INT(Y/3). Only the X function is changed. Similarly, the bit positions are now given by BP=BX+4*BY for BX=X-4*PX and BY=Y-3*PY. The BIT% array now contains twelve entries, initialized according to the bit positions shown in Figure 3.

The most complicated change is unpacking this new coding for printout. Each entry now contains two characters, in bits 6-11 and 0-5. These two-bit sets must be unpacked separately. Listing 3 is Listing 2 converted to double storage. The array initializations and pixel setting subroutine have changed as described above. The printout function now prints two spaces for every empty array entry. If an entry is not empty, it is unpacked in two stages.

First, the entry is ANDed with the integer 4032, which in binary is 111111000000. If anything is stored in bits 6-11, the test condition is true and the entry is divided by 64 to shift bits 6-11 to positions 0-5. The entry is then decoded and printed out.

	1	2	3
0	64	128	1	2
1	256	512	4	8
2	1024	2048	16	32

Figure 3.



"Wow. George... your graphic matrix simulations are starting to approach reality!"

Next, the entry is ANDed with the integer 63, which in binary is 000000111111. If anything is stored in bits 0-5, the contents of bits 6-11 (if any) are stripped off and the remaining bits in positions 0-5 are decoded and printed out.

Any program using the SET function could be converted to use this method. If memory is tight, the internal graphics array could be cut down quite a bit and still be an improvement on a screen display. In addition, the bit manipulation method I have described could easily be used to create subroutines to replace the RESET and POINT functions. Given all of these subroutines and the proper line printer, TRS-80 graphics are no longer limited to the screen. □

Line Drawing Routines for the TRS-80

Richard Wagner and Frederick Wagner

Despite its many good features, the TRS-80 is rather unfriendly about drawing lines on its display screen. Many other home computers have nifty graphics commands in Basic. They compute and plot line segments with lightning speed. About the best you can do with Level II TRS-80 Basic is SET (turn on) and RESET (turn off) individual points or pixels.

The TRS-80 user is thus forced to write special programs or routines for plotting lines. Such programs can be complicated as well as slow.

If the TRS-80 had good built-in line drawing routines you could easily put borders around text output, do simple stick figure animation, draw large or specially-shaped letters, and even draw maps or dungeon rooms for an adventure game. Take heart! The accompanying Basic program incorporates a machine language routine that provides excellent line drawing capabilities.

First, we will discuss the problem of plotting lines in general. The principles involved are essentially the same for all computers that plot lines as a series of individual points on a rectangular display. Our goal will be to compute and plot a string of points representing a desired line, such that:

- The line accurately connects the endpoints, with no gaps between individual pixels (This objective is fairly easy to meet).
- The line appears to be straight and to have uniform density with no bunched-up points (This one is harder, unless the pixel size is very small—hardly the case with the TRS-80).

When we try to satisfy these goals we run into the problem of display screen resolution. That is, we may find few pixel positions on the display screen that fall exactly on the true (calculated) path of the line. In fact, truly straight lines are impossible to draw unless one of two conditions applies:

- The line is horizontal or vertical.
- The endpoint separation (in pixels) in both the horizontal and vertical directions is the same.

Thus, most diagonal lines exhibit a "stair step" effect.

This becomes increasingly apparent with larger pixel sizes, and TRS-80 pixels are pretty large. Figure 1 illustrates the problem, and Figure 2 shows what happens if poor line drawing methods are used. (The technical name for the stair step appearance is "aliasing." It can occur whenever the display screen resolution is less than that of the object being displayed. Sophisticated display screen hardware can compensate by "ramping" or smoothing out the steps.)

Please note that our diagrams ignore another unpleasant fact about TRS-80 graphics. That is the fact that the horizontal and vertical scales are quite different, so that the individual pixels aren't square. However, this does not affect the way in which lines are plotted.

Bresenham's Algorithm

There are several point plotting methods that do a fairly good job. One of them, Bresenham's algorithm, is very useful in assembly language programming. Only integer arithmetic is used, and there are no divides. The only multiplies are by 2, implemented by simple SHIFT operations.

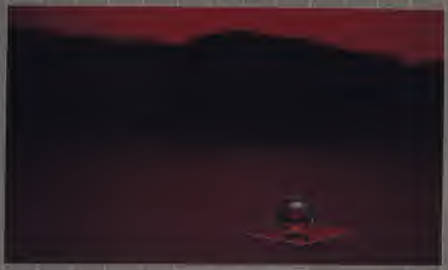
Listing 1 is a Basic program derived from Bresenham's line drawing algorithm. It runs slowly, taking one or two seconds to plot each line, but does help to expose the workings of the algorithm.

Bresenham's method draws fairly presentable lines by ensuring that the stair steps in diagonal lines are evenly spaced. It does this by maintaining an "error term" (variable E) which is initialized with a negative value. E is a measure of the distance between a plotted pixel and the exact path of the line. The plotted position must, of course, fall on an exact display screen coordinate position, whereas the true path of the line may rarely do so (see Figure 3).

Richard J. Wagner and Frederick J. Wagner, 11920 N.W. Oatfield Ct., Portland, OR 97229.

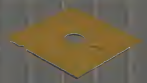
a.d. 2082.

Diskettes duplicated by Allenbach in 1983 will still be guaranteed.



This Lifetime Guarantee, exclusive to Allenbach, adds quality and consumer confidence to your software products. While this alone is reason enough to let Allenbach handle your software duplication, most software developers initially choose us for convenience. We can probably complete your production faster than you can. Additionally, your whole project can become one-easy-step by having us perform all packaging requirements from printing to assembly.

You'll also appreciate the high standard of excellence demanded by Allenbach. Software duplication for practically any format is our primary business. We've established a team of professional technicians who specialize in all phases of software duplication. Your software is effectively reproduced on specially designed precision duplicating equipment. Also used are exacting verification methods unique in the industry to guarantee 100% accuracy. Plus your software will be duplicated onto the Allenbach diskette, the OEM diskette that is Guaranteed for Life.



ALLENBACH

Allenbach *really* is the logical solution for your software duplicating needs. So feel free to call us with your questions. Take advantage of our years of experience and knowledge. Have Allenbach do what we do best, so you can do what you do best.

2101 Las Palmas
Carlsbad, California 92008
619-438-2258
800-854-7815 (Toll Free)
Telex: 19-4561 LSA

ATLANTIC COMPUTER ACCESSORIES

CALL OR WRITE FOR FREE CATALOG

ADDS
A1 TERMINAL 518.00
A2 TERMINAL 546.00

ANDEK
AMDEK I-13" COLOR MONITOR 310.00
AMDEK II-13" HI RES RGB COLOR MON 699.00
AMDEK III COLOR MONITOR 425.00
AMPLOT PLOTTER 795.00
AMQISK3 - 3" DISK DRIVE 719.00

ANCNOR AUTO AARS-232 DIR CON MODEM 85.00

COMPUTER ACCESSORY COMP
P1181 UNIV PRNTR STND (1181 ETC) 119.00
P1101 PRNTR STND (MX100 OR M83A) 94.00

D.C.HAYES
HMICRO/T-P MICRO MODEMII W/TER PRO 309.00
HSMART SMART MODEM 215.00
HCRON CHRONOGRAPH 199.00
HMICRO MICRO MODEMII 275.00
H1200 SMART MODEM 1200 519.00

EPSON
MX 80 DOT MATRIX PRINTER 425.00
FX 80 HI-SPEED PRINTER 585.00

IBM
5 1/4" SS DD DISKS (10) 25.00
5 1/4" DS DD DISKS (10) 30.50

MAXELL
MO1 5.25" SS/SD (BOX OF 10) 32.00
M1DD 5.25" SS/DD (BOX OF 10) 41.00
MO2 5.25" DD/SD (BOX OF 10) 45.00

MBI
I-C-MAGIC ROM FOR IBM 69.00
VIP CARD FOR APPLE 102.95
MONTE CARLO CARD 459.00

MICROSOFT
SOFTCARD* Z80 CARD 249.00
MULTIAPP MULTI PLAN-APPLE 180.00
MULTIAPP CPM MULTI PLAN APPLE CPM 229.00

MICROTEK
64K RAM CD 64K MEMORY CARDS 199.00
128K RAM CD 128K MEMORY CARDS 295.00
80COL-CD 80 COLUMN CARD 169.00
DUMPLING-16K PARA INTRF W/16K BUF 163.00
D DISK 128K W/DISK EMULAT FRMWR 329.00

MICROWARE DIST
GRAFIT APPLE GRAPHING PROGRAM 21.95
PERFORMR PRNTR ENHNC USE W/PAR CD 34.50

NOVATION
CAT-ACUSTIC MODEM 149.00
J CAT DIR CON 300 BAUD MODEM 199.95

OKIDATA
M84S MICROLINE SERIAL PRINTER 1149.00
M83A MICROLINE 83A PRINTER 655.00
MICR080 MICROLINE 80 PRINTER 345.00
M82A MICROLINE 82A PRINTER 429.00
2350P HIGH SPEED PARALLEL PRNTR 2099.00
92-180CPS PRINTER 515.00
93 W/OI CARRIAGE 160CPS PRINTER 899.00

PANASONIC
CT-160 COLOR MONITOR 299.00
TR-120 MNP HI-RES GREEN PHOSPHOR 159.00

QUANTEX 7030 MULTIMODE PRINTER 1634.00

SMITH CORONA TP-1 599.00

TAXAN
VISION I RGB MON 317.00
VISION III HI-RES RGB MON 529.00

TELEVIDEO
910 TERMINAL 620.00
925 TERMINAL 778.00
970 TERMINAL 1145.00

TG PRODUCTS
JOY STICKS 47.00
PADDLES 32.00

TYMAC PARALLEL INTERFACE/CABLE 99.00

USI INTERNATIONAL
PI2 12" GREEN PHOSPHOR MONITOR 159.00
PI3 12" AMBER PHOSPHOR MONITOR 175.00

VIBEE
VIDFX1 80 COLUMN CARD 235.00
VIDEXS ENHANCERII 119.00

WABSH M11A4115 5.25" SS/SD DSK (10) 20.99

Prices subject to change. Fla residents Add 5% Tax
FREE SHIPPING - Payment w/order
Se Habias Espanol. over $50.00.

1-800-327-8020
1-305-972-5399
9:00 A.M. to 5:00 P.M.
6951 N.W. 15th Avenue
Ft. Lauderdale, FL 33309

CIRCLE 117 ON READER SERVICE CARD

Line Drawing, continued...

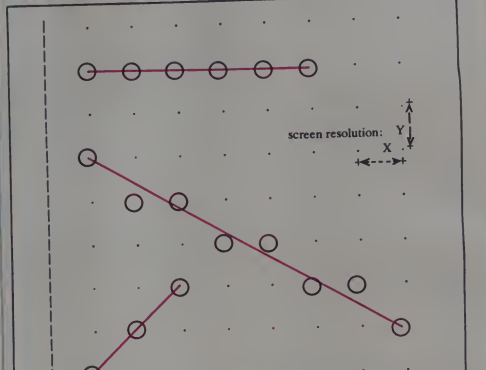


Figure 1. Calculated lines (in red) vs. actual points plotted (in green).

The error term E is initialized at a value related to the horizontal and vertical distances involved. An increment value EI and a decrement value ED are also computed. All these values are adjusted in a proportional manner so as to avoid having to use fractional values. (Fractional values would require use of single-precision numbers instead of integers, greatly slowing up the calculations.)

Assume we are plotting a line from point (X1, Y1) to (X2, Y2) and that the distance to plot is greater in the horizontal or X direction. The unit change in X (variable IX) is set to 1 unless X1 is larger than X2, in which case it is set to −1. The value of IY is determined in the same manner. As each point (X,Y) is plotted, the current value of E is tested; if it is greater than zero, Y is incremented by IY and E is decremented by ED back to a negative value. Otherwise E is incremented by EI.

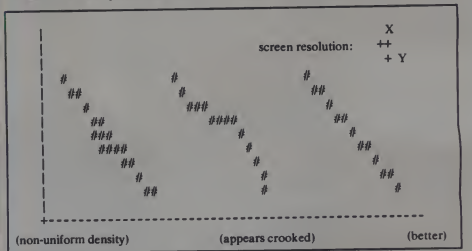


Figure 2. Lines should look straight, with uniform density.

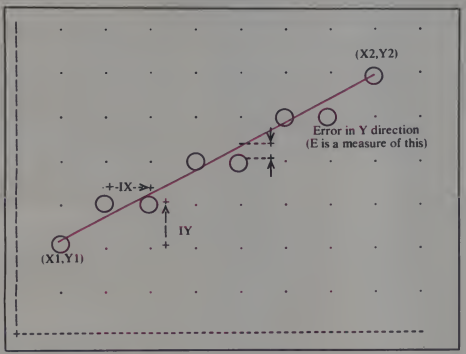


Figure 3. Bresenham's "error term."

X is always incremented by IX after each point is plotted. With properly computed values for EI and ED we are assured of evenly spaced steps in the plotted line. When the distance to plot is greater in the vertical direction (Y) the procedure works in a similar manner, substituting Y for X, IY for IX, etc.

Fastdraw-80

Listing 2, Fastdraw-80, is a Basic program that builds and executes an assembly language implementation of Bresenham's algorithm. It both draws and erases lines. Various tests are included to ensure that plotting stays within the display screen boundaries. We shall call the assembly language routine Quikplot for convenience, since it can be used independently of the Basic program that builds it. Fastdraw-80 demonstrates a simple method one of us

Listing 1.

```
10 REM * * * * * * *  BRESENHAM - 80  * * * * * * *
20 REM
30 REM RICHARD J. WAGNER
40 REM 11920 N. W. OATFIELD CT., PORTLAND, OR 97229
50 REM JULY 15TH, 1982
60 REM
70 REM AN INTEGER-MATH, NO-DIVIDE ROUTINE THAT COMPUTES
80 REM AND DRAWS A "STRAIGHT" LINE CONNECTING TWO END
90 REM POINTS (X1,Y1) AND (X2,Y2). ROUTINE ENSURES
100 REM THAT ONLY "LEGAL" POINTS ARE PLOTTED, E.G.,
110 REM LX<=X<=HX AND LY<=Y<=HY WHERE LX = MIN X VALUE,
120 REM HX = MAX X VALUE, ETC.
130 REM
140 REM FOR THE TRS-80, USING THE FULL SIZE OF THE CRT AS
150 REM A "WINDOW", THE FOLLOWING LIMITING VALUES APPLY:
160 REM          LX=0  HX=127  LY=0  HY=47
170 REM
180 REM THIS ROUTINE WAS DERIVED FROM J. E. BRESENHAM'S
190 REM "ALGORITHM FOR COMPUTER CONTROL OF A DIGITAL
200 REM PLOTTER", P. 26, PRINCIPLES OF INTERACTIVE
210 REM COMPUTER GRAPHICS, W. M. NEWMAN AND R. F. SPROUL,
220 REM MCGRAW-HILL BOOK CO., 1979.
230 REM
240 REM THE NUMBER OF POINTS FORMING THE LINE WILL BE
250 REM EQUAL TO THE GREATER OF THE DIFFERENCE BETWEEN
260 REM X1 AND X2 AND THE DIFFERENCE BETWEEN Y1 AND Y2.
270 REM
280 REM THE POINTS ARE PLOTTED SO THAT THE CHANGE IN THE
290 REM DIRECTION OF LEAST DIFFERENCE IS MADE IN EVENLY
300 REM SPACED STEPS; THE RESULTING LINE THUS WILL APPEAR
```


Experience
the power of knowledge
at the touch of a button.

Soothsayer
THE ELECTRONIC I-CHING

Soothsayer is based on the amazing I-Ching or 'Book of Changes' developed in ancient China as a divination medium

Only $29.95

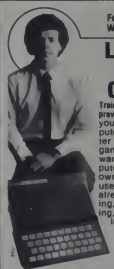
Order now for your first glimpse into the future.

For Apple II 48K Disk. Please add postage and handling. Georgia residents add sales tax. Dealer inquiries invited. Send check or money order to

WARLOCK SOFTWARE

1900 Emery St. Suite 118
Atlanta GA 3 318 (404) 352 5

CIRCLE 296 ON READER SERVICE CARD



For Home or Business
WHAT...WHEN...HOW...

LEARN HOW TO USE A COMPUTER

Train at home in spare time! No previous experience needed! Now you can learn it all! Computer programming...computer applications...computer games...everything you ever wanted to know about computer operations! Write your own computer programs or use hundreds of programs already available...budgeting, real estate, bookkeeping, expenses, investments, interest, taxes, shopping lists, vacation planning, addresses, phone numbers, routing ...even foreign languages and graphics.

You'll know what really happens when you have a computer problem with a bank, store, loan company, oil company, utility or anyone else. You'll be able to talk their language, understand why and how things happen...to be able to take the offensive when you're the victim of a computer error. Experts explain everything in easy-to-understand language with step-by-step directions.

• TIMEX COMPUTER INCLUDED WITH YOUR TRAINING • Plugs into any TV
• SEND FOR FREE FACTS!

ICS SINCE 1891 COMPUTER TRAINING, Dept DH063
Scranton, Pennsylvania 18515

Please rush me free facts and color brochure that tells how I can learn computer applications, programming and operation at home in spare time. No cost. No obligation.

Name _____ Age _____
Address _____
City/State/Zip _____

CIRCLE 206 ON READER SERVICE CARD

(Frederick) developed to encode assembly language routines within Basic programs.

The assembly language routine is developed with the aid of a standard Z80 reference book, and, if available, an Editor-Assembler program. The hex code for the routine is entered as the values of one or more string variables (lines 1010-1050). An initialization routine (lines 1060-1080) is called to convert the hex characters into integers and to POKE them into reserved memory. (A more conventional but far less user-friendly method is to load the assembly language programs from separate files before loading the Basic program. Frederick's method requires only a single LOAD or RUN command.)

Fastdraw-80 requires 32K RAM, and should work on either the Model I or Model III TRS-80. The program can be used with either regular Level II or disk Basic. For non-disk Basic, the USR function call must be changed as described in the remarks of Listing 2.

A demonstration routine is included in Fastdraw-80. It will verify that you have coded the program correctly, and show some of the potential of Quikplot. The demonstration includes a moving pattern and shows how to use the erase feature to draw black lines on a white background. I must admit I was surprised at how fast lines are drawn and with the neat animation effects; who ever thought our TRS-80 could do such tricks?

The Quikplot routine expects to find the number of lines to draw and the coordinates of their endpoints in a two-dimensional array. The memory location of the array is obtained by the VARPTR function and passed to Quikplot via the USR call.

One array dimension is used to specify the picture number P (identifying a set of lines to be displayed in one call to Quikplot). The other dimension holds the specification of the set of lines.

The endpoints of lines are identified in the usual TRS-80 manner, with X ranging from 0 to 127 and Y ranging from 0 to 47. Point (0,0) is at the upper left corner of the display screen. A subroutine (line 2000) is provided to format and transfer the list of end points in the array; the source of the endpoint values can be DATA statements, runtime computations, or interactive input. The demonstration program uses runtime computations.

The array setup routine automatically counts the number of lines to be drawn; this value is entered by the routine in Z(0,P). The size of array Z determines the number of lines that can be drawn in a single call to the plotting routine. Two array elements are needed per line.

```
310 REM AS STRAIGHT AS POSSIBLE.
320 REM
330 REM THIS PROGRAM USES TRS-80 BASIC'S "SET" FUNCTION
340 REM TO TURN ON POINTS ON THE CRT. THE POINTS ARE
350 REM PLOTTED AND SET BY ONE OF TWO SIMILAR ROUTINES.
360 REM THE ROUTINE USED IS SELECTED BASED ON WHETHER
370 REM THERE IS A GREATER DIFFERENCE IN THE X DIRECTION
380 REM OR THE Y DIRECTION.
390 REM
400 REM CLEAR THE CRT, DECLARE ALL VARIABLES AS INTEGER
410 REM AND SET LIMITING VALUES FOR X AND Y COORDINATES.
420 REM
430 CLS
440 DEFINT A-Z
450 LX=0
460 HX=127
470 LY=0
480 HY=47
490 REM GET END POINT INPUT INTERACTIVELY, TEST FOR LEGAL
500 REM VALUES, COMPUTE DIFFERENCES IF THEY ARE O.K.
510 REM
520 INPUT "ENTER X1, Y1, X2, Y2"; X1,Y1,X2,Y2
530 IF LX<=X1 AND X1<=HX AND LX<=X2 AND X2<=HX THEN 560
540 PRINT "X VALUE(S) OUT-OF-BOUNDS"
550 GOTO 520
560 IF LY<=Y1 AND Y1<=HY AND LY<=Y2 AND Y2<=HY THEN 590
570 PRINT "Y VALUE(S) OUT-OF-BOUNDS"
580 GOTO 520
590 DX = X2 - X1
600 DY = Y2 - Y1
610 IX = 1
620 IF DX < 0 THEN IX = -1: DX = -DX
630 IY = 1
640 IF DY < 0 THEN IY = -1: DY = -DY
650 REM
660 REM BRANCH TO PROPER PLOTTING ROUTINE:
670 REM
680 IF DY > DX THEN 920
690 REM FIRST ROUTINE IS USED WHEN DISTANCE BETWEEN POINTS
700 REM THE SAME IN BOTH DIRECTIONS, OR GREATER IN THE X
710 REM DIRECTION.
720 REM
730 EI = 2 * DY
740 ED = EI - 2 * DX
750 E = -DX + EI
760 FOR I = 1 TO DX
770 SET(X1,Y1)
780 X1 = X1 + IX
790 IF E<0 THEN 850
800 Y1 = Y1 + IY
810 E = E + ED
820 NEXT
830 SET(X1,Y1)
840 GOTO 520
850 E = E + EI
860 NEXT
870 SET(X1,Y1)
880 GOTO 520
890 REM
900 REM SECOND ROUTINE IS USED WHEN DIFFERENCE IN THE Y
910 REM DIRECTION IS GREATER.
920 EI = 2 * DX
930 ED = EI - 2 * DY
940 E = -DY + EI
950 FOR I = 1 TO DY
960 SET(X1,Y1)
970 Y1 = Y1 + IY
980 IF E<0 THEN 1040
990 X1 = X1 + IX
1000 E = E + ED
1010 NEXT
1020 SET(X1,Y1)
1030 GOTO 520
1040 E = E + EI
1050 NEXT
1060 GOTO 520
1070 REM
1080 REM END OF PROGRAM
```

APPLE

Apple II E $1149.00

Apple Monitor III w/ Stand ..... $ 199.00

Apple Disk II ..... $ 399.00

Apple 80 Col. Card ... CALL

Apple Extended 80 Co. Card ..... CALL

Apple II E Starter System II E, 80 Co. Card, Monitor III, Monitor Stand, Disk II +, Controller $1699.00

FRANKLIN

ACE 1000 $ 949.00

ACE 1000 w/ color $ 999.00

Starter System
ACE 1000, 12" green screen monitor, RANA Elite I Disk Drive & Controller $1469.00

Starter System w/EPSON MX80 III
Printer Interface Card and Cable $1829.00

ACE 1200 (1 Disk) . $1799.00

ACE 1200 (2 Disk) . $2199.00

SMITH-CORONA TP-1 DAISY WHEEL PRINTER

TP1-Serial $479.00

TP1-Parallel $479.00

Tractor Feed $129.00

EPSON

EPSON AMERICA, INC.

MX 80 III $359.00

MX 100 III ... $599.00

FX 80 ..... $589.00

RanaSystems

Elite I $270.00
w/ Controller .. $350.00

Elite II $460.00
w/ Controller .. $530.00

OKIDATA

ML 80 ..... $ 325.00
ML 82A ..... $ 389.00
ML 83A ..... $ 623.00
ML 84P ..... $ 949.00
ML 84S $1019.00
ML 92P ..... $ 489.00
ML 92S ..... $ 559.00
ML 93P ..... $ 829.00
ML 93S ..... $ 899.00
Okigraph I ..... $ 40.00
(Specify 82 or 83)
Okigraph II ..... $ 50.00
(For Apple or Franklin)
Roll Paper Stand ..... $ 30.00
For 82A
Tractor Feed ..... $ 50.00
For 82A

Hayes®

Micro Modem II $275.00

Micro Modem II ..... $529.00 w/Terminal Program $309.00

Smart Modem 1200 ... $529.00

Novation

Applecat II $269.00
Includes Free Time On Source, Operating Software, and your choice of a free Hondser or DSR Controller

212 Applecat Upgrade $329.00
DSR Controller ..... $ 19.00
Hondset ..... $ 29.00
Expansion Module ..... $ 39.00
*CAT $150.00
*D-CAT $170.00
*AUTOCAT $559.00
*J-CAT $120.00
*SMART CAT 103 ..... $189.00
*Require RS 232 Interface

SANYO

MBC 1000 System
64K RAM
320K 5¼" Disk
Printer Port
RS 232 Communications Port
12" AntiGlare Green Monitor

$2,000 SOFTWARE VALUE FREE WITH PURCHASE
Datastar-Micropro
Reportstar-Micropro
Calcstar-Micropro
Wordstar-Micropro
Mailmere-Micropro

$1599.00 COMPLETE SYSTEM

DOW JONES SOFTWARE™

Market Analyzer

Market Microscope

Market Manager

Connector

CALL FOR PRICING

Prices subject to change without notice (up or down).

Carolina Microsystems

For technical information, call 1-803-781-8081. **To order, call tollfree: 1-800-845-7077.** Add 3% for Visa or MasterCard. All prices include UPS shipping to anywhere in the U.S.A. Or send check or money order to Carolina Microsystems, 6 Tipton Circle, Irmo, South Carolina 29063.

CIRCLE 129 ON READER SERVICE CARD

Happy Hands

Offers Discounts on All

TRS-80™ COMPUTERS

We Have What You Are Looking For

Free Shipping Within United States

- *100% New Original Equipment*
- *Prices Comparable to Any Other*
- *No Tax On Out of State Shipments*

For Prices and Shipping Information Call Toll Free

1-800-545-9019

N.M. Residents Call 257-7865

or write

HAPPY HANDS
P.O. DRAWER 1
RUIDOSO, NEW MEXICO
88345

CIRCLE 183 ON READER SERVICE CARD

CLASSROOM SOFTWARE

for the 16K TRS-80

Easy to use software for models I/III with tape disk or network. Complete manuals plus on screen instructions. As simple as typing CLOAD and RUN.

Each program recorded twice on a separate side of a quality, long lasting cassette.

CLASSROOM PACKS. Each has 4 programs in a subject area and permits self-paced study with unlimited running time. Choice of review or self-test modes plus progress reports and help feature. Missed questions are corrected and recalled until learned. **Price $44.95 each**

- Geography I
- U.S. Government I
- U.S. History I
- Driver Education
- Electronics I
- Music Theory I

Other outstanding cassette software

- Logic Games Package — $24.95
- Anagrams — $19.95
- Scramble-Grams — $19.95

30-DAY GUARANTEE

At local dealers or order direct

Educational Media Associates

Software Products
342 West Robert E. Lee
New Orleans, LA 70124

MC & VISA include card # and expiration date. Free shipping on prepaid and credit card orders. Others add $1.50 per package.

CIRCLE 171 ON READER SERVICE CARD

Line Drawing, continued...

Fastdraw-80 sets up Z with dimensions 300 by 10, so it can hold up to 11 pictures, each with up to 150 lines. You can, of course, change the dimensions of Z or even use a different array name. Don't forget that the variable used for the array name must be defined as integer by a DEFINT statement.

True animation effects are easy to achieve. Simply keep the number of lines in each set fairly small, and call the Quikplot routine inside a loop (using P as the loop variable).

You can also generate a set of picture lines more than once during a program run. Just set Z(0,P) to 0 before calling GOSUB 2000 for the first line of each new picture. Otherwise, the new lines will simply be added to the existing set. The mainline routine in Listing 3 will create and flash an endless series of random designs on your display screen.

To plot a point, simply set the end coordinates equal to the beginning coordinates. Frederick has created some impressive "warp drive" animation effects using arrays of point data.

How fast is Quikplot? We ran several timing tests for lines up to the maximum length of 128 pixels. We found that for relatively short lines (10 to 20 pixels) Quikplot calculates and plots about 50 lines per second. In a worst case example, you can "white out" the entire display screen with 48 lines of 128 pixels each in about three seconds. In comparison with using a Basic routine to SET or RESET points, Quikplot is 10 to 20 times faster.

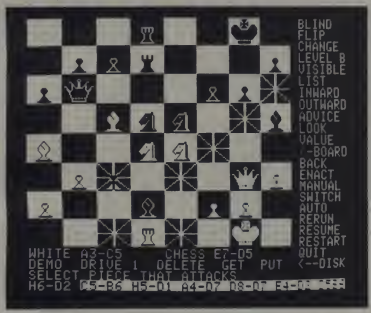
Notes

- If you have TRSDOS and a disk drive you may wish to save the completed routine by use of the command DUMP <your file name> (START=0C00,END=0C300). Then you can reload the executable code with the Disk Basic command CMD "L", "<your file name>/CMD."
- If your TRS-80 has 48K you can usually omit the setting of MEMORY SIZE when running Quikdraw-80. This is due to the location of the Quikplot routine in the "no man's land" between the bottom of variable storage and the top of string space. You may find you can do the same with your application if string assignments are minimal.

Listing 2

```
0 '  ************************************
     *          F A S T D R A W - 8 0   *
     *  By Fred Wagner, 11920 Oatfield Ct., *
     *        Portland, Or., 97229.     *
1 '  ************************************
  This program sets up a machine language
  routine that draws and erases lines from
  a user-created list.

  SET/RESET Routine Adapted From TRS-80
  ASSEMBLY-LANGUAGE PROGRAMING By William
  Barden, Jr.
2 REM
  Line Drawing Routine Adapted To Z-80 From
  a DDA algoritm by J.E. Bresenham (see page
  26 of PRINCIPLES OF INTERACTIVE COMPUTER
  GRAPHICS by W. Newman and R. Sproull),
  which generates accurate, even lines.
3 REM
  This program requires 32 or 48K RAM and
  DISK- or cassette BASIC. On start-up,
  respond to MEMORY SIZE with 49000.
4 REM
  GOSUB 1000 pokes FASTDRAW routine into memory.
  A=USR(VARPTR(Z(0,P))) will then cause my routine to
  draw the lines specified by the integer array Z,
  P being the number of the picture and Z(0,P) being
  the number of lines to be drawn.
5 REM
  To create a list of lines that my routine can use,
  put the coordinates of the line in X1,Y1 and X2,Y2,
  then GOSUB 2000. Repeat this for all the lines.
  To make another picture, add 1 to P and repeat.
6 REM
  This routine draws at a rate of about 50 average-
  lenth lines per second and is well suited for
  animation (it ain't no ATARI when it comes to speed,
  but it's better than nothing) or quick drawings of
  complex displays.
7 REM
  My routine checks all endpoints and will not draw
  lines that go off the screen. To the best of my
```

Explore the Frontiers of Intelligence



- Variations of blind-fold play—camouflaged or invisible pieces
- Invert board to play black on bottom
- Change pieces on board during game, or set up position
- Change between 15 levels of play, plus postal and mate-finder modes
- Show move that **Chess** is thinking about
- List played moves for each side
- Lines of force in: attacks and defenses on a square
- Lines of force out: squares attacked and defended
- **Chess** suggests a move
- Show moves **Chess** thinks you will make, and its responses
- Evaluation of a position
- Return to board or switch to command menu
- Take back a move (repeatable)
- Play move suggested by look-ahead search
- **Chess** plays neither side
- Switch sides
- **Chess** plays against itself—one level against another
- Replay through most advanced position
- Skip to most advanced position
- Start new game
- Leave program
- Save, get, and delete games to and from disk

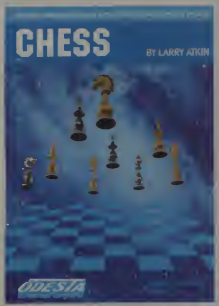
  All features self-documented; all choices cursor-controlled

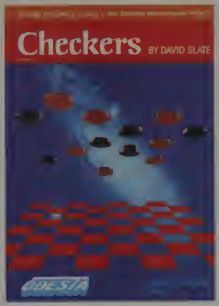
  Screen shows "outward" and "look" features being used

THE PEOPLE BEHIND THE PROGRAMS:

Larry Atkin & David Slate: Authors of the Northwestern University Chess 4.7 program—World Computer Chess Champion, 1977-1980

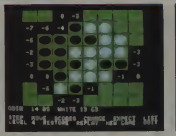
Peter Frey: Northwestern University professor
Editor: Chess Skill in Man and Machine
One of U.S. Othello Assoc.'s top-ranked players



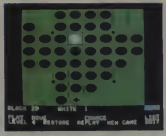


Checkers' features

Black to move and win
(From Checkers documentation)



"Scores" feature in Odin



A clue to the secret of Odin:
Black is destined to lose.

ODESTA

930 Pitner
Evanston, IL 60202
(U.S.A.)

Chess: $69.95
Checkers: $49.95
Odin: $49.95

See your local software dealer, or order (Mastercard or Visa):
800-323-5423
(in Illinois, call 312-328-7101)

For **Apple II**, Apple II Plus 48K disk systems, and **Atari** 48K disk systems. Odin is also available for TRS-80 Model 1 & 3 32K disk systems.

CIRCLE 218 ON READER SERVICE CARD

© 1982 ODESTA

THE INCREDIBLE
NEW PROGRESSIVE GAME FROM
SYDNEY.

EVOLUTION

ONLY THE STRONG SURVIVE.

6 games in 1

You start as an amoeba trying to advance up the evolutionary chain to become a human. To attain this goal you will have to go through 6 distinctively evolutionary steps:

- You're an amoeba fighting microbes while trying to eat DNA.
- You're a tadpole eluding fish to catch waterflies.
- You're a rodent chased by snakes while looking for cheese.
- You're a beaver attacked by alligators while building a dam.
- You're a gorilla protecting his food from monkeys.
- You're a man battling genetic mutants in an elastic background!

Hailed by leading reviewers as one of the most exciting games available.
EVOLUTION is truly different. Try it today!

Created by Don Mattrick and Jeff Sember.
©Sydney Development Corporation

Do you have the instincts and reflexes to survive and evolve to each higher life form? It's a challenge that grips you as no other game!

- Up to 99 levels
- Either a keyboard or joystick control
- Written in machine language
- Colorful high-resolution graphics
- Keeps track of top 10 scores
- Full conversation controls
- Arcade sound
- Even an intermission!

Play Evolution on Apple II, Apple II Plus, Commodore 64, IBM PC or Coleco Cartridge.

Sydney
Dataproducts, Inc.

129-444 Camino Del Rio South
San Diego, California, U.S.A. 92108
(619) 298-5886

In Canada:

600-1385 West Eighth Avenue
Vancouver, B.C. Canada V6H 3V9
(604) 734-8822 Telex 04-54357

Available at your local dealer or directly from Sydney.

CIRCLE 286 ON READER SERVICE CARD

Line Drawing, continued...

```
  knowledge, no values you can pass to it (provided
  the routine was typed in corectly) will cause it
  to 'bomb out'.
8 REM
  How complex can a picture drawn be? Up to 65,536
  lines, although even 48K RAM could not hold an
  array of that size and the routine would loop
  through all of memory several times before
  stopping, minutes later.
9 REM
  FASTDRAW is initalized to DRAW (SET)   nes.
  To erase (RESET) lines instead, POKE -16383,134.
  To go back to drawing lines, POKE -16383,198.
  (It's not a typo, locations ohove 32767 must
  be decremented by 65,536 for POKE.)
10 REM*************************************************
  Lines 20 and 30 set up data
  (If you have a disk system you can save
  the routine by doing a CMD"S" and entering
  DUMP LINEDRAW (START=&C000,END=&C300,TRA=&C000)
11 REM
  To reload from DISK BASIC do a CMD"L","LINEDRAW/CMD")

20 CLS
  :CLEAR 100
  :DEFINT A-Z
  :DIM Z(300,10)'Array Z will hold up to 11 pictures of
                 150 lines each.
30 REM Poke routine into memory:

35 GOSUB 1000
40 REM*************************************************
 Lines 50 through 90 are a demonstration
    of my routine.
41 REM (replace with your own program)

46 CLS:PRINT"CREATING DATA FOR ANIMATION ROUTINE"
47 PRINT"
   PICTURE 0 IS A CONVERGING, TWO-WAY SCREEN FILL"
50 P=0
  :FOR I=0 TO 23
  :X1=0
  :X2=127
  :Y1=I
  :Y2=I
  :GOSUB 2000
  :Y1=47-I
  :Y2=Y1
  :GOSUB 2000
  :NEXT I
59 PRINT"
   PICTURE 1 DRAWS AN EIGHT-BLADED ROTATING CIRCLE FILL

   (WE WILL DISPLAY THESE ALTERNATELY IN WHITE-OUT AND
   BLACK-OUT)

   To stop program while it is drawing you need to hold
   <BREAK> down until BASIC scans the keyboard.
60 P=1
  :FOR I1=0 TO 6.78539 STEP 0.08
  :X1=63
  :Y1=23
  :FOR N1=0 TO 6.2831 STEP 0.78539
  :X2=63+SIN(I1+N1)*40
  :Y2=23+COS(I1+N1)*20
  :GOSUB 2000
  :NEXT N1,I1
70 POKE -16383,198   'Draw next set of lines
80 A=USR(VARPTR(Z(0,1)))
  :A=USR(VARPTR(Z(0,P)))
  :POKE -16383,134  'Now erase
90 A=USR(VARPTR(Z(0,1)))
  :A=USR(VARPTR(Z(0,0)))
  :GOTO 70
990 REM*************************************************
 Lines 1000 to 1090 POKE routine into memory.

1000 A=10
```


EDUCATIONAL SOFTWARE
TRS-80, COLOR COMPUTER, PET & APPLE II

ELEMENTARY	MATH
SCIENCE	HISTORY
GEOGRAPHY	ACCOUNTING
ECONOMICS	BUSINESS ED.
FOREIGN LANG.	PHYSICS
GRAMMAR	FARM RECORDS

Write for FREE Catalogue

MICRO LEARNINGWARE, Box 2134, N Mankato, MN 56001
(507) 625-2205
VISA & MASTER CARD ACCEPTED

We pay 15% royalty for educational Programs listed with us.
TRS-80 is a registered trademark of TANDY CORP.
PET is a trademark of COMMODORE BUS. MACHINES.
APPLE is a trademark of APPLE COMPUTER CO.

CIRCLE 223 ON READER SERVICE CARD

CIRCLE 109 ON READER SERVICE CARD

MEMOREX
FLEXIBLE DISCS

WE WILL NOT BE UNDERSOLD!! Call Free **(800)235-4137** for prices and information. Dealer inquiries invited and COD's accepted.

PACIFIC EXCHANGES
100 Foothill Blvd
San Luis Obispo CA
93401 In Cal call
(800)592-5935 or
(805)543-1037

CIRCLE 236 ON READER SERVICE CARD

NEW 5¼" STORAGE
Vu Case II
Highly Versatile Protection

Carry it. Stack it. Lock it. Hang it.
- Stores 50 5¼" diskettes
- 1 year warranty
- Built-in retractable handle
- Includes index set
- Contents are visible
- Cover easily removable
- Ribbed for solid stacking
- Made of super strong Lexan®

$29.95 Delivered Price
ORDER NOW and receive FREE wall mounting hardware
Call for quantity prices

Software Services®
1326 – 25th St. S., Suite D
Fargo, ND 58103
(701) 280-0121

CIRCLE 253 ON READER SERVICE CARD

Dysan CORPORATION
Solve your disc problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 258-4137 for prices and information. Visa and Master Card accepted.

PACIFIC EXCHANGES
100 Foothill Blvd
San Luis Obispo CA
93401 (In Cal call
(805) 543-1037)

CIRCLE 236 ON READER SERVICE CARD

MICROCOMPUTER OWNERS OUR BROKERS IN YOUR OFFICE EVERY TRADING DAY

That's right! Through your computer we will be in your office with recommendations. Not vague buy low, sell high verbage but with SPECIFIC TRADES and defined risk. You will know our thinking before the trade, and you decide what trades are placed in your account.
If you are serious about your Commodity portfolio, let us show you our stuff. For an introduction to our QuickBroker microcomputer service, send your name, address, phone number to

WORLEY COMMODITIES, INC.
16000 Memorial Drive · Suite 280
Houston Texas 77079 • 713/497-1787

Worley Commodities, Inc.
A REFCO AFFILIATE
Houston • New Orleans • Oklahoma City

CIRCLE 228 ON READER SERVICE CARD

Line Drawing, continued...

```
1005 CLS
    :PRINT"CONVERTING HEX CODE TO DECIMAL AND
POKING INTO MEMORY
"
1010 AS$(0)="3EC618863F8618023E463246C07A06FF04D603F210C0C603CB"
1011 AS$(0)=AS$(0)+"27CF8262000606291FFD16006CB3F3001D6191103C1"
1012 AS$(0)=AS$(0)+"9C8121CB21CB213A4C00B1324C07FF6FF02F23680CB"
1013 AS$(0)=AS$(0)+"FEC8C0C9"
1020 AS$(1)="2AFCC3ED5BFBCC3443E2F90FBF23E2F90FBF453F7F90F8433E7F9"
1021 AS$(1)=AS$(1)+"0FBD5E5CD00C0D1D5CD08C0D1F17C4290325DC37D43"
1022 AS$(1)=AS$(1)+"9037513C33EF33252C33253C33A41C3E6F0280D3A51C"
1023 AS$(1)=AS$(1)+"3FD443251C33FF13252C33A50C3E680280D3A50C3ED"
1024 AS$(1)=AS$(1)+"443250C33E013253C33A51C3FE0020053A50C3FE00C"
1025 AS$(1)=AS$(1)+"83A51C3473A50C390"
1030 AS$(2)="E680283A51C3CB2F473A50CC3903254C33A51C347EB3A50C30"
1031 AS$(2)=AS$(2)+"000325DC33A51C3000032513C3C5D5CD00C0D13A54C3"
1032 AS$(2)=AS$(2)+"E6802D203A51C3473A50C3"
1040 AS$(3)="90F53A54C347F1803254C33A52C3B35F3A53C3B257C110D4C93"
1041 AS$(3)=AS$(3)+"A50C3473A54C3803254C33A52C3B35FC110C0C93A50"
1042 AS$(3)=AS$(3)+"C3473A51C3903254C33A50C347EB3A50C3CB273250C3"
1043 AS$(3)=AS$(3)+"3A51C3CB273251C3C5D5CD00C0D13A54C3E68020203"
1044 AS$(3)=AS$(3)+"A50C347A51C390F53A54C347F1803254C33A53C382"
1045 AS$(3)=AS$(3)+"573A52C3B35FC110D4C93A"
1050 AS$(4)="51C3473A54C3803254C33A53C3B257C110C0C9C9C9CD7F0A462"
1051 AS$(4)=AS$(4)+"34E23C55E2356230E5D5E5D11A6F131A67D1CDB8C1E1"
1052 AS$(4)=AS$(4)+"2323C110E879FE00C80D18E1C34FCB"
1060 N=-16384
    :FOR H=0 TO 4
    :ATS=AS$(H)
    :GOSUB 1070
    :NEXT H
    :GOTO 1080
1070 FOR I=1 TO LEN(ATS) STEP2
    :OS=MID$(ATS,I,2)
    :GOSUB1075
    :PRINT OS;
    :POKE N,Z
    :N=N+1
    :NEXT I
    :RETURN
1075 NS=LEFT$(OS,1)
    :GOSUB 1076
    :Z=X*16
    :NS=RIGHT$(OS,1)
    :GOSUB 1076
    :Z=Z+X
    :RETURN
1076 X=ASC(N$)-48
    :IF X>9 THEN X=X-7
    :RETURN
     ELSE
     RETURN
1080 DEFUSR=-15990
    :REM
    For non-disk BASIC type in line 1080 to look like this:
     POKE 16526,138
    :POKE 16527,194
1090 RETURN
1100 REM*************************************************
 Line 2000 takes the line from (X1,Y1) to (X2,Y2)
 and adds it to picture P

2000 Z(Z(0,P)*2+1,P)=X2+INT(Y2)*256
    :Z(Z(0,P)*2+2,P)=X1+INT(Y1)*256
    :Z(0,P)=Z(0,P)+1
    :RETURN
```

Listing 3.

```
41 Z(0,0)=0  :  P=0  :  X2=RND(127)  :  Y2=RND(47)
42 FOR I=1 TO RND(20)
43 X1=X2  :  X2=RND(127)  :  Y1=Y2  :  Y2=RND(47)
44 GOSUB 2000
45 NEXT
46 CLS
47 A=USR(VARPTR(Z(0,P)))
48 GOTO 41
2000 RETURN
```

WE DIDN'T MAKE IT CUTE,

WE MADE IT TOUGH!

The Grizzly™ EPD's uninterruptible power system is as tough as the name it has earned itself. Like its namesake, don't let its looks deceive you. This powerful system plugs directly into any standard outlet and is ready to go. All you need to do is plug what needs protection into it, flip The Grizzly on and proceed with your normal routine. In the event of a power-line problem such as a brownout or blackout, The Grizzly will take over instantly delivering power at full load for up to twenty minutes. Simultaneously, an alarm will sound alerting you to close out files and shutdown or give you the option of allowing the power to return.

Functioning as a source of backup by simply removing submicrosecond overvoltage-line transients, "spikes" or glitches from electrical circuits, The Grizzly gives you confidence in your ability to operate at peak performance and eliminate data base loss.

It's maintenance-free, warranteed for one year and backed by EPD's Lloyds of London-insured guarantee. It's tough. It's The Grizzly. Available through your local dealer.

EPD

Electronic Protection Devices, Inc.
P.O. Box 673, Waltham, MA 02254
(617) 891-6602 • 1-800-343-1813

CIRCLE 126 ON READER SERVICE CARD

Lo-Res Fantasy Art

Alan Foxx and Todd Holforty

If I told you that you could quickly and simply create interesting and attractively colorful abstract patterns in Apple lo-res graphics and have fun doing so, you might have a hard time believing me. You probably feel that lo-res doesn't pack the necessary punch to do anything really exciting. Well that is just not so—and I will prove it to you.

Alan Foxx, 28090 Tavistock Trail, Southfield, MI.

Todd Holforty, 2783 Hillendale, Rochester, MI 48063.

The demonstration programs that follow show how nested FOR loops in lo-res graphics can be harnessed to create appealing designs. I will assume you already know at least a little bit about lo-res graphics on the Apple. In most of the demos the colors are controlled by DATA statements. The others are controlled by an equation.

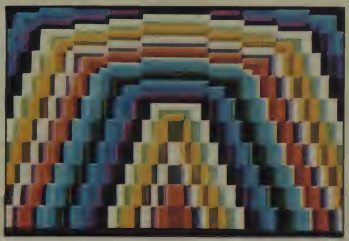
If you want to experiment with your own designs, try altering DATA statements in the program lines that include them. Use numbers between 0 and 15. They will change the design to represent your choice of new colors. Make sure

```
10  REM   LO-RES FANTASY #1
20  GR
30  FOR I = 20 TO 30
40  FOR J = 0 TO 39
50 L = L + 0.8
60  IF L > 4 THEN  READ C:L = 0: IF
     C =  - 1 THEN  RESTORE : READ C
70  COLOR= C
80  VLIN I,I + 9 AT J
82  HLIN I,I + 9 AT J
85  VLIN 39 - I,30 - I AT 39 - J
87  HLIN 39 - I,30 - I AT 39 - J
90  NEXT : NEXT
100  DATA  15,0,2,0,6,0,-1
```

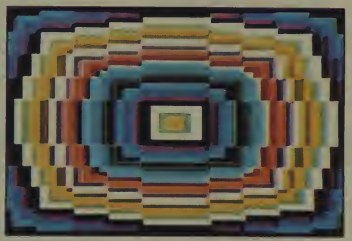
```
10  REM   LO-RES FANTASY #2
20  GR
30  FOR I = 0 TO 19
40  FOR J = 0 TO 39
50 L = L + 0.5
60  IF L > 4 THEN  READ C:L = 0: IF
     C =  - 1 THEN  RESTORE : READ C
70  COLOR= C
80  VLIN I,I + 4 AT J
82  HLIN I,I + 4 AT J
85  VLIN 39 - I,35 - I AT 39 - J
87  HLIN 39 - I,35 - I AT 39 - J
90  NEXT : NEXT
100  DATA  9,9,0,9,15,15,1,5,0,-1
```

```
10  REM  LO-RES FANTASY #3
20  GR
30  FOR I = 20 TO 35
40  FOR J = 0 TO 39
50 L = L + 1.8
60  IF L > 4 THEN  READ C:L = 0: IF
     C =  - 1 THEN  RESTORE : READ C
70  COLOR= C
80  VLIN I,I + 4 AT J
82  HLIN I,I + 4 AT J
85  VLIN 39 - I,35 - I AT 39 - J
87  HLIN 39 - I,35 - I AT 39 - J
90  NEXT : NEXT
100  DATA  9,8,8,8,0,15,15,15,15,
     15,15,15,9,0,-1
```

```
10  REM   LO-RES FANTASY #4
20  GR
30  FOR I = 20 TO 30
40  FOR J = 0 TO 39
50 L = L + 2
60  IF L > 4 THEN  READ C:L = 0: IF
     C =  - 1 THEN  RESTORE : READ C
70  COLOR= C
80  VLIN I,I + 9 AT J
82  HLIN I,I + 9 AT J
85  VLIN 39 - I,30 - I AT 39 - J
87  HLIN 39 - I,30 - I AT 39 - J
90  NEXT : NEXT
100  DATA  15,8,0,9,0,13,15,0,1,-1
```



```
10  REM LO-RES FANTASY #5
20  GR
30  FOR I = 0 TO 39: FOR J = 0 TO
     39: COLOR= I + J / 4 + 4: PLOT
     I,39 - J: PLOT J,39 - I: PLOT
     39 - J,39 - I: PLOT 39 - I,3
     9 - J: NEXT : NEXT
```



```
10  REM LO-RES FANTASY #6
30  GR : FOR I = 0 TO 39: FOR J =
     0 TO 39: COLOR= I + J / 4 +
     4: PLOT I,39 - J: PLOT J,39 -
     I: PLOT 39 - J,39 - I: PLOT
     39 - I,39 - J: PLOT 39 - I,J
     : PLOT 39 - J,I: PLOT I,J: PLOT
     J,I: NEXT : NEXT
```

System Saver™

The most important peripheral for your Apple II and IIe.

For Line Surge Suppression

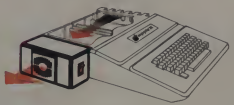
The SYSTEM SAVER provides essential protection to hardware and data from dangerous power surges and spikes.

By connecting the Apple II power input through the SYSTEM SAVER, power is controlled in two ways: 1) Dangerous voltage spikes are clipped off at a safe 130 Volts RMS/175 Volts dc level. 2) High frequency noise is smoothed out before reaching the Apple II. A PI type filter attenuates common mode noise signals by a minimum of 30 dB from 600 khz to 20 mhz, with a maximum attenuation of 50 dB.

For Cooling

As soon as you add 80 columns or more memory to your Apple II you need SYSTEM SAVER.

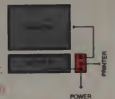
Today's advanced peripheral cards generate more heat. In addition, the cards block any natural air flow through the Apple II creating high temperature conditions that substantially reduce the life of the cards and the computer itself.

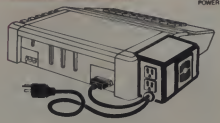


SYSTEM SAVER provides correct cooling. An efficient, quiet fan draws fresh air across the mother board, over the power supply and out the side ventilation slots.

For Operating Efficiency

SYSTEM SAVER contains two switched power outlets. As shown in the diagram, the SYSTEM SAVER efficiently organizes your system so that one convenient, front mounted power switch controls SYSTEM SAVER, Apple II, monitor and printer.





The heavy duty switch has a pilot light to alert when system is on.You'll never use the Apple power switch again!

Easy Installation

Compatible with Apple Stand

$89.95 at your local dealer or order direct by phone or mail.
For phone or mail orders include $2.50 for handling. New York State residents add sales tax. VISA and MASTERCARD accepted. Dealer inquiries invited.

Kensington Microware Ltd.
919 Third Avenue, New York NY 10022
(212) 486-7707 Telex: 236200 KEN UR

KENSINGTON MICROWARE

CIRCLE 203 ON READER SERVICE CARD

that the DATA statements always end with a negative number. As soon as the program encounters a negative, it will replace the pointer and start reading colors from the beginning of the list again.

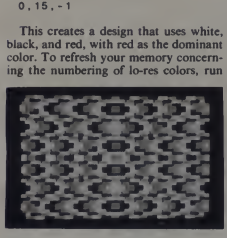
If you use the same number repeatedly in a DATA statement, that color will appear more often. In this way you can create designs with a dominant color. Let's say you want your design to use red as its dominant color. Your DATA statement could read as follows:

```
100 DATA 1,1,1,1,1,0,0,15,
0,15,-1
```

This creates a design that uses white, black, and red, with red as the dominant color. To refresh your memory concerning the numbering of lo-res colors, run the color demo on a DOS master disk. Another effect you may want to try is a checkerboard design. To attempt this, you must alternate colors in the DATA statement. As an example, here is the way to create an orange and yellow checkerboard with a central design:

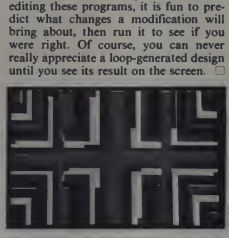
```
100 DATA 9,13,9,13,9,13,9,
13,9,13,9,13,0,0,15,15,
15,-1
```

You may wish to experiment with the numbers in the FOR loops as well. When editing these programs, it is fun to predict what changes a modification will bring about, then run it to see if you were right. Of course, you can never really appreciate a loop-generated design until you see its result on the screen. □

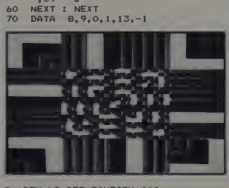


```
5  REM LO-RES FANTASY #7
10  GR : READ C
15  FOR J = 20 TO 39
20  FOR I = 0 TO J
30 L = L + 1
35  IF L > 1 THEN  READ C:L = 0: IF
      C =  - 1 THEN  RESTORE : READ C
38  COLOR= C
40  PLOT 1,J: PLOT 39 - I,39 - J
42  PLOT 39 - I,J: PLOT I,39 - J
50  NEXT I
60  NEXT J
70  DATA  6,2,0,-1
```

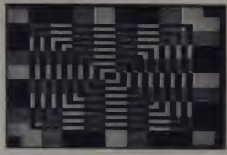
```
5  REM LO-RES FANTASY #8
20  GR
30  FOR I = 20 TO 30
40  FOR J = 0 TO 39
60  READ C: IF C =  - 1 THEN  RESTORE
      : READ C
70  COLOR= C
80  VLIN I,I + 9 AT J
82  HLIN I,I + 9 AT J
85  VLIN 39 - I,30 - I AT 39 - J
87  HLIN 39 - I,30 - I AT 39 - J
90  NEXT : NEXT
100  DATA  0,15,9,8,9,8,9,8,9,8,9
      ,8,9,8,-1
```



```
5  REM LO-RES FANTASY #9
10  GR : READ C
15  FOR J = 0 TO 19
20  FOR I = 0 TO 39
30 L = L + 0.015
35  IF L > 1 THEN  READ C:L = 0: IF
      C =  - 1 THEN  RESTORE : READ C
38  COLOR= C
40  PLOT J,I: PLOT 39 - J,39 - I
42  PLOT I,J: PLOT 39 - I,39 - J
50  PLOT J / 2,I: PLOT 39 - J / 2
      ,39 - I
52  PLOT I / 2,J: PLOT 39 - I / 2
      ,39 - J
60  NEXT : NEXT
70  DATA  8,9,0,1,13,-1
```



```
5  REM LO-RES FANTASY #10
20  GR
30  FOR I = 20 TO 30
40  FOR J = 0 TO 39
60  READ C: IF C =  - 1 THEN  RESTORE
      : READ C
70  COLOR= C
80  VLIN I,I + 9 AT J
82  HLIN I,I + 9 AT J
85  VLIN 39 - I,30 - I AT 39 - J
87  HLIN 39 - I,30 - I AT 39 - J
90  NEXT : NEXT
100  DATA  0,0,15,15,15,13,9,13,9
      ,13,9,13,9,13,9,-1
```



```
10  REM  LO-REB FANTASY #11
20  GR
30  FOR I = 20 TO 35
40  FOR J = 0 TO 39
50 L = L + 1
60  IF L = 4 THEN  READ C:L = 0: IF
      C =  - 1 THEN  RESTORE : READ C
70  COLOR= C
80  VLIN I,I + 4 AT J
82  HLIN I,I + 4 AT J
85  VLIN 39 - I,35 - I AT 39 - J
87  HLIN 39 - I,35 - I AT 39 - J
90  NEXT : NEXT
100  DATA  0,8,13,9,-1
```

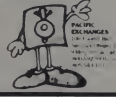
```
5  REM  LO-RES FANTASY #12
10  GR : READ C
15  FOR J = 0 TO 19
20  FOR I = 0 TO J
35  READ C: IF C =  - 1 THEN  RESTORE
      : READ C
38  COLOR= C
40  PLOT I,J: PLOT 39 - I,39 - J
42  PLOT 39 - I,J: PLOT I,39 - J
45  PLOT J,I: PLOT 39 - J,39 - I
47  PLOT 39 - J,I: PLOT J,39 - I
50  NEXT I
60  NEXT J
70  DATA  0,15,3,3,3,3,3,3,3,3,
      3,3,15,0,-1
```

```
5  REM LO-RES FANTASY #13
20  GR
30  FOR I = 20 TO 30
40  FOR J = 0 TO 39
60  READ C: IF C =  - 1 THEN  RESTORE
      : READ C
70  COLOR= C
80  VLIN I,I + 9 AT J
82  HLIN I,I + 9 AT J
85  VLIN 39 - I,30 - I AT 39 - J
87  HLIN 39 - I,30 - I AT 39 - J
90  NEXT : NEXT
100  DATA  0,0,0,15,15,15,13,9,13
      ,9,13,9,13,9,-1
```

Scotch Diskettes

Rely on Scotch® diskettes to keep your valuable data safe. Dependable Scotch diskettes are tested and guaranteed error-free. The low abrasivity saves your read/write heads. They're compatible with most diskette drives.

(800)235-4137



Dealer Inquiries Invited

CIRCLE 236 ON READER SERVICE CARD

FRANKLINS

Ace 10
Ace 1000
Ace 1200

save with Snaave

We'll tell you exactly what system is best for **you.**
&
Make you an offer you can't refuse.

Also, ask about our Hardware and Software at ***up to 50% off.***

SNAVE SYSTEMS **CALL** 312/966-4505

CIRCLE 250 ON READER SERVICE CARD

NEW!

ENERGY-SAVE

EASY-TO-USE MICRO SOFTWARE

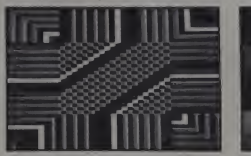
SIMPLIFIED BUILDING ENERGY ANALYSIS FOR BUILDERS, ARCHITECTS, LENDERS, UTILITIES AND HOME BUYERS

- Energy savings for 6 conservation and 3 solar measures
- Net cost savings and payback
- Complete data base

PEACHTREE ASSOCIATES
316 Lamont Dr P O Box 1312 Decatur GA 30031
(404) 373-3000 Dealer inquiries invited

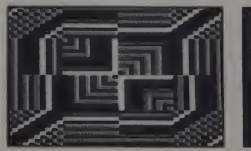
CIRCLE 213 ON READER SERVICE CARD

Lo-Res Fantasy, continued...



```
5  REM LO-RES FANTASY #14
20  GR
30  FOR I = 20 TO 30
40  FOR J = 0 TO 39
60  READ C: IF C =  - 1 THEN  RESTORE
     : READ C
70  COLOR= C
80  VLIN I,I + 9 AT J
82  HLIN I,I + 9 AT J
85  VLIN 39 - I,30 - I AT 39 - J
87  HLIN 39 - I,30 - I AT 39 - J
90  NEXT : NEXT
100  DATA  0,0,9,15,0,13,9,13,9,1
     3,9,13,9,-1
```

```
10  REM  LO-RES FANTASY #17
20  GR
30  FOR I = 20 TO 35
40  FOR J = 0 TO 39
50  L = L + 0.7
60  IF L > 4 THEN  READ C:L = 0: IF
     C =  - 1 THEN  RESTORE : READ C
70  COLOR= C
80  VLIN I,I + 4 AT J
82  HLIN I,I + 4 AT J
85  VLIN 39 - I,35 - I AT 39 - J
87  HLIN 39 - I,35 - I AT 39 - J
90  NEXT : NEXT
100  DATA  8,9,13,0,8,9,0, 1
```



```
5  REM LO-RES FANTASY #15
20  GR
30  FOR I = 0 TO 10
40  FOR J = 0 TO 39
60  READ C: IF C =  - 1 THEN  RESTORE
     : READ C
70  COLOR= C
80  VLIN I,I + 9 AT J
82  HLIN I,I + 9 AT J
85  VLIN 39 - I,30 - I AT 39 - J
87  HLIN 39 - I,30 - I AT 39 - J
90  NEXT : NEXT
100  DATA  0,0,9,15,0,13,9,13,9,1
     3,9,13,9,-1
```

```
3  REM LO-RES FANTASY #18
5  GR
10  FOR J = 0 TO 19: FOR I = 0 TO
     19
15  FOR K = 0 TO 20 STEP 3
17  COLOR= I / 2 + 1
18  PLOT I + K,J + K: PLOT J + K,
     I + K
20  NEXT : NEXT
25  NEXT
```

```
5  REM LO-RES FANTASY #16
20  GR
30  FOR I = 20 TO 30
40  FOR J = 0 TO 39
60  READ C: IF C =  - 1 THEN  RESTORE
     : READ C
70  COLOR= C
80  VLIN I,I + 9 AT J
82  HLIN I,I + 9 AT J
85  VLIN 39 - I,30 - I AT 39 - J
87  HLIN 39 - I,30 - I AT 39 - J
90  NEXT : NEXT
100  DATA  0,0,0,0,15,15,15,15,9,
     8,9,8,9,8,9,8,9,8,9,8,-1
```

New programmer?

HIGH TECHNOLOGY REQUIRES HIGH PERFORMANCE ACCESSORIES

In the fast moving, high technology world of microcomputers, the need for high performance accessories often gets overlooked.

Discwasher, recognized as a world leader in audio/video care accessories, understands this need and has developed a line of computer accessories to allow users to get the most from their computer hardware.

The easy-to-use *Discwasher™ Disk Drive Cleaner* is both a problem preventer and problem solver. Its dry format safely cleans single or double-sided drives without altering the delicate head alignment or doing possible damage to rubber drive parts with solvents.

The *Discwasher® Computer Cassette Drive CareSet™* is a total maintenance package for your cassette drive system. It includes both the Discwasher® Computer Cassette Drive Head Cleaner and the Computer Cassette Drive Mechanism Cleaner. Together, these two maintenance units can keep the high resolution heads and the critical drive system of your cassette drive system in optimum performance.

The *Discwasher® DiscKeeper™* is a magnetically shielded storage system for floppy disks that takes up no more space than conventional folder packs. DiscKeeper protects against stray magnetic fields which can destroy valuable software. Three DiscKeeper sizes provide loss-free storage and protection for transporting any size disk format.

discwasher

1407 NORTH PROVIDENCE ROAD, P.O. BOX 6021, DEPT. CC, COLUMBIA, MO 65205 USA

A DIVISION OF JENSEN an ESMARK Company

CIRCLE 169 ON READER SERVICE CARD

The Official

ZAXXON™

by SEGA

The game that puts space games in perspective. Zaxxon™ one of the most popular arcade games of 1982, is now available for use with your home computer system.

Zaxxon™ technology and creativity present a 3-dimensional-like playfield which sets Zaxxon™ apart from other computer games.

Zaxxon™ looks and sounds like aircraft flight, and players can soar to new levels of home computer entertainment. From the daring attack on the enemy's floating fortress and the blazing battle against the enemy's fighter fleet to the final showdown with the deadly armored robot, Zaxxon™ challenges the skill and imagination of every player at every level of skill.

Imagine yourself the pilot attacking the enemy fortress—climbing, diving, strafing to score points and extra fuel. The enemy fights back with a barrage of missiles and gunfire. Then you face a fleet of enemy fighters in a gripping dogfight of altitude strategy and flying skill. Survive this battle and the enemy's fortress, defended with laser barriers, then you've earned the ultimate challenge; a blazing confrontation with the powerful robot, armed with a lethal homing missile.

Zaxxon™ is the one game that you must see to believe. You have to play it to feel its impact. If you're ready to face the challenge, check with your local software dealer or send check or money order with $2.00 postage handling. California residents add 6½% sales tax. Available on cassette or diskette. Suggested retail price $39.95.

Available in January on Atari®, February on Apple™ and Radio Shack® Color, and April on TI 99/4A™ and NEC 6000™.

Datasoft Inc.®

COMPUTER SOFTWARE

9421 Winnetka Avenue
Chatsworth CA 91311
(213) 701-5161

©1982 Datasoft® Inc.

CIRCLE 155 ON READER SERVICE CARD

Datasoft® is a registered trademark of Datasoft Inc.

Graphics Routines For The IBM PC

Dan Gabrielson

One picture certainly is worth a thousand words. Think of all the ways we communicate with pictures—television, movies, paintings, maps.

Well, the coming computer revolution is going to change all that. With low cost hardware and versatile software available, more and more people are going to be communicating with pictures—through computers.

Math departments across the country are already scrambling to use personal computers as electronic blackboards—tools to bridge the gap between theory and application. In fact, some branches of mathematics, it seems, were just waiting for computer graphics to be developed, so they could really take off.

Being a math and computer major, I had seen many applications in which the two fields complemented each other. So when I began shopping for a home computer, I knew it had to have graphics capabilities.

I came across the IBM PC and was very impressed. It had some powerful graphics commands like CIRCLE and PAINT, but all of them depended on absolute coordinates of 0 to 319 in the x direction and 0 to 199 in the y. These commands were just too limited for the graphing I had in mind. I decided to write my own graphics routines and call them using dummy parameters and subroutines.

Wrong again! IBM Basic allows only GOSUBs in which all variables are global, and the chances were good that I would forget which variables I had used and confuse them with program variables. Another solution would have been to write the routines in machine language, but I didn't have an assembler.

Instead, I came up with a collection of quick and dirty routines which I call Q-Graphics. Every variable used in my subroutines begins with the letter Q, so I no longer have to worry about confusing them with program variables.

Dan M. Gabrielson, 218A Northwestern Ave., Oshkosh, WI 54901.

The method of calling the routines is a bit primitive, but I didn't have to buy an assembler, and they don't take up much memory. All parameters are set, and then the routine is called, but more about that later.

Q-Graphics is loosely based on the Core graphics system standard used by Siggraph, the special interest group for computer graphics. Points are referenced according to a pre-defined "world coordinate system," and are then internally translated into the "screen coordinates" needed by the given machine.

Using The Program

You will have to write a program to use these commands, which start at line 1000. All of the routines are called by the Basic command GOSUB. Along the way I have included as many examples as I could, and the program listing has three mathematical functions drawn with the Q-Graphics commands.

The first command necessary is INIT. This initializes the system to one of the two color palettes available for medium resolution graphics. To start, set the parameter variable Q1 to 0 or 1, depending on the color palette desired. The Initialize routine is on line 1000 and is called by

```
10 Q1=0 : GOSUB 1000                    INIT 0
```

INIT sets several default conditions which will be explained later:

```
VIEWPORT 0,1,0,1
WINDOW 0,1,0,1
MOVETO 0,0
COLOR 3
CLS
```

Viewport

There will be many new terms here, so I shall try to take them slowly. First, there is a viewport. This defines the region of the screen to be used for graphics. It may be the entire screen or only a small portion of it. Let's set up the screen as a one-unit square box with the lower left corner at the origin (see Fig-

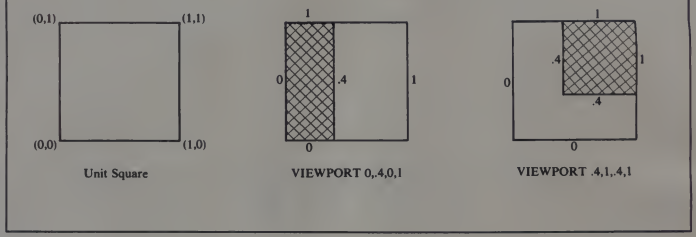


Figure 1.

ure 1). Then we can define any rectangular region of that square by four numbers, the left and right x values (between 0 and 1), and the bottom and top y values (also between 0 and 1).

For example, the left half of the screen could be defined as 0,.4,0,1. The maximum area would be defined as 0,1,0,1 (see Figure 1).

To set the viewport in the Q-Graphics system, you must specify each of the four parameters and then call the VIEWPORT routine located on line 1100. If this was to be line 140, we could say:

```
140 Q1=0: Q2=.4: Q3=0: Q4=1: GOSUB 1100      VIEWPORT 0,.4,0,1
```

All further graphics commands will appear only in this portion of the entire screen. The viewport may be re-defined at any time, and all following commands will then be executed in the new region.

Window

The next new term is window. This sets up a "world coordinate" system for the current viewport. If you want to graph some functions, you specify the region you want to show, and all the following commands need reference points only relative to that region. All translations between the points you choose and the corresponding points on the screen are handled by the computer.

The window is defined the same way as the viewport, but the values given to the variables are not limited to between 0 and 1. Let's say you wanted to draw the parabola $y=x^2$ and only show the region from -5 to 5 in the x direction and -1 to 10 in the y direction. A statement like

```
150 Q1=-5: Q2=5: Q3=-1: Q4=10: GOSUB 1200 WINDOW -5,5,-1,10
```

could set up those coordinates in the current viewport (see Figure 2). Now all you have to do is work with points in this rectangular region; the translations will be handled automatically.

In the above case, the x and y scales are not the same. With a bit of calculation, you could figure out what the true-to-scale parameters would be. The command SHOW will do those calculations for you. It is called exactly the same way as WINDOW, but the values you save may be altered a bit, as the graphing area is stretched or shrunk to fit the viewport with one unit in the x direction approximately equal to one unit in the y.

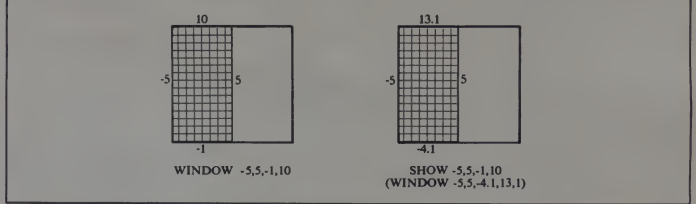
Our previous example could be written as

```
150 Q1=-5: Q2=5: Q3=-1: Q4=10: GOSUB 1300 SHOW -5,5,-1,10
```

and the Q3 and Q4 values would be changed internally to -4.1 and 13.1, to better fit the viewport (see Figure 2).

Now that the graphing area has been defined and scaled, the move and draw commands can be used. Both of these reference points in the world coordinate system and refer to an imaginary

Figure 2.



Hundreds of ways to save hundreds of dollars.

GREAT REVIEWS

The Book of Apple Software 1983 $19.95

Software can be a significant investment. But many times it's difficult to compare similar programs to find exactly the program you want.

Enter *The Book of Apple Software 1983*. It's the only source that evaluates (not just lists) hundreds of programs available for Apple microcomputers.

Each evaluation is written by an expert in the type of program being reviewed, be it Accounting, Education, Word Processing or Games. So you get top-notch, impartial information.

Not only does each evaluation tell you all the hard facts (like price, hardware requirements, language, etc), it also gives you a letter grade (A through F) in categories like Ease of Use, Reliability, and Value for Your Money.

The Book of Atari Software 1983 $19.95

Attention Atari 400/800 or 2600 (VCS) owners. Atari has been famous for games, but they also offer a broad selection of software in other areas, such as Business, Education, and Word Processing.

The Book of Atari Software 1983 contains hundreds of incisive reviews. Each evaluation features a concise description of the program, plus a letter grade rating system (A through F), so you'll know at a glance whether or not a particular program is right for you. And it will help to save you money along the way.

Pick up *The Book of Atari Software 1983* soon. It's not just the best consumer guide to Atari software. It's the *only* one.

FUN AND GAMES

Apple Graphics and Arcade Game Design $19.95

It's finally available. Everything you wanted to know about creating arcade games – from Space Invaders to Pacman – but didn't know who to ask.

Jeffrey Stanton takes you from game concept through Lo-Res and Hi-Res color graphics at the machine language level. And he gives you a thorough grounding in the Apple's screen architecture and the advantages of bit-mapped design.

Using flow charts and working examples he discusses scoring, laser fire, and bomb drops in both single screen and scrolling games.

This is the "must-have" book for anyone who wants to understand and create a computer game.

PROFITABLE PROJECTIONS

WHAT IF...? A Guide to Computer Modeling $19.95

Almost every practical or business application of computers involves a complex scheme of projections called a model.

WHAT IF...? tells you about these powerful programs in terms that even the new computer-user can understand. You get a general explanation of model building, a comparison of the most popular modeling packages on the market (like VisiCalc and SuperCalc), and all the tools you need to build your own modeling programs. So you'll be able to create models for everything from real estate analyses to cash flow projections for your own company.

THE BOOK COMPANY
A Division of Arrays, Inc.

Available at computer stores everywhere or directly from THE BOOK COMPANY.

- ☐ The Book of Apple Software 1983, $19.95.
- ☐ The Book of Atari Software 1983, $19.95.
- ☐ Apple Graphics and Arcade Game Design, $19.95.
- ☐ WHAT IF...? A Guide to Computer Modeling, $19.95.

(Place quantity in box if ordering more than one of each title.)

Visa, MasterCard, Check or Money Order accepted.

☐ Visa #_____(expiration date)_____

☐ MasterCard #_____(expiration date)_____

Signature_____

Total amount enclosed $_____. (California residents add 6% sales tax. Postage will be paid by THE BOOK COMPANY.)

Name_____

Address_____

City_____

State_____ Zip_____

Mail to: THE BOOK COMPANY, (Dept. CC), 11223 South Hindry Avenue, Los Angeles, CA 90045. Or call toll-free (800) 421-3930 or, in California call collect (213) 417-3003.

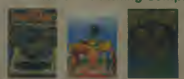
Apple is a registered trademark of Apple Computer, Inc. Atari is a registered trademark of Atari Inc. Space Invaders is a registered trademark of Taito America Corp. VisiCalc is a registered trademark of VisiCorp. SuperCalc is a registered trademark of Sorcim Corp. Pacman is a registered trademark of Bally

CIRCLE 154 ON READER SERVICE CARD

RESTON GUIDES YOU THROUGH THE WORLD OF ATARI.®

Reston takes you step-by-step through the wonders of Atari® Home Computers. **Inside ATARI BASIC®**, by Bill Carris, is the complete guide for beginners learning Atari BASIC®, or for those who know BASIC but haven't used on Atari® before. It's also a quick reference for color, GTIA and other graphic modes. **Designs From Your Mind with Atari® Graphics** is Tom Rowley's new tutorial book which allows you to realize your imaginative visions with the computer, just as an artist uses canvas and paint. Part One introduces you to shapes, colors, and screen design, and Part Two covers advanced graphics. For the novice and experienced programmer. **Space Knights**, by David Heller and Robert Kurcina, is the book/disk game for sci-fi fans. But it's no simple arcade shoot-'em-up. Instead, it links adventure, science fiction and the computer's color, sound and graphic capabilities for a captivating game of role-playing for the ATARI® 400/800 Home Computer with 24k or 48k memory. Reston can help you discover the worlds of knowledge, excitement and adventure hidden in every Atari® computer.

Space Knights is A Creative Pastime™ from Reston Publishing Company



A Prentice-Hall Company
11480 Sunset Hills Rd.
Reston, VA 22090
Available at your local bookstore and computer retailer or call us at (800) 336-0338.

Atari is a registered trademark of Atari, Inc

For the ATARI 400/800 Home Computer with 24k or 48k memory and disk drive.

CIRCLE 233 ON READER SERVICE CARD

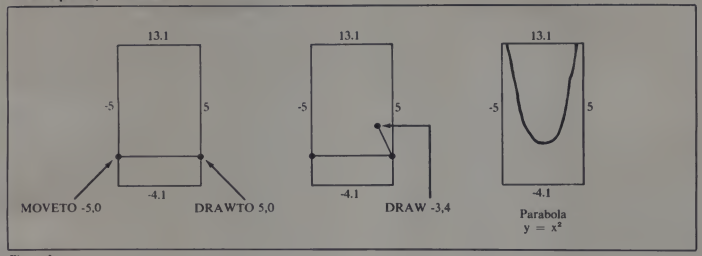


Figure 3.

pen. There are two types of move and draw commands: relative and absolute.

Absolute referencing refers to the actual points of the world system. To move the pen to the point (-5,0) without drawing any lines, we say

```
180 QX= 5  QY=0  GOSUB 1800                    MOVETO -5,0
```

To draw a line from the previous point to the point (5,0), we could say

```
190 QX=5  QY=0  GOSUB 2000                     DRAWTO 5,0
```

Notice that in the above examples, I used QX and QY instead of Q1, Q2, etc. The move and draw commands all use QX and QY to refer to x and y distances in world coordinates.

Relative referencing is similar to absolute but is based on the current position of the pen. A statement like

```
195 QX=-3  QY= 4  GOSUB 1900                   DRAW -3,4
```

would draw a line from the current position of the pen to a point 3 units to the left and 4 units up (see Figure 3). The relative move command does the same thing, but doesn't leave any visible line connecting the two points.

To draw our parabola $y = x^2$ we will start at the point (-5,25) and vary x until $x = 5$, drawing to each point on the parabola as we calculate it.

```
 10 Q1=0  GOSUB 1000                           'initialize
130 DEF FNF(X)=X↑2                             Parabola y=x²
140 Q1=0  Q2= 4  Q3=0  Q4=1  GOSUB 1100        Viewport 0,4,0,1
150 Q1=-5  Q2=5  Q3=-1  Q4=10  GOSUB 1300      SHOW -5,5,-1,10
170 QX=-5  QY=FNF(QX)  GOSUB 1800              MOVETO x,x²
180 FOR QX=-5 TO 5 STEP  2
      QY=FNF(QY)  GOSUB 2000  NEXT             DRAWTO x,x²
```

Clipping

If a point specified is out of range of the window, the line is "clipped" to the edge of the window, but the computer acts as if it has drawn to that point. For example,

```
170 QX=0  QY=0  GOSUB 1800                     MOVETO 0,0
180 QX=20  QY=6  GOSUB 2000                    DRAWTO 20,6
190 QX=2  QY=9  GOSUB 2000                     DRAWTO 2,9
```

results in the line being drawn off the page and back on. Only those parts which fall within the window are shown (see Figure 4).

All lines are clipped to a "clipping region," which is similar to the window. In fact, for the default case, the clipping region is the window. This region can be defined smaller than the current window with the CLIP command, located on line 1400. CLIP has four parameters, Q1, Q2, Q3, and Q4, each of which is defined in world coordinates. Any parameters outside the window are reset to the window, and calling WINDOW automatically resets the clipping region to the window.

This region can also be reset manually to the window with the UNCLIP command. CLIP and UNCLIP are used to limit the region of the window to be used for graphing. In our continuous example, inserting the line

```
175 Q1=-3 . Q2=3 : Q3=0 : Q4=6 : GOSUB 1400    CLIP -3,3,0,6
```

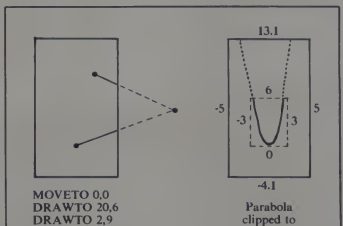
results in only part of the parabola being graphed on the screen, even though the same exact points were referenced (see Figure 4).

The UNCLIP command has no parameters, as it sets the clipping region to the current window, and is called by a statement similar to

```
190 GOSUB 1500                                 UNCLIP
```

CLIP is made up of two user-transparent subroutines, SIGCLP and SIGCOD. SIGCOD assigns a binary code from 0 to 15 revealing the position of a point with respect to the clip-

Figure 4.



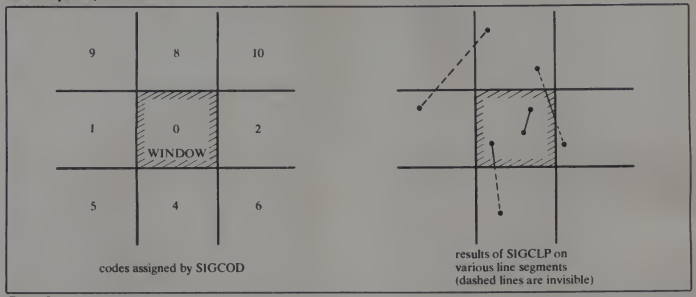


Figure 5.

ping region (see Figure 5). SIGCLP uses the results of SIGCOD on the two endpoints of a line to determine which portion, if any, of the line will be visible in the window. The actual drawing routine, SIGDRW, draws only that visible portion.

All lines are drawn in the current pen color, the default being 3. To change this color, the COLOR routine at line 1600 is used.

```
160 Q1=2  GOSUB 1600                    COLOR 2
```

Q1 can be 0, 1, 2, or 3, and the corresponding color will be determined by the color palette specified in INIT.

Drawing Instructions

The FRAME command, at line 2100, is a series of drawing instructions that draws a box around the current clipping region. This command requires no other parameters.

```
160 GOSUB 2100                          FRAME
```

The GRID command draws a grid of lines in the window based on four parameters. The first one, Q1, is the distance between vertical lines in the x direction. The second, Q2, is the distance between horizontal lines in the y direction. Both Q1 and Q2 must be greater than 0. The third and fourth parameters, Q3 and Q4, are the x and y world coordinates of a point to serve as a reference point. An example is

```
170 Q1=1. Q2=1  Q3=0. Q4=0 : GOSUB 2200     GRID 1,1,0,0
```

to draw a grid centered on the origin, with horizontal and vertical lines in every unit.

The AXES command is similar to GRID, but only a set of x and y axes is drawn. The AXES command is located at line 2300 (see Figure 6).

The last command of the Q-Graphics system is a simple PAUSE routine. This allows the program to wait until the user presses the spacebar. I found this useful to halt the graphing process at various points along the way. It has no parameters and is located at line 2400.

I also wrote two functions which help to integrate my system with the existing IBM Basic commands. They return the screen coordinates of any world coordinate point. Remember, however, IBM Basic allows only x values in the range of 0 to 319 and y values from 0 to 199.

X=FNQX(QX) returns the x screen coordinate
Y=FNQY(QY) returns the y screen coordinate

The program listing contains a similar parabola example and a cubic equation graph. For a general cartesian function, y=f(x), the program steps are usually as follows:

1. Initialize
2. Define viewport
3. Define window
4. Frame, axes, grid, color, etc.
5. Move to first point of function, (x, f(x))
6. Vary x in a loop until the last point, drawing to calculated function points along the way.

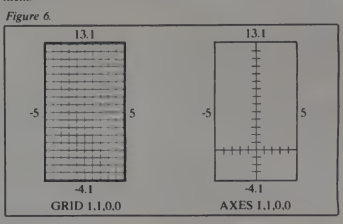
Polar Coordinates

To graph a function in polar coordinates, such as the cardiod in the listing, the steps are similar. But instead of varying the x value, vary the angle from the positive x axes. See any calculus book for a discussion of polar coordinates.

These routines provide a fairly powerful, yet inexpensive, supplement to IBM's absolute graphics. The steps needed to call each routine are a bit awkward, but you won't have to know any machine language or buy any fancy software. The programs are easily modified to allow you to experiment without too much difficulty. As long as none of the variables in your main program begins with the letter Q, you won't mess up any of the Q-Graphics bookkeeping.

I'd be interested to hear from anybody else who uses computer graphics and finds the IBM commands too limited. There are many ways to handle a graphics system; this is only one of them.

Figure 6.



NOW COM 64 OWNERS

CAN HAVE A PIECE OF THE ACTION

© 1981 SEGA ENTERPRISES, INC.

FROGGER™ - The popular coin-op comes home! Action so fast and graphics so brilliant, you'll swear you're at an arcade! $34.95

JAWBREAKER® - No more stale mazes! They're for mice and other pests! Everything moves in a flurry of color - even the walls! $34.95 cartridge

CROSSFIRE ALSO AVAILABLE FOR VIC 20 AND NEC

CROSSFIRE™ - Attacking aliens surround you in a game of speed and accuracy! An ever-dwindling supply of ammunition is your only defense! $34.95 cartridge

ALL PRODUCTS ALSO AVAILABLE FOR APPLE, ATARI AND IBM

These smash hits on other computers are now available for the Commodore 64! And it's just a start. The best! The brightest! The fastest! That's our promise. Get your Frogger, Crossfire or Jawbreaker from your local dealer or order directly from Sierra On-Line, Inc., Sierra On-Line Building, Coarsegold, Calif. 93614 (209) 683-6858.

ADD ONE DOLLAR FOR SHIPPING
VISA ● MASTERCARD ● CHECK ● COD ACCEPTED

SIERRAVISION™

Sierra ON-LINE INC

SIERRAVISION IS A TRADEMARK OF SIERRA ON-LINE, INC.
FROGGER IS A TRADEMARK OF SEGA ENTERPRISES, INC. JAWBREAKER IS A REGISTERED TRADEMARK OF SIERRA ON-LINE, INC. CROSSFIRE IS A TRADEMARK OF SIERRA ON-LINE, INC.

CIRCLE 244 ON READER SERVICE CARD

How to chart your company's fortune without spending one

It's a fact. A single chart or graph can tell you instantly what it takes hours to interpret from printouts or other raw data.

Now, with Strobe Graphics Plotters and Software, you can create superb hardcopy graphics directly from your computer. And you can do it for a fraction of the cost of most other systems.

The Strobe System transforms complex data into dynamic, colorful visuals with a few simple commands from your computer. Charts and transparencies that once took hours to produce are plotted within minutes. Information can be presented as bar charts, pie charts, curves or isometrics using a variety of colors, character styles and symbols. And with a resolution of 500 points per inch, the Strobe plotters match or surpass the quality of plotters costing thousands of dollars more.

You can also save and modify your graphics through Strobe's menu-driven programs. A broad selection of software—including programs that plot directly from VisiCalc* and Supercalc** files—is now available.

When the Strobe Graphics System is interfaced to your computer, an 8½x11 inch sheet of paper can speak anyone's language—visually. Visit your local dealer and learn how to start charting your fortunes today. Because a perspective on the present can also be your window on the future.

STROBE GRAPHICS

Strobe Inc.
897-5A Independence Avenue
Mountain View, CA 94043
Telephone 415/969-5130

The Strobe Graphics System

Seeing is believing

*VisiCalc is a trademark of VisiCorp
**Supercalc is a trademark of Sorcim Corp

CIRCLE 283 ON READER SERVICE CARD

Table 1. Q-Graphics Commands.

1000 INIT Q1	Initializes system to: VIEWPORT 0,1,0,1, WINDOW 0,1,0,1 MOVETO 0, 0 COLOR 3 CLS Q1 determines which color palette, 0 or 1
1100 VIEWPORT Q1,Q2,Q3,Q4	Defines area of screen to be used for graphics. All parameters are between 0 and 1. In order, left, right, bottom, top.
1200 WINDOW Q1,Q2,Q3,Q4	Defines an x-y scale for the current viewpoint. All parameters are in world coordinates. Left, right, bottom, top.
1300 SHOW Q1,Q2,Q3,Q4	Similar to WINDOW, but x and y will be scaled the same.
1400 CLIP Q1,Q2,Q3,Q4	Defines the region of the window to be used for graphics. All parameters are in world coordinates. Automatically set everytime WINDOW is called. Left, right, bottom, top.
1500 UNCLIP	Resets the clipping limits to the window.
1600 COLOR Q1	Changes the color of the pen. Q1=0, 1, 2, or 3.
1700 MOVE QX,QY	Relative move of QX, QY in world coordinates.
1800 MOVETO QX,QY	Absolute move to (QX,QY) in world coordinates.
1900 DRAW QX,QY	Relative draw of QX, QY in world coordinates.
2000 DRAWTO QX,QY	Absolute draw to (QX,QY) in world coordinates.
2100 FRAME	Draws a box around the current clipping region.
2200 GRID Q1,Q2,Q3,Q4	Draws a grid centered on (QX,QY) with a line every Q1 units in the x and every Q2 units in the y direction. All parameters are in world coordinates.
2300 AXES Q1,Q2,Q3,Q4	Draws a pair of axes with properties similar to grid command.
2400 PAUSE	Pauses the program until the spacebar is pressed.

Table 2. Variable References.

Q1, Q2, Q3,Q4	Command parameters.
QVXL, QWXL, QCXL, etc.	Various coordinate systems used: XL - left x XR - right x YB - bottom y YT - top y QV - viewpoint QW - window QC - clipping region
QWVXM, QWVXA	Slope and intercept of lines clipped to current clipping region
QWVYM, QWVYA	
QXSAVE, QYSAVE, QXSAVE2, QYSAVE2, WXT,QYI	Temporary variables
QXCURNT, QYCURNT	Current location of pen in world coordinates
QRATIO	Ratio of x to y distances of current viewport
QCOLOR%	Current color of pen 0, 1, 2, or 3
QCODE%	Binary description of point (QXT, QYI) with respect to clipping region.
QVX1, QVY1, QVX2, QVY2	Actual IBM Basic screen coordinates used to draw line
QGRID%	Flag used to specify GRID or AXES
Q$	Dummy string used in PAUSE routine

"...we could go to a movie, but I'd rather generate graphics on our home computer."

Lyco Computer Marketing & Consultants

TO ORDER CALL US — TOLL FREE 800-233-8760 — In PA 1-717-398-4079

800 48K . . . $459.00

with purchase of Programmer $49.00

FREE CATALOG with over 60 manuf. for ATARI

ATARI 810 . $409.

ATARI — A Warner Communications Company

ATARI HARDWARE

810 DISK DRIVE	$419.00
1[illegible] RECORDER	$75.00
1[illegible] PRECORDER	$75.00
850 INTERFACE	$164.00
400 16K	$199.75
800 64K	$349.75
1200 64K	$CALL
1025 PRINTER	$419.75

PACKAGES

[illegible]462 EDUCATOR	$109.75
[illegible]483 PROGRAMMER	$51.75
[illegible]488 COMMUNICATOR	$219.00
[illegible]410 BOOKKEEPER	$164.75
[illegible]4[illegible]4 ENTERTAINER	$63.75
Do Re ATARI	$19.75

SOFTWARE

OIX	$31.75
[illegible]801 MISSILE COMMAND	$25.75
[illegible]803 ASTEROID	$25.75
[illegible]8020 CENTIPEDE	$29.75
[illegible]8022 PAC MAN	$29.75
[illegible]8[illegible] STAR RAIDER	$29.75
[illegible]8004 BASKETBALL	$25.75
[illegible]805 SUPER BREAKOUT	$25.75
[illegible]8[illegible] SPACE INVADER	$25.75
[illegible]8[illegible] CAVERNS OF MARS	$27.75
[illegible]4007 MUSIC COMPOSER	$33.75
[illegible]400 ATARI BASIC	$45.75
[illegible]26 MICROSOFT	$65.75
[illegible]8[illegible] ASSEMBLER EDITOR	$45.75
[illegible]4[illegible] MACRO ASSEMBLER	$69.75
[illegible]4[illegible] HOME FILING MANAGER	$41.75
GALAXIAN	$29.75
DEFENDER	$29.75
DIGDUG	$29.75
SPEED READING	$53.75
ATARI WRITER	$54.75
BOOKKEEPER	$102.75
CX4101 PILOT HOME	$54.75
CX 405 PILOT EDUCATOR	$91.75
CX404 WORD PROCESSING	$99.75

BUSINESS SOFTWARE

VISICALC	$159.75
LETTER PERFECT	$115.75
LETTER PERFECT (ROM)	$149.75
DATA PERFECT	$99.75
TEXT WIZZARD	$79.75
SPELL WIZZARD	$64.75
FILE MANAGER 800	$69.75
HOME FILING MANAGER	$41.75
BOOKKEEPER	$119.75
C.R.I.S.	$199.75
ATARI WORD PRO	$109.75
VANTAGE	$35.75
HOME ACCOUNTANT	$59.75

ENTERTAINMENT SOFTWARE

MINER 2049er	$32.75
ZAXXON	$29.75
MONKEY WRENCH II	$52.75
CRISIS MOUNTAIN	$25.95
WARLOCKS REVENGE	$25.95
CHOPLIFTER	$22.75
TEMPLE OF ASPHI	$26.75
STAR WARRIOR	$26.75
INVASION ORION	$19.75
KING ARTHUR'S HEIR	$22.75
RESCUE AT RIGEL	$22.75
PACIFIC COAST	$23.75
CANYON CLIMBER	$23.75
CLOWNS & BALLOONS	$23.75
MICRO PAINTER	$23.75
SANDS OF EGYPT	$23.75
APPLE PANIC	$21.75
SERPENTINE	$25.75
STAR BLAZER	$24.75
WIZARD & PRINCESS	$22.75
FROGGER	$22.75
CROSS FIRE	$32.75
SAM SPEECH	$45.75
VOICE BOX II	$125.75
GORF (ROM)	$29.75
WIZARD OF WAR	$26.75
PREPPIE 2	$19.75
STRATOS	$23.75
SEA DRAGON	$23.75
POOL 1.5	$24.75
POOL 400	$28.75
SPEEDWAY BLAST	$28.75
BAJA BUGGY	$23.75
STARBOWL FOOTBALL	$28.75
SUBMARINE COMMANDER	$34.75
JUMBO JET	$34.75
KICKBACK	$34.75
SOCCER	$34.75
SHAMUS	$22.75
SLIME	$22.75

NEW RELEASES

BANK STREET WRITER	$49.75
JUMPMAN	$26.75
PHAROAH'S CURSE	$24.75
FORT APOCALYPSE	$24.75
ELIMINATOR	$18.75

BOOK of ATARI SOFTWARE 1983

346 pages $16.75

JOYSTICKS

POINT MASTER	$12.75

WICO

APPLE - VIC - ATARI - TI

COMMAND CONTROL	$23.75
RED BALL	$26.75
TRACK BALL	$52.75
EXTENSION CORD	$9.75
APPLE ADAPTOR	$18.95
T.I. ADAPTOR	$9.95

commodore

VIC 20		$CALL
VIC 64		$CALL
1542	DISK DRIVE	$339.75
1525	PRINTER	$339.75
1530	DATASETTE	$69.75
1110	8K RAM	$53.75
1211	SUPER EXPANDER	$53.75
1212	PROGRAMMERS AID	$44.75
1213	VICMON	$44.75
VIC 20 DUST COVER		$6.99
VIC 64 DUST COVER		$6.99
CASSETTE INTERFACE		$29.75
6 SLOT EXPANSION		$89.75
3 SLOT EXPANSION		$29.75

POLICY

In Stock items shipped within 24 hours of order. Personal checks require four weeks clearance before shipping. No deposit for COD orders. PA residents add sales tax. All products subject to availability and price change. Advertised prices show 4% discount offered for cash. Add 4% for Mastercard and Visa.

TO ORDER
CALL TOLL FREE
800-233-8760
In PA 1 717 398-4079
or send order to
Lyco Computer
P.O. Box 5088
Jersey Shore, PA 17740

Lyco Computer Marketing & Consultants

TO ORDER CALL US — **TOLL FREE 800-233-8760** — In PA 1-717-398-4079

PERCOM DRIVE

SINGLE DRIVE AT88	$359.00
ADD ON	$289.00
SINGLE DRIVE 40S1	$479.00
ADD ON	$329.00
DUAL DRIVE 40S2	$845.00
DUAL HEAD SINGLE DRIVE 44S1	$649.00
DUAL HEAD DUAL DRIVE 44S2	$989.00

HARD DISK DRIVES for

APPLE / IBM-PC / TRS-80*	
5 MAGABYTE DRIVE	$1099.75
10 MEGABYTE DRIVE	$1399.75
15 MEGABYTE DRIVE	$1799.75
20 MEGABYTE DRIVE	$2275.75

*Add $30.00 for TRS-80 Drives

BLANK DISKETTES

ELEPHANT	$18.25
MAXELL MDI	$32.75
MAXELL MDII	$42.75
DISK CASE (holds 10)	$4.95
DISK CASE (holds 50)	$19.75
ROM CASE (holds 10)	$19.75

CALL for PRICES on
RANA DISK DRIVES
MICROMAINFRAME DRIVES

MONITORS

NEC JB1260	$125.00
NEC JB1201	$155.00
NEC TC1201	$315.00
AMDEK 300G	$159.00
AMDEK COLOR I	$259.00

MODEMS

ANCHOR MARK I	$79.00
ANCHOR MARK II	$79.00
HAYES SMART	$239.00
HAYES MICRO II	$309.00
CAT	$144.00
J-CAT	$ CALL $

INTERFACING AVAILABLE

APPLE DUMPLING GX $99.75
APPLE DUMPLING 64 (16 Buffer) $179.75

	ATARI	APPLE	VIC
EPSON	$35.00	$79.00	$65.00
CITOH	$35.00	$79.00	$65.00
NEC	$35.00	$79.00	$65.00
OKIDATA	$35.00	$79.00	$65.00
GEMINI	$35.00	$79.00	$65.00
SMITH CORONA	$35.00	$79.00	$65.00

PRINTER RIBBONS

PROWRITER	$9.95
NEC	2/$19.75
SMITH CORONA	$8.50
EPSON	$10.95

EDUCATIONAL SOFTWARE

STATES & CAPITALS	$12.75
EUROPEAN COUNTRIES	$12.75
FRENCH	$45.00
GERMAN	$45.00
SPANISH	$45.00
ALIEN ENCOUNTER	$25.75
GULP	$25.75
FRENZY	$25.75
BATTLING BUGS	$25.75
COMPU-MATH	$23.75
COMPU-READ	$23.75
ADDITION	$14.95
ANALOGIES	$14.95
LET'S SPELL	$14.95
MEMORY BUILDER	$14.95
MINICROSSWORD	$14.95
NUMBER SERIES	$14.95
PRESCHOOL IQ BUILDER	$14.95
READING COMP	$14.95
SAMMY the SEA SERPENT	$14.95
SPELLING BUILDER	$14.95
STORY BUILDER	$14.95
VOCABULARY ONE	$14.95
VOCABULARY TWO	$14.95
WORD SEARCH	$14.95
PLAYER MISSILE	$24.75
MATH for FUN	$13.95
MUSIC LESSON	$24.95
FIGURE FUN	$24.95

SAVE on these in-stock PRINTERS

GEMINI 10	$319.00
PROWRITER	$375.00
NEC 8023A	$ 429.00
OKIDATA 92	$489.00

OKIDATA 82	$399.00	PROWRITER 2P	$699.00
OKIDATA 83	$639.00	GEMINI 15	$449.00
OKIDATA 84P	$959.00	STARWRITER	$1269.00
OKIDATA 93	$819.00	PRINTMASTER	$1589.00
TRACTOR	$49.75	SMITH CORONA TP1	$549.00

COMPUTER COVERS

800	$6.99
810	$6.99
400	$6.99
410	$6.99

16K ATARI RAM	$49.75
32K RAM	$69.75
48K RAM	$99.75
64K RAM	$129.75
128K RAM DISK	$399.75
80 Colum Screen Board	$279.75
400 KEY BOARD	$89.75
TECHNICAL NOTES	$29.75

CIRCLE 192 ON READER SERVICE CARD

SELL
CREATIVE COMPUTING
IN YOUR STORE!

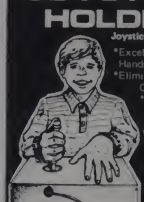
- Big profits on sales
- We pay shipping

Minimum order 8 copies per issue.

FOR DETAILS, CALL COLLECT:
LYNN KUJAWA
(212) 725-7679

AHL COMPUTING, INC
A SUBSIDIARY OF ZIFF DAVIS PUBLISHING COMPANY

IMPROVE YOUR GAME PLAY WITH THE
PHOENIX JOYSTICK HOLDER T.M.
Joystick not included



*Excellent for Small Hands.
*Eliminates Hand Cramping
*Sturdy Heavy Construction (Approximate Weight 7 lbs.)
*Handles Atari, Wico, Pointmaster
* Arcade Feeling

CREATIVE VIDEO, P.O. Box 545
FRANKLIN PARK, IL 60131
Please rush me my Phoenix Joystick Holder (s) at $ 29.95 each plus $2.50 postage and handling. Enclosed find my check for _____. Get two for $49.95 plus $4.50 postage and handling. Illinois residence add 6% sales tax.
Name _____
Address _____
City _____ State _____ Zip _____
Indicate Atari-Wico-Pointmaster
Allow 4 to 6 weeks for delivery

CIRCLE 186 ON READER SERVICE CARD

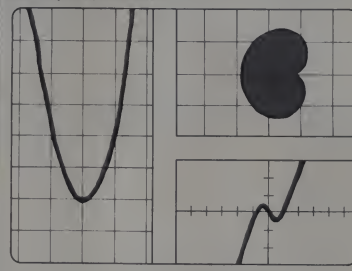


Figure 7. Output of program

```
10  G1= 0: GOSUB 1000

20  '  cardiod
30  DEF FNF(T)=1-COS(T)
40  G1=.5: G2= 1: G3=.5: G4= 1: GOSUB 1100
50  G1=-3: G2= 1: G3=-2: G4= 2: GOSUB 1300
60  G1= 3: GOSUB 1600: GOSUB 2100
70  G1= 1: G2= 1: G3= 0: G4= 0: GOSUB 2200: G1= 2: GOSUB 1600
80  GX=FNF(0)*COS(0): GY=FNF(0)*SIN(0): GOSUB 1800
90  FOR A=0 TO 180 STEP 5
100     A1=-A*2*3.14/180#A1: R=FNF(A1): GX=R*COS(A1): GY=R*SIN(A1): GOSUB 2000: NEXT
110 X=FNGX(-.5): Y=FNGY(0): PAINT (X,Y),2,2

120 '   parabola
130 DEF FNF(X)=X^2
140 G1= 0: G2=.4: G3= 0: G4= 1: GOSUB 1100
150 G1=-5: G2= 5: G3=-1: G4=10: GOSUB 1300
160 G1= 3: GOSUB 1600: GOSUB 2100
170 G1= 2: G2= 2: G3= 0: G4= 0: GOSUB 2200: G1= 2: GOSUB 1600
180 GX=-5: GY=FNF(GX): GOSUB 1800
190 FOR GX=-5 TO 5 STEP .2: GY=FNF(GX): GOSUB 2000: NEXT

200 '   cubic curve
210 DEF FNF(X)=X^3-X
220 G1=.5: G2= 1: G3= 0: G4=.4: GOSUB 1100
230 G1=-3: G2= 3: G3=-3: G4= 3: GOSUB 1300
240 G1= 3: GOSUB 1600: GOSUB 2100
250 G1= 1: G2= 1: G3= 0: G4= 0: GOSUB 2300: G1= 2: GOSUB 1600
260 GX=-3: GY=FNF(GX): GOSUB 1800
270 FOR GX=-3 TO 3 STEP .2: GY=FNF(GX): GOSUB 2000: NEXT

280 '   all done
290 GOSUB 2400: SCREEN 0,1: WIDTH 80: END

1000 '  INIT G1
1010 DEFSNG G1 SCREEN 1,0: KEY OFF: COLOR 0,-(G1=1): CLS
1020 GVXL=0: GVXR=1: GVYB=0: GVYT=1
1030 GWXL=0: GWXR=1: GWYB=0: GWYT=1: GOSUB 1250
1040 GCXL=GWXL: GCXR=GWXR: GCYB=GWYB: GCYT=GWYT
1050 GXCURNT=0: GYCURNT=0: GCOLOR%=3
1060 DEF FNGX(X)=(GWXM # X + GWXA) # 319
1070 DEF FNGY(Y)=199 - (GWYM # Y + GWYA) # 199: RETURN

1100    VIEWPORT G1,G2,G3,G4
1110 IF G1<>2 OR G3 <>G4 OR G1<0 OR G1>1 OR G2<0 OR G2>0 OR G3<0 OR G3>1
     OR G4<0 OR G4>1 THEN PRINT "Error in VIEWPORT parameters.": END
1120 GVXL=G1: GVXR=G2: GVYB=G3: GVYT=G4: GOSUB 1250: RETURN

1200 '  WINDOW G1,G2,G3,G4
1210 IF G1<>G2 OR G3>=G4 THEN PRINT "Error in WINDOW parameters.": END
1230 GWXL=G1: GWXR=G2: GWYB=G3: GWYT=G4: GOSUB 1500

1250 '  Windowing transformation
1260 GWXM=(GVXR-GVXL)/(GWXR-GWXL): GWXA=GVXL-GWXL*GWXM
1270 GWYM=(GVYT-GVYB)/(GWYT-GWYB): GWYA=GVYB-GWYB*GWYM: RETURN

1300 '  SHOW G1,G2,G3,G4
1310 GRATIO=(GVXR-GVXL)/(GVYT-GVYB)*319/199
1320 GXT=(G1-G2)/2*(GRATIO-1)*(GRATIO-1)
1330 GYT=(G3-G4)/2*(1/GRATIO-1)*(1/GRATIO-1)
1340 G1=G1-GXT: G2=G2+GXT: G3=G3-GYT: G4=G4+GYT: GOTO 1200
```

FREE!

A six-pack of tasty Apple* Posters

Here's your chance to get any or all of these beautiful 16 x 24 posters Free! except for just a small postage/handling charge! Commissioned by Datamost, and painted by well-known computer artist, Art Huff, each is a unique experience in design that will grace your home or office.

To get your posters, visit your favorite computer store and pick up a coupon where you see the counter display shown below. Fill out the coupon and mail it to Datamost. For each individual poster you want Free, include a registration card from any Datamost software package. Send only $1.75 postage/handling fee with each order: (Note. Without a Datamost registration card, the Posters are available at only $5.95 each, plus same postage/handling charge.)

Be the first to collect the entire series of these magnificent, exclusive, and FREE Apple* posters from Datamost!

Look for this poster display at your computer store.

DATAMOST

8943 Fullbright Ave., Chatsworth, CA 91311. (213) 709-1202

Copyright 1983 Datamost Inc.

CIRCLE 158 ON READER SERVICE CARD

YES! I Want To Participate in the Datamost FREE APPLE* POSTER OFFER

Please send me the posters indicated below
at $5.95 each plus postage/handling _____
6½% sales tax for California residents _____
Postage/handling charge $1.75 $1.75
Circle poster number: 1 2 3 4 5 6 Total: _____

Name _____
Address _____
City _____ State _____ Zip _____
Master _____ Visa _____ No. _____

Send To:

DATAMOST

8943 Fullbright Ave., Chatsworth, CA 91311 (213) 709-1202

*The posters are exclusive products of Datamost, Inc. and are not connected with, or authorized by Apple Computer, Inc
Apple is a trademark of Apple Computer, Inc

OMEGA INTERNATIONAL

SAVE ON ... COMPUTERS • MONITORS PRINTERS • PERIPHERALS • SUPPLIES*

STAR MICRONICS GEMINI 10

OMEGA SALE PRICED PRINTER

• DOT MATRIX **$329** SALE ENDS 6/30/83

EPSON FX-80 PRINTER

- Up To 160 cps • 11 x 9 Matrix • Pinfeed Platen
- Proportional Spacing • Graphics • Elite Pitch
- Centronics Parallel Interface • Internal 2 K Ram

NOW AVAILABLE FOR IMMEDIATE DELIVERY!

For Our Price...CALL 1-800-343-0873 TODAY!

SAVE ON LETTER QUALITY PRINTERS

DIABLO 620 New Law Price	929.00
DIABLO 630 w/API & cable	1,749.00
NEC 3510 SPINWRITER	1,399.00
NEC 7710 SPINWRITER	2,045.00
NEC 7730 SPINWRITER	2,095.00

DOT MATRIX PRINTER BARGAINS

C-ITOH PROWRITER 8510 AP	399.00
IDS MICROPRISM 480	549.00
OKIDATA MICROLINE 92 (NEW)	549.00
OKIDATA MICROLINE 93 (NEW)	859.00

BIG SAVINGS ON ACCESSORIES

HAYES SMARTMODEM 300 Baud	230.00
HAYES MICROMODEM II (APPLE II)	289.00
MICROSOFT SOFTCARD PREMIUM SYSTEM	459.00
ORANGE MICRO GRAPPLER +	120.00
PKASO PRINTER CARDS	129.00
RANA ELITE I (APPLE II)	299.00
SIGNALMAN MODEMS (MK I) As Low As	85.00

MONITOR SPECIALS FROM OMEGA

AMDEK 300 G	139.00
AMDEK 300 A	165.00
NEC JB1260	119.00
NEC JB1201 M	169.00
USI Pi-2 12" GREEN MONITOR	159.00
USI Pi-3 12" AMBER MONITOR	179.00

ACCESSORIES & SUPPLIES

OMEGA Has A Complete Line of Accessories & Supplies for the Apple II and many other Papular Computers by manufacturers like:

- D. C. Hayes • Microsoft • Tymac
- M & R Enterprises • Mountain Computers
- Kensington Microware • Practical Peripherals
- T.G. Products • Videx

MAGNETIC MEDIA

OMEGA Stocks Diskettes by:

- Dysan • Elephant • Maxell • Verbatim

- All Equipment Factary Fresh w/ MFT Worranty
- Prices Do Not Include Shipping Charges
- Mass. Residents Add 5% Soles Tax
- All Returns Subject To Restacking Fee

CALL TOLL FREE!
1-800-343-0873
Call Toll Free for Ordering
All Others call (617) 229-6464

CHARGE IT!
MasterCard / Visa
WELCOME AT NO EXTRA CHARGE

SOFTWARE

Omega Caries Software by the following companies:

- American Business Systems • Ashtan Tate
- Dakin 5 • Innovative Software • Microsoft
- Sorcim • Stoneware • Visicarp

CUSTOMER PICKUP NOW AVAILABLE
334 R Cambridge St. Burlington, Mass.
(617) 229-6464

* PRICES, SPECIFICATIONS AND AVAILABILITY OF ADVERTISED MERCHANDISE SUBJECT TO CHANGE WITHOUT NOTICE

UNADVERTISED SPECIALS ON • COMREX • EPSON • NEC • IDS PRISM • OKIDATA

OMEGA INTERNATIONAL

334 R CAMBRIDGE STREET, BURLINGTON, MA. 01803

IBM Graphics, continued...

```
1400 '    CLIP Q1,Q2,Q3,Q4
1410 IF Q1>=Q2 OR Q3>=Q4 THEN PRINT "Error in CLIP parameters.": END
1420 IF Q1<GWXL OR Q1>GWXR THEN QCXL=GWXL ELSE QCXL=Q1
1430 IF Q2<GWXL OR Q2>GWXR THEN QCXR=GWXR ELSE QCXR=Q2
1440 IF Q3<GWYB OR Q3>GWYT THEN QCYB=GWYB ELSE QCYB=Q3
1450 IF Q4<GWYB OR Q4>GWYT THEN QCYT=GWYT ELSE QCYT=Q4: RETURN

1500 '    UNCLIP
1510 QCXL=GWXL: QCXR=GWXR: QCYB=GWYB: QCYT=GWYT: RETURN

1600 '    COLOR Q1
1610 IF Q1>=0 AND Q1<=3 THEN QCOLOR%=Q1
1620 RETURN

1700 '    MOVE Qx,Qy
1710 QXCURNT=QXCURNT+Qx: QYCURNT=QYCURNT+Qy: RETURN

1800 '    MOVETO Qx,Qy
1810 QXCURNT=Qx: QYCURNT=Qy: RETURN

1900 '    DRAW Qx,Qy
1910 Qx=QXCURNT+Qx: Qy=QYCURNT+Qy

2000 '    DRAWTO Qx,Qy
2010 QXSAVE=Qx: QySAVE=Qy: GOSUB 2020: QXCURNT=QXSAVE: QYCURNT=QySAVE: RETURN

2020 '    SIGCLP QXCURNT,QYCURNT,Qx,Qy
2022 QXT=QXCURNT: QYT=QYCURNT: GOSUB 2046: QCODE1%=QCODE%
2024 QXT=Qx: QYT=Qy: GOSUB 2046: QCODE2%=QCODE%
2026 IF QCODE1%=0 AND QCODE2%=0 THEN 2042
2028 IF QCODE1% AND QCODE2% THEN RETURN
     IF QCODE1%<>0 THEN QCODE%=QCODE2% ELSE QCODE%=QCODE1%
2032    IF QCODE%>=8 THEN QXT=QXCURNT+(QX-QXCURNT)*(QCYT-QYCURNT)/(QY-QYCURNT):
           QYT=QCYT: GOTO 2040
2034    IF QCODE%>=4 THEN QXT=QXCURNT+(QX-QXCURNT)*(QCYB-QYCURNT)/(QY-QYCURNT):
           QYT=QCYB: GOTO 2040
2036    IF QCODE%>=2 THEN QYT=QYCURNT+(QY-QYCURNT)*(QCXR-QXCURNT)/(QX-QXCURNT):
           QXT=QCXR: GOTO 2040
2038    IF QCODE%>=1 THEN QYT=QYCURNT+(QY-QYCURNT)*(QCXL-QXCURNT)/(QX-QXCURNT):
           QXT=QCXL
2040 IF QCODE%=QCODE1% THEN QXCURNT=QXT:QYCURNT=QYT:GOSUB 2046: QCODE1%=QCODE%:
     GOTO 2026 ELSE Qx=QXT: Qy=QYT: GOSUB 2046: QCODE2%=QCODE%: GOTO 2026
2042 QVX1=QWVXN # QXCURNT + QWVXA: QVY1=QWVYM # QYCURNT + QWVYA
2044 QVX2=QWVXN # Qx + QWVXA: QVY2=QWVYM # Qy + QWVYA: GOSUB 2058: RETURN

2046 '    SIGCOD QXT,QYT,QCODE%
2048 QCODE%=0: IF QXT>QCXL THEN QCODE%=QCODE%+1
2050 IF QXT>QCXR THEN QCODE%=QCODE%+2
2052 IF QYT<QCYB THEN QCODE%=QCODE%+4
2054 IF QYT>QCYT THEN QCODE%=QCODE%+8
2056 RETURN

2058 '    SIGDRW QVX1,QVY1,QVX2,QVY2
2060 QVX1=INT(QVX1#319): QVY1=199-INT(QVY1#199)
2062 QVX2=INT(QVX2#319): QVY2=199-INT(QVY2#199)
2064 LINE (QVX1,QVY1)-(QVX2,QVY2),QCOLOR%: RETURN

2100 '    FRAME
2110 QXSAVE2=QXCURNT: QYSAVE2=QYCURNT: Qx=QCXL: Qy=QCYB: GOSUB 1800: Qx=QCXR:
     GOSUB 2000: Qy=QCYT: GOSUB 2000: Qx=QCXL: GOSUB 2000: Qy=QCYB: GOSUB 2000:
     QXCURNT=QXSAVE2: QYCURNT=QYSAVE2: RETURN

2200 '    QRID Q1,Q2,Q3,Q4
2210 QGRIDX=1: GOTO 2320

2300 '    AXES Q1,Q2,Q3,Q4
2310 QGRIDX=0
2320 IF Q1=0 OR Q2=0 THEN PRINT "Error in AXES/GRID parameters.": END
2325 QXSAVE2=QXCURNT: QYSAVE2=QYCURNT
2330 Qx=QCXL: Qy=Q41 GOSUB 1800
2340 FOR Qx=(QCXL\Q1)*Q1 TO QCXR STEP Q1
2350    IF QGRIDX%=1 THEN Qy=QCYT: GOSUB 1800: Qy=QCYB: GOSUB 2000
2355    IF QGRIDX%=0 THEN Qy=Q41 GOSUB 2000: LINE -STEP(0,2)*QCOLOR%:
           LINE -STEP(0,-4),QCOLOR%: LINE -STEP(0,2)*QCOLOR%
2360    NEXT
2365 IF QGRIDX%=0 THEN Qx=QCXR: Qy=Q4: GOSUB 2000
2370 Qx=Q31 Qy=QCYB1 GOSUB 1800
2380 FOR Qy=(QCYB\D2)*Q2 TO QCYT STEP Q2
2385    IF QGRIDX%=1 THEN Qx=QCXL: GOSUB 1800: Qx=QCXR: GOSUB 2000
2388    IF QGRIDX%=0 THEN Qx=Q31 GOSUB 2000: LINE -STEP(-2,0)*QCOLOR%:
           LINE -STEP(4,0),QCOLOR%: LINE -STEP(-2,0)*QCOLOR%
2389    NEXT
2390 IF QGRIDX%=0 THEN Qx=Q31 Qy=QCYT: GOSUB 2000
2395 QXCURNT=QXSAVE2: QYCURNT=QYSAVE2: RETURN

2400 '    PAUSE
2410 Q$=INKEY$: IF Q$=" " THEN 2410 ELSE RETURN
```


GUIDE TO VIC-20 PROGRAMMING

If you've purchased a VIC-20 recently, you probably know all about playing its great games. But if you're now ready to learn about computer programming, it's time you discovered *Getting Acquainted With Your VIC-20*.

This newly revised book is a step-by-step guide to programming your VIC. Starting with the functions and commands of the BASIC language, it quickly teaches you how to write and adapt programs on your own. And then it shows you how to write programs to take full advantage of your computer's outstanding color, sound and music capabilities!

Even if you've never touched a computer before, the easy "learn by doing" techniques—coupled with the more than 60 programs in the book—will make you an expert VIC programmer in no time.

For parents and educators, there's a section on "VIC as Teacher" that can help you use your computer as a powerful children's learning aid in the classroom or at home.

Get the most from your new VIC-20. Order your copy of *Getting Acquainted With Your VIC-20* today!

5½" x 8½", softcover.
Over 60 full program listings.

For faster service, PHONE TOLL FREE:
800-631-8112
(In NJ 201-540 0445)

Also available at your local bookstore or computer store.

CREATIVE COMPUTING PRESS
Dept. *HB1C* 39 East Hanover Ave., Morris Plains, NJ 07950

Please send me _____ copy(ies) of *Getting Acquainted With Your VIC-20* at *$9.95* each, plus $1.50 postage and handling each. Outside USA add $3.00 per order. =15R

☐ PAYMENT ENCLOSED $_____ *Residents of CA, NJ and NY state add applicable sales tax.

☐ CHARGE MY:
(Charge and phone orders $10 minimum)
☐ American Express
☐ MasterCard ☐ Visa

Card No. _____ Exp. Date _____

Signature _____

Mr./Mrs./Ms. _____

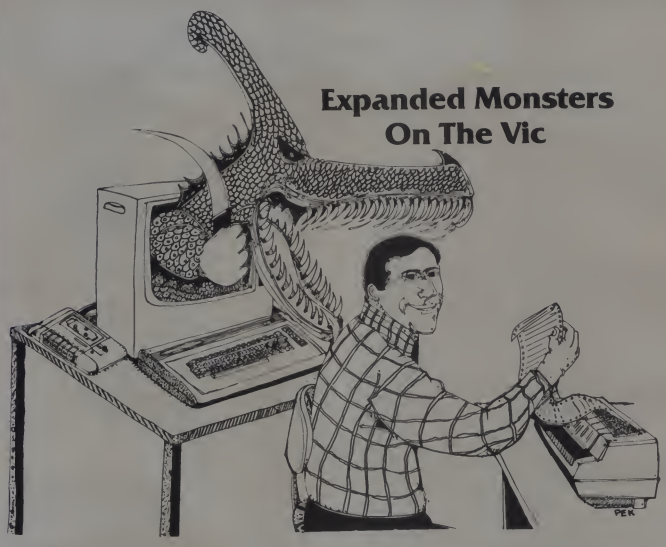
Address _____ Apt. _____

City _____

State _____ Zip _____

☐ Send me a FREE *Creative Computing* Catalog.

Expanded Monsters On The Vic



Eric Luce and James Wheeler

Being able to create your own customized characters, from monsters and battleships to specialized scientific symbols or foreign language alphabets, is a big advantage in personalizing your own computer programs.

There are several programs available to Commodore Vic 20 owners which allow you to create individualized characters. One is Commodore's own cassette program, the *Programmable Character Set and Gamegraphics Editor.* Another, called "8x8 Create," appeared on pages 270 and 272 of the January 1983 issue of *Creative Computing*. Both programs will give you the data statements you need to design almost any figure from a tree to a spaceship and have direct access to it from the keyboard.

When completed, your customized villain or hero will be the size of a capital letter, although the Commodore program manual suggests that you join several shapes together to form larger figures.

James Wheeler, P.O. Box 2034, S. Burlington, VT 05401.

A problem arises, however, when you try to use the new characters in a memory-expanded Vic—they won't work.

When you add memory to the Vic, it does some location shifting, and as a result the area in which you store your special characters is used for another purpose.

Fortunately, there is a method which will allow you to use your custom figures on an expanded Vic.

First, type in the lines in Listing 1 which POKE into the buffer the memory pointers to reserve memory for special characters at the beginning of user RAM. They also provide for automatically loading and running your special character program.

Without running it, save this program at the beginning of a cassette tape. Verify it and then press the stop button on the cassette player. Do not rewind the tape.

Next turn the computer off, then on and type

```
POKE 44,24:POKE 46,24:POKE
48,24:POKE 50,24:POKE
63,10:POKE 65,5:NEW
```

Hit the return key and disregard the syntax error message you get on the screen.

You are now ready to type in the data for your first special character. Begin with line number 10 (do not use any line numbers before 10). Other data statements for additional custom figures can be on lines 11 through 19 or any other number after 10 except those used in Listing 2.

Listing 1.

```
10 Poke199,3 Poke881,76 Poke632,131 Poke633,13 Poke634,82
20 Poke635,117 Poke636 50 Poke637,48 Poke638 13
30 Poke44,24 Poke46,24 Poke48,24 Poke50,24 new
40 end
```

©1982 SPECTRA VIDEO, INC.

HOW TO BEAT ANY VIDEO GAME SINGLE-HANDED.

WITH THE QUICK-SHOT™ JOYSTICK CONTROLLER

MODEL 318-101

Beating any video game is easy, but beating it single handed takes a lot more. It takes a good joystick that is responsive and comfortable. Now with Spectravideo's new Quick-Shot™ Joystick Controller, you can do it all single-handed; control and fire at the same time.

One look at the handle and you know you'll have a better grip on your game. It's contour design fits comfortably around your palm. You can play for hours without developing a case of sore thumb. The firepower button on top of the handle gives you that extra margin of speed. (We didn't call it Quick-Shot for nothing.) You also have the option to use the left hand fire button simultaneously. The four removable suction cups hold the entire joystick firmly on any surface. It also comes with a long cord.

With all those superior features in one joystick, you know you got yourself a winning combination. And when it comes to beating video games, one hand is all you need!

Get the Quick-Shot™ now, you'll be that much ahead. After all, winning is what every game is all about.

FOR USE ON THE

- ATARI VCS SYSTEM
- SEARS VIDEO ARCADE
- VIC-20 COMPUTER
- ATARI 400 & 800 COMPUTER SYSTEMS

THE WINNING EDGE.

CONTOUR HANDLE AND RAPID FIRE BUTTON | OPTIONAL LEFT HAND FIRE BUTTON | UNIVERSAL JACK & LONG CORD | REMOVABLE SURE FOOT SUCTION CUPS

Quick Shot™ BY SPECTRAVIDEO

39 W. 37th Street, New York, N.Y. 10018

*ATARI VCS™ 400 & 800 COMPUTER SYSTEMS™ ARE REGISTERED TRADEMARKS OF ATARI, INC. *SEARS VIDEO ARCADE™ IS A TRADEMARK OF SEARS, ROEBUCK & CO. *VIC 20™IS A TRADEMARK OF COMMODORE

THERE'S A CONCERTO IN YOUR COMPUTER

COMPU-MUSIC

And a waltz, a blues song, a rhapsody, and is where it's at, rock 'n roll. In fact, your computer can now play any kind of music thanks to the new Roland Compu-Music.

Roland, the world's leading producer of synthesizers and electronic musical instruments, has put its years of music programming experience into a high performance computer music synthesizer system that can easily be used by anyone – from the computer user with a musical background to the programmer with a song in his heart.

The Roland Compu-Music does for music what the word processor has done for words. The Compu-Music software allows your computer to write programs that are standard musical compositions of up to eight voices, play a seven voice electronic drummer. The Compu-Music hardware (CMU-800 Sound Module/Synthesizer) that plays these musical parts

The CMU-800 connects to your computer through any auxiliary slot and then connecting to any amplifier or stereo system for performance. Because the Compu-Music system is software based, it allows for virtually infinite hardware expansion. It can never become obsolete.

Playing and programming the Compu-Music is so easy that you don't have to be a musician, but if you are, you'll appreciate the well thought-out programming, a system that Roland has used for many years with proven success. Also, the CMU-800 hardware easily interfaces with many other synthesizers for expanded performance – all controlled by your computer.

The Roland CMU-800 Synthesizer retails for $495.00. The Compu-Music software retails for $175.00 and is available for the Apple II and NEC computers. For more information, see your local computer dealer or contact Roland Corp. US, 2401 Saybrook Avenue, Los Angeles CA 90040, (213) 685-5141.

CIRCLE 255 ON READER SERVICE CARD

Roland

We Design The Future

Your last data statement must end with -99 to tell the computer where the character data ends. For example

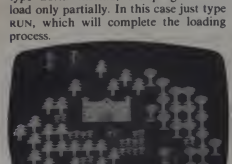
```
19 DATA 0,20,28,28,28,8,
   62,8,20,34,-99
```

Now type in Listing 2, omitting the REM statements, if necessary, to conserve memory.

Continue by adding your own program to this one, using 220 as your first line number. To run your program when you finish it, type the command RUN 20 (just RUN will result in a syntax error). Save your completed program on tape immediately following the saved first program (Listing 1) and verify it. Your cursor will look different, but don't worry. It will work fine.

The next time you want to load your program from tape, turn the computer off, then on. Rewind the tape to the beginning, and press the stop button. Hold down the Vic shift key, hit and release the run/stop key, and release the shift key. The program will run automatically. To run it a second time, type RUN 20.

If you forget to use this method and type LOAD instead, the program will load only partially. In this case just type RUN, which will complete the loading process.



Minotaur.

We have included the Minotaur program from *More Basic Computer Games* (Creative Computing Press, 1979) to provide a sample of the designs you can use. This game, which we have edited and adapted for the Vic, uses special characters for the villain (the Minotaur), the hero (you), a hunting net, stars, and an unidentified fellow with a hunting horn. To type it in, first type in the program in Listing 1 and save it as directed previously. Turn the computer off, then on, and type

```
POKE 44,24:POKE 46,24:POKE 48,
24:POKE 50,24:POKE 63,10:
POKE 65,5:NEW
```

Hit the RETURN key (disregarding the error message), and add the Minotaur program as listed. Save it, verify it, and load it according to the directions in the preceding paragraphs. It requires an 8K expander.

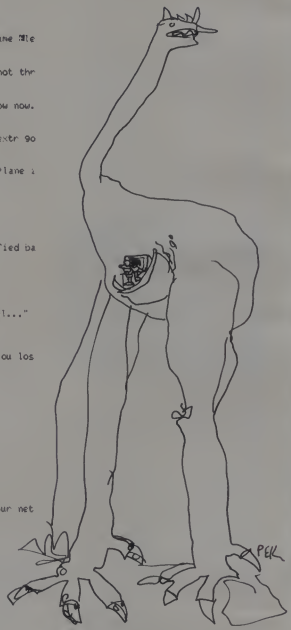
Listing 2.

```
10 rem replace this rem with your first data statement
20 for i=5120to6144 rem set loop to move char. data to ram
30 poke1,peek(1)-4:poke48,peek(1)*256:clr rem move char. data to ram
40 next i
45 poke36869,205 rem tell vic where char.'s are
50 rem *** the data must start at line 10 ***
60 rem the following lines modify the char.'s
70 rem in ram starting at 5120 decimal.
80 rem the first no. in the data statement
90 rem is the char. you wish to modify
100 poke 63,10:poke65,5 rem tell vic where data starts
140 read zz rem read which char. to modify
150 if zz=-99 then220
160 for i=5120+zz*8 to 5127+zz*8 rem set loop for char.
180 read zc
190 poke i,zc rem place char. data in ram
200 next i
210 goto140
220 rem here is where your program starts
```

Minotaur listing.

```
10 data 0,20,28,28,8,62,8,20,34
11 data 91,28,28,8,28,42,8,20,34
12 data 92,60,92,190,93,190,93,62,54
13 data 93,195,163,65,162,65,162,193,201
14 data 94,255,255,255,255,255,255,255,255
15 data 95,40,84,170,85,170,85,42,20
16 data 97,112,112,32,120,165,34,80,136
17 data 98,112,112,32,114,174,32,80,136
18 data 99,112,112,34,126,160,32,80,136
19 data 100,112,114,46,112,160,32,80,136
20 data 101,114,126,40,112,160,32,80,136
21 data 102,3,34,34,44,208,16,16,96
22 data 103,0,32,38,36,196,24,0,0
23 data 104,0,0,16,40,16,0,0,0
24 data 105,0,0,20,8,20,0,0,0
25 data 31,16,16,16,16,16,84,56,16,-99
30 poke44,24
35 print"■":chr$(142)chr$(8)"setting up characters"
40 for i=4608to6144 :poke i,peek(i+29696) :next i
45 poke36869,205 :poke63,10 :poke65,5
50 readzz :if zz=-99then80
55 for i=5120+(zz*8)to5127+(zz*8) :readzc
60 poke i,zc :next i :goto50
80 zz=rnd(-ti) :print"■■■
```

```
684 ifh1$="n"thens6=s6+1 goto700
686 s6=s6-1
700 ifabs(s5)>10orabs(s6)>10then960
790 foree=1to100 nextee s1=s5 s2=s6 s3=12 s9=1 gosub6000
810 fora=1to10 ifs5=b(a)ands6=c(a)then850
830 nexta goto870
850 forr=1to3000 nextr print"■" gosub4180
855 print"■■CZZT! Your net hit" print"barrier #",a,"" print"■
857 forr=1to3000 nextr goto1140
870 nexth3
880 ifs5<>x1ors6<>y1then1010
890 ifrnd(1)<.5then6100
900 onint(rnd(1)*2)+1goto901,1070
901 print"You got the minotaur" print"but it escaped!" goto1010
910 print"You got the Minotaur" print"in"t"turns.■" goto1470
930 input"Play again" x$
950 ifright$(x$,1)="n"then3752
970 clr goto162
1010 print"■Net is at" print"("s5","s6"). you" print"must get it.■"
1016 s1=s5 s2=s6 s3=12 s9=1 goto1090
1070 gosub2840
1080 print"■■You can only throw" print"when you are both" print"on the ■same ■le
vel.■
1090 forjz=1to5500 next goto290
1100 print"■■You are on a diagonal" print"to the Minotaur, you" print"cannot thr
ow now.■
1110 goto1090
1120 print"■■You are not within ■10■" print"spaces. You cannot" print"throw now.
■
1130 goto1090
1140 print"■You are now without" print"a net... You lose!" forr=1to4000 nextr go
to930
1160 print"■" poke36879,8 gosub5600
1165 print"■■■■■■YAAAAAAAAAH! You fell" print"off the edge of the" print"plane i
nto  a cre-
1167 print"vasse!" forr=1to950 nextr gosub5620
1169 poke36879,27 print"■■■" goto930
1200 fora=1to10 ifx2=b(a)andy2=c(a)then1240
1220 nexta goto1270
1240 print"■" gosub4180
1245 print"■■You have just fried" print"your niblets on an" print"electrified ba
rrier!■
1247 forr=1to3000 nextr goto930
1270 x=int(rnd(1)*10)+1 ifx=5then1300
1290 goto2520
1300 print"■" poke36879,8 gosub5640
1305 print"■■■■■YAAAAAAAAH  Trapdoor-" print"you fell down one" print"level..."
1306 forr=1to650 nextr gosub5620
1310 poke36879,27 print"■■■" l2=l2-1
1320 ifl2>0thenprint"■■■" poke36879,27 print"■" goto1290
1330 print"■■Worse yet, you fell" print"out of the cavern" print"and.....you los
e.
1332 forr=1to5800 nextr poke36879,27 print"■■■■" goto930
1350 input"Want to be a champion" x9$
1370 ifright$(x9$,1)="n"then1440
1390 c2=20 print"■Then you must capture" print"it within 10 moves.
1440 return
1450 ifleft$(x9$,1)="n"then930
1470 c3=(2/t)*100 ifc3<20then1630
1480 print"You are now a quali-" print"fied ■Champion■"■" goto930
1630 print"■Sorry, you did not" print"qualify as champion.■" goto930
1670 print forv7=1to22 print"■*■", nextv7
1740 print"■■■Want instructions■" input x$
1770 ifleft$(x$,1)="n"then2320
1800 print"■■The object is to cap-" print"ture the Minotaur" print"with your net
.■■
1813 forv8=1to22 print"■*■", nextv8 print"■■" gosub2395
1830 print"■■     THE CAVERN■■
1840 print"The cavern of the" print"Minotaur has three
1850 print"levels. Each level" print"is a coordinate" print"plane.
1860 print"■Outside the levels" print"is a deep crevasse.■
1870 print"The planes stretch" print"10 spaces on each
1880 print"axis from the origin.■
1882 gosub2395
1938 print"■" fore=1to3
1940 print"       ■HAZARDS■" forw=1to400 nextw print"■                    "
1942 forq=1to500 nextq nexte
1961 print"■■
1962 print"  ♦BARRIERS■
1970 print"■Inside the cavern are" print"10 electrified pil-
1980 print"lars that extend" print"straight up (↑)" print"through the three
```



SCIENCE FICTION

INTERACTIVE FANTASIES™

PRISONER 2

In a surreal environment of misleading clues and sugar-coated propaganda, you survive by your wits. Can you escape? Can you find the bars?
Apple $32.95 retail.
Atari, IBM $39.95 retail.

WORLD BUILDERS™

Struggle to tame the galactic wilderness and establish an infant empire's first colonies.
Apple $32.95 retail.

INTERSTELLAR SHARKS™

Dodge the bureaucracy and pursue ultimate success in a high-tension, inter-galactic entrepreneurial arena.
Apple $32.95 retail.

ARMAGEDDON™

Play the deadly game of rebellion against corrupt authority. (Available in Fall '83)
Apple $32.95 retail.

THE EMPIRE TRILOGY By David Mullich

SCIENCE FACT

INTERACTIVE SIMULATIONS™

RENDEZVOUS™

The drama and difficulty of shuttle flight and space navigation are yours, captured through accurate ballistics, precise orbital mechanics, and a stunningly realistic 3-dimensional space station.
Apple, Atari $39.95 retail.

Expand your mind with innovative adventures from EduWare. Our *Interactive Fantasies* startle your imagination and test your intellectual resources.

Our *Interactive Simulations* put you at the center of real-world challenges, which you must solve using scientific inquiry and instinct.

Through explorations in fiction and fact, EduWare leads you to confront your world.

THE BEST OF BOTH FROM

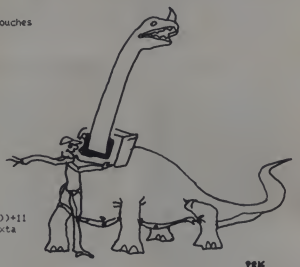
EDUWARE®

28035 Dorothy Drive, Agoura Hills, CA 91301 • 213/706 0661.

EDUWARE is a registered trademark of EduWare Services, Inc. • Apple is a registered trademark of Apple Computer Inc. • Atari is a registered trademark of Atari, Inc

CIRCLE 160 ON READER SERVICE CARD

```
1990 Print"levels.":Print"They will destroy":Print"anything that touches
2000 Print"them!!!"
2020 Print"  TRAPDOORS
2030 Print"Trapdoors will appear":Print"out of nowhere and
2040 Print"drop you down (←) one":Print"level. If you were on
2050 Print"level 1, you lose!":gosub2395
2070 Print"      MINOTAUR"
2080 Print"The Minotaur will":Print"charge if you miss
2090 Print"with your net.":Print"Also, it may charge"
2100 Print"for no reason at all!":gosub2395
2130 Print"Your commands are
2140 Print"e=move east
2150 Print"w=move west":Print"n=move north":Print"s=move south"
2160 Print"u=move up a level":Print"d=move down a level
2165 Print"net=throw the net"
2200 Print"help=list commands"
2300 Print"Have fun...":gosub2395
2320 return
2340 Print"  The barriers are ":fora=1to10:b(a)=int(rnd(1)*(-21))+11
2370 c(a)=int(rnd(1)*(-21))+11:Print"Barrier"a"("b(a)","c(a)")":nexta
2395 Print"  Type any letter...
2400 get$:if$=""then2400
2410 return
2420 l2=9
2430 Print"Which level do you":Print"want to start on
2443 input l2:x2=15:if l2<1 or l2>3 then goto 4000
2450 Print"Type in your starting":Print"coordinates in this":Print"manner   4,
3 "
2455 Print"(whole numbers only,":Print"between -10 and 10):
2456 input x2,y2
2457 if x2>10 or x2<-10 or y2>10 or y2<-10 then Print"You are on level";l2,"." goto2450
2460 if int(x2)<>x2 or int(y2)<>y2 then Print"You are on level",l2;"." goto2450
2462 fora=1to10:if x2=b(a) and y2=c(a) then1240
2466 nexta:f=1
2490 Print return
2520 x4=x1:y4=y1:l4=l1
2550 x3=int(rnd(1)*5)+1
2560 on x3 goto2570,2620,2640,2710,2760
2570 x1=x1+1
2580 if abs(x1)>10 then2600
2590 goto2780
2600 x1=x4:goto2550
2620 x1=x1-1:goto2580
2640 y1=y1+1
2650 if abs(y1)>10 then2670
2660 goto2780
2670 y1=y4:goto2550
2690 forr=1to1500:nextr:Print"Hey! the Minotaur":Print"just walked smack
2695 Print"dab into a barrier!!":forr=1to3800:nextr:goto3180
2700 goto2650
2710 l1=l1+1
2720 if l1>3 or l1<1 then2740
2730 goto2780
2740 l1=l4:goto2550
2760 l1=l1-1:goto2720
2780 fora=1to10:if x1=b(a) and y1=c(a) then2550
2800 nexta:Print:goto290
2840 Print"   You got the":Print"Minotaur, but it escaped"
2850 Print"Bronco Nagurski!!":Print"The Minotaur is":Print"CHARGING...."
2855 fore=1to2000:nexte:Pokesv,15
2860 x3=sgn(x2-x1):y3=sgn(y2-y1):l3=sgn(l2-l1)
3000 if l1=l2 then3050
3010 l1=l1+l3:Print"Level"l1:goto3000
3050 if x1=x2 then3100
3060 x1=x1+x3:gosub3140
3080 fore=1to100:nexte:gosub6000:Poke36874,200:fore=1to20:nexte:Poke36874,0:goto
3050
3100 if y1=y2 then3210
3110 y1=y1+y3:gosub3140:goto3080
3140 forp=1to10:if b(p)=x1 and c(p)=y1 then3180
3160 nextp:return
3180 Print"":gosub4180
3186 Print"ZZZZZZT! The Minotaur":Print"just fried itself.
3188 forr=1to3000:nextr:Print"you win, hero!":forr=1to3000:nextr:goto1450
3210 Print"OH, NO! You're in":Print"for it now!!":forr=1to3000:nextr:gosub5200
goto930
3270 Print"Commands ":Print"e=go east":Print"w=go west":Print"n=go north
3280 Print"s=go south":Print"u=go up":Print"d=go down":Print"net=throw net"
'
3290 Print"help=list commands"
3300 gosub2395:Print"":goto290
```



Products for VIC 20® and CBM 64®

That are Out of This World.

SOFTWARE

Word Wizard For The Vic 20™–Requires at least 8K memory expansion) A user friendly WORD PROCESSOR with optional joystick control. Easy edit and string manipulation commands that follow the standard format. Full use of function keys for ease of use. 100% machine language with Delete Word, Search functions and Full Justification. Use VIC Graphic printer, or any centronics compatible printer connected to the user port. On Tape (supports disk) **$34.95.**

ZAP!–Climbing the corporate ladder could be fun except for all that falling paperwork. This Hires arcade type game allows up to 4 players to advance through each floor and change levels to scale the corporate ranks. Be careful, it's easy to be ZAPPED! CARTRIDGE for VIC 20 **$29.95**

Bomber Word–A unique graphic word game on cartridge that provides the full thrill of arcade action. Complete with six modes of play options for added enjoyment. Play against the computer or another player 6 to adult. For VIC 20 **$29.95.**

Tic Attack–A fast action arcade game on Cartridge that challenges all of your dexterity. Written in machine language for special audio & visual effects. Over 100 levels of play. High score indication. For VIC 20 **$29.95**

Dot-A-Lot–As you wander through the maze of life collecting Berries, you happen upon some magical fruit. Pick one and the treasures appear, but the Meanies are out today looking to spoil your fun. Defeat them and continue on to a higher level. An ever changing maze plus arcade type animation and sound will provide a real winning CARTRIDGE for the VIC 20 **$29.95**

Triple Play–Three word games that are both fun and educational. The games that are included are CROSSWORDS (requires at least 8K expansion). Five complete puzzles are included and each puzzle has up to 100 different words. CRYPTO-SOLVE will help you solve those cryptic messages found in newspapers, books, and magazines with a systematic computer technique. Included are approximately 50 different puzzles. You can even enter your own cryptic messages. HIDDEN WORDS will display a matrix of seemingly random letters on the screen. Upon closer inspection, you will be able to find many words. Included are approximately 25 different puzzles. For VIC 20™ **ONLY $29.95 for all 3**

Sketch Pad & Char-Gen–This hi-resolution drawing program will allow you to draw pictures in detail. Use either the keyboard or optional joystick. A fill command will allow you to fill a block and other commands allow you to easily clear the screen. You can also save and load pictures. Char-Gen is a simple to use custom character generator that will allow you to design different characters for each printable key on the computer. This program is an excellent device to design game creatures, foreign alphabets, secret symbols, or other special characters. One set is included and you can make and store others quite easily. Both for VIC 20™ **ONLY $24.95**

HARDWARE

Expand-O-Ram–8K Expansion Board for the VIC 20™ with reset, memory write protect, full memory allocation, plus TWO expansion slots. Like having 2 products in 1. It can even be used as a cartridge development system. **$119.00**

Universal Tape Interface & Duplicator–(Use on the CBM 64™ and VIC 20™). With this device, you can easily load, save or even duplicate tapes easily with your recorder. Full 3 LED indication of Data transfer makes this the most reliable way to Load, Save and Duplicate. A complete I/O device with extras. NOTE: Duplication requires 2 recorders. **Only $49.95**

Universal Parallel Interfaces–Now you can use most any parallel Centronics® type printer with your VIC 20™/CBM 64™. The inexpensive model will allow you to access your printer through the user port. This cable and driver is only **$19.95**. Our other model from TYMAC is more extensive with graphic capabilities. Call or write for more information and prices.

MasterCard VISA

Dealer and Distributor Inquiries Invited

NOTE: We solicit hardware and software items for the VIC 20™ and CBM 64™. Royalties, license fees or outright purchases can be negotiated. CBM 64™ & VIC 20™ are Registered Trademarks of Commodore Business Machines Inc.

micro WARE
DISTRIBUTING INC.
1342 B Rt. 23, Butler, N. J. 07405
201-838-7927

CIRCLE 221 ON READER SERVICE CARD

CONTEST!

For the best computer animation sequence created using MovieMaker™. $1000 prize. Entries should be submitted on disk by December 31, 1983. Winning entry will be shown at 1984 West Coast Computer Faire. For more details, contact Reston Publishing Company.

RESTON CLOSES THE GAP BETWEEN ART AND COMPUTERS

In Reston's new book, **Genesis II, Creation and Recreation with Computers**, by Dale Peterson, artists, writers and musicians use computers to create new visions, new sounds and new ways of expressing themselves, all interwoven with stunning illustrations. With **MovieMaker**, an exciting new program for the Atari ® Home Computer by Interactive Picture Systems, you'll learn how to do these things yourself. You'll compose scenery and shapes, then propel them into continuous, flicker-free action. You'll actually make a short animated movie, right at your keyboard. Let Reston release the creative spirit in you.

MovieMaker is a Creative Pastime™ from Reston Software™

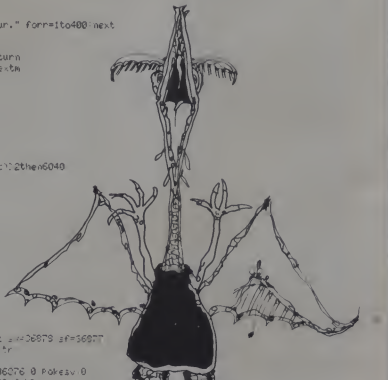
A Prentice-Hall Company
11480 Sunset Hills Rd.
Reston, VA 22090
Available at your local bookstore and computer retailer or call us at
(800) 336-0338.

Atari is a registered trademark of Atari, Inc.

For the Atari 800 with 48k memory. Coming soon: 16k ROM cartridge.

CIRCLE 232 ON READER SERVICE CARD

```
3670 Print"Minotaur moved to" Print"your $Pot." forzz=1to2000 next:z 9osub5200 9
oto930
3690 Print"You have your net." i9=0 forzz=1to2000 next:z 9oto310
3720 Print"How can you throw" Print"your net if you don't? Print"have one?
3730 Print"Net is at ("si","s2")"? Print"on level"s3 9oto1090
3752 Print"■■■  "Print"Ok, maybe the tension" Print"was kind of exhaust-" Print
"ing.■■
3753 Print"Gather your courage." Print"though, and return" Print"soon to the Fea
rsome■■"
3754 Print"■ave of the MINOTAUR■■■"
3760 Poke36869,192 Printchr$(9)chr$(14)  end
4000 Print"■You're not even in" Print"the cavern!
4010 forw=1to3700 nextw 9oto2430
4100 Pokesf,220 forl=15to8steP-1 Pokesv,l form=1to50 nextm
4180 Pokesf,220 forl=15to8steP-1.5 Pokesv,l forN=1to150 nextN
4210 forr=1to5 Poke36879,127 forw=1to5 nextw
4220 Poke36879,47 forw=1to5 nextw
4230 Poke36879,42 forw=1to5 nextw
4235 nextr nextl
4240 Poke36879,8 forkt=1to1500 nextkt Poke36879,27
4250 Pokesf,0 Pokesv,0 return
5200 Poke36879,8 Print"■■" forkt=1to50 w=int(rnd(1)*511)+1
5210 Poke4096+w,int(104.5+rnd(1)) nextkt
5230 Print"■■■■■■■■■■■■■■■n fact, it's just "
5235 Print"thrown you out into "Print"the starry night■" 9osub5400
5238 Print"■Windy, isn't it?)" 9osub5400
5239 Pokesv,0 Pokesf,0
5240 Print"■■■■.  "Poke36879,27 return
5400 ss=180 Pokesf,ss forl=1to2 d=int(rnd(1)*5)*22+50 form=2to14step2
5405 ss=ss+int(rnd(1)*10) Pokesf,ss
5410 Pokesv,m form=1tod nextm nextm form=15to8steP-1 Pokesv,m
5415 ss=ss-int(rnd(1)*10) Pokesf,ss
5420 form=1tod nextm nextm nextl return
5600 Poke36878,10 forl=230to128steP-1 Poke36876,l form=1to20 nextm
5610 nextl Poke36876,0 return
5620 Pokesf,200 forl=15to8steP-.05 Pokesv,l form=1to8 nextm nextl Pokesf,0 return

5640 Pokesv,10 forl=230to128steP-1 Poke36876,l form=1to7 nextm
5650 nextl Poke36876,0 return
5700 Poke sv,15 forl=1to5 Poke36874,200 form=1to20 nextm Poke36874,0
5710 form=1to450 nextm nextl Poke36878,0 Poke36874,0 return
5800 Pokesv,15 b=0
5810 form=1to650 nextr
5820 fol=128 to 233 steP11 Poke36874,l
5830 form=1to30 nextm b=b+1
5850 ifb=3thenb=0 Poke36874,0
5860 nextl Poke36874,0 Pokesv,0 form=1to400 nextr
5870 Print"■■Welcome to the cave" Print"of the awful Minotaur." form=1to400 next
r 9oto5700
5900 Pokesv,15 forzz=200to225steP5 Poke36874,zz form=1to10
5910 nextm Poke36874,0 form=1to450 nextm ne tZZ Pokesv,0 return
5930 Pokesv,15 fork=225to200step-5 Poke36874,k form=1to20 nextm
5940 Poke36874,0 form=1to450 nextm nextk Pokesv,0 return
6000 Print"■■■■■■.  forzz=0to4 forz=0to4
6005 Poke37698+zz+z,22:0
6010 nextzz nextzz
6011 Print"■■■■■■You-4"
6012 Print"■■■■■■■■■■■Minotaur-■■"
6013 Print"■■■■■■■■■■■Barrier-■■■"
6014 Print"■■■■■■■■■■■Net-■■" Poke4142,91
6020 forzz=1to10 zb=b(zz)-x2 zc=y2-(zz) ifabs(zb),20rabs(zc)>12then6040
6030 Poke4142+zb+zc*22,94 Poke37934+zb+zc*22,2
6040 nextzz ifs3<>12ors9=0then6060
6045 zb=s1-x2 zc=y2-s2 ifabs(zb)>2orabs(zc)>2then6060
6050 Poke4142+zb+zc*22,95 Poke37934+zb+zc*22,7
6060 ifi1<>12then6090
6065 zo=x1-x2 zc=y2-y1 ifabs(zo)>2orabs(zc)>2then6090
6070 Poke37934+zo+zc*22,4
6075 ifsl<>-1orsl<>1orl1<>13then6090
6076 Poke4142+zb+zc*22,92 9oto6090
6080 Poke4142+zb+zc*22,0
6090 Print"■■■■" return
6100 zz=93 zb=-2 zc=y2-y1 ifabs(zb)>2orabs(zc)>2then910
6110 forlz=1to30 Poke4142+zb+zc*22,zz forw=1to190 nextlz
6120 zz=abs(zz-93)+92 nextlz 9oto910
6200 Poke37988+w,0 Poke37987+w,0 Poke37986+w,0
6210 forzz=97to101 Poke4096+w zz forw=1to200 nextwz nextzz z=36878 zf=36877
6220 Poke4075+w,103 Pokesv,10 Poke36876,120 form=1to525 nextm
6230 Poke4075+w,102 Poke4054+w,100 Poke36876,200
6240 forl=10to0step-1 Pokesv,l form=1to500 nextm nextl Poke36876,0 Pokesv,0
6250 Poke4075+w,32 Poke4054+w,32 forzz=101to97step-1 Poke4096+w,zz
6260 form=1to300 nextm nextzz return
```



PLACE ORDERS TOLL FREE!

Continental U.S.
800-421-5500

Inside California
800-262-1710

For Technical Inquires or Customer Service call:
213-973-7707

Visit Your Nearest JADE Computer Showroom

LOS ANGELES
SAN FERNANDO VALLEY

SANTA ANA
SAN DIEGO

SAN JOSE
DALLAS

We accept cash, checks, credit cards, or Purchase Orders from qualified firms and institutions. **Minimum prepaid order $15.00** California residents add 6½% tax. Export customers outside the U.S. or Canada please add 10% to all prices. **Prices and availibility subject to change without notice.** Shipping and handling charges via UPS Ground 50¢/lb. UPS Air $1.00/lb. minimum charge $3.00

S-100 MEMORY BOARDS

64K STATIC RAM - Jade

Uses new 2K x 8 static RAMs, fully supports IEEE 696 24 bit extended addressing, 200ns RAMs, lower 32K or entire board phantomable, 2716 EPROMs may be subbed for RAMs, any 2K segment of upper 8K may be disabled, low power typically less then 500ma

MEM-8192S *Bare board*	$49.95
MEM-8915ZK *Kit less RAM*	**$99.95**
MEM-32152K *32K kit*	**$199.95**
MEM-5915ZK *56K kit*	**$299.95**
MEM-64152K *64K kit*	**$299.95**
Assembled & Tested	**add $50.00**

256 RAMDISK - SD Systems

Expandable RAM III expandable from 64K to 256K using 64 x 1 RAM chips compatible with CP/M, Oasis, & most other Z-80 based systems, functions as ultra-high speed disk drive when used with optional RAMDISK software

MEM-65064A *64K A & T*	**$474.95**
MEM-65129A *128K A & T*	**$574.95**
MEM-65192A *192K A & T*	**$674.95**
MEM-65256A *256K A & T*	**$774.95**
SFC-55009000F *RAMDISK sfter CP/M 2.2*	**$44.95**
SFC-55009000F *RAMDISC with EXRAM III*	**$24.95**

SINGLE BOARD COMPUTER

SUPERQUAD - Adv. Micro Digital

Single board standard size S-100 computer system, 4MHz Z-80A single or double density disk controller for 5¼" or 8" drives, 64K RAM, extended addressing up to 4K of EPROM 2 serial & 2 parallel I/O ports, real time interrupt clock CP/M compatible

CPC-30800A *A & T*	**$724.95**
IOX-4232A *Serial I/O adapter*	**$29.95**

DISK TUBS

Diskette Storage Boxes

Clear Plexiglass storage boxes for up to 75 Diskettes

MMA-505 *Holds 75 5¼" Diskettes*	**$19.95**
MMA-508 *Holds 50 8" Diskettes*	**$24.95**

LETTER QUALITY PRINTERS

Letter Quality Printer - BMC

Wordstar compatible, Diablo protocals, proportioned ans incramental spacing, 16 CPS bi-directional printing, 10, 12 or 15 CPI, up to 17-inch wide paper. Available in parallel or serial versions

PRD-52001 *Parallel*	**$799.00**
PRD-52002 *Sarial*	**$829.00**
PRA-52000 *Tractor option*	**$159.95**

380Z by Data Terminals & Communications

Based on the same quality mechanism as the Comrex printer, the 380Z contains electronic enhancements that allow it to run at speeds up to 32 CPS. Other features include a 48K buffer, proportional spacing, and Diablo 1640/1650/630 compatible protocol. Comes with printerhead, cover and users manual. Serial, parallel, and IEEE 488 interfaces standard

PRD-11300 *380Z printer*	**$1295.00**
PRA-11000 *Tractor option*	**$199.95**
PRA-12000 *Cut Sheet Feeder*	**$699.95**

Printers From Jade

SEIKOSHA *10" Graphics, 30CPS*	**$229.95**
OKIDATA 92 *10" 120 CPS*	**CALL**
OKIDATA 92 *10" 160 CPS With Graphics*	**CALL**
OKIDATA 93 *15" 160 CPS With Graphics*	**CALL**
OKIDATA 83 *15" 120 CPS*	**CALL**
OKIDATA 84 *15" 200 CPS With Graphics*	**CALL**
OKIDATA 2350 *15" 350 CPS*	**CALL**
OKIDATA 2410 *15" 350 CPS*	**CALL**
DAISYWRITER 2000 *48K Daisywheel*	**$1395.00**
GEMINI 10 *100 CPS With Graphics*	**$349.95**
GEMINI 15 *15" With Graphics*	**$499.95**
COMREX CR1	**$849.95**

EPROM ERASERS

Ultra-Violet EPROM ERASERS

Inexpensive erasers for industry or home

XME-3100A *Spectronics w o timar*	**$69.95**
XME-3101A *Spectronics with timer*	**$94.95**
XME-3200A *Logical Devices*	**$49.95**

DUAL DISK SUB SYSTEMS

Disk Sub-Systems - Jade

Handsome metal cabinet with proportional balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, nevermar rubber feet, all necessary hardware to mount 2-8" disk drives, power supply, and fan, does not include signal cable

Dual 8" Sub-Assembly Cabinet

END-000420 *Bare cabinet*	**$49.95**
END-000421 *Cabinant kit*	**$199.95**
END-000431 *A & T*	**$249.95**

8" Sub-Systems - Single Sided, Double Density

END-000423 *Kit w 2 Siemens FD100-8Ds*	**$650.00**
END-000424 *A & T w 2 Siemens FD100-8Ds*	**$695.00**
END-000433 *Kit w 2 Shugart SA-801Rs*	**$999.95**
END-000434 *A & T w 2 Shugart SA-801Rs*	**$1195.00**

8" Sub-Systems - Double-Sided Double-Density

END-000426 *Kit w 2 Qume DT-8s*	**$1224.95**
END-000427 *A & T w 2 Qume D-8s*	**$1424.95**
END-000436 *Kit w 2 Shugart SA-851Rs*	**$1274.95**
END-000437 *A & T w 2 Shugart SA-851Rs*	**$1474.95**

8" SLIMLINE SUB-SYSTEMS

Dual Slimline Sub-Systems - Jade

Handsome vertical cabinet with scratch resistant baked enamel finish, proportionally balanced air flow system, quiet cooling fan, rugged dual drive power supply, power cables, power switch, line cord, fuse holder, colling fan, all necessary hardware to mount 2-8" slimline disk drives, does not include signal cable

Dual 8" Slimline Cabinet

END-000820 *Bare cabinet*	**$59.95**
END-000822 *A & T w o drives*	**$179.95**

Dual 8" Slimline Sub-Systems

END-000823 *Kit w 2 SS DD*	**$919.95**
END-000824 *A & T w 2 SS DD*	**$949.95**
END-000833 *Kit w 2 DS DD*	**$1149.95**
END-000834 *A & T w 2 DS DD*	**$1179.95**

S-100 CPU BOARDS

SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included

CPU-30200A *A & T*	**$329.95**

THE BIG Z - Jade

2 or 4 MHz switchable Z-80 CPU board with serial I/O, accommodates 2798, 2716, or 2732 EPROM, baud rates from75 to 9600

CPU-30201B *Bare board w manual*	**$35.00**
CPU-30201K *Kit with Manual*	**$149.95**
CPU-30201A *A & T with Manual*	**$199.95**

2810 Z-80 CPU - C.C.S.

2 or 4 Z-80 CPU with serial I/O port & on board monitor PROM, front panel compatible

CPU-30400A *A & T with Prom*	**$299.95**

CPU-Z CompuPro

2 or 4 MHz Z80A CPU, 24 bit addressing

CPU-30500A *2/4 MHz A & T*	**$279.95**
CPU-30500C *3 6 MHz CSC*	**$374.95**

8085/8088 - CompuPro

Both 8 & 16 bit CPUs standard 8 bit S-100 bus, up to 8 MHz, accesses 16 Megebytes of memory

CPU-20510A *6 MHz A & T*	**$299.95**
CPU-20510C *8 8 MHz CSC*	**$479.95**

VIDEO MONITORS

Video Monitor - Jade

1000 lines ultra-high resolution, 20 MHz ultra-high band width 9" or 12" Amber or Green phosphor, the finest monitors we sell

VDM-750920 *9" Green*	**$99.95**
VDM-750910 *9" Amber*	**$129.95**
VDM-751220 *12" Green*	**$129.95**
VDM-751210 *12" Amber*	**$139.95**

5¼" DISK DRIVES

Tandon TM100-1 single-sided double-density 40 TPI
MSM-551001 ..... **$219.95 ea 2 for $199.95 ea**

Shugart SA400L single-sided double-density 40 track
MSM-104000 ..... **$234.95 ea 2 for $224.95 ea**

Tandon TM100-2 double-sided double-density 48 TPI
MSM-551002 ..... **$294.95 ea 2 for $269.95**

TEAC FD55A single-sided double-density 40 track
MSM-660551 ..... **$299.95 ea 2 for $239.95**

5¼" Cabinets With Power Supply

END-000218 *Single cab w/power supply* **$89.95**
END-000226 *Dual cab w/power supply* **$94.95**

S-100 MOTHERBOARDS

ISO-BUS - Jade

Silent, simple and on sale — a better motherboard

6 Slot (5¼" x 8¾")

MBS-061B *Bare board* **$22.95**
MBS-061K *Kit* **$39.95**
MBS-061A *A & T* **$89.95**

12 Slot (8½" x 8¾")

MBS-121B *Bare board* **$34.95**
MBS-121K *Kit* **$89.95**
MBS-121A *A & T* **$109.95**

18 Slot (14½" x 8¾")

MBS-181B *Bare board* **$54.95**
MBS-181K *Kit* **$99.95**
MBS-181A *A & T* **$149.95**

8" DISK DRIVES

Siemens FDD 100-9 single-sided double-density
MSF-201120 ..... **$274.95 ea 2 for $249.95 ea**

Shugart SA801R single-sided double-density
MSF-10801R ..... **$294.95 ea 2 for $389.95 ea**

Shugart SA851R double-sided double density
MSF-10851R ..... **$554.95 ea 2 for $529.95 ea**

Qume DT-8 double-sided double-density
MSF-750080 ..... **$524.95 ea 2 for $498.95 ea**

Tandon TM848I single-sided double-den thin-line
MSF-558491 ..... **$379.95 ea 2 for $369.95 ea**

Tandon TM848-2 double-sided double-den thin-line
MSF-558482 ..... **$494.95 ea 2 for $484.95**

NEC FD1185 double-sided double-den thin-line
MSF-851185 ..... **$484.95 ea 2 for $449.95**

S-100 I/O BOARDS

THE BUS PROBE - Jade

Inexpensive S-100 Diagnostic Analyzer

TSX-200B *Bare board* **$59.95**
TSX-200K *Kit* **$129.95**
TSX-200A *A & T* **$159.95**

INTERFACER 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel

IOI-1840A *A & T* **$314.95**
IOI-1830C *CSC* **$414.95**

I/O-4 - SSM Microcomputer

2 serial I/O ports plus 2 parallel I/O ports

IOI-1010A *A & T* **$249.95**

I/O-5 - SSM Microcomputer

Two serial & 3 parallel ports 110-19.2K Baud

IOI-1015A *A & T* **$299.95**

MODEMS

SMART BUY in Modems - Signalman

1200 and 300 Baud direct connect, automatic answer or originate selection, auto-answer, auto-dial on deluxe models 9v battery allows total portability, full one year warranty

IOM-5600A *300 baud direct connect* **$89.95**
IOM-5610A *300 baud Deluxe* **$149.95**
IOM-5620A *1200/300 baud Deluxe* **$369.95**
IOM-5650A *300 baud for Osborne* **$119.95**
IOM-5630A *300 baud card for IBM* **$269.95**

SMARTMODEM - Hayes

Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing RS-232C interface programable

IOM-5500A *Smartmodem 1200* **$574.95**
IOM-5400A *Smartmodem 300* **$224.95**
IOK-1500A *Hayes Chronograph* **$219.95**
IOM-1100A *Micromodem 100* **$368.95**
IOM-2010A *Micromodem II w/term prgm* **$329.95**
IOM-2012A *Terminal program for MMII* **$89.95**

1200 Baud SMART CAT - Novation

103/212 Smart Cat & 103 Smart Cat 1200 & 300 baud, built-in dialer, auto re-dial it busy, auto answer disconnect direct connect, LED readout displays mode, analog digital loopback self tests, usable with multi-line phones

IOM-5241A *300 baud 103 Smart Cat* **$229.95**
IOM-5251A *1200 baud 212/103 Smart Cat* **$549.95**

J-CAT™ MODEM - Novation

1/5 the size of ordinary modems, Bell 103, manual or auto-answer, automatic answer/originate, direct connect, built-in self-test, two LEDs and audio beeps provide status information

IOM-5261A *Novation* **$149.95**

CP/M PLUS 3.0

NEW! CP/M Plus 3.0

CP/M 3.0 is Digital Research's latest version of the industry standerd disk operating system It features many performance improvements, such as intelligent record buffering, improved directory handling, "HELP" facilty, time date stamping of files and many more improvements A TREMENDOUS INCREASE IN SPEED! It is fully CP/M 2.2 compatable and requires no changes to your existing application software Available only to Versafloppy II owners with SBC-200 CPU's

SFC-55009058F *Unbanked, RS232* **$250.00**
SFC-55009058F *Unbanked, VDB8024* **$250.00**
SFC-55009057F *Banked, RS232* **$250.00**
SFC-55009058F *Banked, VDB8024* **$250.00**
SFC-55009057D *Manual* **$50.00**

S-100 EPROM BOARDS

PB-1 - SSM Microcomputer

2708 2716 EPROM board with on-board programmer

MEM-99510K *Kit with manual* **$154.95**
MEM-99510A *A & T With Manual* **$219.95**

PROM-100 - SD Systems

2708, 2716 2732 EPROM programmer with software

MEM-99520K *Kit With software* **$189.95**
MEM-99520A *A & T With software* **$249.95**

S-100 DISK CONTROLLERS

VERSAFLOPPY II - SD Systems

Double density disk controller for any combination of 5¼ and 8" single or double sided, analog phase-locked loop data seperator, vectored interrupts CP/M 2.2 & Oasis compatible control/diagnostic software PROM included

IOD-1160A *A & T With Prom* **$359.95**
SFC-55009047F *CP/M 3.0 With VF-II* **$139.95**

DOUBLE D - Jade

High reliability double density disk controller with on-board Z-80A auxiliary printer port, IEEE S-100 can function in multi-user interrupt driven bus

IOD-1200B *Bare board & hdwr man* **$59.95**
IOD-1200K *Kit w/hdwr & sftwr man* **$299.95**
IOD-1200A *A & T w/hdwr 7 sftwr man* **$325.95**
SFC-59002001F *CP/M 2.2 With Double D* **$89.95**

APPLE II ACCESSORIES

DISK DRIVE For Apple™

Totally Apple compatible 143,360 bytes per drive on DOS 3.3 Full one year warranty, half-track capability reads all Apple software, plugs right into Apple controller as second drive DOS 3.3, 3.2.1, Pascal, & CP/M compatible

MSM-431010 *Add-on Apple Drive* **$249.95**
MSM-431030 *Controller only* **$84.95**
MSM-431040 *Controller w/software* **$99.95**

16K RAM Card For Apple II™

Expand your Apple II to 64K use as language card, full one year warranty Why spend $175.00?

MEX-19700A *Save over $115.00* **$49.95**

80 COLUMN APPLE™ Card

80 column x 24 line video card for Apple II addressable 25th status line normal/inverse or high/low video, 128 ASCII characters, upper and lower case 7 x 9 dot matrix with true descenders, CP/M, Pascal & Fortran compatible 50/60 Hz, 40/80 column selection from keyboard Best 80 column card!

IOV-2500A *80 column card* **$149.95**

Z-Card For APPLE II™ - A.L.S.

Two computers in one Z-80 & 6502 more than doubles the power and potential of your Apple includes Z-80 CPU card, CP/M 2.2 and complete manual set Pascal compatible utilities are menu-driven One year warranty

CPX-9280A *A & T with CP/M 2.2* **$159.95**

SERIAL I/O Card - A.L.S.

Full feature serial card for modems & printers baud rates from 110 to 19,200, CTC-RTS & X-on/X-off protocols, auto line feed, RS-232C cable interface included

IOI 1000A *A & T "Dispatcher Card"* **$129.95**

CP/M 3.0 Card For Apple™ - A.L.S.

The most powerful card available for your Apple!

6 MHz Z-80B, additional 64K of RAM CP/M 3.0 Plus 100% CP/M 2.2 compatibility C Basic CP/M graphics, 300% faster than any other CP/M for Apple One year warranty

CPX-9281A *A L S CP/M Card* **$369.95**

JADE
Computer Products
4901 West Rosecrans Ave. Hawthorne, California 90250
CIRCLE 185 ON READER SERVICE CARD

Sound Tables: Fast Sound Effects From Basic

Christopher Adams

Having survived a myriad of attacking space creatures, the sounds of dying aliens and exploding laser bases singing in my ears, I returned to Applesoft and resumed programming. Like many aspiring programmers, I dreamed of writing my own action-packed arcade games. But since the only language I knew was Basic, I knew I had a while to go.

Still, I had mastered shape tables and done some interesting graphics routines. Some of my programs could have been convincing except for one missing feature—sound. The best I could manage was a sickening buzz created by repeatedly POKEing -16336 or the familiar boring beep.

Then I discovered machine language. It was so easy to make sounds that I decided to write a small program that would enable virtually any sound effect to be executed through Basic.

You might have seen sound routines that enable you to select the tone and the duration for a single tone. These are fine for games, but they do have drawbacks. First of all they have a limited range of tones. Second, the higher notes have shorter durations. And most important, any string of tones is subject to pauses where Basic processes the next piece of data.

Wouldn't it be convenient I thought, if any complete sound could be executed with one command? My answer was Sound Table. It is similar to shape tables in that you must create a table of data, select the sound number, then execute it. The table can consist of as many as of 256 sounds, each consisting of up to 255 tones or pauses. A sound can be anything from a single note to an explosion to the

Christopher Adams, 1864 Mathews, Vancouver, BC Canada V6J 2T6.

Listing 1.

```
0300-   A5 F9        LDA   $F9
0302-   0A           ASL
0303-   08           PHP
0304-   18           CLC
0305-   6D D6 03     ADC   $03D6
0308-   A8           TAY
0309-   8D 19 03     STA   $0319
030C-   A9 00        LDA   #$00
030E-   6D D7 03     ADC   $03D7
0311-   28           PLP
0312-   69 00        ADC   #$00
0314-   AA           TAX
0315-   BD 1A 03     STA   $031A
0318-   AD 00 90     LDA   $9000
031B-   C8           INY
031C-   D0 01        BNE   $031F
031E-   E8           INX
031F-   8C 27 03     STY   $0327
0322-   A8           TAY
0323-   8E 28 03     STX   $0328
*326L

0326-   AD 01 90     LDA   $9001
0329-   AA           TAX
032A-   98           TYA
032B-   8D 32 03     STA   $0332
032E-   8E 33 03     STX   $0333
0331-   AC 02 90     LDY   $9002
0334-   84 FB        STY   $FB
0336-   18           CLC
0337-   69 01        ADC   #$01
0339-   D0 01        BNE   $033C
033B-   E8           INX
033C-   8D 6D 03     STA   $036D
033F-   8E 6E 03     STX   $036E
0342-   18           CLC
0343-   8C 47 03     STY   $0347
0346-   69 01        ADC   #$01
0348-   90 01        BCC   $034B
034A-   E8           INX
034B-   8D 72 03     STA   $0372
034E-   8E 73 03     STX   $0373
*351L

0351-   18           CLC
0352-   8C 56 03     STY   $0356
0355-   69 01        ADC   #$01
0357-   90 01        BCC   $035A
0359-   E8           INX
035A-   8D 78 03     STA   $037B
035D-   8E 79 03     STX   $0379
0360-   20 64 03     JSR   $0364
0363-   60           RTS
0364-   A6 FB        LDX   $FB
0366-   B6 FD        STX   $FD
0368-   A2 00        LDX   #$00
036A-   86 FA        STX   $FA

036C-   BD 03 90     LDA   $9003,X
036F-   85 FF        STA   $FF
0371-   BD 04 90     LDA   $9004,X
0374-   8D AA 03     STA   $03AA
0377-   BD 05 90     LDA   $9005,X
037A-   8D B1 03     STA   $03B1
037D-   20 92 03     JSR   $0392
*3B0L

0380-   A4 FD        LDY   $FD
0382-   88           DEY
0383-   F0 08        BEQ   $038D
0385-   A6 FA        LDX   $FA
0387-   E8           INX
0388-   84 FD        STY   $FD
038A-   4C 6A 03     JMP   $036A
038D-   60           RTS
038E-   A5 FE        LDA   $FE
0390-   85 FF        STA   $FF
0392-   AD AA 03     LDA   $03AA
0395-   F0 2B        BEQ   $03C2
0397-   A9 00        LDA   #$00
0399-   38           SEC
039A-   ED B1 03     SBC   $03B1
039D-   8D A8 03     STA   $03A8
03A0-   A6 FF        LDX   $FF
03A2-   CA           DEX
03A3-   F0 1C        BEQ   $03C1
03A5-   86 FF        STX   $FF
*3A7L

03A7-   A2 F0        LDX   #$F0
03A9-   A9 02        LDA   #$02
03AB-   38           SEC
03AC-   E9 01        SBC   #$01
03AE-   F0 08        BEQ   $03B8
03B0-   A0 10        LDY   #$10
03B2-   88           DEY
03B3-   D0 FD        BNE   $03B2
03B5-   4C A8 03     JMP   $03A8
03B8-   8D 30 C0     STA   $C030
03BB-   CA           DEX
03BC-   D0 E8        BNE   $03A9
03BE-   4C A0 03     JMP   $03A0
03C1-   60           RTS
03C2-   A6 FF        LDX   $FF
03C4-   CA           DEX
03C5-   F0 FA        BEQ   $03C1
03C7-   AC B1 03     LDY   $03B1
03CA-   88           DEY
03CB-   D0 FD        BNE   $03CA
*3CDL

03CD-   A0 FF        LDY   #$FF
03CF-   88           DEY
03D0-   D0 FD        BNE   $03CF
03D2-   4C C4 03     JMP   $03C4
```

entire "Star Spangled Banner."

To use Sound Table, you must first POKE in the machine language routine in Listing 1 and then BSAVE it. From then on all that is required is to BLOAD it at the beginning of your program and put the table pointer in locations 982-983 (these are just like locations 232-233 for shape tables).

Once the machine language program and a sound table are in, memory location 249 is POKEd with the sound number to be used (the first sound being #0). When the Basic instruction call 768 is encountered, the sound table program executes the sound number currently in location 249.

Sound Table is very efficient, and is therefore useful in machine language programs so I have provided the assembler listing as well as the Basic listing to POKE it into memory.

Getting Started

To get Sound Table going, just type in the Basic program in Listing 2 and run it. The program has a simple error-checking routine. If everything is in order, the program will create a simple sound table, and if it works a beep will be emitted.

If it doesn't do this, check the data again.

After successfully running the program, type BSAVE SOUND TABLE,A$300, L$D5. This will create a machine language file on your disk that can be retrieved with BLOAD SOUND TABLE. If you don't have a disk drive, just POKE in all the data at the beginning of any program that uses Sound Table.

Listing 2. Sound Table.

```
1  CLEAR
10 A = 768
15  READ D: IF D > 255 THEN 150
16 DT = DT + D
20  POKE A,D:A = A + 1: GOTO 15
100  DATA  165,249,10,8,24,109,21
     4,3
101  DATA  168,141,25,3,169,0,109
     ,215
102  DATA  3,40,105,0,170,141,26,
     3
103  DATA  173,0,144,208,208,1,23
     2,140
104  DATA  39,3,168,142,40,3,173,
     1
105  DATA  144,170,152,141,58,3,1
     42,51
106  DATA  3,172,2,144,132,251,24
     ,105
107  DATA  1,208,1,232,141,109,3,
     142
108  DATA  110,3,24,140,71,3,105,
     1
109  DATA  144,1,232,141,114,3,14
     2,115
110  DATA  3,24,140,86,3,105,1,14
     4
111  DATA  1,232,141,120,3,142,12
     1,3
112  DATA  32,108,3,96,166,251,13
     4,253
113  DATA  162,0,134,250,189,3,14
     4,133
114  DATA  255,189,4,144,141,170,
     3,189
115  DATA  5,144,141,177,3,32,146
     ,3
116  DATA  164,253,136,240,8,166,
     250,232
117  DATA  132,253,76,106,3,96,16
     5,254
118  DATA  133,255,173,170,3,240,
     43,169
119  DATA  0,56,237,177,3,141,168
     ,3
120  DATA  166,255,202,240,28,134
     ,255,162
121  DATA  240,169,2,56,233,1,240
     ,8
122  DATA  160,16,136,208,253,76,
     171,3
123  DATA  141,48,192,202,208,235
     ,76,160
124  DATA  3,96,166,255,202,240,2
     50,172
125  DATA  177,3,136,208,253,160,
     255,136
126  DATA  208,253,76,196,3,300
150  IF DT <  > 25333 THEN  PRINT
     "I THINK YOU MADE A MISTAKE
     IN ENTERING THE DATA"
155  FOR A = 36864 TO 36869: READ
     D: POKE A,D: NEXT A: POKE 98
     2,0: POKE 983,144: POKE 249,
     0: CALL 768
160  DATA  2,144,1,3,2,180
```


FineTech Presents

THE WOODBURY SERIES.

Because your home computer furniture shouldn't look like computer furniture.

Computer furniture. The phrase alone brings to mind cold steel legs and pressboard veneer. But as our computer age swiftly moves into the home, FineTech realizes the need for custom-made fine furniture to house the *personal* computer. Thus the handcrafted solid oak designs of the Woodbury Series.

Choose either our traditional or contemporary design, in your preference of three hand-stained finishes. Each making its mark as fine furniture to even the most discriminating tastes, yet you'll find that the Woodbury Series is priced very affordably. Call or write for our full color complimentary brochure and specifications. Because there's no reason for your computer furniture to look like computer furniture.

FineTech
FURNITURE, INC.
P.O. Box 280 Woodbury, TN 37190
615/765-5021

Yes, I am interested in the Woodbury Series. Please send me your brochure.

NAME _____

ADDRESS _____

CITY _____

STATE _____ *ZIP* _____

FINETECH FURNITURE, INC.
P.O. Box 280 Woodbury, TN 37190

CIRCLE 166 ON READER SERVICE CARD

Sound Tables, continued...

Making A Table

You can either learn to make tables by hand or you can use the Soundmaker program (Listing 3) to simplify the process. The first thing you must know is what makes up a tone. Each tone consists of three pieces of data: duration (2-255), coarse tone (2-255), and fine tone (2-255). Notice that the parameters for all these are 2-255—a 2 for the duration causes a duration of one unit and a 2 for fine tone causes a frequency of one unit. In other words, the actual unit used = desired unit + 1.

Next we must distinguish between coarse tone and fine tone. As I mentioned earlier, one byte isn't sufficient to designate all the possible tones, so the frequency is derived from coarse tone times fine tone (CT-1 * FT-1). In this program the higher the tone (frequency) the lower the tone sounds. This is because Sound Table makes the tone by making a delay loop; the length is specified by the tone between clicks of the speaker.

Duration is a loop which specifies how many times the speaker is clicked. The longer the time between clicks (frequency), the longer the duration. Sound Table automatically counters this, but there will still be a slight stretching of duration for very low tones.

To create pauses between notes, make the coarse tone equal to zero (this is the one exception to the 2-255 parameter. In this case, the duration is still duration, but fine tone becomes fine duration. The duration of a pause is much shorter than that of a tone, so make the duration a high number.

Before getting into the table structure it would be best to familiarize yourself with Sound Table by using Soundmaker. Type in Soundmaker and run it. To give you an idea of what tone all these pieces of data create, use the following procedures to make a tone similar to the CTRL-G beep, using the data pieces CD-3, CT-3, FT-50.

The first question asked is where to put the table in memory. Since the table isn't relocatable as are shape tables, it is necessary to decide now. If you have a 48K Apple, the best place to put it is about 36864 ($9000 hex) setting himem to 36863.

The next question is how many sounds you want in this table. This can be any number from 1 to 256. For this example enter 1. You will then enter the create mode. Choose a length of 1 for the number of tones and pauses in this sound. You will then get the prompt CD,CT,FT (duration, coarse tone, fine tone).

Enter 3,3,50. Try listening to it; it should sound like the CTRL-G beep. Next enter the editing mode. Fiddle around by changing the data. Adjusting all CD will increase the length of all the tones in the sound you are working on (in this case only one tone). A similar action is taken when CT and FT are adjusted. Be careful that adjustments do not push any of the data beyond the 2 to 255 limits.

When you have made your adjustments, return to the main menu and select option 2. Re-create the sound. This time choose a longer length and try different combinations of tones and pauses—you might even try writing a short tune. Once you have satisfied your curiosity choose Next Sound. The program will finish creating the table and ask you what you want to name it. Even if you don't want to keep this table give it a name anyway to see what comes next (you can delete it later). Soundmaker will give you all the

Listing 3.

```
1   HOME : CLEAR : PRINT  CHR$ (4)
    "BLOAD SOUND TABLE"
5   INPUT "WHERE IS THIS TABLE TO
    BE LOCATED ";ST:PS = ST
6 MS =  INT (ST / 256):LS = ST -
    (MS * 256): POKE 982,LS: POKE
    983,MS
10  INPUT "HOW MANY SOUNDS?";NS:S
    N = 1
11 PS = (NS * 2) + ST
20  HOME : PRINT "                C
    REATE MODE": PRINT "SOUND #"
    ;N
25  INPUT "LENGTH OF THIS SOUND "
    ;L
26 MS =  INT (PS / 256):LS = PS -
    (MS * 256)
28  POKE (ST + ((SN - 1) * 2)),LS
    : POKE (ST + 1 + ((SN - 1) *
    2)),MS
30  POKE PS,L
35  FOR X = 1 TO L: INPUT "CD,CT,
    FT ";CD,CT,FT
40  POKE (PS + X),CD: POKE (PS +
    L + X),CT: POKE (PS + L + L +
    X),FT: NEXT
45  INPUT "DO YOU WANT TO HEAR IT
    ?";I$: IF  LEFT$ (I$,1) = "Y
    " THEN  POKE 249,(SN - 1): CALL
    768
50  HOME : PRINT "      1 :NEXT SO
    UND": PRINT "       2 :RE-CREA
    TE": PRINT "        3 :EDIT MOD
    E"
55  GET I$:I =  VAL (I$): ON I GOTO
    60,20,70: GOTO 55
60  SN = SN + 1: IF SN > NS THEN 2
    80
65  PS = PS + 1 + (3 * L): GOTO 20

70  HOME : PRINT "
        EDIT MODE": PRINT : PRINT
    "      1 :CHANGE ALL OF ONE
    TONE": PRINT "      2 :CHANG
    E ALL CD'S": PRINT "      3
    :CHANGE ALL CT'S": PRINT "
    4 :CHANGE ALL FT'S": PRINT "
    5 :LISTEN":
72  PRINT "       6 :RETURN": POKE
    34,0
75  GET I$:I =  VAL (I$): ON I GOTO
    80,90,100,110,120,130 GOTO 7
    5

80  HOME : INPUT "WHICH TONE #";T
    N
82  PRINT "OLD VALUES---"; PEEK (
    PS + TN);"--"; PEEK (PS + L +
    TN);"--"; PEEK (PS + L + L +
    TN): INPUT "NEW CD,CT,FT ";C
    D,CT,FT
85  POKE (PS + TN),CD: POKE (PS +
    L + TN),CT: POKE (PS + L + L
    + TN),FT: HOME
87  GOTO 75
90  INPUT "WHAT DO YOU WANT TO AD
    D TO ALL THE CD'S (A NEGATIV
    E # WILL DECREMENT THEM) ";I

95  FOR X = (PS + 1) TO (PS + L):
    POKE X,( PEEK (X) + I): NEXT
    X: HOME : GOTO 75
100 INPUT "WHAT DO YOU WANT TO A
    DD TO ALL THE CT'S (A NEGATI
    VE # WILL DECREMENT THEM) ";
    I
105 FOR X = (PS + L + 1) TO (PS +
    L + L): POKE X,( PEEK (X) +
    I): NEXT X: HOME : GOTO 75
110 INPUT "WHAT DO YOU WANT TO A
    DD TO ALL THE FT'S (A NEGATI
    VE # WILL DECREMENT THEM) ";
    I
115 FOR X = (PS + L + L + 1) TO
    (PS + (3 * L)): POKE X,( PEEK
    (X) + I): NEXT X: HOME : GOTO
    75
120 POKE 249,(SN - 1): CALL 768:
    HOME : GOTO 75
130 POKE 34,0: HOME : GOTO 50
200 POKE 34,0: HOME : PRINT " TH
    E TABLE IS FINISHED!!!!!"
201 NS = NS
205 LE = (3 * L) + 1
210 PRINT : PRINT : PRINT : PRINT
    "STARTING AT ";ST: PRINT "LE
    NGTH ";LE
215 INPUT "WHAT DO YOU WANT TO N
    AME IT?";NAME$
220 S$ =  CHR$ (4) + "BSAVE " + N
    AME$ + ",A" + STR$ (ST) + "
    ,L" + STR$ (LE): PRINT S$
225 PRINT "WHEN USING THIS TABLE
    POKE 982,"; PEEK (982): PRINT
    "AND POKE 983,"; PEEK (983)
230 PRINT "POKE 249,(";0;" TO ",
    NS - 1;") TO SELECT THE SOUN
    D #": PRINT "THEN CALL 768":
    END
```

What the home computer was really meant for.

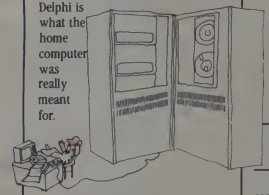
Your Home Computer Is Just The Beginning.

You've got your home finances organized, learned a little French, played a lot of Zork. You have all the software you want.

Yet, something is missing.

Introducing Delphi™. The information, communications and entertainment system that takes you far beyond the limitations of disks and cartridges. The system that's so friendly the whole family can use and enjoy it.

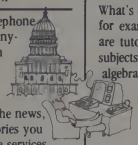
Delphi is what the home computer was really meant for.



Here's What Delphi Gives You Now.

With a simple telephone call, you can look up anything in a vast research library which includes a 20,000-entry encyclopedia. You can do your banking. Get the news, weather and sports stories you want from several wire services. Check airline schedules and make reservations. Shop from an electronic catalog. Tap into the Comp-U-Store* discount shopping service. Keep track of your appointments. Play games. Get in touch with other people through the electronic bulletin board, mail and "talk" services. Seek advice from other members and volunteer your own expertise. Collaborate on the Delphi novels. Take part in or run a subscriber poll.

That's just the beginning.



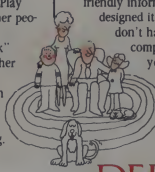
You Can Be Part Of The Design Committee.

We're continually adding new services. But only services we think you and your family will use and enjoy. What's coming, for example, are tutorials on subjects from algebra to zoology.

You can be part of the design committee. Just tell us what you'd like to see on Delphi.

So Friendly, You Don't Even Need Our Handbook.

Delphi is the easy-to-use, friendly information system. We designed it for humans. You don't have to speak computerese. In fact, you don't even need our friendly handbook. We'll take you on a guided tour right on your screen.



The Price Is Friendly, Too.

It's just $49.95 to establish your Delphi membership and for the handbook to get you started. Then just as little as 85 cents for 10 minutes ($5 per hour) on-line for most services during home time . . . evenings, weekends and holidays. Office time, of course, is more.

Delphi Is Compatible With Your Equipment.

No matter what home computer you have, you can use Delphi. Unlike other systems, Delphi is compatible with all makes and is easily adaptable to any screen size. And you can use just about any acoustic coupler or direct connect modem to connect Delphi to your telephone.

We Protect Your Privacy.

We designed privacy into Delphi from the start. Our password system prevents unauthorized access. We don't even know your password, and you can change it any time. We can't monitor your transactions or communications. We can't retrieve information except at your request. The safeguards are spelled out in our policy statement and agreed to by our people. A copy is available. We are members of and subscribe to the policies of the Videotex Industry Association.

Sign Up, Log On, Be In Touch.

To sign up and log on, or for more information, just see your dealer. Or get in touch with Delphi.

We'll put your computer in touch with destiny.

*Comp-U-Store is a registered trademark of Comp-U-Card of America

Dealer Inquiries Invited

DELPHI™

What the home computer was really meant for.

General Videotex Corp., 3 Blackstone Street, Cambridge, MA 02139 (800) 544-4005 (617) 491-3393

CIRCLE 174 ON READER SERVICE CARD

NOW You Can Draw Literally Anything With Your Apple II

And More!

CAD IS WITHIN YOUR REACH

Introducing affordable computer-aided drafting. ROBOGRAPHICS™ MDS turns your *standard* Apple* II (or Apple* IIe) into a professional drafting and graphics center that generates schematics, mechanical drawings, architectural layouts and business presentations. Simply, effectively, and unbelievably fast.

This powerful, productive system allows the design engineer, draftsperson, architect and illustrator to create. It leaves tedious alterations, symbol repetition and other time-consuming chores to the computer.

Operating MDS. This truly user-friendly, interactive system utilizes a unique controller which serves as both the drawing instrument and function selector. There are no keystroke commands to interrupt the workflow. And once the program has been loaded there is practically no need to touch the computer again. With ROBOGRAPHICS MDS you do not need computer know how. Just sit back and create your designs and drawings, starting within minutes of installation.

MDS, your Image-processor. As with a word-processor, ROBOGRAPHICS MDS helps the creative flow of images by taking all the effort out of editing. You create, electronically. Without making a single mark on paper you can draw, store, retrieve, amend, then store again. Perfect camera-ready linework can be plotted, when needed, on paper, vellum, drafting film, or recorded on video tape or photographic slides.

MDS has many unique features, including a library of unlimited size that stores your customized pre-drawn shapes and symbols. Symbols, such as electrical components, that can be used over and over in the design process, scaled automatically to the appropriate size. ROBOGRAPHICS MDS is surprisingly affordable. At $1,095 for the complete hardware/software system, MDS gives you the CAD capability you can not afford to be without.

To preview this remarkable system, send for the MDS brochure, or send $15 for your advance copy of the MDS User Manual to ROBO-GRAPHICS, Suite 2B, 125 Pheasant Run, Newtown, PA 18940. Credit for this amount will be given when you order the system. For faster service, call us with your MasterCard, VISA or American Express card number at (215) 968-4422.

*A registered trademark of Apple Computer Inc

ROBO GRAPHICS

CIRCLE 238 ON READER SERVICE CARD

Sound Tables, continued...

necessary information for using the shape table in your own program.

When using Sound Table you must always load the program itself and an actual table and POKE in the table pointers at locations 982 and 983 (Soundmaker will tell you what values to use).

Table Structure

The first section of the table holds the sound pointers. The first two bytes are the absolute address of sound 1 (remember that if location 249 equals 0, then sound 1 is executed; if it equals 1 then sound 2 is executed). The next two bytes point to sound 2 and so on. Note that there is no place to designate the number of sounds in the table, so an attempt to execute a non-existent sound will cause random effects.

The absolute address goes in the order of least significant byte followed by the most significant byte. To find the decimal equivalent MSB=int (address/256) and LSB=address-(MSB*256).

The data tables for the sounds do not have to appear in any sort of order. The datafield for each sound starts with a byte specifying the number of tones in the sound (for this discussion this byte will become the variable L).

The next L number of bytes contain all the durations. That is, the first byte after L is the duration for the first tone, the second byte is the duration of the second tone, and so on. Immediately after the last duration byte comes the first coarse tone byte, followed by the CT for the second tone. After the last coarse tone byte comes the first fine tone byte, followed by the second, etc.

Table 1 details the components of the tone CD-3,CT-2,FT-70 followed by tone CD-2,CT-3,FT-100. The table starts at 36864. If there were two sounds the pointer for the second sound would have been at 36866 and sound 1 would have started at 36868.

Table 1.

36864:	2	144	points to sound 1
36866:	2		length of sound 1
36867:	3		duration of tone 1
36868:	2		duration of tone 2
36869:	2		coarse tone of 1
36870:	3		coarse tone of 2
36871:	70		fine tone of 1
36872:	100		fine tone of 2

Summary

Now that Sound Table is up and running, you can create a table with 256 sounds each of which can have 255 parts. The sound number can be selected by POKEing 249 and executed by call 768. The program is located starting at 768 ($300 hex), and the actual table is pointed to by locations 982-983(LSB-MSB). □

discount software

CALSOFT

Personal—Entertainment—Business

SOFTWARE

Low Discount Prices/15% to 25% Discount off List Price
Fast Convenient Service/Same day shipping on most orders
Large Selection of Software/Call or Write for our FREE Catalog!

We have all the latest software—ASK US!

ATARI, IBM PC, CP/M: send for FREE catalog!

***Call Toll Free:** (800) 423-5290 **In California:** (213) 991-9641*

BEAGLE

	List Price	Our Price
DOS Boss	24.00	20.40
Utility City	29.50	25.05
Apple Mechanic	29.50	25.05
Pronto DOS	29.95	25.45
★ Double Take	34.95	26.20

BPI GENERAL LEDGER
~~395.00~~ 316.00

BPI SYSTEMS

Accounts Receivable	395.00	316.00
Accounts Payable	395.00	316.00

BRODERBUND

David's Midnight Magic	34.95	29.70
★ The Arcade Machine	59.95	44.95
Choplifter	34.95	29.70
Serpentine	34.95	29.70
Sea Fox	29.95	25.45
AE	34.95	29.70
★ Bank Street Writer	69.95	52.45
Gumball	29.95	25.45
Lode Runner	34.95	29.70

CONTINENTAL

★ Home Accountant	74.95	56.20
CPA Modules #1-4 (each)	250.00	199.95
★ FCM	99.95	74.95

EDU-WARE

Rendezvous	39.95	33.95
Prisoner 2	32.95	26.00
★ Algebra 1-4 (each)	39.95	29.95
Algebra 5 & 6	49.95	42.45
Fractions/Decimals (each)	49.00	41.65
PSAT/SAT Word Skills (each)	49.00	41.65

INFOCOM

★ Zork I, II, III (each)	39.95	29.95
Deadline	49.95	42.45
★ Starcross	39.95	29.95
Suspended	49.95	42.45

MICROSOFT

★ Multiplan	275.00	206.25
Typing Tutor II	24.95	21.20
★ TASC Compiler	175.00	131.25
RAM Card	99.95	84.95

PENGUIN

★ Complete Graphics System	69.95	52.45
★ Graphics Magician	59.95	44.95
Special Effects	39.95	33.95
Spy's Demise	19.95	16.95
Transylvania	19.95	16.95
Crime Wave	19.95	16.95

SIERRA ON-LINE

	List Price	Our Price
Wizard & the Princess	32.95	26.00
★ Ulysses	34.95	26.20
★ Dark Crystal	39.95	29.95
Cross Fire	29.95	25.45
★ Screenwriter II	129.95	97.45
★ Screen Writer Professional	199.95	149.95
★ Ultima II	59.95	44.95
Frogger	34.95	29.70
The Artist	79.95	67.95
General Manager	229.00	183.20
Jawbreaker	29.95	25.45
Learning with Leeper	34.95	29.70
Dragon's Keep	29.95	25.45
Bop-a-Bet	25.95	22.05
Troll's Tale	29.95	25.45
Sammy Lightfoot	29.95	25.45

SIR-TECH

Wizardry	49.95	42.45
Knight of Diamonds	34.95	29.70
Legend of Llylgamyn	39.95	33.95
Star Maze	34.95	29.70

FREE DISKETTE
with each order over $50.
Just mention this ad.

SOFTWARE PUBLISHING

★ PFS	125.00	93.75
★ PFS: Report	125.00	93.75
PFS: Graph	125.00	106.25

SPINNAKER

★ Snooper Troops #1, #2 (each)	44.95	33.70
Story Machine	34.95	29.70
Face Maker	34.95	29.70
Delta Drawing	59.95	50.95

STONEWARE

★ DB Master	229.00	171.75
DB Master Utility Pak #1	99.00	84.15
DB Master Utility Pak #2	99.00	84.15

TG PRODUCTS

★ Joystick	59.95	44.95
Game Paddles	39.95	33.95
★ Select-a-Port	59.95	44.95

ULTRASOFT

Mask of the Sun	39.95	33.95
★ Serpent's Star	39.95	29.95

XEROX

Sticky Bear Bop	39.95	33.95
Sticky Bear Numbers	39.95	33.95
Sticky Bear ABC	39.95	33.95

SIRIUS SOFTWARE

	List Price	Our Price
★ Blade of Blackpoole	39.95	29.95
The Joyport	49.95	42.45
★ Type Attack	39.95	29.95
Wavy Navy	34.95	29.70
★ Repton	39.95	29.95
Critical Mass	39.95	33.95
Fowl Play	39.95	33.95

MERLIN
~~84.95~~ 48.70

SOUTHWESTERN

★ Ascii Express Professional	129.95	97.45
Routine Machine	64.95	55.20
Munch-a-Bug	49.95	42.45
SDS Combo	119.95	101.95

STRATEGIC SIMULATIONS

Napoleon's Campaigns	59.95	50.95
★ Road to Gettysburg	59.95	44.95
Guadalcanal Campaign	59.95	50.95
The Cosmic Balance	39.95	33.95
★ Germany: 1985	59.95	44.95
Battle for Normandy	39.95	33.95
★ Galactic Adventures	59.95	44.95
Bomb Alley	59.95	50.95
Epidemic	34.95	29.70
Fighter Command	59.95	50.95
RDF: 1985	34.95	29.70
North Atlantic '86	59.95	50.95
Knights of the Desert	39.95	33.95

VISICORP

★ Visicalc	250.00	193.75
★ Visitrend/Visiplot	300.00	225.00
★ Visifile	250.00	193.73

We also carry complete lines from the following companies:

ASHTON-TATE • AVANTE-GARDE
BUDGECO • DATAMOST
DATASOFT • HAYDEN
HAYES • KRAFT
KENSINGTON • LEARNING CO.
LOTUS • MICROLAB
MICROPRO • PEACHTREE
SILICON VALLEY • MUSE
ODESTA • QUALITY
SOFTWARE DIMENSIONS
SATURN • SENSIBLE
SUBLOGIC • SYNERGISTIC
TERRAPIN • VIDEX

If you don't see it, Ask Us!

CALSOFT

346 N. Kanan Rd. #103
Agoura, CA 91301

***Call Toll Free:** (800) 423-5290 **In California:** (213) 991-9641*

We accept Mastercard & Visa (include # and Expiration Date), check, COD ($1.50 extra), or Money Order. California residents add 6% sales tax. Include $2.00 for shipping (UPS Blue Label $3.00, Canada $6.00, other foreign countries 10% of order - minimum $10.00).

★ Sale prices are through August only! Prices subject to change without notice.

CIRCLE 128 ON READER SERVICE CARD

Apple Hit List

Cyborg	$22
Crisis Mountain	$23
Cytron Masters	$27
S.E.U.I.S.	$27
Knight of Diamonds	$27
Way Out	$27
Zaxxon	$27
S.A.G.A. Adventure	Ea $27
Serpentine	$23
Choplifter	$23
Frogger	$23
Sea Fox	$20
Temple of Apshai	$27
Ultima	$27
Zork I	$27
Zork II	$27
Zork III	$27
Castle Wolfenstein	$20
Wiz & Princess	$22
Ulysses & The Golden Fleece	$20
Wizardy	$34
Tigers In The Snow	$27
Sherwood Forest	$23
Deadline	$34
Bandits	$23
Starcross	$27
Aztec	$20
Mask of the Sun	$27
Pie Men	$20
Minar 2049er	$29
Wavy Navy	$23
Ultima	$39
Dork Crystal	$27
Evolution	$34
Millionaire	$55
Hi Res Secret	$79
Police Artist	$23
Suspended	$35
S A G A: Secret Mission	$27

Pre-School/ Educational

Sticky Beer Bop	$30
Sticky Beer Numbers	$30
Sticky Beer ABC	$30
In Search of Amazing Things	$27
Hey Diddle Diddle	$20
Snooper Troops #1/Spinnaker	$30
Snooper Troops #2/Spinnaker	$30
Delta Drawing/Spinnaker	$45
Story Maker/Spinnaker	$26
Face Maker/Spinnaker	$26
Rhymes & Riddles/Spinnaker	$20
PLATO Whole Numbers	$39
PLATO Decimals	$39
PLATO Fractions	$39
Alien Counter/Face Flash	$24
Quip & Arrow Graphics	$24
Franzy-Flip/Flop	$24
Battling Bugs/Concentretion	$24
The Jar Game/Chaos	$24
PDI Preschool IQ Builder	$24
Pienetery Guide/Synergistic	$23
Star Gazers Guide/Synergistic	$27
Astro Quotes/PDI	$17
Juggles Rainbow/Learning Co	$30
Bumble Games/Learning Co.	$30
Bumble Plot/Learning Co	$39
Gertrudes Secrets/Learning Co.	$49
Gertrudes Puzzles/Learning Co.	$49
Rocky's Boots/Learning Co	$39
Compu-Read/Eduware	$23
Spelling Bee w/Reading Primer	$27
Algebra I/Eduware	$34
Fractions/Eduware	$34
Decimals/Eduware	$34
Master Type/Lighting Software	$27
Type Attack/Sirius	$27
Wordrace/Don't Ask	$17
Dueling Digits/Broderbund	$20
SAT Word Attack/Hercourt Brace	$34
New Step by Step/PDI	$59
Whole Brain Spelling/Sublogic	$23

We Now Have Apple IIe & Franklin Computers CALL NOW

Peripherals

Softcard	$229
Ramcard	$ 69
Microsoft Premium Sys (Contains Softcard, Ramcard, Videx, Videoterm)	$479
System Saver Fan	$ 65
Flip & File Diskette Box	$ 21
Enhancer II	$ 99
Lower Case Adapter	$ 25
Microtek Apple Parallel Interface	$ 79
Apple Adepter (Wico Joystick)	$ 17
Wico Joystick	$ 23
Wico Redball	$ 24
Wico Trackball	$ 49
12 Ft Ext Cord	$ 9

Microbuffer II 32K Parallel	$199
Apple Dumpling GX	$ 95
Buttered Dumpling 16K	$155
Buttered Dumpling 32K	$199
8088 Coprocessor Board	$549
Versawriter Graphics Tablet	$209
Videoterm 80 Column Board	$229
Vista Vision 80 Column Board	$189
Smarterm II 80 Column Board	$149
EZ Port	$ 19
Game Peddles	$ 29
Joystick TG	$ 39
Select-A-Port	$ 39
Kraft Joystick	$ 45
Kraft Paddles	$ 34
The Joyport	$ 34
TG Trek Ball	$ 45

Hardware/Printers

Mannesman Telly 160	$ 799
CITOH Prowriter	$ 365
IDS 480 Printer	$ 529
IDS Prism Printer	$1,299
NEC 8023	$ 439
NEC 3530 Printer	$1,599
Qume Sprint II + Printer	$1,359
Microline 82	$ 419
Microline 83	$ 679

Microline 84	$1,029
Microline 93	$ 949
Delta 10/20R	$ 949
Diablo 630R	$1,795
Gemini 10	$ 319
Gemini 15	$ 479
CITOH Printmaster	$1,599
CITOH Starwriter	$1,349
Smith Corona TP-1	$ 499

Call Toll Free **800-634-6766** Order Line Only

Information Order Inquiries (702) 369-5523

1095 E. Twain
Las Vegas, Nevada 89109
(702) 796-0296

★★★ Specials of the Month ★★★

Elephant Disks s/s	**$ 20**
Verbatim Disks s/d	**$ 24**
Maxell Disketts s/d	**$ 30**
Amdek Color I	**$299**
Amdek Color II	**$659**
Micromodem II	**$259**
Micromodem ii w/Terminal Pk.	**$299**
Novation Apple Cat Ii Modem	**$329**
Hayes Smart Modern 300	**$209**
Hayes Smartmodem 1200	**$499**
The Grappler +	**$119**
Rana System 40 Track Drive	**$299**
Rana System 80 Track Drive	**$659**

ORDERING INFORMATION AND TERMS

For Fast Delivery send cashiar checks, money orders or direct bank wire transfers Personal and company checks allow 3 weeks to clear C.O.D. orders ($3.00 minimum) end 1% of all orders over $300. School purchase orders welcomed. Prices reflect a cash discount only and are subject to change. Please enclose your phone number with any orders Shipping — Software ($2.50 minimum) Shipping — Hardware (please call) Foreign orders, APO & FPO orders — $10 minimum and 15% of all orders over $100. Nevada residents add 5¼% sales tax. All goods are new and include factory warranty. Due to our low prices, all sales are final. All returns must have a return authorization number. Call 702-369-5523 to obtain one before returning goods for replacement.

Business & Utilities

Screenwriter II	$ 82
Visicalc 3.3	$165
Visischedule	$199
Visitrend/Visiplot	$199
The Word Handler	$129
Magic Window II	$ 95
Magic Mailer	$ 45
Magic Words	$ 45
Reel Estate Analyzer II	$119
Supercalc	$165
PFS: Report (New)	$ 59
PFS:	$ 79
PFS: Graph	$ 79
The Generel Meneger	$ 97
D.B. Master	$145
Pascal Preprogrmmar	$ 89
Pie Writer	$ 95
Wordster	$299
Datefax	$129
Datelink	$ 65
The Home Accountent	48
Payroll Maneger	$199
Pie Writer/Multi 80 column	$ 95
Pro-Easywriter/Mail Combo	$209
Executive Briefing System	$139
The Sensible Speller	$ 79
Mail Merge	$159
Wordstar (French)	$299
Wordstar (Spanish)	$299
Spellster	$119
Calster	$119
First Class Mail	$ 49
E Z Ledger	$ 45
Tex Menager	$ 99
The Dictionery	$ 65
Versawriter Pak 1	$ 27
Versawritar Pak 2	$ 27
Personel Investor	$ 95
Ganeral Ledger	$239
Accounts Receivable	$239
Accounts Peyable	$239
Executive Secretary	$159
Executive Speller	$ 55
TASC Compiler	$119
Basic Compiler	$ 65
Link Video Apple II	$105
Link Video Appla III	$139
LISA 2.5	$ 55
Bag of Tricks	$ 27
A L D S	$ 89
S A M	$ 85
Super Disk Copy III	$ 20
The Artist	$ 65
3-D Supergraphics	$ 27
Program Line Editor	$ 27

Top Sellers

Canyon Climber	$20
Normandy	$27
Germany	$39
Epidemic	$23
Galactic Adventure	$39
Galactic Gladiator	$27
The Cosmic Balance	$27
The Battle of Shiloh	$27
Guadacanel	$39
Pursuit of the Grel Spree	$39
The Shattered Alliance	$39
Space Eggs	$20
Sneakers	$20
Rendezvous Asteroid	$15
Acey Deucey	$20
AE	$20
Space Vikings	$34
Zenith	$23
Rendevous	$27
Wordrace	$17
Fathom's Forty	$23
Raster Blester	$20
Cyclod	$20
Kebul Spy	$20
Zero Gravity	$20
Electric Dust	$20
Tuesday Morning Quarterback	$20
Hi-Res Computer Golf	$20
David's Midnight Magic	$23
Track Attack	$20
Bug Attack	$20
Sargon II	$23
Hi-Res Football	$27
Star Blazer	$22
Swashbuckler	$23
Rear Guard	$20
Labyrinth	$23

Atari

1200 XL $519
with factory rebate
800 48K $389
with factory rebate
400 16K $159
with factory rebate

1010 Recorder	$ 72
410 Recorder	$ 72
810 Disk Drive	$419
1025 Printer	$409
830 Modem	$145
850 Interface	$159
481 Entertainer	$ 84
482 Educator	$110
483 Programmer	$ 52
484 Communicator	$289
853 16K Ram	$ 74
The Bookkeeper Kit	$165
CX4104 Mailing List	$ 19
CX404 Word Processor	$102
CX4007 Music Composer	$ 42
Programming 2 & 3	$ 22
Conversational Languages	$ 42
CX4018 Pilot	$ 55
CX405 Pilot	$ 92
CXL4003 Assembler Editor	$ 42
CX8126 Microsoft Basic	$ 62
CXL4022 Pac-Man	$ 30
CX8130 Caverns of Mars	$ 28
CXL4020 Centipede	$ 30
CXL4006 Super Breakout	$ 26
CXL4008 Space Invaders	$ 26
CXL4009 Computer Chess	$ 26
CXL4011 Star Raiders	$ 30
XCL4012 Missile Command	$ 26
CXL4013 Asteroids	$ 26
The Bookkeeper	$102
Home Filing Manager	$ 36
Atari Speed Reading	$ 54
My First Alphabet	$ 26
Juggles House (D, C)	$ 22
Juggles Rainbow (D, C)	$ 22
Home Manager Kit	$ 55
Family Finance	$ 36
Time Wise	$ 23
Galaxian	$ 30
Defender	$ 30
Qix	$ 30
Dig Dug	$ 30
ET Home Phone	$ 34
Atari Writer	$ 55

Business & Utilities

Visicalc	$169
Mail Merge	$ 20
Data Perfect	$ 75
Letter Perfect	$105
Text Wizard	$ 65
Datasm65 2.0	$ 59
File Manager 800 +	$ 65
Syn Assembler	$ 34
Page 6	$ 20
Atari World	$ 39
K-Dos	$ 39
Micropainter	$ 23
Color Print	$ 27
Lisp Interpreter	$ 79
Bishops Square	$ 20
Graphic Master	$ 27
Graphic Generator	$ 17
Basic Compiler	$ 65
Computari's Financial Wizard	$ 45
Color Accountant	$ 65
Datalink	$ 27
File It 2 System	$ 34
Diskette Inventory System	$ 17
P M P Property Managamant	$179

Programming Techniques

Display Lists	$ 17
Horiz/Vert Scroll	$ 17
Page Flipping	$ 17
Basics of Animation	$ 17
Player Missile Graphics	$ 24
Sound	$ 24
Data Files	$ 24

Incredible Prices! Incredible Programs!

commodore

VIC 20 . . . . . $ 99
COMMODORE 64 . $289
with factory rebate

1530 DATTASETTE	$ 59
1541 DISK DRIVE	$329
1525 GRAPHIC PRINTER	$329
1600 MODEM	$ 89
1701 MONITOR	$289

VIC 1210 3K Memory Expander	$ 34
VIC 1110 8K Memory Expander	$ 52
VIC 1111 16K Memory Expander	$ 89
VIC 1011 RS-232 Terminal Interface	$ 43
VIC 1211 Super Expander	$ 59
VIC 1212 Programmers Aid Cartridge	$ 45
VIC 1213 Vicmon Machine Language Monitor	$ 45
VL 102 Introduction to Basic Programming	$ 21
VT 106A Recreation Pack	$ 45
VT 107 A Home Calculation Pack	$ 45
VT 164 Programmable Character Set	$ 12

VIC 1600 Vicmodem	$ 89
VIC 1311 Joystick	$ 8
VIC 1312 Game Peddles	$ 16
VM Programmers Reference Guide	$ 14

VIC Software

Avenger	$ 23
Supersloi	$ 23
Super Alien	$ 23
Jupiter Lander	$ 23
Draw Poker	$ 23
Midnight Drive	$ 23
Reder Ret Race	$ 23
Raid on Fort Knox	$ 23
Sargon II Chess	$ 29
Super Smash	$ 23
Cosmic Cruncher	$ 23
Gorf	$ 29
Omega Race	$ 29
Money Wars	$ 23
Menagerie	$ 23
Cosmic Jailbreak	$ 23
Clowns	$ 23
Gerden Wers	$ 23
Sea Wolf	$ 23
Adventureland	$ 29
Pirate Cove	$ 29
Mission Impossible	$ 29
The Count	$ 29
Voodoo Castle	$ 29
The Sky is Falling	$ 23
Mole Attack	$ 23
Bingo Speed Meth	$ 23
Home Babysitter	$ 23
Visible Solar Systam	$ 23
Personal Finance	$ 29
Quick Brown Fox	$ 65

★★★ *Specials of the Month* ★★★

Flip n' Sort Diskette Box (Holds 50 Diskettes)	$ 21
Kraft Joystick	$ 45
Diablo Printer 620R	$ 949
Nec 3530 Printer	$1,599
Microsoft 64K Ram Card	$ 239
IBM Anchor Automation Mark VI Modem	$ 179
Qume Sprint 11 + Printer	$1,349
Wico Joystick	$ 23
Wico Redball Joystick	$ 24
Wico Trackball	$ 49
Microline 92	$ 539
Peachtree 5000	$ 239
USI Amber Monitor	$ 159

Call Toll Free **800-634-6766** Order Line Only

Information & Order Inquires (702) 369-5523
We accept VISA & Mastercard
Mon. - Fri. 8 A.M. - 6 P.M.
Sat. 9 A.M. - 5 P.M.
Dealer Inquiries Invited

CIRCLE 139 ON READER SERVICE CARD

IBM Specials

Advanced Operating Systems

The Programmer	$129

Applied Software

Versaform	$249

Ashton-Tate

sBase II (CP/M 86)	$419
sBase II (MS Dos)	$419

Continental Software

The Home Accountant Plus	$ 95
1st Class Mail	$ 79

Computer Sotware Technology

Word/PC	$ 49

Davidson & Associates

Speed Reader	$ 49

Datamost

Real Estate Investment Program	$ 79
Write-On	$ 65

Comprehensive Software

PC Tutor	$ 55

Denver Software

Executive Accounting System (128K)	$469

Eagle Software

Money Decisions	$129

Howard Software

Real Estate Analyzer II	$159
Tax Preparer 1983	$159

Information Solutions

25:01	$ 65

Innovative Software

T I M III	$299

IUS

Easy Filer	$239
Easy Writer II	$209
Easy Planner	$159
Accounts Receivable	$369
Accounts Payable	$369
General Ledger	$389
Financial Menegement Series	$899

Micro Lab

The Tax Manager	$159

Micro Pro

Wordstar	$299
Mailmerge	$159
Spellstar	$109
Infostar	$299
Reportstar	$209

North American Business Systems

Answer	$159

PBL Corporation

Personal Investor	$ 89

Peachtree

General Ledger	$329
Accounts Receivable	$329
Accounts Payable	$329
Peach Pak (GL/AR/AP)	$329

Software Publishing

PFS Report	$ 84
PFS File	$ 84

Digital Research

Concurrent CP/M 86	$209
C Basic 86	$125
Pascal/MT + 86	$239
Speed Programming Package 86	$125
CIS Cobol 86	$489

Peter Norton Computing

Norton Utilities	$ 55

Select

Select Word Processing System	$299

Softword Systems

Wordmaker	$289

Sorcim/iSA

Supercalc	$179
Supercalc 2	$239
Supercalc 3	$299
Spellguard	$125

Southeastern

Date Capture	$ 75

Visicorp

Visicalc (256K)	$165
Desktop Plan 1	$199
Visitrend/Plot	$199
Visifile	$199
Visidex	$165
Visischedule	$199
Business Forecasting Model	$ 89

The Well-Tempered Apple

Michael Fink

Games and other programs have made Apple users aware of the Apple speaker as a source of music and sound effects. Nearly every guide to Apple programming gives the memory address (49200, -16336, or $C030) at which you can PEEK and "tweak" the speaker. Some sources list a machine language routine which enables you, by supplying one value (1-255) for frequency and another (1-255) for duration, to produce a pitch through the speaker. CALLing such a routine several times in succession, each time supplying new frequency and duration values, results in a sequence of tones, a melody.

Problem: Tuning And Range

This is all well and good for fun-and-games programming. But for genuine musical applications—or better quality recreational software—those routines have serious limitations in tuning accuracy and range (low bass to high treble) because of the limited range of frequency values.

If you try various values in one of those machine language routines, you will have no trouble going high in the range, but the lowest pitch you can access, unfortunately, is somewhere around g. That is certainly not an acceptable lower limit for even the simplest melody.

However, the root of the problem lies not so much in the limited numeric values as in the high operating speed of the machine language routine. The routine, as it stands, simply pushes the speaker in and out at a frequency which cannot be adjusted below a defined limit. Clearly, what is needed is a way of *delaying* each tweak of the speaker, of slowing down the routine in a controlled manner, so that the bottom limit can be lowered significantly through program control. As will be seen, solving the range problem also solves the pitch accuracy problem.

What is needed is a way of delaying each tweak of the speaker.

Solution: A Delay Factor

The following routine produces a pitch somewhere around f:

```
10 X= -16336
20 S= PEEK(X) : GOTO 20
```

But it is probably the highest pitch available by operating the speaker purely from Basic. Because of the inherent slowness of working through the Basic interpreter, there is a built-in delay between one tweak of the speaker and the next.

The delay may be lengthened by adding program lines or delaying loops, and the result will be a lowered pitch. But there is no way of raising the pitch, since the built-in delay in the operation of the Basic interpreter cannot be reduced. Thus, music in a Basic program has a severe *upper* pitch limit problem due to its inherent slowness, and music in a machine language program has an equally severe *lower* pitch limit due to its inherent higher speed.

By applying the principle of delay illustrated above to machine language routines, I arrived at the solution to both the range and tuning problems of the Apple speaker. I employed a fairly common machine language routine (Listing 1) that uses X and Y registers for work

Listing 1. Machine language routine, including delay factor, for sounding pitches.

```
0300-  00          BRK
0301-  00          BRK
0302-  00          BRK
0303-  AC 01 03    LDY   $0301
0306-  AE 01 03    LDX   $0301
0309-  AD 02 03    LDA   $0302
030C-  20 A8 FC    JSR   $FCA8
030F-  AD 30 C0    LDA   $C030
0312-  E8          INX
0313-  D0 FD       BNE   $0312
0315-  88          DEY
0316-  D0 EE       BNE   $0306
0318-  CE 00 03    DEC   $0300
031B-  D0 E6       BNE   $0303
031D-  60          RTS
```

Michael Fink, 4826 Bucknell, San Antonio, TX 78249.

with a frequency value (POKEd into $0301) and a decrementing duration value (POKEd into $0300). However, I added a third value, the *delay factor*, and POKEd it into $0302 for control within the subroutine itself, which begins at $0303.

The value of the delay factor (1-255) is loaded into the accumulator at $0309. Then, at $030C a resident subroutine, JSR $FCA8, is executed. Using the value currently in the accumulator, this subroutine causes the machine language routine to WAIT a specified length of time. (For L = delay factor value, the delay will equal $.5(26+27L+5L^2)$ microseconds, and the accumulator will be zeroed at the end.)

This is the crux of the whole operation, and its implications are twofold. 1) Using large delay factor values makes it possible to lower pitch all the way down to about 1 Hz. 2) It is now possible to arrive at an accurately tuned, equal tempered scale. By increasing or decreasing the delay factor value, the pitch can be lowered or raised by a significant degree. That is, with the frequency value constant, incrementing or decrementing the delay factor changes the pitch by about a half-step. This leaves the frequency value free to "fine tune" the desired pitch.

Tuning The Apple

Using the machine language routine and principles mentioned above, I have arrived at numeric values for a wide range, equal tempered chromatic scale extending from C to e_3 (see Figure 1). Each pitch is accurate to ±1 cent (1% of the distance to the next higher or lower equal tempered pitch). That degree of difference is not apparent to the human ear.

If you wish, you can extend the scale even further in either direction, but you will need to use some sort of tuning device. I used a Korg Chromatic Tuner (model WT-12) and placed it near or against the left side of the Apple where the microphone could pick up the speaker easily and the meter could also be read. Using the Korg, I tested the pitch on four different Apples to make sure that the clock rate of the processor would be consistent among various computers. Accuracy was within .5 cents.

Playing The Apple

Accessing pitch from a Basic program using the machine language routine is not difficult. Two things are necessary: a subroutine that will POKE the three values into memory and CALL the machine language routine that drives the speaker, and a method for assigning values to the three variables for each note.

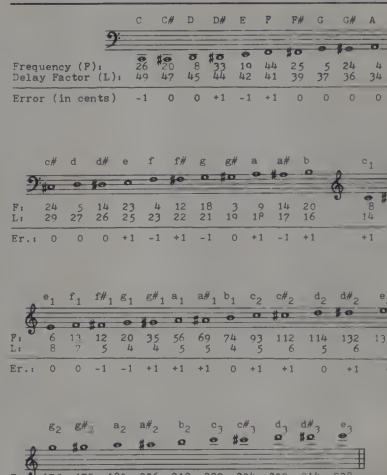


Figure 1. Table of values for a four-octave chromatic scale.

Accessing pitch from a Basic program using the machine language routine is not difficult.

The speaker driver subroutine can be quite simple:

```
10 REM SPEAKER DRIVER
20 POKE 769, F
30 POKE 770, L
40 POKE 768, D
50 CALL 771
60 RETURN
```

For storing variable values, I suggest creating an array of data to be read into the program with one DATA line for each sound. The array can be set up to be used either sequentially or by random access. If arranged sequentially, as in a melody, values are assigned to F (frequency), L (delay factor), and D (duration) for each of N notes:

```
500 FOR I=1 TO N
501 READ F(I), L(I), D(I)
502 NEXT I
1000 REM THREE BLIND MICE
1001 DATA 6,8,50
1002 DATA 5,11,60
1003 DATA 8,14,45
```

If several melodies are required in a program, random access may be more desirable. In that case, the array is made up of the entire, full-range scale of N notes that may be needed, but only F and L values are read in at first:

```
500 FOR I=1 TO N
501 READ F(I), L(I)
502 NEXT I
1000 REM E-MAJOR SCALE
1001 DATA 23,25
1002 DATA 12,22
1003 DATA 3,19
```

Here, the D value for a given note is assigned only when the speaker driver subroutine is CALLed for that note.

FEEL LIKE A KID IN A CANDY STORE?

Now rent or buy all the software you want

SoftRent™ — an exclusive software club since 1981 — has gone public. . . offering unparalleled benefits.

Members
— RENT software at 20% of list price.
— Buy software at 67% of list price.
— LIMITED time offer: $75 *Lifetime Membership.*

Non-Members
— RENT software at 25% of list price.
— Buy software at 75% of list price.

Choose from the most popular Recreational, Educational and Business software available.

Original manufacturers' software complete with manual. Now you can afford all the software you want.

SOFTRENT™

341 S. Cedros Avenue
Solana Beach, CA 92075
8:30 a.m.-4:00 p.m. PST Monday thru Saturday

Orders/Free Brochure Call:
619 481-0559 San Diego
1 800 221-1031 California
1 800 221-4568 All Others

CIRCLE 252 ON READER SERVICE CARD

SOLID, OAK SOFTWARE.

DISTINCTIVE COMPUTER FURNITURE. FACTORY DIRECT. UNCONDITIONALLY GUARANTEED.

All the peripherals you can buy won't help the productivity of your computer system if you don't have an organized way to utilize them. System VII Furniture gives you an efficient comfortable workspace. With the warmth and beauty of hand-rubbed Oak and the affordability of factory-direct delivery.

Write us or call our toll-free number to order a full-color catalog. Send $1.00 plus $1.00 shipping and handling. *$2.00 will be credited toward first purchase.*

SYSTEM VII FURNITURE

CALL: 1-800-547-8888 Dept. G
P.O. Box 427 • Lafayette, Oregon 97127

CIRCLE 189 ON READER SERVICE CARD

Apple Speaker, continued...

The Rhythm Trade-Off

My method of making music through the Apple speaker is three-dimensional, and there are always trade-offs when juggling three dimensions. The trade-off here is one of frequency/delay vs. duration, and the challenge is to maximize tuning accuracy while maintaining as much flexibility as possible in duration or rhythm. Long notes are no problem, but the programmer should be able to sound a pitch for a very short duration as well. The brevity of any note in my system is dependent somewhat on the value of the delay factor. That is why each pitch in Figure 1 is assigned the *lowest* possible delay factor consistent with close tuning.

Since pitch and duration are so interdependent in any program using the Apple speaker, there is no reliable ratio between duration values. For a given duration (say, either a quarter note or 0.5 second) one pitch will require one value and another pitch will require something quite different. Therefore, duration values must be assembled by experimentation.

Conclusion

Although synthesizer cards and complete music systems offer more expensive and more sophisticated means of making music with an Apple, there are still many applications to be explored using immediately accessible sound through the speaker. With accurate and full-range pitch, the speaker possesses more of the capabilities of a real synthesizer and by relatively simple means games and educational programs can include music that actually sounds like music.

"I was afraid of this—it must have something seriously wrong with it!..."

Micro The Computer Book Club®

"The ONLY Book Club for micro users"

Play games . . . develop new programming skills . . . organize your finances . . . earn extra income . . . even build your own microcomputer!

HAVE IT ALL FOR ONLY $2.95

Select any 5 books (values to $94.80) for only $2.95 when you join!

Ready-To-Run Software

(Counts as 2 books)
No. 7113 Tape for TRS-80 Models I or III List $24.95
No. 7114 Disk for TRS-80 Models I or III List $29.95

(Counts as 2 books)
No. 7122 Tape for TRS-80 Models I or III List $14.95
No. 7123 Disk for TRS-80 Models I or III List $19.95
No. 7503 Tape for TS-1000, ZX81 List $14.95

1455 List $15.95

1622 List $17.95

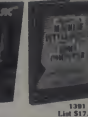
1198 List $14.95

1422 List $14.95

1285 List $16.95

1330 List $19.95

1514 List $19.95


1391 List $17.95

1396 List $13.95

1526 List $19.95

1195 List $13.95

1521 List $17.95

1277 List $19.95

1506 List $12.95

1498 List $17.95

1285 List $16.95

1228 List $14.95

1160 List $13.95

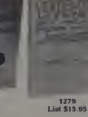
1480 List $22.95

1251 List $16.95

1045 List $13.95

1485 List $21.95

1055 List $18.95


1279 List $15.95

7 very good reasons to try Micro The Computer Book Club®

Blue Ridge Summit, PA 17214

- **Reduced Member Prices.** Save 20% to 75% on books sure to increase your computer know-how
- **Satisfaction Guaranteed.** All books returnable within 10 days without obligation
- **Club News Bulletins.** All about current selections—mains, alternates, extras—plus bonus offers. Comes 13 times a year with dozens of up-to-the-minute titles you can pick from
- **"Automatic Order."** Do nothing, and the Main selection will be shipped automatically! But . . . if you want an Alternate Selection—or no books at all—we'll follow the instructions you give on the reply form provided with every News Bulletin
- **Continuing Benefits.** Get a Dividend Certificate with every book purchased after fulfilling membership obligation, and qualify for discounts on many other volumes
- **Extra Bonuses.** Take advantage of added-value promotions, plus special discounts; on software, games, and more
- **Exceptional Quality.** All books are first-rate publisher's editions, filled with useful, up-to-the-minute information

Micro The Computer Book Club®

Blue Ridge Summit, PA 17214

Please accept my membership in The Computer Book Club® and send the 5 volumes circled below, billing me $2.95 plus shipping and handling charges. If not satisfied, I may return the books within ten days without obligation and have my membership cancelled. I agree to purchase 4 or more books at reduced Club prices (plus shipping/handling) during the next 12 months, and may resign any time thereafter.

1045 1055 1108 1160 1195 1205 1228 1251
1276 1277 1295 1330 1391 1396 1422 1423
1455 1480 1485 1496 1506 1513 1521
1526 7113 7114 7122 7123 7503

Name _____ Phone _____

Address _____

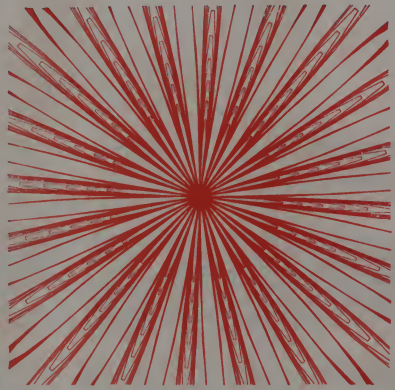
City _____

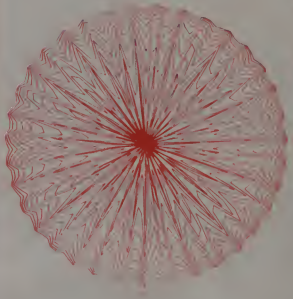
State _____ Zip _____

Valid for new members only. (Orders outside U.S. or Canada must be prepaid in International Money Orders in U.S. dollars. Canada must remit in U.S. dollars.) This order subject to acceptance by The Computer Book Club®

CC-783

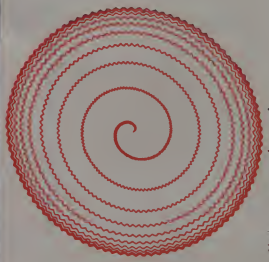
CIRCLE 133 ON READER SERVICE CARD





Computer Art For The Tektronix 4052

```
100 REM WOBBLY SPIRAL
110 PAGE
120 WINDOW -1.1,1.1,-1.1,1.1
130 D=0
140 SET DEGREES
150 PRINT " ENTER 1 FOR SINGLE LAYER, OR 2 FOR OVERLAY."
160 INPUT P
170 PRINT "ENTER L"
180 INPUT L
190 PRINT "ENTER G"
200 INPUT G
210 PRINT "ENTER E"
220 INPUT E
230 PRINT "ENTER K"
240 INPUT K
250 PRINT "ENTER C"
260 INPUT C
270 GO TO 470
280 FOR A=0 TO 3600 STEP G
290 B=E+C*EXP(-L*A)
300 R=1-EXP(-L*A)+-1*(M-1)*B*SIN(K*A)
310 X=R*COS(A)
320 Y=R*SIN(A)
330 IF T1=2 THEN 360
340 VIEWPORT 30,100,30,100
350 GO TO 370
360 VIEWPORT 15,115,0,100
370 IF ABS(A)>0 THEN 400
```



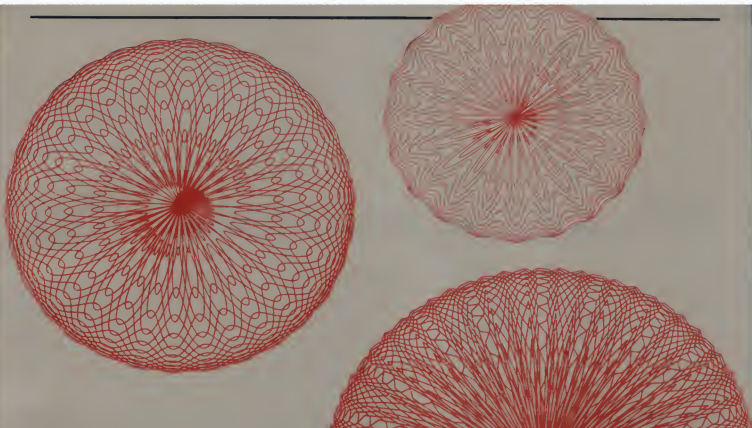
Joe Jacobson

This month I will describe a polar coordinate program that is completely different from those I have presented in past issues of *Creative Computing*. This is the Wobbly Spiral program. The name follows directly from the algorithm.

The program draws an exponential spiral that has a sine wave superimposed on it. The "tightness" of the spiral is controlled by the parameter L. The amplitude and frequency of the sine wave are controlled by the parameters C, E, and K. All these constants are entered from the keyboard, following user prompts.

The sine wave amplitude has a constant component (E) and a component

Joe Jacobson, 675 E. Street Road, Apt. 1009, Warminster, PA 18974.



```
380 MOVE X,Y
390 GO TO 410
400 DRAW X,Y
410 NEXT A
420 Q=Q+1
430 IF P=1 THEN 520
440 IF Q=2 THEN 520
450 M=2
460 GO TO 280
470 PRINT "ENTER T1.  T1 MUST BE 1 OR 2."
480 INPUT T1
490 PAGE
500 M=1
510 GO TO 280
520 IF T1=2 THEN 650
530 WINDOW 0,130,0,100
540 VIEWPORT 0,130,0,100
550 MOVE 0,20
560 PRINT "          WOBBLY SPIRAL PROGRAM PARAMETERS"
570 MOVE 0,10
580 PRINT "(P,L,G,E,K,C) = (";
590 PRINT P;",";L;",";G;",";E;",";K;",";C;")"
600 INPUT J$
610 T1=2
620 Q=0
630 WINDOW -1.1,1.1,-1.1,1.1
640 GO TO 490
650 END
```

(C) that decays exponentially with angle. (If you want the wobble to be the same size everywhere along the spiral, set C equal to 0. Otherwise, the wobble will decrease in size from the center of the spiral to the outer edge.) The parameter G is the angular increment used in computing the curve.

If you set T1=1, you will get a plot of the wobbly spiral with a list of input parameter values at the bottom of the picture. If you like the picture, make a hardcopy print for future reference. Then clear the screen and hit RETURN and you will get a "clean" plot (without the parameter list) of the same picture. Then you can make a hardcopy to show your friends. If you don't want a parameter value list at all, enter 2 after the prompt to enter T1.

If you want an overlay, yielding intertwining sine waves along the spiral, set P equal to 2. Otherwise, use P=1. Table 1 lists suggested ranges of values for all of the input parameters. □

Table 1. Suggested Parameter Values.

Parameter	Range of Values	
	From	To
P*	1	2
L	0.001	0.002
G	0.5	3
E	0	0.4
K	5	20
C	0	0.4
T1*	1	2

*P and T1 must each be either 1 or 2.

Modification of Celestial Music

Bob Perkins

I read with great interest the article "Celestial Music" by Leo Christopherson in the March 1982 issue of *Creative Computing*. I was, however, unhappy that in his approach the Apple was incapable of producing musical lines of more than 120 notes. His method of packing a machine language program into a DATA statement is interesting, but restrictive.

I recoded the machine language portion, and have presented the source code here (as Listing 1) for others with assemblers. It is only two bytes longer than Christopherson's original, but will now accept any length of musical line.

Mr. Christopherson also asserted that while Atari users could utilize all free memory for their music programs, Apple users could not. By using the pointers at 109-110 ($6D-$6E) this program enables all free memory.

There is a hitch, however. All variables, including string variables, must be defined previously. The definitions themselves are irrelevant, but all pointers must be set up and space allocated beforehand. In this program I have set aside space for an array, which allows musical data to be entered in the form of a FOR-NEXT loop as opposed to a DATA statement. Bear in mind that all variables, including string variables, must be defined *before* the data are POKEd into memory.

Bob Perkins, Box 116, Tussy, OK 73088

The routine can be CALLed from two different locations: the first, at 768, will automatically set the pointers to the end of the variable table. The second, at 776, allows the user to use any point in memory as a starting point for the data set. This allows storing of multiple songs back to back if the user keeps track of their starting locations in memory.

Listing 2 is a Basic program which converts alphabetical musical notation burden themselves with cryptic numerical key codes. I found that entering durations was more effective if left as numerical data, and not converted to whole, half, quarter, and so on. The slight delay coming to and from the data fetch leaves an audible pause, so though a whole and half note might have a duration of 16+8, a single note of duration 24 is more accurate.

The Applesoft program appears in somewhat ragged shape in order to have as much correlation as possible between the modification presented here and Christopherson's original program. More music could have been added very easily, as could better program flow. So get to work! □

Listing 1.

```
]ASM

                        1000 %CELESTIAL MUSIC SUBROUTINE
                        1010 %  BY LEO CHRISTOPHERSON
                        1020 %  CREATIVE COMPUTING MAR/82
                        1030 %  MOD. BY BOB PERKINS
                        1040 %-----------------------------------
0064-                   1050 REST       .EQ $64
                        1060 % END.NUM IS THE APPLESOFT PNTR
                        1070 % TO THE END OF NUMERIC STORAGE
006D-                   1080 END.NUM    .EQ $6D,6E
00FA-                   1090 PNTR       .EQ $FA,FB    POINTER TO
                        1100 %                        DATA IN MEMORY
00FC-                   1110 DURATION .EQ $FC
00FD-                   1120 PITCH      .EQ $FD
00FE-                   1130 BEAT1      .EQ $FE
00FF-                   1140 BEAT2      .EQ $FF
00FF-                   1150 END.DATA .EQ $FF
C030-                   1160 SPKR       .EQ $C030
                        1170 %-----------------------------------
                        1180            .OR $300
                        1190 %-----------------------------------
```

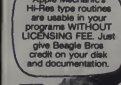
New! DOUBLE-TAKE
ONLY 34.95

2-WAY-SCROLL / MULTIPLE UTILITY
BY MARK SIMONSEN

LISTINGS & CATALOGS SCROLL Up AND Down, making file names and program lines much easier to access. Arrow-keys control scroll direction. **New Applesoft List Format** lists each program statement on new line for *FAST* program tracing and de-bugging.

Variable-Display shows all of a program's strings and variables with current values. **Cross-Reference** shows line nos. on which each variable & string appears. **Better Renumber/Append** lets you *merge* programs (not just connect end-to-end). Applesoft **Auto-Line-Number** as you type. Instant Hex/Dec Converter, Program Stats, Cursor Eliminate/Redefine, Free Space-On-Disk...

With 2 Charts: Peeks/Pokes and Tips & Tricks



Apple Mechanic's Hi-Res type routines are usable in your programs WITHOUT LICENSING FEE. Just give Beagle Bros credit on your disk and documentation.

ONLY 29.50

APPLE MECHANIC
SHAPE-WRITER / BYTE-ZAP UTILITY
BY BERT KERSEY

SHAPE EDITOR: Keyboard-draw shapes for animation in your programs. Create **Proportionally-Spaced Typefaces** with special characters. Six fonts included. Listable Applesoft demos show you how to animate graphics and create professional Charts & Graphs.

BYTE-ZAP: Rewrite any byte on a disk for repair or alteration. **Load entire sectors on the screen** for inspection. Hex/Dec/Ascii displays and input. Educational instructions include experiments for making trick file names, restoring deleted files, changing DOS, etc.

MORE: Useful music, text and hi-res tricks for your programs. Clear educational documentation.

(Includes Peeks & Pokes Chart and Tip Book #5)

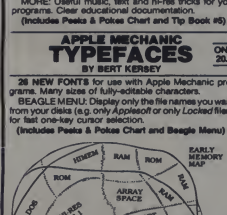
APPLE MECHANIC TYPEFACES
ONLY 20.00

BY BERT KERSEY

28 NEW FONTS for use with Apple Mechanic programs. Many sizes of fully-editable characters.

BEAGLE MENU: Display only the file names you want from your disks (e.g. only files *Starting* or only *Locked* files) for fast one-key cursor selection.

(Includes Peeks & Pokes Chart and Beagle Menu)



UTILITY CITY
ONLY 29.50

21 UTILITIES ON ONE DISK
BY BERT KERSEY

LIST FORMATTER prints each program statement on a new line. Loops indented with **printer page breaks**. A great Applesoft program de-bugger! Also...

Multi-Column Catalogs for printouts, auto-post Run-number & Date in programs, put Invisible commands in programs, create **Invisible file names**, alphabetize/store info on disk, convert dec to hex or integer to FP, protect and append programs, dump text to printer...

MORE TOO: 21 Programs Total, a best-seller!

(Includes Peeks & Pokes Chart and Tip Book #3)

AD #1

Beagle Bros
Micro Software Inc.

4315 Sierra Vista | San Diego, California 92103

DOS BOSS
ONLY 24.00

DISK COMMAND EDITOR
BY BERT KERSEY & JACK CASSIDY

RENAME COMMANDS AND ERROR MESSAGES: "Catalog" can be "Cat"; "Syntax Error" can be "Oops" or anything you want. **Protect your programs.** An unauthorized save-attempt can produce a "Not Copyable" message, or *any* message you want. Also LIST-prevention and one-key program-execution from catalog.

Customize DOS. Change the Disk Volume heading to your message or title. Omit or alter catalog file codes. Fascinating documentation, tips and experiments. Hours of juicy Apple reading material.

Anyone using your disks (booted or not) will be formatting DOS the very you designed it.

(Includes Peeks & Pokes Chart and Tip Book #2)

All Beagle Bros disks are Unlocked, Copyable, and Compatible with Apple* II, II+ and IIe. Don't settle for less.

*"APPLE" is a registered trade mark of You-Know-Who.

New! FLEX TEXT
ONLY 29.50

20/40/56/70-COLUMNS WITHOUT HARDWARE
BY MARK SIMONSEN

PRINT VARIABLE-WIDTH TEXT on both hi-res screens with normal Applesoft commands (including Htab 1-70). Normal, expanded & compressed text with no hardware. 70-columns requires a monitor (not tv).

Add graphics to text or text to graphics. Run your existing Applesoft programs under Flex Text control. Easy to use and compatible with GPLE.®

DOS Tool Kit* font compatibility, or use the supplied Flex Text typefaces. Select up to 9 fonts with control-key commands. Print, List and Catalog in any type style! Custom text chain-printing capability.

(Includes Peeks & Pokes Chart)

BEAGLE BAG
ONLY 29.50

12-GAMES-PLUS ON ONE DISK
BY BERT KERSEY

COMPARE BEAGLE BAG with any one-game locked-up disk on the market today. All 12 games are a blast, the price is right, the instructions are crystal clear ... AND the **disk is Copyable.** You can even *change* the programs or list them to learn by seeing how they work.

Twelve Games from the Apple Arcade. Bert Kersey—TextTrain, Slippery Digits, Wowzo, Buzzword, Magic Pack... A great variety that taps your Apple's flexibility. **Excellent review in January 83 Softalk** (page 146).

BEAGLE MENU too: See "Typefaces" disk.

(Includes Peeks & Pokes Chart and Beagle Menu)

FRAME-UP
ONLY 29.50

HIGH-SPEED DISK-ART UTILITY
BY TOM WEISHAAR

MAKE PROFESSIONAL PRESENTATIONS of existing hi-res, lo-res & text frames. *FAST* hi-res loads in 2½-second! Paddle or Keyboard-advance frames.

Unattended Shows are optional with each picture arranged and pre-programmed to display from 1 to 99 seconds. **Text Screen Editor** lets you create black-and-white text "slides" and add type "live" from the keyboard during shows. **Mail copies of presentations** on disk to friends and associates (and home to Mom!).

(Includes Peeks & Pokes Chart)

New! PRONTO-DOS
ONLY 29.50

HIGH-SPEED DISK UTILITY
BY TOM WEISHAAR

Put HIGH-SPEED DOS in your Apple's normal memory, Language Card or Apple IIe high-memory—

Function	Normal	Pronto
BLOAD HI-RES IMAGE	10 sec.	3 sec.
LOAD 80-SECTOR PROGRAM	16 sec.	4 sec.
SAVE 80-SECTOR PROGRAM	24 sec.	9 sec.
BLOAD LANGUAGE CARD	13 sec.	4 sec.

(FILE FILES: No Change)

Boot the Pronto disk or your updated disks, created with the normal **INIT** command. Compatible with **all DOS commands**, G.P.L.E.® and most of your programs.

Pronto-DOS will move DOS to your Language Card or Apple IIe's standard high-memory, giving you **10,000 Extra-Bytes** of programmable memory!

ProntoDOS also frees-up **15-extra-sectors** per initialized disk, almost one full track of disk space!

PLUS: Auto Free-Disk-Space, New "TYPE" Command displays Text File contents, and much more...

(Includes Peeks & Pokes Chart)

ALPHA PLOT
ONLY 39.50

HI-RES GRAPHICS/TEXT UTILITY
BY BERT KERSEY & JACK CASSIDY

DRAW IN HI-RES, on both pages, using keyboard OR paddles/joystick. View lines before plotting. Use mixed-colors and Reverse (background opposite) plotting. Fast hi-res circles, boxes and ellipses, filled or outlined.

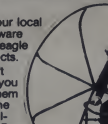
Compress Hi-Res Images to 1/3 Disk-Space. Superimpose hi-res pages 1 and 2 or re-locate any rectangular Image area anywhere on either hi-res page.

Proportionally-Spaced Hi-Res Type with adjustable character size and color. Upper and lower case with no htab/vtab limits. Many typing for graphs too.

(Includes Peeks & Pokes Chart and Tip Book #4)

GOTO your local Apple Software Store for Beagle Bros products.

If they don't have what you want, tell them to get on the *stick* by calling Beagle Bros (619-296-6400) or ANY Apple Software Distributor.



TIP DISK #1
ONLY 20.00

100 TIP BOOK TIPS ON DISK
BY BERT KERSEY

100 LISTABLE PROGRAMS from Beagle Bros Tip Books 1-4. Make your Apple do things it's never done! All 100 programs are changeable for experimentation. Includes our **Apple Command Chart** featuring all Applesoft, Integer Basic and DOS Commands!

(Includes Peeks/Pokes and Command Charts)

RUSH the following disks by First Class Mail—

- ☐ Alpha Plot . . . $39.50
- ☐ Ap.Mechanic . . 29.50
- ☐ Beagle Bag . . . 29.50
- ☐ DOS Boss 24.00
- ☐ Double-Take . . . 34.95
- ☐ Flex Text 29.50
- ☐ Frame-Up 29.50
- ☐ Pronto-DOS . . $29.50
- ☐ Tip Disk #1 . . . 20.00
- ☐ Typefaces 20.00
- ☐ Utility City . . . 29.50
- ☐ Add me to mailing list.
- ☐ Already on mailing list.

AT YOUR APPLE DEALER NOW!
Or order directly from Beagle Bros—

VISA | master charge

Visa/MasterCard/COD, call TOLL-FREE
Nationwide: **1-800-854-2003** ext. 827
California: **1-800-522-1500** ext. 827
Alaska/Hawaii: **1-800-854-2822** ext. 827

OR mail U.S.Check, Money-Order or Visa/MC# to BEAGLE BROS, 18th-Floor
4315 SIERRA VISTA, SAN DIEGO, CA 92103

Add $1.50 First Class Shipping, Any-Size Order
Oversees add $4.00. COD add $3.00. California add 6%.
ALL ORDERS SHIPPED IMMEDIATELY.

CIRCLE 119 ON READER SERVICE CARD

Listing 1. continued.

```
0300- A5 6D     1200 START  LDA END.NUM     GET END OF
0302- 85 FA     1210        STA PNTR    NUMERIC STORAGE
0304- A5 6E     1220        LDA END.NUM+1  POINTER FOR
0306- 85 FB     1230        STA PNTR+1   DUR ROUTINE
                1240 ;
                1250 GET.DATA
0308- A0 00     1260        LDY #$00
030A- B1 FA     1270        LDA (PNTR),Y
030C- C9 FF     1280        CMP #END.DATA
030E- D0 07     1290        BNE CELESTE  MAY EXIT
                1300 ;
                1310 BUMP.PNTR
0310- E6 FA     1320        INC PNTR    THRU BUMP.PNTR
0312- D0 02     1330        BNE .1      IF END OF DATA
0314- E6 FB     1340        INC PNTR+1  IS ENCOUNTERED
0316- 60        1350 .1     RTS
                1360 ;--------------------------------
                1370 CELESTE
0317- 85 FC     1380        STA DURATION
0319- 20 10 03  1390        JSR BUMP.PNTR    GET PITCH
031C- 81 FA     1400        LDA (PNTR),Y
031E- 85 FD     1410        STA PITCH
0320- 20 10 03  1420        JSR BUMP.PNTR    NEXT DURATION
0323- A6 FD     1430        LDX PITCH
0325- A4 FD     1440        LDY PITCH
                1450 ;
0327- A9 20     1460 PLAY   LDA #$20         INITIALIZE
0329- 85 FE     1470        STA BEAT1     TIMING LOOPS
032B- A9 FF     1480 .1     LDA #$FF      TO PRODUCE
032D- 85 FF     1490        STA BEAT2    DELAY IN TONE
032F- CA        1500 .2     DEX          WAIT (PITCH) CYCLES BEFORE BEEP
0330- D0 0B     1510        BNE .4
0332- A5 FD     1520        LDA PITCH
0334- C9 64     1530        CMP #REST    IF REST SKIP
0336- F0 03     1540        BEQ .3       SPKR TOGGLE
0338- AD 30 C0  1550        LDA SPKR
033B- A6 FD     1560 .3     LDX PITCH
033D- BB        1570 .4     DEY          WAIT (PITCH) CYCLES HERE TOO
033E- D0 0C     1580        BNE .6
0340- A5 FD     1590        LDA PITCH
0342- C9 64     1600        CMP #REST    IF REST SKIP
0344- F0 03     1610        BEQ .5       SPKR TOGGLE
0346- AD 30 C0  1620        LDA SPKR
0349- A4 FD     1630 .5     LDY PITCH
034B- 88        1640        DEY
                1650 ; THE GRADUAL SHORTENING OF THE
                1660 ; BEAT DELAYS ACCOUNTS FOR
                1670 ; MOST IF NOT ALL OF THE
                1680 ; BEATING EFFECT HEARD IN THIS
                1690 ; ROUTINE. BEAT2 IS RENEWED EVERY
                1700 ; TIME BEAT1 IS DECREMENTED.
034C- C6 FF     1710 .6     DEC BEAT2
034E- D0 DF     1720        BNE .2
0350- C6 FE     1730        DEC BEAT1
0352- D0 D7     1740        BNE .1
0354- C6 FC     1750        DEC DURATION   UNTIL TIME
0356- D0 CF     1760        BNE PLAY       IS UP THEN
0358- F0 AE     1770        BEQ GET.DATA   ALWAYS...


SYMBOL TABLE

00FE- BEAT1
00FF- BEAT2
0310- BUMP.PNTR
.01=0316
0317- CELESTE
00FC- DURATION
00FF- END.DATA
00D0- END.NUM
0308- GET.DATA
00FD- PITCH
0327- PLAY
.01=032B, .02=032F, .03=033B, .04=033D
.05=0349, .06=034C
00FA- PNTR
0064- REST
C030- SPKR
0300- START
```

CALL 768 comes here.

CALL 776 comes here.

Listing 2.

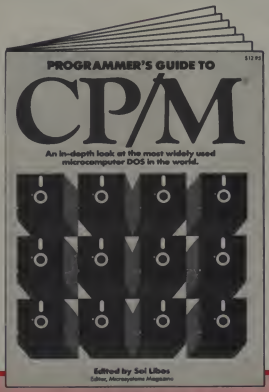
```
10  REM  MUSIC ROUTINE MAY BE
       CALLED IN TWO WAYS. EITHER
       WITH DATA AT THE END OF THE
       VARIABLE TABLES OR AT ANY
       FREE SPOT IN MEMORY
20  REM CALL 768 FOR TABLE END
       OR 776 FOR USER DEFINED
       LOCATION
30  REM ------------------------
40  HOME : VTAB 12: HTAB 10: PRINT
     "CELESTE MUSIC DEMO": PRINT
     CHR$ (4);"BLOAD B.CELESTE"
50  GOSUB 250: REM       THIS USES
     END OF VAR TABLE
60  FOR N = 0 TO 52: READ D: POKE
     A0 + N,D: NEXT N:A = A0 + N
70  REM ------------------------
80  FOR N = 0 TO 52: READ D: POKE
     1 + N,D: NEXT N
90  CALL 768: REM  FIRST DATA
100 POKE 250,(1 / 256 -   INT (1 /
     256)) * 256: POKE 251, INT (
     1 / 256)
110 CALL 776: REM  THIS USES END
     OF FIRST DATA  AS A LOCATID
    N FOR THE DATA
120 REM ------------------------
130 END
140 REM      DATA CAN NOW BE ANY
          REALISTIC LENGTH
150 DATA  16,215,16,107,8,113,4,
    143,4,127,8,113,6,107,2
160 DATA        100,16,215,16,127,2
    4,143,8,100,16,254,16,161,8,
    171
170 DATA    4,215,4,192,8,171,6,
    161,2,100,8,192,4,229
180 DATA      2,215,8,192,8,171,32
    ,215,255
190 DATA  8,215,8,107,4,113,2,14
    3,2,127,4,113,3,107,1
200 DATA      100,8,215,8,127,12,1
    43,4,100,8,254,8,161,4,171
210 DATA    2,215,2,192,4,171,3,1
    61,1,100,4,192,2,229
220 DATA  2,215,4,192,4,171,16,2
    15,255
230 REM ------------------------

240 REM   DECLARE ANY VARIABLES
     TO BE USED BETWEEN HERE AND
      CALL TO MUSIC ROUTINE
250 I = 0:N = 0:D = 0:A1 = 0:A2 =
    0:A0 = 0:A1 =  PEEK (109):A2
     =  PEEK (110):A0 = A1 + (A2
    * 256)
260 RETURN
```

PROGRAMMER'S GUIDE TO CP/M®

Edited by Sol Libes

Here's an important collection of CP/M insights that you'll never find in any CP/M manual. CP/M is the most popular microcomputer DOS in use today, and this widespread use has generated many innovative techniques and enhancements of CP/M. *Programmer's Guide to CP/M* tells you what these enhancements are and how to put them to use, how to get around apparent limitations of a CP/M system and why CP/M is far more versatile than you might have imagined. Every article in *Programmer's Guide to CP/M* originally appeared in MICROSYSTEMS between January 1980 and February 1982. Except for this collection, these articles are now unavailable! *Programmer's Guide to CP/M* gives you an in-depth look at CP/M from the viewpoint of the programmer—the individual who creates the software that interfaces directly with CP/M, or who is installing CP/M on systems for which configurations do not already exist.

Contents include "An Introduction to CP/M," "The CP/M Connection,' "CP/M Software Reviews," "CP/M Utilities & Enhancement," "CP/M 86" and "CP/M Software Directories." 200 pages, $12.95.



CP/M is a registered trademark of Digital Research, Inc.

Microsystems

MICROSYSTEMS PRESS
Dept. HC6F • 39 East Hanover Avenue • Morris Plains, NJ 07950

Send me _____ copies of *Programmer's Guide to CP/M* at $12.95 each, plus $2 for postage and handling. **=14C**

Foreign orders (except Canada and Mexico) add $3 for postage and handling. Shipped airmail only.

☐ **PAYMENT ENCLOSED** $_____ (NJ residents add 5% sales tax.)

☐ **CHARGE MY:**
☐ American Express ☐ MasterCard ☐ Visa

Card No._____ Exp. Date_____

Signature_____

Print Name_____

Address_____ Apt_____

City_____

State_____ Zip_____

For faster service,
CALL TOLL FREE: 800-631-8112
(In NJ only, call 201-540-0445)
Please refer to Dept. NA2F when ordering.

☐ Check here for FREE catalog.

Institutions only—purchase orders under $50 not accepted.

Animated Hi-Res Sailboat

Peter Schug

Twenty years ago I invested three months and about four hundred dollars in my first sailboat. Then, armed with a copy of *The Penguin Book of Sailing* by Peter Heaton, I set forth in my home-made Windmill class sloop to investigate just what does happen when the wind is abaft the beam with the boom athwartships and the vang is slackened off. (As soon as I could find out what a vang was.)

Now, face wizened by the sun and salt spray, sitting in front of my Apple, the old lore in the Heaton book percolates upward from some long dormant recesses of my brain. I think back across the span of years to the vector diagrams in the opening chapters and wonder if I can implement them on my screen.

In approximately the same length of time as it took twenty years ago, I built my second homemade sailboat.

I remember wondering why it took so long the first time also.

The program was conceived as a sailing tutorial that produces an animated vector diagram to illustrate the forces acting on a sailboat in motion. Somewhere along the way, I decided it would be nice to be able to sail a boat around the screen. After all, it's more fun to sail than to read a book about it and you can learn more by doing (or simulating) than by trying to understand someone else's vector diagrams.

Thus was born the idea of a two-dimensional animated graphic hi-res simulation of a displacement hull with a trimmable sail and steerable rudder.

The program runs in either a moving boat mode, or a vector diagram mode. The choice is given at the beginning, but M or V can be pressed at any time to toggle the display. It makes sense to use the moving boat mode to start, then set up a situation (like beating to windward, running, setting the sails too tightly, etc.) then toggle to the vector mode and look at the operating forces.

Run the program and the boat will be drawn facing into the wind (10 kts coming out of the north). After a couple of cycles the boat will start drifting back slowly (as in leaving a mooring) and if you put the tiller hard over (paddle 0) the boat will start turning broadside to the wind. The sail is controlled by paddle 1 and should be fully until the boat has turned about 60° counterclockwise from the wind. Then sheet in the sail (paddle 1 clockwise) and straighten out the rudder. Since the screen updates are rather slow, make the adjustments and wait a couple of cycles to see their effect or you may tend to over-control.

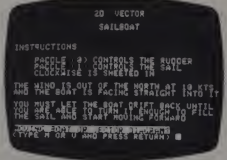


Photo 1. This title page greets you when the program is run.

Photo 2. This is the opening frame, with the boat stationary and facing into a 10-knot wind. The screen legend titles are in place but no values have been written in.

Peter Schug, 1356 Odell St., Bronx, NY 10462.

MODULES FOR:

TIMEX-Sinclair

MODEM $119.95 * KIT (RS-232) Port & Software Included)

$149.95 * ASSEMBLED

64-K MEMORY $129.95 * KIT

the "ULTIMATE MEMORY"

$139.95 * ASSEMBLED

FEATURES:

- Battery backup
- PROM/ROM socket
- Reset Switch
- **BYTE-BACK EXCLUSIVE FULL 64-K**

New

The O-8K area is available. You can execute a copy routine (provided) to copy the TIMEX ROM into the O-8K area of RAM then flip a switch and you have your operating system in RAM. You can modify it and create your own customized operating system.

WHY PAY MORE FOR LESS FEATURES?
GET THE "ULTIMATE MEMORY" BYTE-BACK UM-64

A COMPANY YOU CAN DEPEND ON

BYTE-BACK CO. is the oldest and one of the world's largest suppliers of modules for the ZX81 and TIMEX-Sinclair 1000 computers. There are thousands of BYTE-BACK modules in use with a track record of proven reliability

RS-232 PRINTER INTERFACE Only $59.95 * KIT $69.95 * ASSEMBLED

CONTROL MODULE 8 Relays, 8 Inputs. $59.95 * KIT $69.95 * ASSEMBLED

16K MEMORY UM16 $59.95 * KIT $69.95 * ASSEMBLED & TESTED.

Battery backup, reset switch, PROM/ROM socket PLUS.

1 year, 100% trade-in credit towards the **UM-64.**

BYTE BACK CO.
Rt. 3, Box 147, Brodie Road
Leesville, S.C. 29070
ORDER PHONE 803-532-5812
Add $4.95 shipping & handling to all orders.

90 Day Warranty On All Modules. 10—Day Return Priviledge

CIRCLE 127 ON READER SERVICE CARD

SUPER DISK

Floppy Disk Drive For VIC-20 & Commodore 64

Super Disk' is a Commodore compatible disk drive designed to interface to the various Commodore computers such as the PET, VIC-20 and the Commodore 64. The disk drive is compatible to the model 4040, 2031, 1540, and the 1541 disk drives and recognizes programs generated on any of these disk drives. The capacities are comparable to those found on the Commodore drives, and Super Disk recognizes the full instruction set of the Commodore drives. Super Disk' offers RAM area within the disk unit, a serial and an IEEE bus interface.

Introductory Offer . . . $395.00

Also Available:

Gemini-10 w/Interface	$399	V3K RAM	25.
CPI Parallel Interface	65.	V8K RAM	45.
Expandoport 3 VIC	25.	V16K RAM	75.
Expandoport 6 VIC	75.	V24K RAM	105.
Expandoport 4 C64	65.	CIE (IEEE for C64)	95.

CATALOG OF OTHER HARDWARE & SOFTWARE AVAILABLE ON REQUEST. We accept: VISA, Mastercharge, and AE

Southwest Micro Systems, Inc

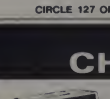
2554 Southwell • Dallas, Texas 75229

(214) 484-7836

[1]Trademark of Commodore Int [2]Trademark of MSD

CIRCLE 258 ON READER SERVICE CARD

CHEAP!



TRS-80 16
TWO DRIVE, 256K
IT'S NO SECRET —
why we can sell for less! Low overhead — pure, simple, & straight! As everyone knows, Radio Shack is a huge corporation...with huge expenses. We are able to buy the bare bones computers from Radio Shack. To these, we add our own memory chips, disk drives, cables, etc. *The savings is yours!*

$4799

SMITH CORONA TP-1
Daisy Wheel Printer

Quality printout at 144 words per minute*

Compatible with almost all computer systems.

$559

EPSON PRINTERS
- MX-80
- MX-80 F/T
- MX-100
- FX-80

STAR MICRONICS
THE GEMINI 10 & 15
For printer values out of this world

OUR PRICES ARE SO LOW WE CANNOT EVEN PRINT THEM!

CALL FOR LATEST INFORMATION ON RADIO SHACK, EPSON, STAR MICRONICS, OKIDATA, AND FRANKLIN PRODUCTS

1-800-338-3896

AMERICAN 918 825-4844 Small Business COMPUTERS

CIRCLE 110 ON READER SERVICE CARD

From Computer Plus to YOU . . .

PLUS after PLUS after PLUS

Model 12
1 Drive 12699
2 Drive 13775

Color Computer 16K 1175
w/ 16K Ext. Basic 1358
w/ 32K Ext Basic 1545

Model IV 16K 1849
Model IV 64K
2 Disk & P1233C 1149.99

Okidata 80 1320
Okidata 82A 1399
Okidata 92 1510

Color Computer Disk Drive
Drive 0 1470 Drive 1 1299

Smith Corona TP1
Daisy Wheel 1495

BUY DIRECT

Here are just a few of our fine offers call TOLL FREE for full information.

COMPUTERS		8 ½ Activate Coupler AC 3	129
Model 12 64K 1 Drive	12699	8 ½ Modem I D C	129
Model 12 64K 2 Drive	13775	8 ½ Modem II D C	199
Model IV 64K	849	**PRINTERS**	
Model IV 64K		Daisy Wheel II	1795
2 Disk & P1232 C	1699	DWP-210	1320
Color Computer 16K	175	Smith Corona TP- Daisy Wheel	495
Color Computer 16K w/extended basic	256	Epson	Call
(Color Computer 32K w/extended basic	340	CGP 115	199
Color Computer 64K	399	Okidata 182	315
Pocket Computer 2	99	DWP-630	610
Model 16 CPR 128K	4199	DWP-810	399
Model 16 2CR 128K	4799	DWP-3100	1099
Model 100 8K	679	Okidata 82A	399
Model 100 24K	835	Okidata 83A	665
MODEMS		Okidata 84 Parallel	999
Lynx Direct Connect Modem	235	Okidata 92	510
Hayes Smart Modem II	235	Okidata 93	889
Hayes Smart Modem 1200	565	Gemini 10	319
Novation Smartcat 1200	409	Prowriter	575
Novation J-CAT	125	P C Porter Printer	180

We have the lowest possible Fully Warranteed Prices AND a full complement of Radio Shack Software.

Prices subject to change without notice. Not responsible for typographical errors. TRS-80 is a registered trademark of Tandy Corp

DISK DRIVES

8 ½ Model IV 157 Drives	505
Tandon 40 Track Mt	289
Color Computer Drive 1	290
Color Computer Drive 0	315
Primary Hard Disk Mtr	1099
Primary Hard Disk Mtr	2199
ETC.	
CCR 81 recorder	52
C C Joysticks	22
16K RAM Chips	12
64K Ram Chips	75
Color Pak, Free D Q S	all 95
Color Computer Interw	229
SOFTWARE	
Brand New Software +	
Send for listing	
8 ½ Software 10% off list	
Parallel Printer Cables are available for most computers	

TOLL FREE 1-800-343-8124

computer plus

P.O. Box 926
Littleton, Mass.
Littleton 486-0145
617 486-3193

Write for your free catalog

CIRCLE 145 ON READER SERVICE CARD

On the bottom of the screen you will see a legend that bears these titles each followed by a number.

HEADING
MAKING GOOD
SPEED KTS
SAIL ANGLE
APPARENT WIND
ANGLE TO BOAT

They translate as follows:

HEADING is the direction the boat is pointed.

SPEED KTS tells how fast the boat is going.

MAKING GOOD is the direction the boat is actually moving. Sailboats go a little sideways due to the force of the wind. The sideways motion is called leeway. The course made good includes leeway, therefore is not the same as the heading.

SAIL ANGLE is the angle at which the wind hits the sail. Positive numbers indicate starboard tack (meaning the wind is coming over the right side of the boat) and negative indicate port (wind coming over left side). The range is 0° to 180°. Specifically, it is not the sail freedom nor is it the angle of the sail to the boat.

Photo 3. About five frames from the start. The sail is luffing (sail angle = 0) and the boat is backing up. (Notice the course made good vs. the heading.) If the rudder is centered and the sail is sheeted in, the boat will start moving to windward.

Photo 4. A couple of frames after the start, sailing to windward in vector diagram mode. The left boat shows the real wind (the vertical line), the boat motion vector (the one furthest from vertical), and the apparent wind, which is the remaining line. The right boat shows the lift vector, which is the upper of the two long lines on the right; the drag vector, which is somewhat obscured by the sail but still discernible, pointing SSW from the center of the boat, and the total force vector, just below the lift vector. The driving force applied to the hull is the forward component of the total force, and the lateral component divided by 20 is the leeway.

APPARENT WIND is the strength of the wind as it is felt on the boat. The vector sum of the forward motion of the boat and the speed of the wind add up to a strength and direction that is not the same as the real wind. Ask someone who has been sailing downwind with a large genoa on a breezy day, then turned around and tried to beat to windward.

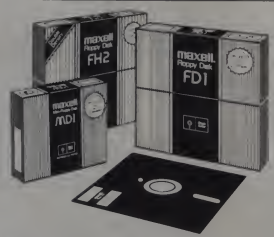
ANG TO BOAT is the angle of the apparent wind to the centerline of the boat. Once again, positive numbers indicate starboard and negative numbers port with a range of 0° to 180°.

Between the information in the legend and the image of the boat moving across the screen, you can get a fair idea of how a boat sails.

You can get a fair idea of how a boat sails.

For an even closer look, you can type V and toggle to the vector diagram mode. In this mode there are two boats on the screen. The one on the left shows the real wind, which is the vertical line going to the center of the boat, the motion of the boat, which is the line furthest from the real wind, and the apparent wind, which is the line between the other two.

On the right diagram I show the lift force generated by the sail, which is the line closest to the front of the boat (unless you are sailing by the lee). The rearmost line, often too small to be seen, is the drag force, and the line between them is the total force of the wind on the boat.



Maxell. The Gold Standard.
The floppy disks that meet or exceed every standard of quality.

Look for the Gold Standard seal.
It's your assurance that Maxell disks meet or exceed every definition of quality. For every computer, including yours.

Dealer Inquiries Invited

A B Computers
252 Bethlehem Pike
Colmar, PA 18915
215-822-7727

CIRCLE 107 ON READER SERVICE CARD

A Short Sailing Glossary

Abaft: Behind.
Abeam: At 90° to the boat.
Apparent Wind: Vector sum of real wind and the motion of the boat.
Athwartships: Across the boat.
Beam: The widest part of a boat, the width of a boat.
Beat, Beating: To sail into the wind.
Boat: A hole in the water into which one throws money.
Boom: The stick to which the bottom of a sail is attached.
Bow: The front of a boat.
Displacement Hull: A hull designed to go through the water rather than slide over it.
Drag: Force in line with the wind.
Forestay: Wire that keeps the mast from tipping backwards.
Genoa: Large overlapping jib.
Headed: Being hit by a wind shift that moves you away from your objective.
Heeling: Being tipped part way over by the wind.
Hull: The body of the boat.
Jib: Sail set between mast and bow of boat. Usually on the forestay.
Jibe: To have a sail suddenly and often violently swing from one side to the other while sailing downwind.
L/D: Lift to drag ratio.
Lift: A force 90° to the wind felt by an object.
Lee: The downwind direction. The sheltered side of something.
Leeway: The slight sideward motion of a sailboat in the downwind (leeward) direction.
Luffing: Flapping in the breeze.
Mast: Tall stick, usually near middle of the boat, that holds sails up. Some boats have more than one.
Mooring: A float anchored to the bottom to which one ties a boat. The act of tying a boat to a mooring.
Port: The left side of the boat. A harbor.
Reach: Sail across the wind.
Run: Sail downwind.
Starboard: The right side of the boat.
Sheet: Rope used to trim (adjust) a sail.
Sheet In: Pull a sail tight, or tighter.
Sloop: A boat with one mast and two fore and aft rigged sails.
Tack: To zig zag into the wind. Alternatively, which side of the wind you are sailing on.
Tiller: Arm attached to rudder used to steer.
Trim: Adjust.
Trimmable: Adjustable.
Vang: A device used to keep the boom from pivoting up.
Vector: A quantity that has both magnitude and direction. The magnitude represents force or speed.
Windward: Toward the wind.

Not shown in the diagram are the lift and drag characteristics of the hull and how it resolves the force of the wind into forward motion. I just assume a twenty to one L/D ratio (which means that the boat is twenty times harder to move sideways than forward).

The display on most Apples can be stopped with a CTRL-S allowing a careful study of a single frame.

Some definitions are in order before I explain how the program works. I will call the sail an airfoil in the sense that anything that interacts with moving air may be so described. Airfoils possess two significant characteristics, lift and drag, both of which may be measured at various angles of attack (sail angles in this program).

Lift is a force at 90° to the wind. The program calculates the lift of the sail by multiplying the square of the apparent wind by a number selected by the sail angle from an array that represents the lift characteristic of the sail (see Figure 1).

Drag is a force in line with the wind. Drag force is calculated in a manner similar to lift using a sinusoidal curve (see Figure 2) starting at a base value that represents the windage of the hull and spars and hits a peak at 100°, then drops back to the base value again (100° degrees instead of 90 because I set the minimum drag to 10° since the luffing sail has a higher drag than the sail that has just stopped luffing).

The sine function of Basic is used to generate an appropriate array that covers 180° of operation. The values in both arrays are arbitrary. Only the relationship of the value of one angle to another

Photo 5. Vector diagram of the beam reach. Notice that the total force vector is smaller than during the windward sailing but the boat is moving faster. This is because the forward component is larger for a reaching situation, and the leeway is less.

Photo 6. Sailing by the lee. Sailing downwind with the sail on the wrong side. Notice that the apparent wind is only 6.5 kts. The force of the wind goes up with the square of the speed, so the forces shown by the right boat are very small compared to the windward situation of Photo 4. The lift vector here points west and is generated by negative peak of the lift curve (see Figure 1).

Photo 7. This is the jibe warning message. This boat jibes with less fuss than anything I have sailed except a windsurfer so I have the program announce the jibes.

THE WORLD W
YOUR COMP

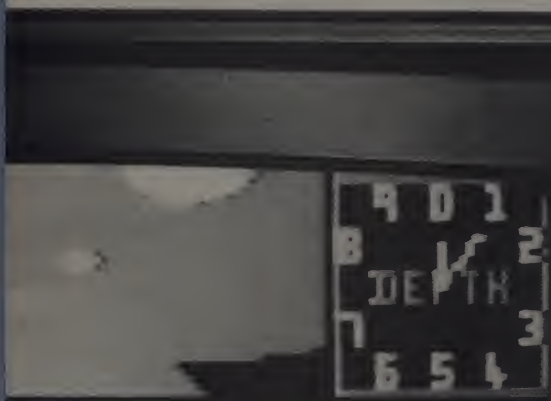
Send us your game and THO

Got a great home computer game you've programmed? Working on one? We'd like to hear about it. Play it. And if we like it, we want to help you sell it to the world.

We're THORN EMI Video, the worldwide entertainment/electronics company. One of the giants in home computer software. We market a full line of computer games to the world. So, if your computer game meets our own high standards, it means people all over the world could be buying it, playing it.

ANTS TO PLAY UTER GAME!

N EMI will give you the world.



Think you've got a great computer game? Then write us to find out how to submit your game to THORN EMI.

Just think. The whole world could be playing your computer game soon.

THORN EMI, HOME COMPUTER SOFTWARE DEVELOPMENT, 1370 AVENUE OF THE AMERICAS, NEW YORK, NY 10019.

THORN EMI
VIDEO

CIRCLE 272 ON READER SERVICE CARD

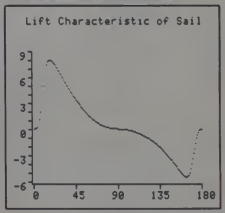


Figure 1. This is the Lift Characteristic of the sail. The numbers on the Y axis are arbitrary. only the relationship between the value for one angle and another and the relationship to the drag characteristic are important.

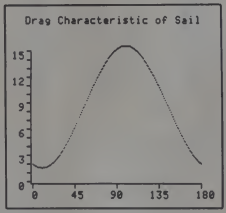


Figure 2. This is the Drag Characteristic. The peak value was arrived at empirically while trying to make the boat behave in a realistic manner. Notice that the drag has a base value of 1.5. This represents the drag of the hull and spars. Without this base value in the Drag Characteristic, the boat would need an engine to leave the mooring.

and the relationship of the value of the arrays to each other are significant.

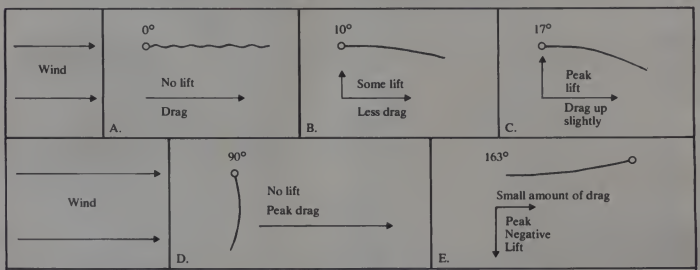
The arrays that represent the lift and drag characteristic of the sail are speculative, but in concept I believe them to be fair representations of the actual lift and drag curves of a real sail (see Figure 3).

The program is relatively straightforward and with the aid of the variable table should be understandable with some study. The init section is at the end of the program. When the program goes into hi-res mode, the screen chops the back of the program off. Beware of this. Do not save the program after running it because it is not all there.

The subroutines that do the turtle graphics and the vector calculations are both written in map convention, with 0° at the north and numbers increasing clockwise, instead of 0° being east and the numbers increasing counterclockwise. I hope that explains the nonstandard arrangement of sine versus cosine.

The jibe routine beginning at line 1720 and the acceleration section at line 2790 may require some thought but the only thing that needs explanation is the purpose of the routine at lines 2550 to 2580 which is to keep the boat from responding to changes in sail trim with sudden large changes in leeway.

A careful look at the program will show that shortcuts have been taken in the interest of speed and simplicity. My sincere apologies to the laws of physics for some of these. The goal of this simulation is realistic and predictable performance. The approach I took was to find an appropriate imitation of the behavior of a boat, rather than a painstaking model of each facet of the problem. I hope you like it. Happy sailing.



Note: The drag vector is shown disproportionately large in most of the drawings.

Figure 3. This is the sail in an imaginary wind tunnel. The known data is that lift starts from zero and hits a peak at about 17°, then drops off sharply. From there it must fall to 0 at 90°, and for similar reasons there is probably also a peak at 163°, only in the negative direction. The drag curve should start at the base value that represents windage, then increase to a peak at 90° then fall back again. I feel that the luffing sail has slightly more drag than the sail that is just filled, so I set the low drag to 10°—anything to improve windward performance. Frame A shows the luffing sail—no lift and drag slightly above the base line. Frame B has the sail at 10° where I think the drag drops to its lowest value. At this point lift reaches more than half its total value. In Frame C we have peak lift, with the drag up slightly. Incidentally, the best lift to drag ratio almost always occurs at an angle less than the peak lift angle, and I/D is what you need to go to windward. On the other hand, the peak lift will drive you faster in a reaching situation. Frame D shows the sail at 90°—no lift here, but peak drag. This is what you want (or must use) to sail down wind. Frame E shows the sail at 163°. Once the sail is past 90°, it starts generating lift in a downward direction. Based on the assumption that the 17° peak applies in either direction, but that the sail works more efficiently in the direction it was made to work, I finished the lift curve with the negative peak shown in Figure 1.

VIC 20

40-80 COLUMN BOARD

NEW only $99.00 NEW

Now you can get 40 or 80 Columns on your T.V. or monitor at one time! No more running out of line space for programming and making columns. Just plug in this board and you immediately convert your VIC-20 computer to 40 or 80 columns! PLUS, you get a Word Processor, Mail Merge program, Electronic Spreadsheet (like VISICALC) and Terminal Emulator! These PLUS programs require only 8K RAM memory and comes in an attractive plastic case with instructions. List $149 Sale $99

• COMMODORE 64 COMPUTER — "80 COLUMN BOARD" LIST $275 SALE $179

(Less $20 Accessory Purchase Discount)

"15 DAY FREE TRIAL"

- **We have the lowest VIC-20 prices**
- **We have over 500 programs**
- **Visa — Mastercharge — C.O.D.**
- **We love our customers!**

PROTECTO
ENTERPRIZES (WE LOVE OUR CUSTOMERS)
BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

NEW

MAKE YOUR VIC-20 COMPUTER TALK

when you plug in our

ONLY *$79.00

VOICE SYNTHESIZER

You can program an unlimited number of words and sentences and even adjust volume and pitch.
You can make: • Adventure games that talk • Real sound action games
This voice synthesizer is VOTRAX based and has features equivalent to other models costing over $370.00. To make programming even easier, our unique voice editor will help you create words and sentences with easy to read, easy to use symbols. The data from the voice editor can then be easily transferred to your own programs to make customized talkies.

*FREE — Your choice of $19.95 4" Speaker and Cabinet or $14.95 Voice Editor

"15 DAY FREE TRIAL"

- **We have the lowest VIC-20 prices**
- **We have over 500 programs**
- **Visa — Mastercharge — C.O.D.**
- **We love our customers!**

PROTECTO
ENTERPRIZES (WE LOVE OUR CUSTOMERS)
BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

CIRCLE 220 ON READER SERVICE CARD

Variables Used In Hi-Res Sailboat

A	(Utility)	Represents angle for turtle and vector sum subroutines. Also used as utility variable in sail angle routine.
AN	(Angle)	Holds angle for turtle routine.
AR	(Aspect Ratio)	Sets height to width. Adjust for your monitor in initialization section (constant).
BW	(Boat Wind)	Relative direction of the wind to the long axis of boat.
CR	(Convert Radians)	Convert radians to degrees (constant).
D1	(Utility)	Carries direction information to vector sum subroutine.
D2	(Utility)	Same as above.
D3	(Utility)	Carries direction information from Vector Sum subroutine.
DB	(Direction Boat)	The compass heading of the long axis of the boat.
DD	(Direction Drag)	The direction of the drag vector.
DF	(Direction Force)	The direction of the total force vector acting on the boat.
DH	(Direction Headed)	The actual direction in which the boat is moving.
DL	(Direction Lift)	The direction of the lift vector.
DR	(Direction Real)	The direction of the real wind (constant).
DX	(Direction Apparent)	The direction of the apparent wind. (Vector sum of real wind and boat motion.)
D(	(Array)	The drag array.
H	(Utility)	Horizontal quantity used in polar to rect. subroutine.
H1	(Utility)	Horizontal input to vector sum subroutine.
H2	(Utility)	Same as above.
H3	(Utility)	Horizontal output of vector sum subroutine.
I	(Utility)	For-Next loop control.
J	(Utility)	Same as above.
LR	(Lateral Resistance)	Lateral resistance, used in adjusting the leeway of boat (constant).
LW	(Leeway)	The difference between the compass course and the course made good.
L(	(Array)	The lift array.
M1	(Utility)	Magnitude information for the vector sum subroutine.
M2	(Utility)	Same as above.
M3	(Utility)	Magnitude output from vector sum subroutine.
MA	(Mass)	The displacement of the boat (constant).
MB	(Magnitude Boat)	The speed of the boat.
MD	(Magnitude Drag)	The magnitude of the drag.
MF	(Magnitude Force)	The magnitude of the total wind force acting on boat (lift and drag).
ML	(Magnitude Lift)	The magnitude of the lift.
MO	(Move)	Passes how far to move to the turtle routine.
MR	(Magnitude Real)	The magnitude of the real wind (constant).
MX	(Magnitude Apparent)	The magnitude of the apparent wind (vector sum of MR + MB).
M(	(Move Array)	Stores the lengths of lines used to draw boat.
OQ	(Old Q)	Stores old value of Q for keypress processing.
OX	(Old X)	Saves X position of boat while using vector diagram mode.
OY	(Old Y)	Saves Y as above.
Q	(Utility)	Stores keypress information.
QS	(Utility)	Accepts input.
RA	(Rudder Angle)	The angle calculated from the paddle setting.
RC	(Radian Convert)	Converts degrees to radians (constant).
SA	(Sail Angle)	The angle of the sail to the wind.
SF	(Sail Freedom)	The slack in the sheets (sail control lines) according to paddle setting.
SI	(Size)	Sets relative size of drawing (constant).
TF	(Total Force)	Temporary storage for total force angle.
TM	(Total Magnitude)	Temporary storage for total magnitude.
T(	(Turn Array)	Stores the angle of turn for the draw boat routine.
V	(Utility)	Vertical quantity used in turtle subroutine.
V1	(Utility)	Vertical input to vector sum subroutine.
V2	(Utility)	Same as above.
V3	(Utility)	Vertical output from vector sum subroutine.
X	(Utility)	Next X position of plotted point from turtle subroutine.
XX	(Horizontal Location)	The current horizontal location of the boat.
Y	(Utility)	Next Y position of plotted point from turtle subroutine.
YY	(Vertical Location)	The current vertical location of the boat.
ZZ	(Utility)	Stores numbers for the screen legend.

SJB DISTRIBUTORS. THE MOST COMPETITIVE PRICES ON COMMODORE.

commodore

NEW COMMODORE PRODUCTS

CBM 128-40	$ 695
CBM C128-80	795
CBM 8700	2990
CBM 1520 Plotter	169
CBM 1701 Color Monitor	269
B Series Software	Call
CBM 4023 Printer	399

SOFTWARE FOR CBM 64 E

Word Processing (WordPro 3+)	$ 69
M File Database (merge with Word Pro)	89
Quick Brown Fox	56
Writer's Assistant (easy and flexible)	99
File Assistant (database with merge)	99
Spreadsheet Assistant	99
Pers. Finance Assist.(great reports)	45
Busicalc (Spreadsheet)	55
Cocd It (build your own games easily)	45
Calc Result	125
General Ledger, A/R, A/P (with check writing)	ea.139
CBM EasyFinance	50
CBM EasyScript	80
CBM EasyFile	80
Data Manager	70
Stock(investment analysis)	80
Pet Emulator (emulates 4.0 basic)	30
Sprite-Master	29
Assembler Package (cassette or disk, compiled, includes editor, loader, disassembler)	39
Spacebelt	20
Retroball	34
ZWARK	25

INTERFACES & ACCESSORIES

80 Column Expander	$159
VIC 1600 Modem	95
VIC 1650 (auto answer, auto dial)	150
VIC 1525 Graphic Printer	329
VIC 1530 Datasette Recorder	65
VIC 1541 Disk Drive	329
VIC Switch (connect 8 64's or Vics to printer, dd)	149
PET-IEEE cable	33
IEEE-IEEE cable (2m)	43
Parallel Interface (Epson, Okidata, IDS, NEC)	80
RS-232 Printer Interface (Okidata, Diablo, etc.)	80
Programmers Reference Guide	18
Verbatim Diskettes (10 per box)	26
Victree (Programmers Utility)	75

VIC PRODUCTS & ACCESSORIES

8K RAM Memory Expansion Cartridge	$ 40
16K RAM	70
24K RAM	105
VIC 3 Slot Expander	27
VIC 6 Slot Expander	70
RS-232 Printer Interface	65
Cassette Interface	30
Gorf (64 also)	30
Omega Race	30
Arcade Joystick - Heavy duty w/2 firing buttons! Great for the VIC or 64	25

MONITORS - GREAT RESOLUTION (64 OR VIC)

Amdek Color I	$ 299
Amdek II or III	call
Panasonic CT180	279
Comrex 6500 - 13" Color	299
Transtar 20 (High Resolution Green Phosphor)	129
Video/Audio Cable	15

PRINTERS - LETTER QUALITY

CBM 8300, 40 cps	$1450
Diablo 620, 25 cps	949
ComRitter, 17 cps	819
Transtar 130, 16 cps (auto load, wp features!)	769
NEC 7700 series	2350
NEC 3500 series	1600

PRINTERS - DOT MATRIX

CBM 8023, 150 cps/graphics	589
Epson FX Printer, 180 cps	549
Epson MX-80FT	459
Epson MX-80 w/GraftrAx	349
CBM Graphics for Epson	65
Okidata 82A, 120 cps (serial and parallel)	429
NEC 8023A (parallel)	429
Okidata 92	559
Star Gemini, 10	329
Star Gemini, 15	499

COMMODORE BUSINESS SERIES

SuperPet (5 languages, 2 processors)	$1409
CBM 8032 Computer, 80 Column	1029
CBM Memory Expansion, 64K	359
CBM 8050, 1 mg. Dual Drive	1259
CBM 8250, 2 mg. Dual Drive	1395
CBM D9060, 5 mg. Hard Disk	1995
CBM D9090, 7.5 mg. Hard Disk	2295
CBM 2031, 170K Single Drive (New)	489
DC Hayes Smart Modem	220

BUSINESS SOFTWARE

WordPro 4+ or 5+	$ 309
Administrator	489
VisiCalc (expanded)	199
The Manager (database)	199
BPI A/R, G/L, Job Cost, Inventory, Payroll	ea.325

MasterCard, Visa, Money Order, Bank Check

COD (add $5) accepted.
Add 3% surcharge for credit cards.
In stock items shipped within 48 hours.
F.O.B. Dallas, Texas
All products shipped with manufacturer's warranty.

Prices are subject to change without notice.

TO ORDER
CALL TOLL FREE
800-527-4893
800-442-1048
(Within Texas)

Business Hours
Mon.- Fri. 8 to 6, Sat. 10-2

Write for free catalog.

GAME OF THE MONTH

Adventu-Writer (make your own adventure game) 39

PRODUCT OF THE MONTH

INTERPOD (intelligent IEEE RS232, serial interface for VIC or C64) ..... $ 179

SJB DISTRIBUTORS INC.
10520 Plano Road, Suite 206
Dallas, Texas 75238
(214) 343-1328

CIRCLE 247 ON READER SERVICE CARD

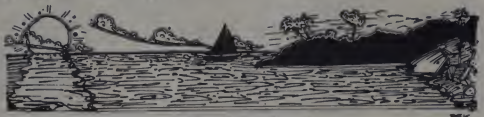
Listing 1. Hi-Res Sailboat.

```
100  LOMEM: 16384
110  TEXT : HOME : GOTO 3170
120  REM
130  REM $$$ TURTLE $$$
140  REM
150  LET ANGLE = ANGLE + TURN
160  LET A = ANGLE * RC
170  LET MOVE = MOVE * SIZE
180  LET H = MOVE *  SIN (A) * AR
190  LET V = MOVE *  COS (A)
200  LET X = X + H
210  LET Y = Y - V
220  LET TURN = 0
230  RETURN
240  REM
250  REM $$$ VECTOR SUM $$$
260  REM
270  LET A = D1 * RC
280  LET H1 = M1 *  SIN (A)
290  LET V1 = M1 *  COS (A)
300  LET A = D2 * RC
310  LET H2 = M2 *  SIN (A)
320  LET V2 = M2 *  COS (A)
330  LET H3 = H1 + H2
340  LET V3 = V1 + V2
350  LET M3 =  SQR (H3 ^ 2 + V3 ^ 2)
360  IF V3 = 0 THEN V3 = .000000001
370  LET D3 =  ATN (H3 / V3) * CR
380  IF V3 < 0 THEN D3 = D3 + 180
390  IF H3 < 0 AND V3 > 0 THEN D3 = D3 + 360
400  RETURN
410  REM
420  REM ** SCREEN LEGEND **
430  REM
440  REM TYPE SPACES INSTEAD OF      PERIODS
450  REM
460  VTAB 21: PRINT "HEADING..............SPEED KTS.........MAKING GOOD.
     .........SAIL ANGLE.........APPARENT WIND........ANG TO BOAT": RETURN

470  REM
480  REM ************************
490  REM *                      *
500  REM *       MAIN LOOP      *
510  REM *                      *
520  REM ************************
530  REM
540  REM ** PROCESS KEYPRESS **
550  REM
560  LET QQ = Q
570  POKE ( - 16368),0
580  IF Q = 205 THEN 720
590  REM IF KEYPRESS = M
600  IF Q = 209 THEN  VTAB 24: PRINT : PRINT : PRINT : INPUT "WANT TO QUI
     T? TYPE Y OR N    ";Q$: GOTO 620
610  GOTO 650: REM VECTOR MODE
620  IF  LEFT$ (Q$,1) = "Y" THEN  TEXT : HOME : VTAB 10: HTAB 10: PRINT "
     HAPPY SAILING": END
630  INPUT "TYPE M OR V TO DISPLAY   ";Q$:Q = ( ASC ( LEFT$ (Q$,1)) + 128
     ): GOSUB 460: GOTO 480
640  GOSUB 460
650  FOR I = 1 TO 2
660  LET YY = 79
670  IF I = 1 THEN XX = 70: GOTO 720
680  IF I = 2 THEN XX = 210: GOTO 730
690  REM
700  REM **   DRAW HULL   **
710  REM
720  HGR
730  LET ANGLE = DB
740  LET MOVE = 4
750  LET X = XX
760  LET Y = YY
770  HCOLOR= 7: GOSUB 150: HPLOT X,Y
780  FOR J = 1 TO 7
790  LET TURN = T(J)
800  LET MOVE = M(J)
810  GOSUB 150: HPLOT  TO X,Y
820  NEXT
830  REM
840  REM $$$ DRAW SAIL $$$
850  REM
860  LET ANGLE = DB
870  LET MOVE = 2
880  LET X = XX
890  LET Y = YY
```

PEK

PEK

```
900  GOSUB 150: HPLOT X,Y
910  IF BW > 180 THEN BW = BW - 360
920  LET A =  SGN (BA): IF A = 0 THEN  LET A =  SGN (BW)
930  IF  ABS (BW) > BF THEN  LET ANGLE = ANGLE + BF * A + 180: GOTO 950
940  LET ANGLE = ANGLE + BW + 180
950  LET MOVE = 5
960  GOSUB 150: HPLOT  TO X,Y
970  REM
980  REM *** DRAW RUDDER ***
990  REM
1000  LET ANGLE = DB
1010  LET MOVE =  - 4
1020  LET X = XX
1030  LET Y = YY
1040  GOSUB 150: HPLOT X,Y
1050  LET ANGLE = DB - RA + 180
1060  LET MOVE = 1
1070  GOSUB 150: HPLOT  TO X,Y
1080  IF Q = 205 THEN 1510
1090  IF I = 2 THEN  GOTO 1200
1100  REM
1110  REM *** DRAW REAL WIND ***
1120  REM
1130  LET X = XX: LET Y = YY: HPLOT X,Y
1140  LET ANGLE = 0: LET MOVE = MR
1150  GOSUB 150: HPLOT  TO X,Y
1160  REM
1170  REM * DRAW APPARENT WIND *
1180  REM
1190  LET X = XX: LET Y = YY: HPLOT X,Y
1200  LET ANGLE = DX: LET MOVE = MX
1210  GOSUB 150: HPLOT  TO X,Y
1220  REM
1230  REM ** DRAW BOAT MOTION **
1240  REM
1250  LET X = XX: LET Y = YY: HPLOT X,Y
1260  LET ANGLE = DH: LET MOVE = MB
1270  HCOLOR= 6: GOSUB 150: HPLOT  TO X,Y: HCOLOR= 7
1280  IF I = 1 THEN  GOTO 1470
1290  REM
1300  REM * DRAW SAILFORCE *
1310  REM
1320  LET X = XX: LET Y = YY: HPLOT X,Y
1330  LET ANGLE = DL: LET MOVE = ML / 260
1340  GOSUB 150: HPLOT  TO X,Y
1350  REM
1360  REM * DRAW TOTAL DRAG *
1370  REM
1380  LET X = XX: LET Y = YY: HPLOT X,Y
1390  LET ANGLE = DD: LET MOVE = MD / 260
1400  GOSUB 150: HPLOT  TO X,Y
1410  LET X = XX: LET Y = YY: HPLOT X,Y
1420  REM
1430  REM ** TOTAL FORCE **
1440  REM
1450  LET ANGLE = TF: LET MOVE = TM / 260
1460  GOSUB 150: HPLOT  TO X,Y
1470  NEXT I
1480  REM
1490  REM * FIND APPARENT WIND *
1500  REM
1510  LET D1 = DH
1520  LET D2 = DR
1530  LET M1 = MB
1540  LET M2 = MR
1550  GOSUB 270
1560  LET DX = D3
1570  LET MX = M3
1580  REM
1590  REM *** TURN BOAT ***
1600  REM
1610  LET RA =  PDL (0) / 2.55 - 50
1620  LET DB = DB + (RA *  SGR (MB) *  SGN (RE)) / 5
1630  REM ********************
1640  REM *                  *
1650  REM *    SAIL ANGLE    *
1660  REM *                  *
1670  REM *       AND        *
1680  REM *                  *
1690  REM *  JIBE ROUTINE.   *
1700  REM *                  *
1710  REM ********************
1720  IF DB > 360 THEN DB = DB - 360
1730  IF DB < 0 THEN DB = DB + 360
1740  LET BF = (255 -  PDL (1)) / 5 + 15
1750  IF DB > DX THEN DX = DX + 360
1760  LET BW = DX - DB
```



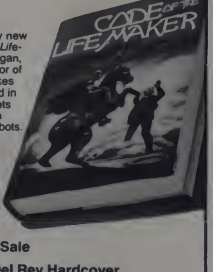
PEIK

```
1770  IF BW > 180 THEN BW = BW - 360
1780  IF DX > 360 THEN DX = DX - 360
1790  IF BF > ABS (BW) THEN BA = 0: GOTO 2020
1800  IF  SGN (BW) =  - 1 THEN BW = BW + 360
1810  IF BA > 0 THEN 1920
1820  IF BA < 0 THEN 1930
1830  GOTO 1890
1840  VTAB 24: PRINT : PRINT "..............JIBE HO!!!"
1850  PRINT : PRINT
1860  FOR I = 1 TO 500: NEXT
1870  GOSUB 460
1880  REM RE-INIT SCREEN LEGEND
1890  IF BW > 180 THEN BW = BW - 360
1900  IF  SGN (BW) = 1 THEN BA = BW - BF: GOTO 2020
1910  LET BA = BW + BF: GOTO 2020
1920  LET BA = BW - BF: GOTO 1940
1930  LET BA = BW - 360 + BF
1940  IF  ABS (BA) > 180 THEN 1840
1950  REM ***********************
1960  REM *                     *
1970  REM * FIND VECTOR SUM     *
1980  REM *                     *
1990  REM * OF LIFT AND DRAG    *
2000  REM *                     *
2010  REM ***********************
```


What is man?
Where does he come from?
Where is he going?

In his extraordinary new novel, *Code of the Lifemaker*, James P. Hogan, the bestselling author of *Inherit the Stars* takes you to a future world in which mankind meets its match in an alien race of intelligent robots.

It's the most amazing novel yet from the man who puts the science back in science fiction.



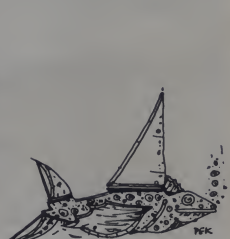
Now on Sale

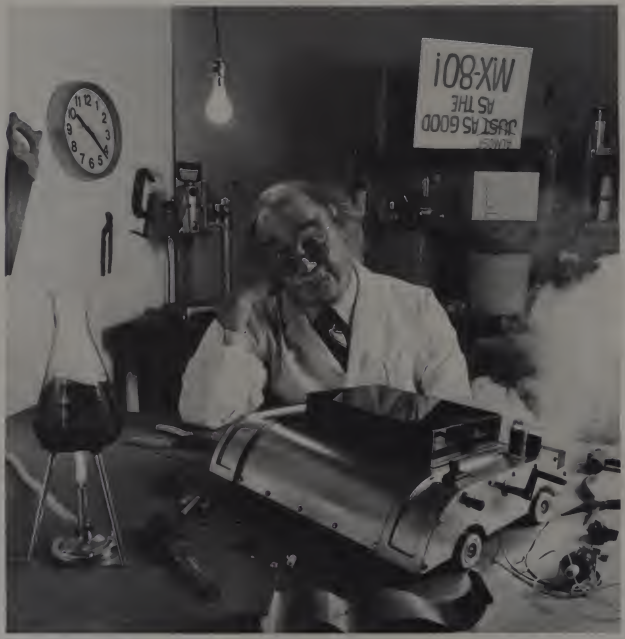
DEL REY **A Del Rey Hardcover**
Published by Ballantine Books

CIRCLE 118 ON READER SERVICE CARD

```
2020  IF BA =  > 0 THEN DL = DX - 90
2030  IF BA < 0 THEN DL = DX + 90
2040  IF DL > 360 THEN DL = DL - 360
2050  IF DL < 0 THEN DL = DL + 360
2060  LET ML = 2 * (L( ABS (BA)) * MX ^ 2)
2070  LET DD = DX + 180
2080  IF DD > 360 THEN DD = DD - 360
2090  LET MD = D( ABS (BA)) * MX ^ 2
2100  LET D1 = DL:D2 = DD:M1 = ML:M2 = MD
2110  GOSUB 240
2120  LET DF = D3:MF = M3
2130  LET TF = DF: LET TM = MF
2140  REM TF AND TM FOR VECTOR        DISPLAY
2150  REM
2160  REM **********************
2170  REM *                    *
2180  REM * NORMALIZE FORCE    *
2190  REM *                    *
2200  REM *      TO HULL       *
2210  REM *                    *
2220  REM **********************
2230  REM
2240  LET DF = DF - DB
2250  IF DF < 0 THEN DF = DF + 360
2260  LET D1 = DF:D2 = 0:M1 = MF:M2 = 0
2270  GOSUB 240
2280  REM
2290  REM ************************
2300  REM *                      *
2310  REM * DIRECTION OF FORCE   *
2320  REM *                      *
2330  REM *     MODIFIED BY      *
2340  REM *                      *
2350  REM * LATERAL RESISTANCE   *
2360  REM *                      *
2370  REM ************************
2380  REM
2390  LET M1 = M1 / LR
2400  LET M3 = M1:V3 = V1
2410  GOSUB 340
2420  LET DF = D3:MF = M3
2430  IF DF > 180 THEN DF = DF - 360
2440  REM
2450  REM **    FIND LEEWAY    **
2460  REM **                   **
2470  REM **  RATE OF CHANGE   **
2480  REM ** AFFECTED BY MASS  **
2490  REM **                   **
2500  REM ** SGN (RE) SAYS     **
2510  REM ** WHICH WAY THE     **
2520  REM ** RUDDER TURNS THE  **
2530  REM ** BOAT.             **
2540  REM
2550  LET D1 = LW:D2 = DF
2560  LET M1 = MB
2570  LET M2 = MF / (MA / 5)
2580  GOSUB 240
2590  LET LW = D3:RE = V3
2600  IF DF < 0 THEN DF = DF + 360
2610  IF LW > 180 THEN LW = LW - 360
2620  IF BW > 180 THEN BW = BW - 360
2630  REM
2640  REM ************************
2650  REM *                      *
2660  REM * LEEWAY & BOATWIND    *
2670  REM *                      *
2680  REM * BOTH + OR - CENTER   *
2690  REM *                      *
2700  REM * OF BOAT (- = PORT)   *
2710  REM *                      *
2720  REM ************************
2730  REM
2740  REM THIS IS WHERE FORCE
2750  REM ACCELERATES BOAT
2760  REM
2770  REM AND DRAG SLOWS IT.
2780  REM
2790  LET MB = MB + (MF / MA) - ( ABS (MB) * .2) ^ 2.1
2800  LET DH = DB + LW: IF DH < 0 THEN DH = DH + 360
2810  IF DH > 360 THEN DH = DH - 360: GOTO 2810
2820  LET D1 = DH:D2 = 0:M1 = MB:M2 = 0: GOSUB 240
2830  VTAB 21: HTAB 15: PRINT "     "
2840  VTAB 21: HTAB 34: PRINT "     "
2850  VTAB 22: HTAB 15: PRINT "     "
2860  VTAB 22: HTAB 34: PRINT "     "
2870  VTAB 23: HTAB 15: PRINT "     "
2880  VTAB 23: HTAB 34: PRINT "     "
2890  LET ZZ =  INT (DB * 10 + .5) / 10: VTAB 21: HTAB 15: PRINT ZZ
2900  LET ZZ =  INT (MB * 10 + .5) / 10: VTAB 21: HTAB 34: PRINT ZZ
```

```
2910 LET ZZ =  INT (DH # 10 + .5) / 10: VTAB 22: HTAB 15: PRINT ZZ
2920 LET ZZ =  INT (BA # 10 + .5) / 10: VTAB 22: HTAB 34: PRINT ZZ
2930 LET ZZ =  INT (MX # 10 + .5) / 10: VTAB 23: HTAB 15: PRINT ZZ
2940 IF DX > 180 THEN DX = DX - 360
2950 IF DB > 180 THEN DB = DB - 360
2960 LET DB = DB #  - 1
2970 LET ZZ =  INT ((DB + DX) # 10 + .5) / 10: VTAB 23: HTAB 34: PRINT ZZ
2980 IF DX < 0 THEN DX = DX + 360
2990 LET DB = DB #  - 1
3000 IF DB < 0 THEN DB = DB + 360
3010 IF  PEEK ( - 16384) = 205 OR  PEEK ( - 16384) = 209 OR  PEEK ( - 16
     384) = 214 THEN 3040
3020 GOTO 3050
3030 IF Q = 209 THEN 600
3040 LET Q =  PEEK ( - 16384)
3050 REM CHOOSE DIAGRAM OR            MOVING BOAT
3060 IF Q = 214 THEN 470
3070 IF QQ <  > 214 THEN 3090
3080 LET XX = OX: YY = OY
3090 LET XX = XX + H3 # SIZE
3100 LET YY = YY - V3 # SIZE
3110 IF XX > 250 THEN XX = 30
3120 IF XX < 30 THEN XX = 250
3130 IF YY > 130 THEN YY = 30
3140 IF YY < 30 THEN YY = 130
3150 LET OX = XX: OY = YY
3160 GOTO 470: REM LOOP
3170 VTAB 4: PRINT "                        2D  VECTOR"
3180 PRINT : PRINT "                         SAILBOAT"
3190 PRINT : PRINT : PRINT "INSTRUCTIONS:"
3200 PRINT : PRINT "     PADDLE (0) CONTROLS THE RUDDER"
3210 PRINT "     PADDLE (1) CONTROLS THE SAIL."
3220 PRINT "     CLOCKWISE IS SHEETED IN"
3230 PRINT : PRINT "THE WIND IS OUT OF THE NORTH AT 10 KTS."
3240 PRINT "AND THE BOAT IS FACING STRAIGHT INTO IT"
3250 PRINT : PRINT "YOU MUST LET THE BOAT DRIFT BACK UNTIL"
3260 PRINT "YOU ARE ABLE TO TURN IT ENOUGH TO FILL"
3270 PRINT "THE SAIL AND START MOVING FORWARD."
3280 PRINT : PRINT "PRESS Q TO HALT ON A FRAME OR TO QUIT"
3290 LET SIZE = 5
3300 LET RC = 3.1415927 / 180
3310 LET CR = 1 / RC
3320 LET AR = 1.15
3330 LET DR = 0: REM FROM NORTH
3340 LET MR = 10: REM AT 10
3350 LET MA = 1000: REM MAGS
3360 LET LR = 20: REM LAT RESIS
3370 LET XX = 139: OX = XX
3380 LET YY = 79: OY = YY
3390 LET DB = 0: REM HEADING
3400 DIM T(7),M(7)
3410 FOR I = 1 TO 7
3420 READ T(I)
3430 READ M(I)
3440 NEXT
3450 DATA 165,4,15,2,17,2,73,1,73,2,17,2,15,4
3460 DIM L(180),D(180)
3470 FOR I = 0 TO 180: READ L(I): D(I) = ( SIN ((I # 2 - 110) # RC) + 1) #
     7 + 1.5: NEXT I
3480 PRINT
3490 INVERSE : PRINT "MOVING BOAT OR VECTOR DIAGRAM?"; NORMAL : INPUT "(
     TYPE M OR V AND PRESS RETURN) ";Q$: Q = LEFT$ (Q$,1)
3500 IF Q$ = "M" THEN Q = 205
3510 IF Q$ = "V" THEN Q = 214
3520 IF Q$ = "M" OR Q$ = "V" THEN 3540
3530 VTAB 21: HTAB 15: FLASH : PRINT "TRY AGAIN": NORMAL : GOTO 3490
3540 GOSUB 460
3550 GOTO 470
3560 DATA  0,.02,.05,.11,.23,.55,1.1,2.2.65,3.3,4,5,6,6.9,7.44,7.78,7.95
     ,8,7.98,7.92,7.82
3570 DATA 7.72,7.59,7.42,7.24,7.05,6.85,6.69,6.48,6.3,6.1,5.88,5.66,5.5,
     5.31,5.12,4.93,4.74,4.56,4.37,4.18
3580 DATA 4.02,3.85,3.68,3.52,3.36,3.2,3.06,2.9,2.76,2.53,2.4,2.26,2.13,
     2.03,1.9,1.79,1.7,1.6,1.5,1.39
3590 DATA 1.29,1.2,1.11,1.01,.93,.85,.77,.7,.63,.53,.5,.46,.41,.37,.33,.
     28,.24,.21,.18,.15
3600 DATA .12,.1,.08,.06,.05,.04,.03,.02,.01,0,-.01,-.02,-.03,-.04,-.05,
     -.07,-.08,-.09,-.1,-.12
3610 DATA -.14,-.17,-.2,-.22,-.24,-.27,-.31,-.35,-.39,-.43,-.47,-.51,-.5
     4,-.62,-.67,-.73,-.78,-.84,-.89,-.95
3620 DATA  -1,-1.06,-1.12,-1.19,-1.23,-1.32,-1.39,-1.46,-1.55,-1.63,-1.7
     2,-1.8,-1.89,-2,-2.1,-2.2,-2.3,-2.4,-2.52,-2.65
3630 DATA -2.75,-2.88,-3,-3.13,-3.26,-3.38,-3.5,-3.62,-3.75,-3.9,-4.05,-
     4.2,-4.37,-4.53,-4.67,-4.77,-4.93,-5.08,-5.22,-5.32
3640 DATA -5.41,-5.46,-5.5,-5.49,-5.43,-5.28,-5.05,-4.5,-4,-3.4,-2.87,-2
     .35,-1.65,-1,-.65,-.42,-.24,-.11,-.02,0
```





For everyone who's tried
to top the MX-80, bad news.
We just did.

Epson.

The Epson MX-80 is the best-selling dot matrix impact printer in the world. It has been since its introduction. And despite the host of imitators it spawned, no one has been able to top it. Until now.

FX-80: Son of a legend.
The new Epson FX-80 is far more than just doo-dads added on to last year's model. It's the most astonishing collection of features ever assembled in a personal printer.

For starters, it's fast: 160 CPS. And clean. All the print quality Epson is famous for in a tack-sharp 9x9 matrix.

But that hardly scratches the surface.

Create your own alphabet.
With the new FX-80, you aren't limited to ASCII characters. You can create your own. Any character or symbol that can be defined in a 9x11 matrix can be added to the FX-80's already impressive library of type styles and stored in its integral 2K RAM.

So you can create "Sally's Gothic" or "Tom's Roman" just by downloading and modifying standard characters. Or you can create a custom set from scratch. Either way, you can store up to 256 new characters. And if you don't need a new alphabet, the RAM functions as a 2K data input buffer.

Who knows graphics better than Epson?
Nobody, that's who. And if you don't believe it, witness the FX-80.

With a 12K ROM capacity, the FX-80 gives you a few things the others don't. For example, not one, not two, but *seven* different dot addressable graphic modes are program selectable. And can be mixed in the same print line. Everything from 72 DPI (dots-per-inch) Plotter Graphics to the 640 dots per line resolution designed to match the remarkable monitor clarity of the Epson QX-10 personal computer.

And *that* is in addition to an astonishing array of 136 different user-selectable type styles including Proportional, Elite and Italic as well as the more conventional faces you get on other printers.

Hard-to-beat hardware.
The FX-80 has all the hardware features you've come to know and love on the MX Series: logic seeking, bidirectional printing, the by-now-famous disposable printhead, and more.

The FX-80 features an adjustable pin platen or optional friction/tractor feed, so you can use fanfold, roll or sheet paper ... backwards or forwards. The FX-80 even gives you reverse paper feed.

And if you're printing forms, the FX-80 has a feature you're gonna love: a function that allows you to tear off the paper within one inch of the last print position.

Be the first on your block.
We'd be willing to bet that the FX-80 — like the MX-80 — will have its share of imitators. Don't be fooled. To make sure you get the genuine article, rush down to your local computer store right now and let them show you everything the FX-80 can do.

And while you're there ... ask them to show you how it works with our computers.

EPSON
EPSON AMERICA, INC.
COMPUTER PRODUCTS DIVISION

3415 Kashiwa Street
Torrance, California 90505
(213) 539-9140.
Outside California, phone
(800) 421-5426 for the
Epson dealer nearest you.

CIRCLE 205 ON READER SERVICE CARD

An Adventure Game For The Bally Arcade and Commodore Vic 20

Cavern Quest

Bruce Jaeger

The Bally Arcade (or Astrocade) is probably the most undersung of the home computer systems, and undeservedly so. The color graphics and sound capabilities were, and in many cases still are, years ahead of the competition, both in the cartridge games and with Bally Basic. The most serious limitations have been the small, calculator-style keyboard and the mere 1800 bytes of RAM.

Was I crazy then, to attempt to write an adventure game for the Bally? Perhaps. But I tried, and I think you will enjoy the result.

I knew that no magic was strong enough to fit any kind of traditional Adventure game into those 1800 bytes. In addition, a novice at the Bally keypad could take days to type in "Take the Amulet," so I elected to use joystick 1 for input.

The scenario of the game is straightforward. Jesse James, the Robin Hood or Attila the Hun of Missouri (depending on your point of view), has hidden a treasure deep in a cave, and you want to go in, find it, and bring it out. That's it. No magic birds, sword-wielding ogres or dissembling oracles. Not only would that have been quite a task in 1800 bytes, but it turns out that a simple, realistic exploration of a three-dimensional cave is difficult enough, thank you.

The cavern passages do not form a traditional maze, as there is often more than one path to the treasure, and any path is liable to loop back on itself—sometimes in an inexplicable way. Make a map.

Bruce Jaeger, 1253 Ashland Ave., St. Paul, MN 55104.

The Program

The first third of the program generates the passages of the cave, using the random number generator, so unlike most adventure games, the cave is different each time. Also at this time the various artifacts of the James boys are strewn about, and the treasure hidden. It takes about half a minute or so for the computer to do its work.

The rest of the program is the playing section. The player enters the cave, and is told whether passages lead north, south, east, west, up or down. Pushing the joystick forward is the equivalent of saying Go North, and the other compass directions correspond.

As you will never get both an Up and a Down choice at the same point, a simple pull of the trigger (or firing button) suffices to indicate climb or descent. Then it is simply a matter of wandering through the cave, keeping track of where you are, finding the treasure, and making your way out again.

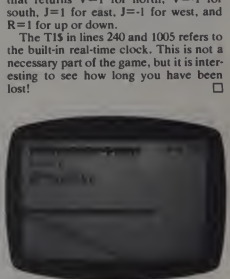
To make the cavern as large as possible none of the fine Bally sound effects or graphics other than color changes have been used. Because of the restricted memory, it is also important not to type in any spaces between commands, except as noted in lines 54 and 55.

Vic Version

I have included a translation of Cavern Quest for the Vic computer (or any other regular Basic computer, with modifications), as Bally Basic code is often difficult to translate. The cavern can be made much larger if you wish, by increasing the value of variable B in line 15 to as much as your available memory will allow.

Again, I have used no sound effects or fancy graphics, to make translation of the program into other dialects of Basic easier. The POKEs in lines 15 and 260 change the Vic screen and border colors, and the joystick subroutine at line 1000 is obviously peculiar to Vic. For Pet or Commodore 64, substitute the keyboard subroutine at 1000. For other microcomputers, simply write your own subroutine that returns V=1 for north, V=-1 for south, J=1 for east, J=-1 for west, and R=1 for up or down.

The TI$ in lines 240 and 1005 refers to the built-in real-time clock. This is not a necessary part of the game, but it is interesting to see how long you have been lost! □



FRANKLIN COMPUTER CORPORATION

ACE 1000

$899.00

With Color $949.00

Novation

APPLE CAT II	295.00
APPLE CAT 212	295.00
J-CAT	149.00
AUTO CAT 212	599.00
D-CAT MODEM	179.00
CAT	169.00
SMART CAT 103/212	479.00

BASIS

TWO DRIVES
128K; 3.0 CP/M
DIAGNOSTIC CONTROLLER
CALL FOR LOWEST PRICES

SOFTWARE

ASCII EXPRESS II	49.00
AZTEC	29.00
BANK STREET WRITER (AP, AT)	49.00
BEAGLE BROS	$Call
BPI: GL, AR, INV	299.00
CP/M 3.0 (Basis)	189.00
CYDEX	49.00
D BASE II	489.00
FACEMAKER (AP, IBM)	25.00
FLIGHT SIMULATOR (IBM)	39.00
HOME ACCOUNTANT	
APPLE	49.00
IBM	109.00
INFOSTAR	299.00
LEARNING COMPANY	$Call
MAILMERGE (APPLE)	99.00
PEACHTREE	$Call
PASCAL/MT + 86 (IBM)	329.00
PFS (AP, IBM)	$Call
SUPERCALC	199.00
ULTAMA II	47.00
VOLKSWRITER (IBM)	149.00
WORDHANDLER II	129.00
WORDSTAR	279.00

MONITORS

BMC 12" Green AU	89.00
BMC 12" Green EU	129.00
BMC 9191 Color	299.00
Quadchrom Hi-Res RGB	499.00
Taxan 12" Amber or Green	149.00
Taxan RGB III	549.00
USI Pi-3 12" Amber	169.00
USI Pi-1 9" Green	89.00

PRINTERS

BMC	789.00
C-ITOH Prowriter 8510AP	459.00
DTC 380Z	1195.00
EPSON	$Call
GEMINI 10	329.00
GEMINI 15	499.00
OKIDATA	$Call
SEIKOSHA GP100	239.00

HARDWARE

APPLESURANCE	99.00
DISPATCHER (SERIAL INTERFACE)	119.00
HAYES	
SMARTMODEM 1200	529.00
MICROMODEM II	269.00
LEGEND 64K	299.00
LEGEND 128K w/Software	359.00
MICROBUFFER II 16K	329.00
MICROSOFT	
16K RAM CARD	59.00
SOFTCARD	239.00
MX-PLUS (Finger Print)	45.00
PAYMAR L/CASE Rev 7	20.00
RIBBONS	
EPSON MX 80	7.00
EPSON MX 100	11.00
OKI 82 83, GEMINI	3.95
SMARTERM II	149.00
SNAPSHOT	99.00
WIZARD 8PO 16K	149.00
WILDCARD	119.00
Z-CARD II	149.00

MOUNTAIN COMPUTER

A/D - D/A	269.00
CPS CARD	159.00
CABLES	$Call
CLOCK	195.00
EXPANSION CHASSIS	559.00
MUSIC SYSTEM	299.00
RAMPLUS 32K	145.00
ROMWRITER	145.00
SUPERTALKER	149.00

Videx

80 COLUMN	199.00
ENHANCER II	119.00
FUNCTION STRIP	[illegible]00
INVERSE VIDEO	19.00
ULTRATERM	$Call
PSIO	$Call
SOFTWARE	$Call

KENSINGTON MICROWARE

SYSTEM SAVER

- Surge Suppression
- Dual Outlet
- U.L. Listed
- Fits Apple Stand

$65

Verbatim

5 1/4" SS/DD/SS (100)	239.00
5 1/4" SS/DD/SS (10)	25.95
5" SS/DD/SS (10)	39.00
8" DS/DD/SS (10)	45.00

16K RAM CARD

Compatible with
DOS 3.3, CP/M
Vascalc, PASCAL
2 YR. WARRANTY

$39.00

GAME I/O

TG	
JOYSTICK (IBM)	45.00
JOYSTICK II	40.00
JOYSTICK III	45.00
PADDLES	29.00
SELECT-A-PORT	47.00
TRACKBALL	59.00
KRAFT	
JOYSTICK (AP, IBM, TRS)	47.00
JOYSTICK (AT, COM)	15.00
PADDLES	35.00
PARADISE PORT	24.95
PADDLE-APPLE	24.95

DRIVES

4th DIMENSION	249.00
MICRO SCI A2	249.00
MICRO SCI A3, A40, A70	$Call

SATURN SYSTEMS

64K	$319.00
128K	459.00
V-C Expand 80	99.00

SMITH CORONA TP-I

LETTER QUALITY DAISY WHEEL

$569.00

QUADRAM

QUADBOARD 64K	299.00
MICROFAZER	$Call
QUAD 512 + (64K)	329.00
QUADBOARD II 64K	299.00

POWER STRIP

W/SURGE PROTECTION

$25.00

- No Charge for Credit Cards
- Min. $4.00 Shipping Charge
- Purchase Orders Welcome Call for Terms First

COMPUTER DISCOUNT PRODUCTS

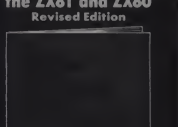
MAIL ORDERS & RETAIL STORE
860 S. Winchester Blvd
San Jose, CA 95128

(408) 985-0400

CIRCLE 144 ON READER SERVICE CARD

FOR SINCLAIR AND TIMEX SINCLAIR USERS...

The Gateway Guide to the ZX81 and ZX80
Revised Edition



By Mark Charlton

This helpful book has more than 70 fully documented programs for the ZX80, ZX81 and Timex Sinclair 1000. If you're just learning about computing, *The Gateway Guide* will help you grasp the basics of programming your computer.

The book starts with a look at each function and statement in ZX BASIC, and explains how it works with a demonstration program. Game programs, graphics programs and increasingly sophisticated programs are given as you progress... until you've become completely well-versed with your computer and what you can do with it.

A special section is included on using the ZX80, ZX81 and Timex Sinclair 1000 in the classroom, showing how programs can be built around commonly-used formulae to teach problem-solving.

Appendices cover memory used, ZX BASIC commands, machine specifications, hex dump, graphic symbols and codes, conversions, the ZX81 hexadecimal chart, documentation and overheating problems.

Softcover, 5½" x 8½", illustrated. $9.95.

For faster service,
PHONE TOLL FREE: 800-631-8112
(In NJ only 201-540-0445)

Also available at your local bookstore or computer store.

CREATIVE COMPUTING PRESS
Dept. HB2C 39 East Hanover Avenue
Morris Plains, NJ 07950

Please send me _____ *The Gateway Guide to the ZX81 and ZX80* at $9.95* plus $2.00 postage and handling each. Outside USA add $3.00 per order. #180.

☐ **PAYMENT ENCLOSED $**_____ *Residents of CA, NJ and NY State add applicable sales tax

☐ **CHARGE MY:**
(Charge and phone orders $10 minimum)
☐ American Express
☐ MasterCard ☐ Visa

Card No. _____ Exp. Date _____

Signature _____

Mr / Mrs / Ms _____
(please print full name)

Address _____ Apt. _____

City _____

State/Zip _____

☐ Send me a FREE *Creative Computing* Catalog

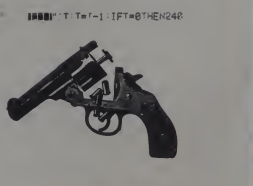
Cavern Quest, continued...

Cavern Quest for Bally.

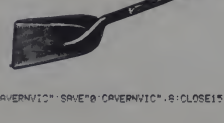
```
 1 BC=4:S;FC=125;CLEAR ;E=10;Z=0;B=300;T=B;C=B/2;FOR A=1TO B+11;@(A)=Z;NEXT A
 2 A=E;@(A)=1;NT=0
 3 D=RND (7);CLEAR ;PRINT T;T=T-1;IF T=0GOTO 24
 4 IFD=2D=-1
 5 IFD=3D=-E
 6 IFD=4D=E
 7 IFD=5D=-C
 8 IFD=6D=C
 9 IFD=7GOTO 18
10 H=A+D;IF H<1GOTO 3
11 IFH>BGOTO 3
12 K=@(H);IF K=3GOTO 3
13 IF K=4GOTO 3
14 IF K>BGOTO 3
15 @(H)=1;IF D=-C2(A)=3;@(H)=4
16 IF D=C2(H)=3;@(A)=4
17 A=H;GOTO 3
18 IF RND (3)=2GOTO 10
19 IF @(A)=1GOTO 3
20 Z=Z+1;K=0;IF Z>EGOTO 3
21 V=RND (E);K=K+1;IF K=40GOTO 3
22 IF @(V+B)=0GOTO 21
23 @(A)=V+B;@(V+B)=1;GOTO 3
24 @(A)=B+11;CLEAR ;A=E;G=0
25 CLEAR ;IF A=EGOTO 27
26 PRINT "ENTRANCE";IF G=1BC=102;FC=16;PRINT "$$ YOU MADE IT' $$";;NT=2;STOP
27 PRINT "PASSAGES LEAD:";IF A>EIF @(A-E)PRINT"NORTH"
28 IF A<(B-E)IF @(A+E)PRINT "SOUTH"
29 IF @(A-1)PRINT "WEST"
30 IF A<BIF @(A+1)PRINT "EAST"
31 IF @(A)=4PRINT "UP"
32 IF @(A)=3PRINT "DOWN"
33 PRINT ;IF @(A)<BGOTO46
34 PRINT "YOU SEE";X=@(A)-B
35 IF X=1PRINT "A BOOT"
36 IF X=2PRINT "A SKELETON"
37 IF X=3PRINT "A SHOVEL"
38 IF X=4PRINT "HILDEWED SADDLEBAGS"
39 IF X=5PRINT "A RUSTY PISTOL"
40 IF X=6PRINT "A BROKEN LANTERN"
41 IF X=7PRINT "'J. JAMES WAS HERE'"
42 IF X=8PRINT "YUCK! BATS'"
43 IF X=9PRINT "A BUSTED LADDER"
44 IF X=10PRINT "AN EMPTY TRUNK"
45 IF X=11PRINT "$$ TREASURE $$";G=1;@(A)=1
46 V=0;J=0;R=0;J=JX(1);IF J#0GOTO 50
47 V=JV(1);IF V#0GOTO 50
48 R=TR(1);IF R#0GOTO 50
49 GOTO 46
50 IF V=1L=A-E
51 IF V=-1L=A+E
52 IF J=1L=A+1
53 IF J=-1L=A-1                          Put a space
54 IF @(A)=3IF R L=A-C;GOTO56    <-      after the 'R'
55 IF @(A)=4IF R L=A+C           <-      in lines
56 IF L<10GOTO 60                        54 & 55!
57 IF L>BGOTO 60
58 IF @(L)=0GOTO 60
59 A=L;GOTO 25
60 PRINT "###SOLID ROCK###";GOTO 46
```

Cavern Quest for Vic 20, PET/CBM.

```
10 PRINT"□■";POKE36879,72:C=150 E=10 Z=■:B=300 T=B:C=B/2:FOR A=1TO B+11:@(A)=Z:NEXT A
15 PRINT"□ CAVERN QUEST"
20 A=E B=@(A)+1
30 D=INT(RND(1)*7)+1:PRINT"■ SP(13)"  ■■■■";T:T=T-1:IFT=0THEN240
40 IFD=2THEND=-1
50 IFD=3THEND=-E
60 IFD=4THEND=E
70 IFD=5THEND=-C
80 IFD=6THEND=C
90 IFD=7THEN100
100 H=A+D:IFH<10OTO30
110 IFH>BTHEN30
120 K=@(H):IFK=3OOTO30
130 IFK=4OOTO30
140 IFK>BOOTO30
150 @(H)=1:IFD=-CTHEN@(A)=3:@(H)=4
160 IFD=CTHEN@(H)=3:@(A)=4
170 A=H:GOTO30
```



```
100 IFINT(RND(1)*3)+1<>2THEN30
110 IFAX(A)<>10OTO30
200 Z=Z+1:K=0:IFZ>EOOTO30
210 V=INT(RND(1)*E)+1
220 IFAX(V+B)<>00OTO210
230 AX(A)=V+B:AX(V+B)=1:GOTO30
240 AX(A)=B+11:PRINT"▯":A=E.0=3:T1$="000000"
250 PRINT"▯":IFA>ETHEN270
260 PRINT" ▯RAVE ENTRANCE▮":IF0=1THENPOKE36879,210:PRINT"▮▮▮▮  YOU MADE IT!
  ▮▮  ▮":END
270 PRINT" PASSAGES LEAD":PRINT:IFA>ETHENIFAX(A-E)<>0THENPRINT" NORTH"
280 IFAC(E-E)THENIFAX(A+E)THENPRINT" SOUTH"
290 IFAX(A-1)THENPRINT" WEST"
300 IFACBTHENIFAX(A+1)THENPRINT" EAST"
310 IFAC(B-C)THENIFAX(A)=4THENPRINT" UP"
320 IFA>CTHENIFAX(A)=3THENPRINT" DOWN"
330 PRINT:IFAX(A)<BOOTO460
340 PRINT" YOU SEE":X=AX(A)-B:PRINT " ";
350 IFX=1THENPRINT"A BOOT"
360 IFX=2THENPRINT"A SKELETON"
370 IFX=3THENPRINT"A SHOVEL"
380 IFX=4THENPRINT"MILDEWED SADDLEBAGS"
390 IFX=5THENPRINT"A RUSTY PISTOL"
400 IFX=6THENPRINT"A BROKEN LANTERN"
410 IFX=7THENPRINT"J. JAMES WAS HERE"
420 IFX=8THENPRINT"YUCK! RATS!"
430 IFX=9THENPRINT"A BUSTED LADDER"
440 IFX=10THENPRINT"AN EMPTY TRUNK"
450 IFX=11THENPRINT"▮▮▮ TREASURE $$$":O=1:AX(A)=1
460 FORDEL=1TO125:NEXTDEL:V=A J=0:R=0 GOSUB1000
500 IFV=1THEN_=A-E
510 IFV=-1THENL=A+E
520 IFJ=1THENL=A+1
530 IFJ=-1THEN_=A-1
540 IFAX(A)=3ANDRTHEN:L=A-C GOTO560
550 IFAX(A)=4ANDRTHENL=A+C
560 IFLC10OTO600
570 IFL>BOOTO600
580 IFAX(L)=0OOTO600
590 A=L:GOTO250
600 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮▮▮SOLID ROCK▮▮▮▮":GOTO460
1000 REM VIC JOYSTICK ROUTINE
1005 PRINT"▮":PRINTSPC(17);MID$(T1$,3,2);":" ";RIGHT$(TI$,2)
1010 POKE37139,0:POKE37154,127:S%=-((PEEK(37152)AND128)=0):POKE37154,255
1020 PK=PEEK(37137):S1=((PK)AND8)=0):S2=((PKAND16)=0):S0=-((PKAND4)=0)
1030 R=-((PKAND32)=0)
1040 V=S0ORS1:J=S2ORS3:IFR=0ANDJ=0ANDV=0THEN1000
1050 RETURN
2000 KT=0
2010 GOSUB1000
2020 IFV=1ORV=-1THEN2030
2025 GOTO2010
2030 IFV=-1THENKT=KT+1
2040 IFV=1THENKT=KT-1
2050 IFKT<1THENKT=R+11
2060 IFKT>R+11THENKT=1
2070 PRINTKT.AX(KT)
2080 GOTO2010
9000 OPEN15,8,15:PRINT#15,"S0 CAVERNVIC":SAVE"0 CAVERNVIC",8:CLOSE15
```



Keyboard subroutine for Pet/CBM or Vic without joystick.

```
1000 REM PET NUMBER KEYPAD ROUTINE
1005 PRINT"▮" PRINTSPC(17);MID$(TI$,3,2,":" RIGHT$(TI$,2) REM PRINT HOME
1010 REM VIC W,S,E,N,U,D KEYS
1020 GET0$:IF0$=""THEN1020
1030 J=0 V=0 R=0
1040 IF0$="4"OR0$="W"THENJ=-1:RETURN
1050 IF0$="6"OR0$="E"THENJ=1 RETURN
1060 IF0$="8"OR0$="N"THENV=1:RETURN
1070 IF0$="2"OR0$="S"THENV=-1:RETURN
1080 IF0$="5"OR0$="U"OR0$="D"THENR=1:RETURN
1090 GOTO1020
```

Sure it's insured?

SAFEWARE™ Insurance provides full replacement of hardware, media and purchased software. As little as $5/yr covers:
• Fire • Theft • Power Surges
• Earthquake • Water Damage • Auto Accident

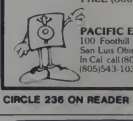
For information or immediate coverage call:
1-800-848-3469
(In Ohio call 1-800-848-2112)

SAFEWARE
COLUMBIA NATIONAL GENERAL AGENCY

CIRCLE 289 ON READER SERVICE CARD

Maxell Floppy Disks
The Mini-Disks with maximum quality.

Dealer inquiries invited. C.O.D's accepted. Call FREE (800) 235-4137.



PACIFIC EXCHANGES
100 Foothill Blvd., San Luis
San Luis Obispo, CA 93401
In Cal. call (800) 592-5935 or (805) 543-1037

CIRCLE 236 ON READER SERVICE CARD

PROWRITER
Printers
now only **$393**
Interfaces available for:
Apple
Atari
Radio Shack
IBM
etc.
SNAVE SYSTEMS
CALL 312/966-4505

CIRCLE 251 ON READER SERVICE CARD

COMPUTERS

TRS-80 MODEL 100

Radio Shack's new TRS-80 Model 100 is a lightweight portable computer that features a full-sized typewriter keyboard with eight programmable function keys, an eight-line, 40-character liquid crystal display, nonvolatile memory and built-in software. The machine will compete in a market that has previously been dominated by the Epson HX-20.

The Model 100 is 2" thick, 8 1/2" tall, less than 12" wide and weighs less than four pounds. It features a nonvolatile memory that maintains information after the machine has been turned off. The processor used is an 8-bit 80C85 CMOS microprocessor. A 300-baud, auto-dial telephone modem is built in, as is the software required to use the modem to connect to the outside world.

Other features include a real-time clock; RS-232, cassette and parallel printer interfaces; four cursor keys; four command keys; and eight function keys. The liquid crystal display can produce both upper and lowercase characters, dot addressable graphics, and a selection of European and graphics characters.

The Model 100 comes with four application programs and a Basic interpreter, all stored in ROM. TELCOM is the built-in communications control program, which features automatic telephone dialing, auto log-on, and both full and half duplex communication. The ADRSS program stores phone numbers and addresses and can be used along with the TELCOM software and the built-in modem to dial phone numbers or log into remote database services. TEXT is a text generation and word processing package that includes search, move, copy, delete, and cut-and-paste commands. The SCHEDL software functions as a personal note pad to help the user keep track of a variety of daily events. All five programs can be accessed from the main menu by positioning the cursor on the desired program and pressing the ENTER key.

The Model 100 will work for 20 hours on four AA batteries or can be powered by an optional AC adapter. Built-in nickel cadmium batteries maintain the contents of memory for up to 30 days.

The 8K version of the Model 100 sells for $799. A 24K version is available for $999. Either unit can be expanded to 32K with 8K memory expansion kits selling for $119.95 each. See the August 1983 *Creative Computing* for an in-depth evaluation of the Model 100.

Available at Radio Shack stores and Computer Centers.

TWO PORTABLE COMPUTERS

Osborne has introduced two portable computers. Both units are enhanced versions of Osborne's original product, the Osborne 1. The Executive I is a Z80-based system with a 7" display and two half-height, double density disk drives. The Executive II closely resembles the Executive I with the addition of an Intel 8088 co-processor that provides compatibility with an IBM PC.

The Executive I has much in common with the Osborne 1. The keyboard is identical. Brightness, contrast, and reset

controls, external video, and the ten function keys are also unchanged. The two full-height drives of the Osborne 1 have been replaced with two 200K half-height floppy drives. A 7" amber screen is used in place of the 5" black and white screen.

The display format on the Executive I has been enlarged to 24 lines by 80 characters. A composite video output has also been added saving the user the price of an adapter should he wish to attach an external monitor. Five cursor options are provided: invisible cursor, a blinking block, steady block, blinking underline, and steady underline. The character set is read from disk rather than from ROM as on the Osborne 1. This allows the user to adapt the character set to his needs.

Software packaged with the Executive I includes *WordStar, SuperCalc,* CBasic, MBasic and the CP/M Plus operating system. Software written for the Osborne 1 should be compatible with the Executive I with few modifications.

The Executive II includes most of the features of the Executive I with a few additions. The addition of the second processor allows the II to function as either an 8-bit or a 16-bit computer. While operating in 8-bit mode the Executive II should be fully compatible with the Executive I. When operating in 16-bit mode the computer can access and use software written for the 8088 processor. In this mode the system has access to an additional 128K bytes of memory that is entirely independent of the memory accessed by the Z80 processor. In this mode the system can also access the built-in IBM PC compatible video graphics system.

Both of the new machines have been designed with increased communications capabilities. IBM communications protocols supported include 3271, 3780, 2780, and 3741 terminal emulations, and X.25 and SNA network interfaces.

The Executive I is currently available. It sells for $2495 with 128K bytes of memory. The Executive II will be available later in 1983. The price of the Executive II is tentatively set at $3195.

Osborne Computer Corporation, 26538 Danti Ct., Hayward, CA 94545. (415) 887-8080.

CIRCLE 405 ON READER SERVICE CARD

NEW SUBSCRIBERS ONLY

Send me one year of

creative computing

at 20% off!

☐ I want 12 issues of *Creative Computing* for only $19.97! (The full one-year subscription price is $24.97.)

☐ I prefer two years for $36.97.

☐ Make that three years for $49.97.

Mr.
Mrs.
Ms._____
(please print full name) 45150

Address_____ Apt.____

City_____

State_____ Zip_____

CHECK ONE: ☐ Payment enclosed. ☐ Bill me later.

Would you like to receive special offers from qualified users of our mailing list? ☐ Yes. ☐ No.

Add $5 a year in Canada; all other foreign add $10 per year. Please allow 30 to 60 days for delivery of first issue.

NEW SUBSCRIBERS ONLY

Send me one year of

creative computing

at 20% off!

☐ I want 12 issues of *Creative Computing* for only $19.97! (The full one-year subscription price is $24.97.)

☐ I prefer two years for $36.97.

☐ Make that three years for $49.97.

Mr.
Mrs.
Ms._____
(please print full name) 45150

Address_____ Apt.____

City_____

State_____ Zip_____

CHECK ONE: ☐ Payment enclosed. ☐ Bill me later.

Would you like to receive special offers from qualified users of our mailing list? ☐ Yes. ☐ No.

Add $5 a year in Canada; all other foreign add $10 per year. Please allow 30 to 60 days for delivery of first issue.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 66 BOULDER, COLORADO

POSTAGE WILL BE PAID BY ADDRESSEE

creative computing
P.O. Box 5214
Boulder, Colorado 80321

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 66 BOULDER, COLORADO

POSTAGE WILL BE PAID BY ADDRESSEE

creative computing
P.O. Box 5214
Boulder, Colorado 80321

7 Good reasons why you should subscribe to *Creative Computing*.

It's the Number One magazine of computer applications and software!

There's one place you can always be sure of learning more about microcomputer software and applications: *Creative Computing*.

Every month *Creative Computing* provides you with a continuing education on everything related to microcomputers and computer equipment. Useful articles, "how to" tutorials, exciting new applications, games and "no holds barred" reviews of the latest software and equipment make up a major part of *Creative Computing*'s editorial content.

We give you probing features on programming breakthroughs and important news. Plus in-depth articles on elementary, intermediate and advanced software and applications topics—to help you develop your knowledge and skills, save hundreds (perhaps thousands) of dollars in unneeded software, discover uses for your personal computer that you might never have considered. Articles that increase your overall "computer consciousness." Here's how:

1 *Creative Computing* gives you things to actually do with a computer.

Just owning a computer isn't enough. You've got to know what to do with it. That's why applications are our primary focus. Text editing, animation, graphics, business simulations, data base and file systems, music synthesis, control of household devices, communications, games—some of the applications and software you'll learn about in *Creative Computing*.

2 *Creative Computing* discusses business applications in simple, nontechnical language.

If you're a business person who needs to know about the latest developments in word processing and office applications, turn to *Creative Computing*. We clarify such business applications as investment analysis, futures evaluations, data base management, mailing list programs, text editing, word processing and simulations. And all the software available for business people.

3 *Creative Computing* helps you decide which computer equipment is best for you.

Our tough, no-nonsense equipment profiles arm you with the facts before you walk into a computer store. You'll know the right questions to ask and how to cut through the jargon and sales hype. We give you authoritative guidance in deciding what you need, what you don't need—and what's right for you and your pocketbook.

4 *Creative Computing* covers computer education in depth.

We started out as a computer education publication, and we're still committed to the educational community. We regularly carry articles on designing educational software, evaluating educational software, teaching concepts and terminology in computer education, text editing applications for literature and computer simulations in the classroom—plus a great deal more.

5 *Creative Computing* brings you hours of mind-expanding game entertainment.

We've got a soft spot for the computer game addict—and computer game software. We know you want to understand more about the new computer games flooding the market: which ones are easiest to learn? Require the most skill? Offer the most surprises? Give you the best graphics? Provide the most challenge? Contain a new twist? *Creative Computing* brings you the answers.

6 *Creative Computing* features the state of the art.

Columns on the most popular personal computers, a "software legal forum," letters to the editor. Reviews of books, games, organizations, dealers and events. Fascinating interviews with leading innovators, equipment designers, program developers and game inventors—men and women who'll give you a real glimpse of the future!

7 Our price is right.

By subscribing to *Creative Computing* now, you can save as much as 33% off the full subscription price. To learn elsewhere what you'll learn from *Creative Computing*, you might spend hundreds of dollars in course fees and books. Then you'd have to winnow out what you could use from all that you'd learned. But *Creative Computing* does that for you, so you'll have time to enjoy your own computing interests. And that saving of time makes this offer very inexpensive indeed.

Join over 150,000 *Creative Computing* readers by subscribing today! Just use the coupon at right.

SAVE UP TO 33%!

Creative Computing · P.O. Box 5214 · Boulder, Colorado 80322

YES! Send me *Creative Computing* for:

- ☐ One year (12 issues) for $19.97—I save 20%!
- ☐ Two years (24 issues) for $36.97—I save 26%!
- ☐ Three years (36 issues) for $49.97—I save 33%!

Savings based on full one-year subscription price of $24.97.

Check one: ☐ Payment enclosed. ☐ Bill me later. 4S150

Mr. / Mrs. / Ms. _____
(please print full name)

Address _____ Apt. _____

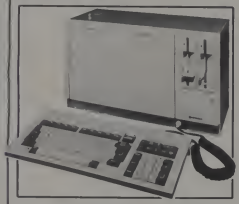
City _____

State _____ Zip _____

Offer valid in U.S. and possessions only. Please allow 30 to 60 days for delivery of first issue.

16-BIT COLOR COMPUTER

The chief selling point of the Hitachi MBE1600 computer is its excellent graphics capabilities. The unit boasts 192K bytes of video RAM over and above user memory. The large amount of video storage allows the machine to address each pixel individually in color. This gives the 1600 the ability to present graphics display in 15 colors with up to 640 by 200 screen resolution.



User memory for the 1600 starts at 128K and is expandable to 384K. Five expansion slots, one occupied by a disk drive, are built into the unit, which currently runs under the MS-DOS operating system. CP/M-86 is expected some time in the future. The unit includes interfaces for color or monochrome display, keyboard, printer, asynchronous communications device, light pen, and a disk drive.

The price for a MBE1600 computer equipped with 128K bytes of user memory, detachable keyboard and choice of color or monochrome monitor starts at $3000.

Hitachi Sales Corporation of America, 401 West Artesia Blvd., Compton, CA 90220. (213) 537-8383.

CIRCLE 406 ON READER SERVICE CARD

EAGLE PERSONAL COMPUTER

The newest member of the Eagle family of microcomputers, the Eagle PC, is the lowest priced Eagle computer introduced to date. Priced from $1995, the PC can be used either as a stand alone personal computer or as an intelligent terminal attached to one of Eagle's 1600 Series computers.

The PC is a desktop system based around an Intel 8088 microprocessor. The main processor cabinet is less than 14" deep and weighs less than 30 pounds. Standard features include two asynchronous serial ports, a parallel port, and 64K bytes of main memory. The computer also comes with a 105-key keyboard that tucks underneath the processor cabinet. The keyboard boasts 24 user-definable special function keys. A monochrome monitor that features 720 by 352 graphics is also included with the system. Available options include memory expansion to 512K bytes, support for either two floppy disk drives or 10 and 32Mb hard disk drives. The Eagle PC is available with either the MS-DOS or CP/M-86 operating system and MicroSoft GW Basic.

The new Eagle PC will be priced from $1995 for a 64K system with a single disk drive. A system equipped with two 320K drives and either MS-DOS or CP/M, Eagle word processing, and Eagle Calc financial planning software will cost $3495.

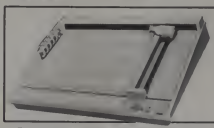
Eagle Computer, 983 University Ave., Los Gatos, CA 95030. (408) 395-5005.

CIRCLE 407 ON READER SERVICE CARD

TERMINALS & I/O

SIX-COLOR PLOTTER AND MONITOR

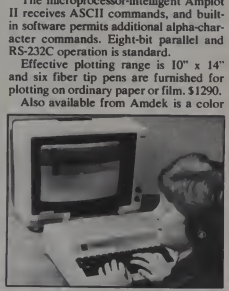
Amplot II, six-color plotter, has been introduced by Amdek Corp. It is compatible with most personal computers and features high pen speed, automatic pen retrieval and .002" resolution.



The microprocessor-intelligent Amplot II receives ASCII commands, and built-in software permits additional alpha-character commands. Eight-bit parallel and RS-232C operation is standard.

Effective plotting range is 10" x 14" and six fiber tip pens are furnished for plotting on ordinary paper or film. $1290.

Also available from Amdek is a color monitor, the Color-I Plus which features a non-glare screen, and a headset for front panel compartment interconnect to the built-in audio amplifier.



Line resolution, 260(H)x300(V), is provided on the 13" CRT. The Color-I Plus accepts a composite video signal to produce colored graphics or text. $449.

Amdek Corporation, Marketing Department, 2201 Lively Blvd., Elk Grove Village, IL 60007. (312) 364-1180.

CIRCLE 408 ON READER SERVICE CARD

COLOR INTERFACE

Pkaso interfaces include color text and graphics for IDS Color Prism Printers, as well as the Pkaso ID12-Color Interface for the Apple II and Apple III. These include full snapshot dumps of any text or graphics screen image, 16-level gray scale printing, user-created or software-defined printing characters, and SuperRes graphics using the full dot resolution of the printer. Also included are: hi-res and lo-res screen prints, commands to swap and rearrange the color set, commands to change printing colors within word processor text, and commands to create and print with definable sets of colors.

The Pkaso ID12-Color is compatible with Basic, Pascal, and CP/M.

The ID12-Color comes with cable and instructional diskette. ID12-Color Apple II costs $195 and ID12-Color Apple III costs $225.

Interactive Structures Inc., 146 Montgomery Ave., Bala Cynwyd, PA 19004. (215) 667-1713.

CIRCLE 409 ON READER SERVICE CARD

WIDE CARRIAGE PRINTER

Micro Peripherals, Inc. (MPI) announces four new wide carriage versions of the PrintMate 150 printer. PrintMate 150 models offer graphics and font capabilities, optional buffer expansion, and high speed.

PrintMate 150 models A2 and B2 have standard 16K memory buffers. Models A1 and B1 have 4K and 2K buffers respectively.

Models A1 and A2 include the Soft-

Apple 128K RAM Card Sale

Legend.....$599*
Saturn.....$599*
Alpha Byte...$299*!!

*Manufacturers' suggested list price

Alpha Byte's new 128K card for the Apple II, Apple II+, and Apple IIe is now available at this special low price — compare! It comes fully-populated with 128K bytes of RAM and can be configured to execute any software written to run with Saturn Systems' or Legend Industries' 128K RAM cards. Visicalc™ expansion and disk emulation software are standard and the board comes with a full 2 year no hassle warranty.

Alpha Byte COMPUTER PRODUCTS

31245 LA BAYA DRIVE
WESTLAKE VILLAGE, CA 91362

To order or for information call

In Chicago: (312) 454-1236

In New York: (212) 509-1923

In Los Angeles: (213) 706-0333

In Dallas: (214) 744-4251

By Modem: (213) 991-1604

We accept VISA, MasterCard or C.O.D. (add $3 for C.O.D.). Add a $3 shipping charge to prepaid orders; actual shipping charges will be added to non-prepaids. California residents, add appropriate sales tax.

CIRCLE 287 ON READER SERVICE CARD

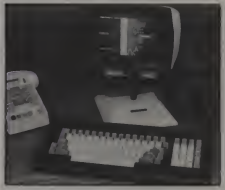
Switch front panel keypad for direct control of forms length, print density, horizontal and vertical tabs, baud rate, and character set.

Applications packages called Ap-Paks are designed to enable most microcomputers, with the PrintMate 150, to produce various type styles and graphics. Prices of printers start at $995.

Micro Peripherals, Inc., 4425 South Century Dr., Salt Lake City, Utah 84107. (800) 821-8848.

CIRCLE 410 ON READER SERVICE CARD

TELERAY TERMINAL



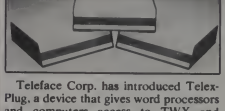
Teleray has introduced the Model 16 terminal.

Features include a user-definable keyboard and memory format; a four-function calculator; a clock that displays either time of day or elapsed time on the 25th line; four pages of display memory (optionally up to eight pages, non-volatile); two bi-directional, buffered communications ports; and ANSI X3.64-compatibility. $1610.

Teleray, Box 24064, Minneapolis, MN 55424. (612) 941-3300.

CIRCLE 411 ON READER SERVICE CARD

TELEX INTERFACE



Teleface Corp. has introduced TelexPlug, a device that gives word processors and computers access to TWX and Telex.

TelexPlug connects any computer or word processor with the Western Union telex network, as well as other common carriers, so that users may send and receive messages directly through their word processor or computer.

When the word processor or computer is unattended, or involved with other tasks, and the unit senses an incoming message, it will automatically store the message, or route it to the printer. $1485.

Teleface Corp., GPO Box 2238, New York, NY 10116. (212) 477-6802.

CIRCLE 412 ON READER SERVICE CARD

PRINTER INTERFACE

Interface No. 1 by Looking Glass Microproducts allows you to connect any printer with a Centronics compatible parallel interface (Anadex, C. Itoh, Epson, Microline, Okidata, etc.) to an Atari 400 or Atari 800 Personal Computer System via Controller Jacks J3 and J4.

A printer handler is provided on cassette or diskette. This handler replaces the resident printer handler, occupies less than 128 bytes of user program area, and is compatible with all Atari cartridges and programs.

Interface No. 1 comes with full documentation, step-by-step installation instructions, and complete program listings. $85.

Looking Glass Microproducts, P.O. Box 5084, Loveland, CO 80537.

CIRCLE 413 ON READER SERVICE CARD

DAISYWHEEL PRINTER

Data Terminals and Communications has introduced a daisy wheel printer, the DTC 380Z for the personal computer user.

The specification includes a 48,000 character buffer memory, allowing the computer to load the printer memory within a few seconds, then be used for further applications while the 380Z prints at up to 32 characters per second. Interconnecting cables are available to enable the DTC 380Z to work with most personal computers, including Osborne, IBM, Apple and TRS-80.

Other features are full bi-directional printing, automatic proportional spacing, serial and parallel interfaces, software compatibity with the Diablo 1640/1650/630, graphic plotting, 50 to 19.2K baud, and a momentary pause capability for paper, printwheel and ribbon changing. The printwheel is available in 12 different print styles and works with standard ribbons. $1199.

Data Terminals and Communications, 590 Division St., Campbell, CA 95008. (408) 378-1112.

CIRCLE 414 ON READER SERVICE CARD

CONVERSION BOARDS FOR TRS-80

The Freedom Option and Freedom Plus Boards allow the TRS-80 Models I and III, the PMC 80 and 81, and the LNW 80 to run CP/M applications software as well as TRSDOS software. The Freedom Option is the basic CP/M conversion board while the Freedom Plus provides

CP/M conversion and adds 16K of RAM to the TRS-80.

The Freedom Boards include the CP/M compatible operating system, T8/OS, which can run with any combination of 5 1/4 and 8 inch drives, single or double density, single or double sided. Freedom Option is $275 and Freedom Plus is $490.

Freedom Technology International, 119 North 18th Street, Philadelphia, PA 19103. (215) 569-2381.

CIRCLE 415 ON READER SERVICE CARD

SERIAL INTERFACE FOR APPLE

Versa Computing, Inc., announces a serial interface for Apple II computers. The Versa serial interface has been designed to function only with those features necessary to operate a serial printer. It operates with the RS-232C protocol and other configurations can also be accommodated at installation times.

Discover the hidden power of your TS 1000 and ZX-81

The 50 ready-to-run programs in this book will show you how!

If you suspect you're not getting all you can from your Timex Sinclair 1000, here's a new book that will make sure you do.

David H. Ahl has written 16 books about computers. In **The Timex Sinclair 1000 IdeaBook** he puts 25 years of experience to work—to help you put your computer to work.

The Timex Sinclair 1000 IdeaBook includes 50 complete, pre-tested programs—each one designed to illustrate a specific problem-solving technique.

By working these programs on your own computer, you'll understand more fully its hidden strengths. Plus, you'll learn how to overcome its inherent weaknesses.

Armed with this knowledge, you're ready to put your Timex to work performing a multitude of practical everyday tasks. Everything from balancing the family budget, to taking inventory, to performing science experiments.

Ten informative chapters show you how to solve problems using:

- Repetitive trial
- Convergence
- Recursion
- Compounding
- Probability
- Geometry
- Science
- Simulation
- Drill
- Practice

The Timex Sinclair 1000 IdeaBook is the only volume of its kind ever published for TS 1000 and ZX-81 owners.

Order your copy today—and start taking full advantage of your TS 1000.

MAIL TODAY TO:
CREATIVE COMPUTING PRESS
Dept. **HC4F**, 39 East Hanover Avenue
Morris Plains, NJ 07950

Please send me _____ copies of the **The Timex Sinclair 1000 IdeaBook** for only $8.95 each, plus $2.00 shipping & handling per book.

Total Amount $_____

☐ Payment Enclosed (CA, NJ and NY. State residents please add applicable sales tax.)

☐ Charge my (Charge and phone orders $10 minimum)
☐ American Express ☐ MasterCard ☐ Visa

Card # _____ Exp. Date _____

Signature _____

NAME _____
(please print)

ADDRESS _____

CITY _____

STATE _____ ZIP _____

*Outside U.S. add $3 for shipping and handling

☐ Check here to receive a FREE catalog of computing books magazines and guides

For faster service, PHONE TOLL FREE:
800-631-8112
(in NJ only 201-540-0445)

Also available in your local bookstore and computer store

New Products, continued...

The interface operates at switchable baud rates of 300, 600, 1200, 1800, 2400, 4800, 9600 and 19,200. In addition to baud rate the printer is equipped with switches for automatic line feed, screen display and line length. The interface package contains a 4.5"x2.7" printed circuit board, a ribbon cable with eight female pins crimped on one end, and a 16 pin dip header on the other. The crimped pins are installed into the female connector to interface it to a particular printer. $79.95.

Versa Computing, Inc., 3541 Old Conejo Rd., Suite 104, Newbury Park, CA 91320. (805) 498-1956.

CIRCLE 416 ON READER SERVICE CARD

PASCAL SUPER SYSTEM

Legend Industries Ltd. announces the availability of the Pascal Super System for the Apple II. This system supports the simulation of fast access disk drive units for storage and retrieval of standard Apple Pascal files with the added speed of the 6809 Stellation Mill.

The system contains Legend 128KDE RAM card, Stellation Two 6809 Mill, and Super1: diskette.

The Super1: diskette is software designed as a Pascal Disk Emulator with patch routines to run a 128K emulated disk drive with a 6809 processor card. The 6809 or 128KDE can also be used separately.

Both the Legend 128KDE RAM card and the Stellation Two 6809 Mill plug easily into any I/O port on the Apple II motherboard except slots 3 and 6.

Legend Industries, Ltd., 2220 Scott Lake Rd., Pontiac, MI 48054 or Stellation Two, P.O. Box 2342, Santa Barbara, CA 93120.

CIRCLE 417 ON READER SERVICE CARD

LOW COST TERMINALS

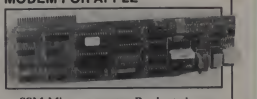
The ZTX-10 and ZTX-11 are menu-oriented, DEC VT-53 compatible, ASCII computer terminals. Each weighs less than four pounds and is housed within a seven by fifteen inch casing. Both can be programmed to remember up to 26 names and telephone numbers.

The ZTX-10 terminal costs $399. It includes a 63-key keyboard and both an RS-232 and a Centronics interface. The ZTX-11 retails for $479. It boasts all the features of the lower priced machine, plus the addition of a built-in, auto-dial, auto-answer, 300 band modem.

Zenith Data Systems, 1000 Milwaukee Ave., Glenview, IL 60025. (312) 391-8744.

CIRCLE 418 ON READER SERVICE CARD

MODEM FOR APPLE



SSM Microcomputer Products has announced a 110/300 baud full duplex modem for the Apple II.

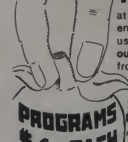
The SSM Apple ModemCard features half and full duplex, auto answer/auto dial, Touch Tone and pulse dialing, and audio monitoring to provide increased flexibility for use with many systems, including PBX. The ModemCard plugs directly into any Apple slot (except 0) and requires no additional external devices. $299.

SSM Microcomputer Products Inc., 2190 Paragon Dr., San Jose, CA 95131. (408) 946-7400.

CIRCLE 419 ON READER SERVICE CARD

CASSETTE INTERFACE FOR COMMODORE

The Vik-Dubber cassette interface allows Commodore 64 and Vic users to save and load data using a standard cassette recorder. The product also allows two cassette recorders to be connected to make backup copies of programs. The



NEW!! The Apple users group software library bonanza at truly affordable prices. For the first time enjoy your Apple to its fullest capacity using specially packed disks with over **60 outstanding programs each.** Not available from any other source!

• Applesoft • 3.3 DOS

PROGRAMS $1-EACH OR **APPLEWARE INC.** offers An extensive variety of interesting, useful and entertaining programs indispensable to the serious computerist including:

Business	• Educational	• Graphics	
Games	• Music	• Science	
Utilities	• Data Base	• Finance . . .	

Library disks 1, 2 & 3 are mixed categories and new disks 4 (Games), 5 (Utilities), 6 (Graphics) & 7 (Integer) at $59.95 each. Why pay more?

Order direct from this ad and $ave up to $136. Buy disk library package 1, 2 & 3 and get a special bonus disk **FREE** — over **260** programs for $179.95 + shipping. For best value, get all 8 disks for $349, postage prepaid, for over **530** of our best programs at 65¢ each! Call now toll free: 1-800-327-8664 Florida: 1-305-987-8665

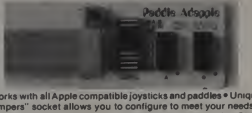
6400 Hayes St.
Hollywood, FL 33024

MasterCharge VISA

CIRCLE 115 ON READER SERVICE CARD

Paddle-Adapple

I/O EXPANSION ADAPTOR FOR APPLE][& //e



• Works with all Apple compatible joysticks and paddles • Unique "Jumpers" socket allows you to configure to meet your needs • Select one of two devices or use 4 paddles simultaneously • Gives you four pushbutton inputs • Supports shift key modification • Exchange X & Y joystick axis • Small & compact—adheres to computer with supplied foam tape • All strobes, annunciators and power available on both connectors. **$29.95**

Paddle-Adapple 'D'

Same as the PADDLE-ADAPPLE that we all know and love, except it has two subminiature 'D' connectors. These are used on the new paddles and joysticks for use with the APPLE //e. It also permits the new style paddles and joysticks to be used with the APPLE][and][+ **$29.95**

Paddle-Adapple Combo

Again, the same PADDLE-ADAPPLE except it has one 16 pin socket, and one subminiature 'D' socket **$29.95**

These fine products come with a 90 day warranty
Available at your local dealer or direct from:
SOUTHERN CALIFORNIA RESEARCH GROUP
Post Office Box 2231-C
Goleta, CA 93118
(805) 685-1931
VISA, MASTERCARD accepted

Add $2.50 for shipping, $5.00 outside U.S.A. & Canada. CA add tax.

Apple is a trademark of Apple Computers

CIRCLE 256 ON READER SERVICE CARD

Vik-Dubber plugs directly into and derives its power from the computer. $34.95.

Bytesize Micro Technology, P.O. Box 21123, Seattle, WA 98111. (800) 227-3000.

CIRCLE 420 ON READER SERVICE CARD

VOICE INPUT MODULE FOR APPLE

The MCE Voice Input Module (VIM) can be programmed to recognize an 80-word or phrase vocabulary with up to 98 percent accuracy. With proper use the package provides voice control of software, and allows for simultaneous input of data by voice and keyboard. Vocabularies for Basic, *VisiCalc*, *WordStar*, and *Magic Window* are predefined in the software.

MCE Inc., 157 South Kalamazoo Mall, Kalamazoo, MI 49007. (800) 421-4157.

CIRCLE 421 ON READER SERVICE CARD

LOW COST 40-COLUMN PRINTER

The Alphacom 42 is a 40-column, thermal printer that can print up to two lines per second. It prints both upper- and lowercase letters and features a wrap-around facility that allows printing of text lines longer than 40 characters. Alphacom also sells the cables required to interface the cartridge-like interface on the printer to the Vic 20, Commodore 64, Atari or Texas Instruments home computers.

The Alphacom 42 retails for $179.95. Interface cables start at $29.95.

Alphacom Inc., 2323 South Bascom Ave., Campbell, CA 95008. (408) 559-8000.

CIRCLE 422 ON READER SERVICE CARD

NETWORK CONTROLLER FOR PET

Petnet is a network controller designed to be used with the Commodore Pet series of microcomputers. All computer stations may be loaded simultaneously from the master computer using the master disk or cassette unit, and vice versa.

NO POWER SPIKES WITH SUPER FAN II.

Super Fan II's Zener Ray™ Transient Voltage Suppressor and Power Filter squelches spikes up to 6000 amps – even those caused by lightning – while responding up to 100 times faster than Apple II's built-in suppressor.

In addition, Super Fan II cools your Apple, removing heat buildup at a remarkable 17 cubic feet of air per minute. Yet it's the quietest fan of its kind on the market.

Super Fan II also positions a lighted on/off computer switch and two accessory plugs at your fingertips. It's warranted for two years and simply clips to your Apple II, IIe or monitor stand.

See your R.H. Electronics dealer today about Super Fan II*, or contact us at 566 Irelan Street, Buellton, CA 93427, (805) 688-2047.

AIR CONDITIONED

RHELECTRONICS, INC.

CIRCLE 237 ON READER SERVICE CARD

New Products, continued...

Petnet includes plug-in installation; compatibility with all Pets including Vic 20; no interference with normal operation of communication ports (cassette, parallel, IEEE); and no supporting software. $695.

Micro Solutions, P.O. Box 25291, Tempe, AZ 85282. (602) 831-6433.

CIRCLE 423 ON READER SERVICE CARD

APPLE-VERTER MODEL APX-800

ATV Research has announced a color video modulator, the Apple-Verter, Model APX-800. It is high VHF-band, tunable modulator, for the Apple II. It includes a 10' direct-connect antenna cable. A built-in 5V regulator allows the modulator to be used on other computer systems with power sources anywhere between 8 and 24VDC. $29.75.

ATV Research, New Product Sales, 13th & Broadway, Dakota City, NE 68731. (402) 987-3771.

CIRCLE 424 ON READER SERVICE CARD

CRT INTERFACES

Micro Display Systems, Inc. has announced three compatible interfaces for

The Genius full page display CRT: RS-232, S-100 and Apple III versions.

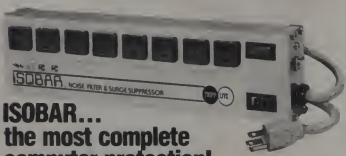
The Genius displays an optional 57 or 73 lines of text by 80 characters across. It is used for office automation, applying to word processing, data processing and software development. It is compatible with WordStar (with SoftCard), and other CP/M based software programs. It has an 87 MHz bandwidth and 8K bytes of high-speed buffer memory. An Apple II interface card is standard with the Genius. $1,795.

Micro Display Systems, Inc., 1310 Vermillion St., P.O. Box 455, Hastings, MN 55033. (612) 437-2233.

CIRCLE 425 ON READER SERVICE CARD

PRINTER INTERFACE FOR COMMODORE

Xitel Inc. announces the Model CX-6401 interface which allows the Commodore 64 or Vic 20 computer to use any type of standard commercially available parallel interface printer. The interface connects to the serial port/bus on the computer, not the user port, allowing the user port to remain open for us by a modem or RS-232C peripheral device. The CX-6401 features elimination of the hand shaking problem of RS-232C cartridge, mode switch to correct ASCII problem, no RS-232C cable, the use of parallel



ISOBAR... the most complete computer protection!

More features to prevent errors, false printout, disc skips! *Only ISOBAR has 3-way spike protection, noise suppression for RFI PLUS isolated filter banks!* Individual filter banks isolate each load from other loads minimizing data errors of *any* kind. MOV surge suppressors arrest both common mode and differential mode surges. L/C filter network rejects radio frequency noise at any amplitude. Torroidal coils for greatest efficiency! All-metal housing.

Indus-Tool, 325 W. Huron, Dept. Chicago, IL 60610 • Call 1-312-642-6871
Enclosed is $ _____ or charge on
☐ MasterCard or ☐ Visa *Expires* _____
Card no. _____
Name _____
Signature _____
Company _____
Address _____
City _____ State _____ Zip _____

Model IBAR 4-6 (4 outlets, 6 ft. cord) **Only $79.95**
Model IBAR 3-6 (3 outlets, 6 ft. cord) **Only $54.95**
Model IBAR 8-15 (8 outlets, 15 ft. cord) **Only $97.95**

CIRCLE 179 ON READER SERVICE CARD

OUR ISOLATORS FOR YOUR PROTECTION

Prevents:
disk drive woes, printer interaction, memory loss and damage due to lightning or AC power line disturbances.

Commercial Grade Isolators	
ISO-1 3 Isolated Sockets	$76.95
ISO-2 2 Isolated Socket Banks, 6 Sockets	76.95
Industrial Grade Isolators	
ISO-3 3 Double Isolated Sockets	115.95
ISO-11 2 Double Isolated Banks, 6 Sockets	115.95
Laboratory Grade Isolators	
ISO-17 4 Quad Isolated Sockets	200.95
ISO-18 2 Quad Isolated Banks, 6 Sockets	169.95
Circuit Breaker, any model (Add-CB)	Add 10.00
Remote Switch, any model (Add-RS)	Add 18.00

ESP Electronic Specialists, Inc.
171 South Main Street, Box 389, Natick, Massachusetts 01760

Toll Free Order Desk 1-800-225-4876
MasterCard, VISA, American Express

CIRCLE 172 ON READER SERVICE CARD

type printers, multiple printers, and unused user port lines available for external usage.

The CX-6401 comes standard with a 6-foot serial bus cable and connector for direct connection to the Commodore 64 or Vic 20. In addition the CX-6401 has a 1-foot parallel cable for connection to the printer. $89.95.

Xitel Inc., 2678 North Main St. #1, Walnut Creek, CA 94596. (415) 944-9277.

CIRCLE 426 ON READER SERVICE CARD

It is compatible with Disk II mini and SVA 8" floppy drives, as well as a micro programmed controller that plugs into any slot, and eliminates the need for additional hardware.

Sorrento Valley Associates, Inc., 11722 Sorrento Valley Rd., San Diego, CA 92121. (714) 452-0101.

CIRCLE 428 ON READER SERVICE CARD

ATARI DISK DRIVE

Percom Data Corporation has released a new disk drive system for the Atari computer line.

The Percom Data AT-88 is compatible with both the Atari 400 and 800 models.

It is a single density drive, offering 88 Kbytes (formatted), plug-in compatibility to Atari computers, and its own integral power supply. It is shipped with the OSA/Plus operating system. The Percom Data drive may also use the Atari operating system software without any modification.

Percom Data Company, Inc., 11220 Pagemill Road, Dallas, TX 75243. (214) 340-7081.

CIRCLE 429 ON READER SERVICE CARD

DISK SYSTEMS

HARD DISK SYSTEM FOR APPLE II

A 5-megabyte Winchester disk system package for Apple II microcomputers has been introduced by Xebec. It is a kit aimed at the home/hobbyist market and system integrators.

The 5 megabyte hard disk system features up to 22-bit error detection and up to 11-bit error correction, a full sector data buffer, and single command disk initialization. The total cost is $1,299.

Xebec, 432 Lakeside Drive, Sunnyvale, CA 94086. (408) 735-1340.

CIRCLE 427 ON READER SERVICE CARD

APPLE II HARD DISK SYSTEM

SVA announces the AMS 5000 Megabyter Hard Disk System adding up to 20 megabytes of on-line data storage for the Apple II.

Using Winchester technology, the AMS 5000 can be used for standard DOS, Pascal and CP/M based operating systems.

Thank Heaven We got a Guardian Angel.™

"POWER FAILURE"

Goodbye valuable data. Unless you have a Guardian Angel uninterruptable power source on duty.

Guardian Angel switches to 150 watts of backup power in 1/100 of a second or less while alerting you of blackout or brownout conditions. Its rugged 12V battery gives you up to six minutes (15 at half-rated power), enough to save your data and shut down your system if line power does not return.

Guardian Angel is compatible with virtually every major microcomputer system, including Apple, IBM, H-P, TRS-80, Xerox, Eagle and Osborne. Its transient voltage suppressor also prevents system damage from power spikes.

Guardian Angel simply plugs in between your power source and your microcomputer. Its compact size permits either desktop use or out of the way placement.

Protect your investment: see your R.H. Electronics dealer today about Guardian Angel or contact us at 566 Irelan Street, Buellton, CA 93427, (805) 688-2047.

"Guardian Angel" with LED power status indicator automatically safeguards data from blackouts, brownouts for just $595.

RHELECTRONICS, INC.

*Patents pending. UL listed. FCC approved. 240V/50 Hz version available. Dealers and OEM inquiries invited.

CIRCLE 282 ON READER SERVICE CARD

PERIPHERALS

REMOTE CONTROL INTERFACE

An electric circuit remote control unit that interfaces with personal and small business computer systems has been introduced by Circuit Science, Inc.

The Circuit Science CSI-1200 Electric Appliance Controller features a serial RS-232 interface that allows computer control of up to 256 lights, wall switches, and appliances. Compatible with Apple, TRS-80, IBM, Atari, Osborne, Commodore and any computer with a serial interface, it operates with BSR X10 remote modules to help save energy and provide added security. $169.

Circuit Science, Inc., 3 Four Townsend West, Nashau, NH, 03063. (603) 880-4066.

CIRCLE 430 ON READER SERVICE CARD

TOUCH SENSOR

Interaction Systems, Inc. has developed a new method of detecting the touch of a human finger on the face of a CRT display. The new method utilizes an unpatterned tempered coated glass faceplate which overlays the CRT monitor. Touch detection is accomplished through the sensing of impedance changes resulting from the touch of the finger.

The touch detector provides the "X" and "Y" coordinates of the point which was touched in an 8-bit numeric output (0 through 255) for each of the two dimensions.

A keyboard can be displayed on a video monitor to enable a person to "type" directly on the screen. Alternatively, a person can draw the shapes of letters directly on the screen and have them be recognized by the computer.

In electronic games, instead of using keyswitch controls, the user can directly touch game icons displayed on the video monitor. Rolling the finger on the icons can replace the joystick to direct movements of objects in the game. Price to OEM's, about $200.

OEM Marketing, Interaction Systems, Inc., 24 Munroe Street, Newtonville, MA 02160. (617) 964-7000.

CIRCLE 431 ON READER SERVICE CARD

SOFTWARE

GRAPHICS

ES Painter allows anyone who owns an IBM PC to try his hand at being an artist. When using the program, the color monitor becomes a drawing board. The program runs on an IBM PC with 64K bytes of memory, disk drive, color graphics card, joystick, and game adapter. $45. E & S Software Services, P.O. Box 238, Bedford, MA 01730. (617) 275-8534.

CIRCLE 432 ON READER SERVICE CARD

Are you paying more for your options than you are for your computer?

OPTIONS

DESCRIPTION

- 64K Base System
- Additional Memory for Display
- Auxiliary Display Processor
- Display Adapter
- 12 Inch High Resolution Monitor
- 80 Character Display
- Upper/Lower Case
- Detachable Keyboard
- Numeric Pad with Function Keys
- Second Disk Drive
- Parallel Printer Port
- RS-232C Port
- CP/M® Compatible Hardware
- CP/M Plus® Operating System
- CBASIC
- Perfect Writer™
- Perfect Speller™
- Perfect Calc™
- Perfect Filer™

With MAGIC, you get all of the above for only, $2,995.

You can believe it's

Magic computer

For additional information contact your local computer dealer or

MAGIC COMPUTER COMPANY, INC.
2 Executive Drive, Fort Lee, NJ 07024
(201) 944-6700

® Registered Trademarks of Digital Research, Inc ™ is a trademark of Perfect Software, Inc.

CIRCLE 230 ON READER SERVICE CARD

EDUCATIONAL

In Search Of The Most Amazing Thing is a combination adventure, strategy and arcade game designed for children from ages 10 to 90. Skills used in the game include decision making, note-taking, writing, map reading, trading, music-writing and drawing. The program is available for Apple, Atari, IBM and Commodore 64 computers. $39.95. Spinnaker Software, 215 First St., Cambridge, MA 02142. (617) 868-4700.

CIRCLE 433 ON READER SERVICE CARD

The **Radio Shack Color Author** courseware authoring system allows teachers to create instructional materials for use on a 32K Color Computer with disk drives. The system is menu-driven, guiding the instructor through the frame by frame creation of individual study plans. Available at Radio Shack stores and Computer Centers.

BUSINESS

The Microsoft Multi-Tool expert systems are a set of business management productivity tools that help the user analyze financial data. Each expert system includes a set of pre-programmed templates that are used to customize Microsoft's *Multiplan* spreadsheet package for specific financial or accounting applications.

The *Budget* expert system is appropriate for retailers or manufacturers who require an operating budget planning and control system. The *Financial Statement* expert system will be of interest to business managers, sophisticated individual investors, and people in the financial service industries such as stock brokers, investment analysts, and management consultants. The Budget expert system retails for $150, while the Financial Statement expert system is priced at $100.

The *Multi-Tool* expert systems run on any MS-DOS system with 128K bytes of memory and one disk drive or on an Apple II with 64K bytes of memory and at least one disk drive. Microsoft Corporation, 10700 Northup Way, Bellevue, WA 98004. (206) 828-8080.

CIRCLE 434 ON READER SERVICE CARD

WORD PROCESSING

Wordcraft 20 is a word processing program for the Vic 20. It comes in a cartridge that houses the 16K program and 8K of RAM memory that can be used for word processing or for Basic programming. Features include variable page widths and lengths, automatic page centering, justified or ragged margins, text highlighting, tab stops, decimal tabs and a page capacity of 66-lines of 99 characters. $230. United Microware Industries, Inc., 3503-C Temple Ave., Pomona, CA 91768. (714) 594-1351.

CIRCLE 435 ON READER SERVICE CARD

PERSONAL

Super SST is a spreadsheet program for the Sharp PC-1500 and Radio Shack PC-2 pocket computers. Written in machine language the program is provided on a cassette tape. The program requires an 8K expansion module and a cassette interface. $49.95. The Pocket Computer Newsletter, P.O. Box 232, Seymour, CT 06483. (203) 888-1946.

CIRCLE 436 ON READER SERVICE CARD

CPAids has announced **Tax Planner**, a year-round personal tax planning program. It is based on user-definable tax tables beginning with 1982 and computes tax schedules plus Schedules G, 4625, 4972, 6251 and sales tax tables. Up to four different assumption data files for a given year and tax calculations for four different years can be programmed. A depreciation program is also included. The package is compatible with any system which has CP/M or MP/M, 64K of RAM, an 80 x 24 screen and an 80-column printer, including the IBM PC and Apple II. $300. CPAids, 1061 Fraternity Circle, Kent, OH 44240. (216) 678-9015.

CIRCLE 437 ON READER SERVICE CARD

SCRG PRESENTS

For Your Apple][, Apple][+, Apple //e, Apple /// & Franklin

switch-a-slot

The **switch-a-slot** connects to any peripheral slot of the computer through an 18" cable. The user can plug up to four cards in the **switch-a-slot**. The desired card is chosen by using a switch on the front, and only the selected card draws power. This product is suitable for most peripheral cards. The **switch-a-slot** is perfect for selecting between different printer cards.

- **Holds 4 peripheral cards**
- **Saves wear and tear on delicate connectors**
- **All connectors are gold plated for reliability**
- **Only selected card draws power**
- **Works with most cards**

$179.50

Extend-A-Slot

The EXTEND-A-SLOT brings a slot outside your APPLE™, allowing an easy change of cards. The 18" flex cable is long enough to allow placement of the card in a convenient location. The high quality connectors are gold plated for reliability. **$34.95**

These products work well with all slow to medium speed cards, such as Modems, Printers, Clock, Music, etc. They are not recommended for high speed data transfer devices such as alternate processor and disk drive controller cards.

These fine products come with a 6 month warranty

Available at your local dealer or direct from:

SOUTHERN CALIFORNIA RESEARCH GROUP
Post Office Box 2231 - C
Goleta, CA 93118
(805) 685-1931
VISA, MASTERCARD accepted

Add $2.50 for shipping, $5.00 outside U.S.A. & Canada. CA add tax.

Apple is a trademark of Apple Computers. Franklin is a trademark of Franklin Computers.

CIRCLE 257 ON READER SERVICE CARD

The Sketch Pad

Tom and Kelda Riley

The capacity of the Apple and other home computers to produce complex graphics gives us an exciting new artistic medium, but one which is often difficult to use. There are several commercial software packages that simplify entering images into the computer, but the lack of suitable drawing instruments limits their use. Graphics paddles and graphics tablets are currently on the market, but the cost of this hardware is prohibitive for many would-be computer artists.

If you are interested in experimenting with computer graphics but can't spend much money on hardware, consider building this versatile sketch pad which will let you draw directly into the high resolution graphics screen. We will show you how to construct the sketch pad for a total cost of about $30.

Features of the Device

The sketch pad has a drawing surface slightly larger than a standard sheet of paper (8½ × 11 inches). You can attach drawings and photographs to the pad and trace them into the hi-res screen, or you can use a blank sheet of paper and draw simultaneously on the paper and the screen. You can also use the sketch pad to read graphs, strip charts, and business charts directly into the computer.

Figure 1 is a drawing of the finished device. Features to note are the baseboard, the upright post which can be adjusted to change scale, the head with its two potentiometers, the cantilever, the pencil holder, and the cable with a box for the pushbuttons.

The unit is constructed of plywood and sheet metal and can easily be made in a home workshop or shop class. It could be built completely with hand tools, but the use of a table or radial arm saw speeds up the job. The wiring is extremely simple, so the electronics work shouldn't intimidate an interested builder. All in all, this is a good beginner's project.

We have included three programs in Applesoft Basic to give you a start in using the sketch pad. Listing 1 is a linearity test program that shows how well this sketch pad or any commercial graphics unit is working. Listing 2 lets you draw directly onto the hi-res graphics screen in three different modes, store pictures to the disk, and then retrieve them. Listing 3 is a program that lets you measure points on data sheets and enter them into your computer for data analysis, a process called digitizing the data. The sketch pad will digitize

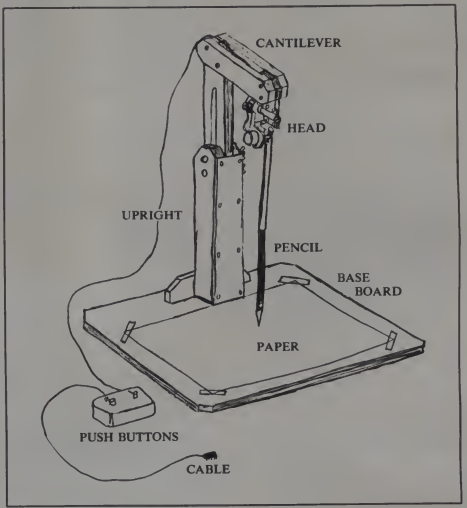


Figure 1. Sketch Pad.

Tom and Kelda Riley, 1002 Lewis Ave., Rockville, MD 20851

quickly and with reasonable accuracy, and this program will store and retrieve the data from disk as well. We will examine all of these programs in detail later in the article.

Precision and Linearity

Simple game controllers can be rather sloppy devices, since accuracy is often sacrificed for speed and feel. But in constructing a sketch pad, you want all the precision you can get. Two parameters are important in obtaining that precision.

First is the theoretical precision of the electronic circuits, whether they are 8-bit, 10-bit, or greater. Second is the uniformity or linearity of the mechanical to electrical converters, in this case the potentiometers. These considerations arise whenever you are continuously changing quantities (analog) to numbers (digital) or vice versa.

The paddle input on the Apple II and most other home computers is a timer circuit which converts a resistance value into a number between 0 and 255. This is an inexpensive and stable 8-bit analog to digital (A to D) converter. It is also an extremely slow one. The best possible precision it can have is one part in 256, or about 0.57. This sounds pretty good; old style panel meters had an accuracy of about 5% at best.

The problem with even 0.5% precision is that errors creep in because of aging components and temperature changes, so the theoretical precision is rarely achieved. And, if you have to measure several numbers and use them in mathematical equations, the inaccu-

Parts List

Number Required	Description of Part	Suggested Supplier	Total Cost
3	CMU1052 linear taper pot, 1 Meg, Mil Spec	Jameco	$9.00
1	16-pin DIP header	Jameco	.70
2	Pushbuttons, #275-609	Radio Shack	1.90
1	Box, #270-230	Radio Shack	1.90
12 ft.	Telephone cable, #278-365	Radio Shack	3.00
2	Resistors, 1K, ¼ watt	Radio Shack	.40
2 sq. ft.	Plywood, ½" hardwood preferred		4.00
1 sq. ft.	Sheetmetal, aluminum or steel		1.00
2	Bolts, ¼ x 2"		.60
2	Wing nuts, ¼"		.30
2	Flat washers, ¼"		.10
16	Flathead wood screws, #6 x ½"		.60
10	Flathead wood screws, #8 x 1"		.60
3	Bolts with lockwashers and nuts, #6 x ½"		.40
2	Bolts with nuts, #8 x 1¾"		.30
6	Pop rivets, ⅛ x 3/16"		.40
1	Brass tube (to fit pencil)	Hobby shop	.60
Misc.	Cotton felt, sandpaper, varnish, etc.		2.50
		Approximate total	$28.00

Jameco Electronics
1355 Shoreway Rd.
Belmont, CA 94002

ALF COPY SERVICE

1315F Nelson Street Denver, CO 80215 (303) 234-0871

FAST • RELIABLE • LOW COST

If you produce software, ALF's disk copying service is the quick, convenient answer to your duplication needs. Most orders are shipped in less than a week. Every disk we copy is verified bit by bit and guaranteed 100% flawless.

We can copy virtually any soft sectored mini format. Standard formats: Apple II (including nibble copy proof, double-boot, and fast load), Apple III, Atari, IBM PC, Kaypro, NEC PC8000, Osborne, TRS-80 I and III, Zenith Z-90 and Z-100, and more. Copy protection is available for most formats.

Our "no frills" pricing means you don't have to buy extras you don't need—set-up charges start at $10, and copying charges are 30¢ to 40¢ per side. (See blank disk prices at right. Minimum: 50 copies.) Quantity discounts available for large orders.

Of course, we have the frills too: label application, 3-hole vinyl pages, printing of labels and sleeves, shrink packaging, heat sealing, and much more. We can put your product in a customized package—vinyl folder or IBM-style binder/slip case—for a low price in small or large quantities.

ALF is one of the oldest and most trusted names in the duplication business. ALF designs and manufactures copying machines that other copying services and software publishers around the world rely on every day. Our complete understanding of duplication technology assures you of the finest reproduction available.

We're eager to solve your duplication and packaging problems—whether you want one service or a total package. Give us a call today!

BLANK DISKS

ALF buys large quantities of disks for our disk copying service—and we can pass our savings on to you. If you're buying hundreds of disks, ALF is your ideal source for top quality disks at a reasonable price. We buy our disks in bulk packages, avoiding the expense of fancy printing and labeling.

The disks listed below are 5 1/4", single sided, double density (except as noted), unlabeled, with hub reinforcement ring. Other disks are available, call for details.

3M	**$165** per 100
MEMOREX	**$165** per 100
NASHUA	**$160** per 100
NASHUA (single density)	**$140** per 100
VERBATIM	**$190** per 100

Without sleeves: add $2.50 shipping per 100.

With tyvek sleeves: add $7 plus $2.50 shipping per 100.

Packed in boxes of 10 with tyvek sleeves: add $15 plus $3.00 shipping per 100.

VOLUME ONE

The Best of Sync, Volume One, is an all-new collection of articles, programs, tutorials and reviews that appeared in the first six issues of *Sync* magazine. If you own a Sinclair ZX80, ZX81 or Timex Sinclair 1000, this information-packed book is a must!

Sections cover

Games • Math and Math Graphics • Software Programming Techniques • Translation • Graphics • Machine Language Hardware • Resources • Reviews • Glossary—and more!

In *The Best of Sync*, you'll find game programs like "Forest Treasure" and "Motorcycle Race Game". Hardware plans for a "Key Click Generator" and a "Parallel Interface". Programming features on "Handling Character Strings in the ZX80," "Converting from Other BASICs" and "An Introduction to Machine Code." And that's just a small sample!

These features appeared in issues that are now out of print and are nearly impossible to find. But you can still get the invaluable information, techniques and programs they hold—by ordering *The Best of Sync* today!

8½" x 11" softcover ONLY $9.95!

Sinclair and Timex Sinclair owners—get your copy now!

For faster service, PHONE TOLL FREE: 800-631-8112
(In NJ only 2/1-540-0445)

Also available at your local bookstore or computer store.

CREATIVE COMPUTING PRESS
Dept. HA9C 39 East Hanover Avenue
Morris Plains, NJ 07950

Please send me _____ *The Best of Sync, Volume One* at $9.95* plus $2.00 postage and handling each. Outside USA add $3.00 per order. **#6M**

☐ **PAYMENT ENCLOSED $** _____
*Residents of CA, NJ and NY State add applicable sales tax

☐ **CHARGE MY:** ☐ American Express ☐ MasterCard ☐ Visa

Card No. _____ Exp Date _____

Signature _____

Mr /Mrs /Ms _____
(please print full name)

Address _____ Apt _____

City _____

State/Zip _____

☐ Send me a FREE *Creative Computing* Catalog.

racies tend to add up. Expensive computer systems usually have 10- or 12-bit A to D converters. (The most accurate converter we have seen is a 24-bit system in an astronomical observatory.) The more precision you try for, the more difficult it is to calibrate and stabilize the system so that you can approach its theoretical limit.

The second problem is linearity. For the sketch pad, linearity defines how straight a line it will draw. The electronic timer circuit has strikingly good linearity, but the potentiometers do not. If we draw a graph of the resistance of a pot versus the degree of turn of the pot shaft, we should get a straight line. But if the manufacturing processes for the resistive element in the pot, are not extremely uniform, the measured reading will vary from the ideal straight line. If you use cheap, non-linear pots in the sketch pad, the lines you draw with it will be bent. Your drawings will look like the reflections in a funhouse mirror.

There is not much you can do to increase the precision of the 8-bit Apple digitizer, at least not cheaply. But eight bits is almost enough for Apple graphics, anyway. The resolution of the hi-res screen is 280 by 192 picture elements, and the two paddles resolve 256 by 256. This is more than enough precision vertically, and we are only short by 8% horizontally.

Construction of the Unit

Figure 2 gives a top view of the baseboard and details of other wooden parts. The first step in constructing the sketch

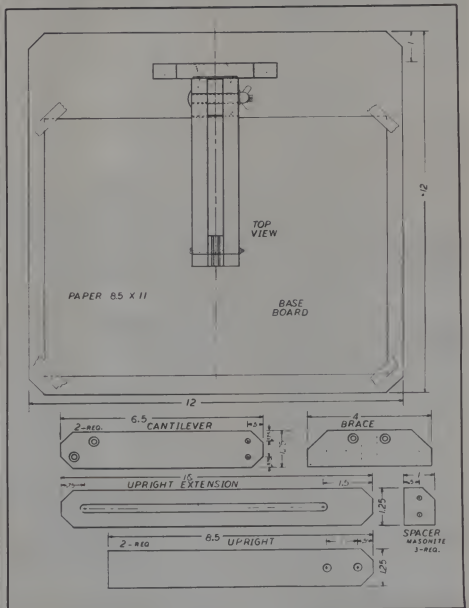


Figure 2. Wooden Parts.

pad is to gather all the materials and cut out the parts.

The prototype was made from 1/2" hardwood plywood (part of a salvaged kitchen cabinet), but standard fir plywood would work as well. The drawing surface of the baseboard must be sanded smooth. The wooden parts of the uprights and cantilever were cut from the same plywood and also had to be well-sanded, particularly along the edges. Most of the holes shown in Figure 1 are for #8 × 1" wood screws. They were drilled with a Screw Mate drill, which produces exactly the right shape hole and countersink.

Most of the metal parts (see Figure 3) were cut from a 1/16" thick piece of aluminum scrap. Galvanized steel about 1/32" thick would also give good results. You must be able to work the material with hand shears, but it can't be so flimsy that the parts are easily bent. When you are drilling sheet metal, you should hold it with vise-grip pliers or in a bench vise to keep it from spinning and cutting your hand. The front and back of the upright have countersunk holes for #6 flathead wood screws. File all edges and corners smooth as soon as you cut or drill them.

The parts for the head, which holds the two pots, are somewhat complicated; Figure 4 shows them in detail. It helps if you have your pots in hand so you can trial-fit them. If your first attempt doesn't look right, make another.

Cut out the two metal pieces that form the hanger, as shown in Figure 3, then drill only the two central pop rivet holes. Pop rivet the pieces together. Now open up the bottom parts of the hanger and bend them around a 1/4" bolt to form the pot shaft clamp. Bend back the bottom tabs so that they don't quite touch. With the bolt still in place (it substitutes for the pot shaft), drill the clamp bolt holes for the bottom shaft. Drill the top bolt holes. Then, using this metal piece as a pattern, drill the matching holes in the cantilever parts and the masonite spacers.

Cut out the pot mount piece and brace, file the edges smooth, and drill the holes for the pots. You will need a hacksaw for the two small cuts. Use the pots to mark the positions of the spin prevention tab holes. Now bend the pot mount to look like the one in Figure 4. For the prototype, the metal was bent in a bench vise with custom-made oak jaw faces. Fit the brace in position and clamp it with vise grip pliers in order to drill the pop rivet holes. Install each pop rivet after its hole is drilled, working from the outside to the inside.

The holder for the drawing instrument is made from brass tubing available at your local hobby shop. You may want to make several different size holders for pencils, pens, and a plain wooden pointer or stylus. Be sure to take the instruments to the hobby shop with you for trial fittings. Cut the brass tubing with a small triangular file. If the fit is a little loose you can insert a 3/4" strip of heavy polyethylene sheet (a garbage bag is a good source) inside the tube. You may have to cut the erasers off pencils.

Next, cut a 1 1/4" wood plug from 3/4" maple dowel to fit inside the top of the tube and glue it in place with epoxy. After the glue has completely set (preferably overnight), drill the pot shaft hole, the bolt hole, and the saw cleft stop hole. Make the saw cleft with a hacksaw and file all edges smooth.

Put together the wood parts with wood screws and carpenter's glue and then fit and mount the metal parts. Install the clamping bolts, but leave them loose; the upright extension should slip smoothly into the upright. You may have to sand and rasp the extension some more to get a smooth adjustment.

When everything fits, take off the metal parts and fine sand the wood. All wood parts should be finished with two or three coats of satin-finish polyurethane varnish. When the varnish is

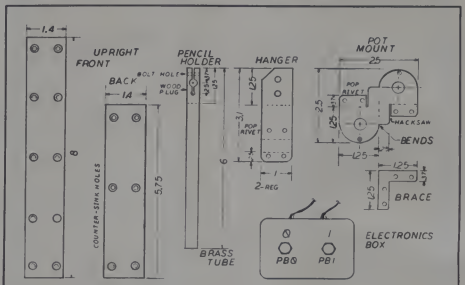


Figure 3. Metal Parts.

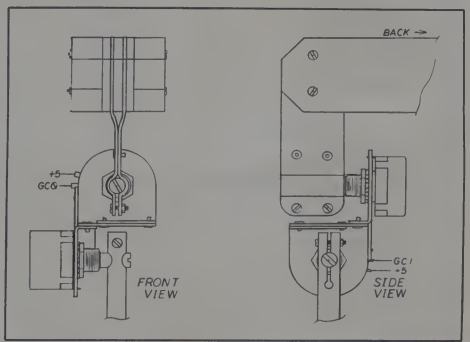


Figure 4. Head Detail.

How to use computers to teach math!

COMPUTERS IN MATHEMATICS:

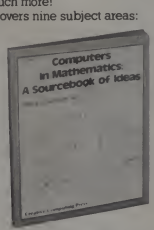
A SOURCE BOOK OF IDEAS

Now that more and more math departments have access to a microcomputer, the problem becomes: How to use the computer effectively as a teaching aid?

Here's where COMPUTERS IN MATHEMATICS can help you. This 224-page book of reprints from *Creative Computing* magazine is a goldmine of learning ideas, problem-solving strategies, programming hints, puzzles, brain teasers, and much more!

COMPUTERS IN MATHEMATICS covers nine subject areas:

- Computer literacy and computers in society.
- Thinking strategies and how to solve problems.
- Computer simulations and how to write them.
- Probability.
- Mathematical miscellany, from circular functions to differential equations.
- Art and graphics and their relation to mathematics.
- Computer Assisted Instruction (CAI).
- Programming style.
- Puzzles, problems and programming ideas.



8¼" x 11", softcover, hundreds of black-and-white diagrams and illustrations, 224 pp.

In all, COMPUTERS IN MATHEMATICS contains 77 fascinating articles, over 200 problems for assignment, and nearly 100 programs. Edited and with a preface by David H. Ahl, Editor-in-Chief of *Creative Computing*, this immensely practical volume is an invaluable classroom tool for teachers and students of all grades.

USE THE COUPON TO ORDER YOUR COPY TODAY!

creative computing Dept. HA3B , 39 East Hanover Avenue Morris Plains, New Jersey 07950

Please send me _____ copies of COMPUTERS IN MATHEMATICS. A Sourcebook of Ideas, at $15.95, plus $2.00 postage & handling,* each. #12D

CHECK ONE: ☐ **Payment enclosed $**_____ (NJ residents add 5% sales tax)

☐ **Charge my:** ☐ AmericanExpress ☐ MasterCard ☐ Visa

Card No _____ Expire Date_____

Signature_____

Mr /Mrs /Ms _____
(please print full name)

Address_____ Apt._____

City_____ State_____ Zip_____

*All foreign orders (except Canada and Mexico) add $3 to postage and handling shown. Shipped air mail only

Purchase orders under $50 not accepted

For faster service, call **TOLL FREE 800-631-8112.** (In NJ call 201-540-0445.)

thoroughly dry, reassemble the entire device.

To prevent the sketch pad from scratching your furniture, you can glue cotton felt to the bottom of the baseboard with contact cement. To make a better surface to work on than the finished wood, attach a heavy piece of drawing paper to the unit with drafting tape.

Electrical Components

The utility of the sketch pad is dependent on good potentiometers; the pots must be as linear as possible. We have had good luck with the pots that meet military specifications (mil spec) described in the parts list, but even with these you should consider buying a few extras so you can choose the ones that draw the straightest lines. The pots listed have short shafts; they are just long enough for the homemade clamps. If you have a choice, get long-shafted pots and saw off the shafts as needed.

The pots do not travel through their full turning of 300 degrees, so you will

Listing 1.

```
10  REM  ************************
12  REM  *
14  REM  *  LINEARITY TEST
16  REM  *
18  REM  * TOM RILEY COPYRIGHT 83

20  REM  *
22  REM  ************************
24  REM
30  DIM X(5),Y(5)
50  FOR N = 0 TO 4
55 X(N) = 255 * N / 4:Y(N) = X(N)

60  NEXT N
70 NX = 0:NY = 0
90  HOME
100  REM  ** HEADINGS
110  PRINT "          LINEARITY TES
     T"
120  PRINT
125  PRINT "          CORRECT  REA
     D  ERROR     %"
130  PRINT " X - AXIS"
132  PRINT
135  PRINT "POINT 0 = ";X(0)
140  PRINT "POINT 1 = ";X(1)
150  PRINT "POINT 2 = ";X(2)
160  PRINT "POINT 3 = ";X(3)
170  PRINT "POINT 4 = ";X(4)
180  PRINT
190  PRINT " Y - AXIS"
195  PRINT
200  PRINT "POINT 5 = ";Y(0)
210  PRINT "POINT 6 = ";Y(1)
220  PRINT "POINT 7 = ";Y(2)
230  PRINT "POINT 8 = ";Y(3)
240  PRINT "POINT 9 = ";Y(4)
260  PRINT
270  PRINT "PRESENT POSITION"
280  PRINT
290  PRINT "      X =          Y
     ="
295  FLASH : VTAB 6: HTAB 18: PRINT
     " "
298  VTAB 14: HTAB 18: PRINT " ":
     NORMAL
300  REM  READ PADDLES
310  GOSUB 1000
312 XE =  INT ((X - X(NX)) * 100)
     / 100:PX =  INT (XE / .255)
     / 10
314 YE =  INT ((Y - Y(NY)) * 100)
     / 100:PY =  INT (YE / .255)
     / 10
```

need pots with values much greater than the standard values for your computer. The 1 meg-ohm pots listed work well for the Apple II, which normally uses 150K pots.

If you can't find good pots with the higher values, or if you find some especially good pots at a surplus store, you can use correction capacitors, as described in the first article in this series ("Rebuilding Game Paddles and Joysticks," *Creative Computing*, February 1983, pp. 140-150). Correction caps can easily be mounted in the pushbutton box, and you are much more likely to obtain straight lines if you use them.

The pushbuttons, which should be at least 3/8" in diameter, are mounted in a small plastic box. Your fingers will tire quickly if the buttons are smaller than this. The correction caps, pull-down resistors (R1 and R2), and the filter cap (C1) are mounted on a small piece of printed circuit board that is placed in this box.

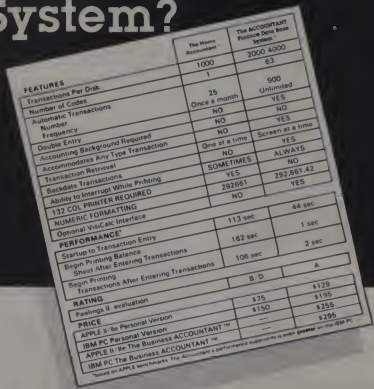
Wiring

For the electronics work on this project you will need a small pencil soldering iron of 25 to 40 watts and fine resin-core solder. The necessary hand tools are long-nose pliers, diagonal cutters, and wire strippers.

The cable from the pots to the pushbutton box must be very flexible and have at least three conductors.

```
320  REM  ** NOTE TEST POINTS
330  IF PT$ = "X" THEN  VTAB (6 +
     NX): HTAB 18: PRINT X;: HTAB
     25: PRINT XE;: HTAB 33: PRINT
     PX:NX = NX + 1
340  IF PT$ = "Y" THEN  VTAB (14 +
     NY): HTAB 18: PRINT Y;: HTAB
     25: PRINT YE;: HTAB 33: PRINT
     PY:NY = NY + 1
342  IF NX > 5 THEN NX = 5
344  IF NY > 5 THEN NX = 5
355  FLASH : VTAB (6 + NX): HTAB
     18: PRINT " ": NORMAL
365  FLASH : VTAB (14 + NY): HTAB
     18: PRINT " ": NORMAL
370  FOR N = 1 TO 500: NEXT N
380  IF NY = 5 AND NX = 5 THEN  GOTO
     400
390  GOTO 300
400  REM  ** TEST AGAIN ?
410  VTAB 20
420  INPUT "NEW TEST ? ( Y OR N )
     ";YN$
430  IF YN$ = "Y" THEN  GOTO 70
999  END
1000  REM  ** READ PADDLES SUBROU
     TINE
1010 X =  PDL (0)
1020  VTAB 22: HTAB 10: PRINT "
     ";
1025  HTAB 10: PRINT X
1027 P0B =  PEEK ( - 16287)
1028  IF P0B > 127 AND NX < 5 THEN
     PT$ = "X": RETURN
1030 Y =  PDL (1)
1040  VTAB 22: HTAB 25: PRINT "
     ";
1045  HTAB 25: PRINT Y
1070 P1B =  PEEK ( - 16286)
1080  IF P1B > 127 AND NY < 5 THEN
     PT$ = "Y": RETURN
1090  GOTO 1010
9999  END
```


Do you want the #1 Seller or the #1 Financial System?



FEATURES	The Home Accountant™	The ACCOUNTANT Finance Data Base System™
Transactions Per Disk	1000	2000 4000
Number of Codes	1	63
Automatic Transactions Number	25	900
Frequency	Once a month	Unlimited
Double Entry	NO	YES
Accounting Background Required	NO	NO
Accommodates Any Type Transaction	NO	YES
Transaction Retrieval	One at a time	Screen at a time
Backdate Transactions	NO	YES
Ability to Interrupt While Printing	SOMETIMES	ALWAYS
132 COL PRINTER REQUIRED	YES	NO
NUMERIC FORMATTING	292661	292,661.42
Optional VisiCalc Interface	NO	YES
PERFORMANCE*		
Startup to Transaction Entry	113 sec	44 sec
Begin Printing Balance Sheet After Entering Transactions	162 sec	1 sec
Begin Printing Transactions After Entering Transactions	106 sec	2 sec
RATING		
Peelings II evaluation	B/D	A
PRICE		
APPLE II/IIe Personal Version	$75	$129
IBM PC Personal Version	$150	$195
APPLE II/IIe The Business ACCOUNTANT™	—	$255
IBM PC The Business ACCOUNTANT™	—	$295

*based on APPLE benchmarks. The Accountant's performance superiority is even greater on the IBM PC

MONEY MAGAZINE — Nov. 1982
"Among bookkeeping programs, earns high marks and is easy to use."

CREATIVE COMPUTING — Jan. 1983
"The documentation is thorough, easily read, and complete."
"The program is so easy to use that rarely will reference have to be made to the manual."

SOFTALK — Jan. 1982
"For the home user (and perhaps in some less complex small business), *the best package we evaluated was The ACCOUNTANT by Decision Support Software."*
"The ACCOUNTANT does, indeed, make financial management a simple and straightforward procedure."

Now available for IBM PC

INFOWORLD — Jan. 3/10, 1983
"Complete flexible financial data base package for the home user."
"... exceptionally fast. ... highly recommend."

The ACCOUNTANT
Finance Data Base System™

Decision Support Software Inc.
1438 Ironwood Drive, McLean, VA 22101 • (703) 241-8316 • Orders Only: (800) 368-2022

Apple™, IBM®, VisiCalc™, The Home Accountant™ are trademarks of Apple, IBM, VisiCorp and Continental Software respectively

CIRCLE 159 ON READER SERVICE CARD

Using four-conductor telephone cable with the +5 wire doubled up worked well for the prototype. The cable should be about 30" in length—long enough to loop to the top of the upright and then run to the pushbutton box. Figure 4 shows the pot terminals to which you will solder the wires.

The run from the pushbutton box to the plug requires six conductors. Two lengths of telephone cable will work nicely. Ribbon cable can also be used for this run if that is what you have on hand. If you have extra wires, double up the +5 supply and ground. The length of this cable will depend on how far away from the computer you want to place the sketch pad for general use.

The plug is a standard 16-pin DIP header. You can mount resistors R1 and R2 on it if you like. Be very careful to identify pin 1 by its marked corner. The cable usually enters the header from the pin 8 end.

The best way to check your wiring is to make two photocopies of Figure 5. On the first copy, color in each wire, component, and solder joint as you progress. Color in the second copy as a final check when you go over your work. This is standard practice in electronics.

Testing and Alignment

If you have a multimeter, check the resistance from pin 1 to ground pin 8. It should be at least 50 ohms (normally, it will be much higher) even when you press the buttons and turn the pots. Shut down your computer, plug in the sketch pad, and turn the computer on again. If your computer does not start up in the normal way, turn it off at once and recheck your work. If you have the paddle checkout program from the February article, run it. If not, you can use the linearity test program (Listing 1) to provide readings while you adjust the pots.

To adjust the pots, tape a blank piece of paper on the board and mark the spot in the center where the pencil is exactly straight up and down. With a program that shows the pot readings running, and with the clamping bolts loose, turn the pot shafts within the clamps until both readings are 128 when the pencil is on the mark.

Now tighten all three clamping bolts. Move the pencil around the paper and make marks at the 0 and 255 points in each direction. The reading in the top lefthand corner should be 0,0 just as the top lefthand corner of the hi-res graphics screen is 0,0. If one or both axes are backwards, you can reverse them by moving the +5 wire to the other outside pot terminal and resetting the 128,128 point.

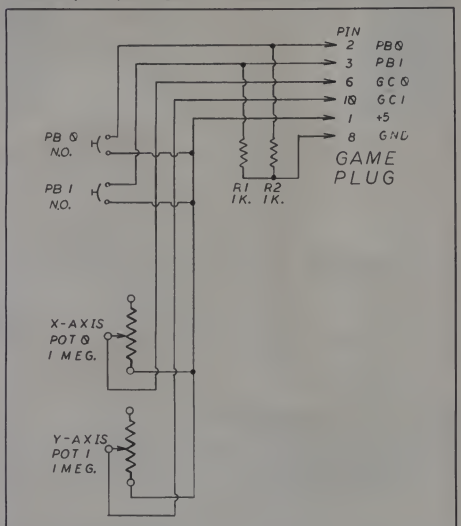


Figure 5. Sketch Pad Schematic.

Listing 2.

```
10  REM  ************************
11  REM  *
12  REM  *   DRAWING PROGRAM
14  REM  *         FOR
16  REM  *    THE HOME-BUILT
18  REM  *      SKETCH PAD
20  REM  *
22  REM  * TOM RILEY COPYRIGHT 83

24  REM  *
26  REM  ************************

30  REM
50  TEXT : HOME
70 C1 = 191:C2 = 255:C3 = 279
80 C = 3: HCOLOR= C
90 YN$ = "":D$ =  CHR$ (4)
100  REM  *** MAIN MENU
110  GOSUB 9000: REM  INTRODUCTIO
     N
120  GOSUB 8000: REM   MAIN MENU
125 YN$ = ""
130  IF A = 1 THEN  VTAB 22: INPUT
     " ARE YOU SURE ? (Y/N) "!YN$

135  IF YN$ = "Y" THEN  HGR : TEXT

140  IF A = 2 THEN  GOSUB 2000
150  IF A = 3 THEN  GOSUB 3000
160  IF A = 4 THEN  GOSUB 4000
170  IF A = 5 THEN  GOSUB 5000
180  IF A = 6 THEN  GOSUB 6000
190  IF A = 7 THEN  HOME : END
200  GOTO 120
2000  REM  ** GET A DRAWING FROM
     DISK
2010  HOME :D$ =  CHR$ (4)
2020  HTAB 7: PRINT "GETTING A DR
     AWING FROM DISK"
2030  VTAB 7: PRINT "    GETTING
     A DRAWING WILL DESTROY"
2040  INPUT "THE DRAWING NOW IN M
     EMORY.  OK ? (Y/N) "!YN$
2060  IF  LEFT$ (YN$,1) = "N" THEN
      RETURN
2070  PRINT
2080  INPUT "     CATALOG ? (Y/N)
     "!YN$
2090  IF  LEFT$ (YN$,1) = "Y" THEN
      PRINT D$"CATALOG"
2100  PRINT
2110  INPUT "DRAWING NAME ? "!DN$

2120  PRINT D$"BLOAD "!DN$
2130  RETURN
2999  END
3000  REM  *** SAVE DRAWING ON DI
     SK
3010  HOME
3020  HTAB 7: PRINT "SAVE A DRAWI
     NG ON DISK"
3040  VTAB 4: INPUT "    CATALOG
     ? (Y/N) "!YN$
3050  IF YN$ = "Y" THEN  PRINT D$
     "CATALOG"
3060  PRINT
3070  INPUT "DRAWING NAME ? "!DN$

3080  PRINT
```

Whether you're in the market
for new software or need assistance
with existing software, there is
only one number to call:

1-800-237-8977

In Florida call 1-813-786-1259

Business Applications Software with
TOTAL SUPPORT...specializing in:
IBM,™ APPLE,™ TRS-80™ and XEROX™

The Systems Group

2340 State Route 580/Suite 234
Clearwater, Florida 33575
Telex 701484

IBM is a trademark of IBM Corporation
APPLE is a trademark of Apple Computer Inc.
TRS-80 is a trademark of The Radio Shack Division of Tandy Corporation
XEROX is a trademark of Xerox Corporation

CIRCLE 267 ON READER SERVICE CARD

Controller Corner, continued...

```
3000  INPUT      IS THERE A DRAWI
      NG OF THAT NAME ON  THIS DIS
      K  Y N) "1$N$
3100  IF 1$N$ = "Y"  THEN  PRINT D$
      ; DELETE "1DN$
3110  PRINT D$; BSAVE "1DN$1,A$2
      000,L$2000
3190  RETURN
3999  END
4000  REM  *** CONTINUOUS POINT D
      RAWING
4010  TEXT : HOME
4020  HTAB 5: PRINT "DRAWING BY C
      ONTINUOUS POINTS"
4030  VTAB 5: PRINT "   THE POINT
      THE STYLUS IS ON WILL"
4040  PRINT "BE DRAWN REPEATEDLY.
4045  PRINT
4050  PRINT "    THE ZERO (0) BUT
      TON WILL SHOW THE "
4060  PRINT "X" AND "Y" COORDINA
      TES AND HCOLOR="
4075  PRINT
4080  PRINT "    THE NUMBERS 0 TO
      7 WILL SELECT "
4090  PRINT "HCOLOR."
4095  PRINT
4100  PRINT "   THE ORIGIN IS THE
      UPPER LEFT CORNER."
4110  PRINT "FROM LEFT TO RIGHT I
      S X = 0 TO 279."
4120  PRINT "FROM TOP TO BOTTOM I
      S Y = 0 TO 191."
4125  PRINT
4140  PRINT     PRESS 'ESC' TO RE
      TURN TO MAIN MENU."
4150  VTAB 22: INPUT "  ( PRESS R
      ETURN )  "1$N$
4155  HOME
4200  REM   *** SETTING GRAPHICS
4210  POKE  - 16297,0: POKE  - 16
      300,0: POKE  - 16302,0: POKE
       - 16304,0
4300  REM  *** WATCHING PADDLE
4320  X =  INT ( PDL (0) * 0.7 / 2
4330  Y =  INT ( PDL (1) * 0.1  2
4340  HCOLOR= X,Y
4350  IN=  FEEK ( - 16287)  - FEEK
      ( - 16286)*256: POKE  - 16368,0
4360  IF IN=  127 OR I  127 THEN
      4390
4370  GOTO 4320
4380  HOME
4400  IF IN=  127 THEN POKE  - 1
      6301,0: VTAB 22: PRINT "  X
      = "1X1" Y = "1Y1"  HCOLOR =
      "1C1: FOR I = 0 TO 1000: NEXT
      I: POKE  - 16302,0: GOTO 432
      0
4410  IF I = 155 THEN  RETURN
4420  GOSUB 4500
4430  GOTO 4320
4500  REM  *** CHECK HCOLOR
4510  IF I = 177 THEN C = 1: HCOLOR=
      C
4520  IF I = 178 THEN C = 2: HCOLOR=
      C
4530  IF I = 179 THEN C = 3: HCOLOR=
      C
4540  IF I = 180 THEN C = 4: HCOLOR=
      C
4550  IF I = 181 THEN C = 5: HCOLOR=
      C
4560  IF I = 182 THEN C = 6: HCOLOR=
      C
4570  IF I = 183 THEN C = 7: HCOLOR=
      C
4580  IF I = 176 THEN C = 0: HCOLOR=
      C
4999  RETURN
5000  REM  *** CONTINUOUS LINE D
      RAWING
5010  TEXT : HOME
5015  PRINT
5020  HTAB 7: PRINT "DRAWING BY C
      ONTINUOUS POINTS"
5030  VTAB 5: PRINT "    THE POIN
      T THE STYLUS IS ON WILL"
5040  PRINT "BE USED AS THE END P
      OINT OF A LINE."
5050  PRINT "DRAWN FROM THE LAST
      LINE'S END POINT."
5060  PRINT
5070  PRINT "    THE ZERO (0) BUT
      TON WILL DISPLAY"
```

Try moving the upright up and down to change scale. Mark the 0 and 255 limits for different upright heights to learn the range of sizes available for drawings. You should be able to adjust from about 6" × 8" down to 3" × 4". If 0 and 255 fall off the baseboard, you will need the correction caps as discussed earlier.

Linearity Test

The program in Listing 1 provides a test of the linearity of your pots and the accuracy of the sketch pad as a whole. To make this test you will need paper, compass, and straight edge. Tape the paper to the board and run Listing 1.

As shown in Figure 6, draw a line front to back down the center of the paper. Mark the points on this line where Y, as shown on the screen, just becomes 0 and where it reaches 255. Using the compass, bisect this line (the required arcs are shown in Figure 6). Draw the bisecting line completely across the paper. Bisect each half of the first line with short cross marks. Mark the points on this line 5, 6, 7, 8, and 9, as shown in Figure 6.

Mark the 0 and 255 points on the X axis line and bisect the line between the points. The central point #2 may or may not fall exactly on the Y axis. Bisect each half of the Y line and mark points 0 to 4.

Now for the linearity test. Carefully place the pencil on point 0 and press the 0 button, then do the same for points 1, 2, 3, and 4 in turn. Move to points 5 through 9 and on each press pushbutton 1. The screen will now show the correct reading for each point, the value actually read, the error, and the error as a percentage of full scale. The lowest repeatable score could have as low as 0.5% as the worst error percentage. Sketch pads with error rates below 4% will generally produce good drawings. Run the test several times to see how good you are at hitting the same points. Pots with large error values will draw distorted pictures, but the distortions may lead to interesting effects.

After testing the unit as described, you may want to cover the exposed wires on the pots and the DIP header with several coats of fingernail polish or with silicone sealer. Gluing cotton felt to the bottom of the pushbutton box will keep it from scratching the desktop. Be sure to mark pushbuttons 0 and 1 clearly.

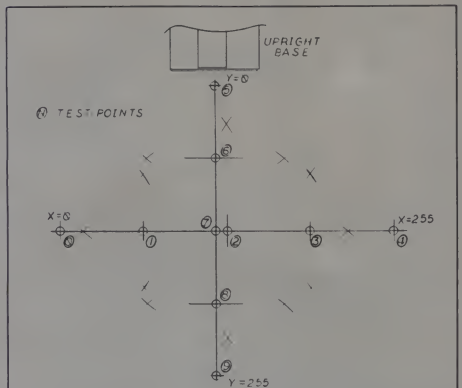


Figure 6. Linearity Test.

The Drawing Program

Now that the device (and perhaps its builder) have been thoroughly tested, we can begin to draw with the sketch pad. Listing 2 is a fairly detailed sketching program. It lets you draw pictures in three different modes, save your work on

Add 3-D to your VisiCalc®

(No, it's not a new graphics package.)

Now, you can get a consolidation system for your VisiCalc program that lets you combine multiple VisiCalc 'pages', and there's no need to learn a new system!

- Perform Hierarchical Consolidations
- Perform Time Period Roll-Ups
- Ask "What If" at Multiple Levels
- Customize Report Formats
- Word Processor Interface

VIZ-A-CON™

See your software dealer, or order directly from **ABACUS ASSOCIATES**, (713) 666-8146, 6565 W. Loop S., Suite 240, Dept. 8, Bellaire, TX 77401

Visa/Mastercard, Call Toll-Free (800) 547-5995, ext. 170

Apple II, II+, IIE, TRS-80 I, III---$ 99.95 + 3.95 S&H
Apple III, TRS-80 II 12/16, IBM PC--$139.95 + 3.95 S&H

DEALER INQUIRIES INVITED

CIRCLE 102 ON READER SERVICE CARD

CIRCLE 204 ON READER SERVICE CARD

Special Introductory Offer

CompuPrint

PHILLIPS INVESTMENT GROUP
225 Main Street
Ogden, Utah 82235
(Professional Typestyle)

MARSTON & STEVENS
325 Main Street
Boise, Utah 82235
(Commercial Typestyle)

500 continuous letterheads with matching #10 business envelopes for an incredibly low

$89.95

Postage Included

☐ Please send me 500 clean perf letterheads. I would like to have (A) commercial typestyle (B) professional typestyle. (C) my own original artwork. please circle desired typestyle with matching noncontinuous envelopes. black ink. Enclosed is my check for $89.95 (California residents add $5.40 sales tax). I am enclosing clear, legible copy for my letterheads and envelopes on a separate sheet. I understand that original artwork must be camera-ready. Sample letterheads will not reproduce. A check must accompany order for this special limited offer.

☐ I am not interested in the introductory offer at this time but please send me your catalog of other computer and standard business forms.

Name _____ Company _____

Address _____

City _____ State _____ Zip _____

Computer Make _____ Software _____

Printer Make _____ Phone ( ) _____

Send Check or Money Order to 008

CompuPrint • P.O. Box 1889 • Davis, CA 95617

CIRCLE 134 ON READER SERVICE CARD

Use All 20 Fingers

Fastype reduces typos and spelling errors while increasing speed.

Word processors are nice. Spelling checkers help. But a keystroke still takes time.

Now **Fastype** eliminates wasted keywork by supplying abbreviations for frequently used words. Just type 't' for 'the', 'io' for 'information', 'oe' for 'of the'. You just enter the code for a word and **Fastype** fills in the rest automatically.

Fastype knows codes for 500 frequently used words and word phrases.

Allows you to create a user-defined table of mnemonics for your special words or word phrases.

Just use your word processor to create a quick file, then invoke **Fastype** to generate your full text.

Minimum Requirements: 56K CP/M System with at least one drive

Only $29.95 (Disk and Manual)
To order
***call:* (614) 261-8697**
Phone orders shipped within 24 hours
or write:
☐ check enclosed (no C.O.D.)
☐ MC ☐ VISA exp. date_____

Number

Signature

☐ 5 1/4" hard ☐ 5 1/4" soft ☐ 8"

Mail to:
Cowtown Software, Inc
128 West California Avenue
Columbus, Ohio 43202

CP/M is a registered trademark of Digital Research Corp

CIRCLE 149 ON READER SERVICE CARD

Controller Corner, continued...

```
5080  PRINT "'X' AND 'Y' COORDINA
      TES AND THE HCOLOR."
5090  PRINT
5100  PRINT "     PRESSING A NUMBE
      R 0 THROUGH 7 WILL"
5110  PRINT "CHANGE HCOLOR TO THA
      T NUMBER."
5120  PRINT
5130  PRINT "     PRESSING THE 'ES
      C' KEY WILL RETURN"
5140  PRINT "YOU TO THE MAIN MENU
      ."
5150  VTAB 23: INPUT "  ( PRESS R
      ETURN TO CONTINUE )  "1YN$
5195  HOME
5200  REM  *** SETTING GRAPHICS
5210  POKE  - 16297,0: POKE  - 16
      300,0: POKE  - 16302,0: POKE
       - 16304,0
5300  REM  *** WATCHING PADDLE
      S
5310  REM  *** X POT 0 , Y POT 1
5320  X =  INT ( PDL (0) * C3 / C2
      )
5330  Y =  INT ( PDL (1) * C1 / C2
      )
5340  XI = X:YI = Y
5350  X =  INT ( PDL (0) * C3 / C2
      )
5360  Y =  INT ( PDL (1) * C1 / C2
      )
5370  HPLOT X,Y TO XI,YI
5380  XI = X:YI = Y
5390  B0 =  PEEK ( - 16287):K =  PEEK
      ( - 16384): POKE  - 16368,0
5400  IF B0 > 127 OR K > 127 THEN
      5420
5410  GOTO 5350
5420  IF B0 > 127 THEN  POKE  - 1
      6301,0: VTAB 22: PRINT "  X
      = "1XI"  Y = "1YI"  HCOLOR =
       "1C1"  ": FOR I = 0 TO
      1000: NEXT I: POKE  - 16302,
      0: GOTO 5350
5430  IF K = 155 THEN  RETURN
5440  GOSUB 4500
5510  GOTO 5350
5999  END
6000  REM  *** REFERENCE POINT LI
      NES
6010  TEXT : HOME
6020  HTAB 7: PRINT "DRAWING BY R
      EFERENCE POINTS"
6040  VTAB 3: PRINT "    THE STYL
      US AND PADDLE BUTTONS"
6050  PRINT "ARE USED TO FIND REF
      ERENCE POINTS AND"
6060  PRINT "THEN DRAW LINES BETW
      EEN THEM."
6070  PRINT
6080  PRINT "     THE ZERO (0) BUT
      TON DISPLAYS "
6090  PRINT "THE  X' AND 'Y' COOR
      DINATES AND HCOLOR."
6100  PRINT
6110  PRINT "     THE ONE (1) BUTT
      ON WILL FIX THE"
6120  PRINT "STYLUS LOCATION AS A
      REFERENCE POINT."
6130  PRINT "WHEN A SECOND REFERE
      NCE POINT IS CHOSEN"
6140  PRINT "A LINE IS DRAWN BETW
      EEN THEM."
6150  PRINT
6160  PRINT "     PRESSING KEY 'C'
       CLEARS THE"
6170  PRINT "REFERENCE POINTS."
6180  PRINT
6190  PRINT "     PRESSING A NUMBE
      R BETWEEN 0 AND 7"
6200  PRINT "SELECTS HCOLOR."
6210  PRINT
6230  PRINT "     PRESSING 'ESC' R
      ETURNS YOU TO"
6240  PRINT "THE MAIN MENU."
6250  VTAB 23: INPUT "     ( PRE
      SS RETURN )  "1YN$
6260  HOME
6270  REM  *** SETTING GRAPHICS
6280  POKE  - 16297,0: POKE  - 16
      300,0: POKE  - 16302,0: POKE
       - 16304,0
6290  HOME
6300  REM  ** WATCHING PADDLES
6305  DD = 0
6310  X =  INT ( PDL (0) * C3 / C2
      )
6315  Y =  INT ( PDL (1) * C1 / C2
      )
6320  B0 =  PEEK ( - 16287):B1 =  PEEK
      ( - 16286):K =  PEEK ( - 163
      84): POKE  - 16368,0
6330  IF B0 > 127 OR B1 > 127 OR
      K > 127 THEN 6350
6340  GOTO 6310
6350  IF B0 > 127 THEN  POKE  - 1
      6301,0: VTAB 22: PRINT "  X
      = "1XI"  Y = "1YI"  HCOLOR =
       "1C1": NEXT I: POKE  - 1630
      0,0: GOTO 6310
6360  IF B1 > 127 AND DD = 0 THEN
      XI = X:YI = Y:DD = 1: HPLOT
      X,Y: VTAB 23: PRINT "  REF P
      OINT 1 SELECTED": FOR I = 0 TO
       500: NEXT I: GOTO 6300
6370  IF B1 > 127 AND DD = 1 THEN
       HPLOT XI,YI TO X,Y:DD = 0: FOR
       I = 0 TO 500: NEXT I: HOME
6380  IF K = 155 THEN  RETURN
6390  GOSUB 4500
6400  IF K = 195 THEN DD = 0: HOME
      : HCOLOR= 0: HPLOT XI,YI: HCOLOR=
      C
6410  GOTO 6310
6999  END
8000  REM  *** MAIN MENU
8010  TEXT : HOME
8020  HTAB 14: PRINT "MAIN MENU"
8030  VTAB 5
8040  HTAB 8: PRINT "(1) CLEAR HI
      -RES SCREEN"
8045  PRINT
8050  HTAB 8: PRINT "(2) GET DRAW
      ING FROM DISK"
8055  PRINT
8060  HTAB 8: PRINT "(3) PUT DRAW
      ING ON DISK"
8065  PRINT
8070  HTAB 8: PRINT "(4) DRAW CON
      TINUOUS POINTS"
8075  PRINT
8080  HTAB 8: PRINT "(5) DRAW CON
      TINUOUS LINES"
8085  PRINT
8090  HTAB 8: PRINT "(6) DRAW REF
      ERENCE POINT LINES"
8095  PRINT
8100  HTAB 8: PRINT "(7) QUIT "
8110  VTAB 22: INPUT "  CHOOSE A
      NUMBER :  "1A
8120  IF A  < 0 OR A > 7 THEN  GOTO
       8110
8130  RETURN
8999  END
9000  REM  ***     INTRODUCTION
9010  VTAB 1: HTAB 10: PRINT "SKE
      TCHING PROGRAM"
9020  HTAB 16: PRINT "FOR"
9030  HTAB 8: PRINT "HOME-BUILT S
      KETCH PADDLES"
9040  VTAB 5: PRINT "     THIS PRO
      GRAM WAS PREPARED FOR USE"
9050  PRINT "WITH THE HOME-BUILT
      SKETCH PADDLES."
9060  PRINT "IT MAY BE USED WITH
      EITHER THE SKETCH"
9070  PRINT "OR ONE OR ANY DOUBLE PO
      T PADDLE."
9080  PRINT
9090  PRINT "     THE MAIN MENU WI
      LL LET YOU CHOOSE"
9100  PRINT "TO DRAW IN SEVERAL D
      IFFERENT WAYS OR"
9110  PRINT "MOVE DRAWINGS ON OR
      OFF THE DISK."
9120  PRINT
9130  PRINT "     WITH A LITTLE PR
      ACTICE YOU WILL"
9140  PRINT "SOON CHOOSE WHICH WA
      Y YOU LIKE BEST."
9190  VTAB 23: INPUT " ( PRESS TH
      E RETURN KEY TO CONTINUE ) "
      1YN$
9195  RETURN
9999  END
```

disk, and retrieve it. The program is menu-driven and includes three pages of instructions.

First tape a clean piece of paper onto the board. To run the program, select item 1 on the menu to clear the hi-res screen. Next enter item 4, Drawing Continuous Points, and read the instructions. Press RETURN. As you move the pencil, dots will appear on the screen. The 0 pushbutton will show the values X, Y, and HCOLOR. Pressing numbers 1 through 7 on the keyboard will change HCOLOR to the number pressed. The ESCAPE key will bring you back to the main menu.

Again, press 1 to clear the screen; now select item 5, Drawing by Continuous Lines. The rules are similar to those for selection 4, but we think the resulting drawings look better. You might trace a plastic circle template to see how distorted the circles are on the hi-res screen. Tracing the same shape several times will give you some idea of how accurately you can copy drawings. Press ESCAPE to return to the main menu.

The third drawing mode is 6 on the menu, Drawing by Reference Point Lines. Both pushbuttons are used here. Pushbutton 0 does just what it did before. Pushbutton 1 has a new function: it fixes the stylus location as a reference point, which will be shown as a small blinking cursor on the screen. To draw in this mode, think of your picture as a series of straight lines. Move the stylus to one end of a line and press button 1. Find the other end of the line and press 1 again. A line will appear on the screen between the reference points. This drawing mode is more affected by the nonlinearity of the pots.

You can use all three modes in one picture: draw straight lines with the reference point mode, draw curves with the continuous line mode, and fill in areas with the continuous points mode. To erase, simply change HCOLOR to 0 or 4 (black) and retrace the line. You can shift between modes without erasing the screen.

Main menu selections 2 and 3 place and retrieve the entire hi-res screen on the disk (this requires 34 disk sectors). Practice saving and retrieving a simple practice sketch before spending too much time on a drawing. You don't want to risk losing a masterpiece by making a simple mistake.

The Digitizing Program

Listing 3, the digitizing program, assumes that you have a stack of up to 41 graphs or charts, each with up to 15 data points, and that you need to transfer this information into the computer. You must first name the disk file. If you want to add to an existing file, answer

that the file is not new—the program will get the file off the disk.

Adjust the height of the sketch pad upright so that the stylus will just cover the entire area where points are found on any of the graphs. If all your graphs are the same size, make a reference corner by taping strips of cardboard to the sketch pad base. This will make it easy to place each graph in the same location.

Write down the values of X=0, X=255, Y=0, and Y=255 on the axes of the graphs. These readings will be needed in the next step. Press pushbutton 0 to continue.

Enter the units of the X axis (centimeters, days, whatever), then the graph axis value for X=0 and the graph axis value when X=255. Do the same for the Y axis. Since the 0,0 point is in the upper lefthand corner, the value for Y=0 is usually larger than the value for Y=255.

Now you are ready to transcribe data. Place sheet 0 on the baseboard, move the stylus to the first point, and press pushbutton 0. The screen will show the X reading, the Y reading, the X axis value in the X units of the graph, and the Y axis value in the Y units. Continue moving the stylus and pressing pushbutton 0 to enter up to 15 data points.

Pressing pushbutton 1 at any time will bring up a question asking if a new sheet is desired. A yes answer brings up a new sheet, a no answer sends you to the disk storage routine.

This digitizing program is an example to get you started. You will probably want to add correction features and restructure the data files to suit your data reduction programs. The number of sheets and points is limited by the size of your computer memory.

Summing Up

The sketch pad is an inexpensive, easy-to-build device that can be used for computer art work and data entry. Its major limitation is the imprecise linearity of inexpensive pots. (Commercial units, however, also have difficulty achieving good linearity.) The programs included here let you check the quality of the sketch pad and help you get started with drawing and data entry.

In our next article we will look at the construction of joysticks for the Atari. Some of these will be conventional in shape, while others will be strikingly new and have a very fast response.

Listing 3.

```
10  REM  ************************
12  REM  *
14  REM  * DIGITIZER
16  REM  *
18  REM  * TOM RILEY COPYRIGHT 83

20  REM  *
22  REM  ************************
24  REM
30  DIM PTX(40,2,15)
35  REM    * LIMITS 41 PAGES WITH
        16 DATA POINTS PER PAGE
50 D$ =  CHR$ (4)
60 PTN = 1:SN = 0
100  REM  *** NAME OF FILE
110  HOME
120  PRINT "   DIGITIZING WITH SK
     ETCH PAD"
130  PRINT : PRINT
140  INPUT "NAME OF FILE ? "1F$
150  INPUT "IS THIS A NEW FILE ?
     (Y OR N) "1YN$
170  PRINT
175  IF YN$ = "Y" THEN  GOTO 300
180  INPUT "IS DISK WITH THIS FIL
     E IN THE DRIVE ? "1O$
185  PRINT
190  IF O$ = "N" THEN  PRINT "PUT
       THE CORRECT DISK INTO THE D
     RIVE.":GOTO 170
200  REM  ** READING FILE FROM DI
     SK
210  PRINT D$;"OPEN "1F$
220  PRINT D$;"READ "1F$
230  INPUT SN
232  INPUT UX$: INPUT UY$
234  INPUT X0V,XMV,Y0V,YMV
235  FOR R = 0 TO SN
240  FOR S = 0 TO 1
245  FOR T = 0 TO 15
250  INPUT PTX(R,S,T)
260  NEXT : NEXT : NEXT
270  INPUT EOF$
280  PRINT D$;"CLOSE "1F$
285  IF EOF$ <>  "EOF" THEN  PRINT
     "FILE READING ERROR ": END
300  REM  *** ADJUST SKETCH PAD
310  HOME
320  PRINT "   ADJUST SKETCH PAD"

330  PRINT : PRINT
340  PRINT "       USE THE X AND Y
     READINGS BELOW."
350  PRINT "TO ADJUST THE LOCATIO
     N OF THE SHEET"
360  PRINT "AND THE HEIGHT OF THE
       UPRIGHT."
370  PRINT
380  PRINT "     PRESS PB0 TO CON
     TINUE."
390  VTAB 16: PRINT "     X =
          Y ="
400  REM  * READ PADDLES
410 X = PDL (0)
420  VTAB 16: HTAB 10: PRINT "
     "1
430  HTAB 10: PRINT X
440 PB = PEEK ( - 16287)
450  IF PB   127 THEN  GOTO 500
460 Y = PDL (1)
470  VTAB 16: HTAB 20: PRINT "
     "1
480  HTAB 20: PRINT Y
490  GOTO 410
500  REM  ** SCALE INFORMATION
510  HOME
520  PRINT "SCALING INFORMATION "

530  PRINT
540  INPUT "UNITS OF X AXIS ? "1U
     X$
550  PRINT
560  INPUT "VALUE FOR X=0 ? "1X0V

570  INPUT "VALUE FOR X MAX. ? "1
     XMV
580  IF X0V = XMV THEN  GOTO 550
590  PRINT
600  INPUT "UNITS FOR Y AXIS ? "1
     UY$
610  PRINT
620  INPUT "VALUE FOR Y=0 ? "1Y0V

630  INPUT "VALUE FOR Y MAX. ? "1
     YMV
640  IF Y0V = YMV THEN  GOTO 610
650  PRINT
660 AX = (XMV - X0V) / 255
670 AX =  INT (AX * 1000) / 1000
680 AY = (YMV - Y0V) / 255
690 AY =  INT (AY * 1000) / 1000
800  REM  *** TAKE DATA
810  HOME
820  PRINT "PRESS PB0 TO TAKE DAT
     A"
830  PRINT "PRESS PB1 TO START NE
     W SHEET"
870  PRINT
875  PRINT "SHEET NUMBER =  "1SN
877  PRINT
880  PRINT "          X     Y"1
885  HTAB 20: PRINT "Y-"1UX$1: HTAB
      30: PRINT "Y-"1UY$
890  PRINT
900  FOR N = 1 TO 15
910  PRINT " PT "1N1" =  0"
920  NEXT N
930  VTAB 24: PRINT "       X =
      Y =    "1
1000  REM   * READ PADDLES
1010 X = PDL (0)
1020 XV = AX * X + X0V
1025 XV =  INT (XV * 1000) / 1000

1030 PB = PEEK ( - 16287)
1040 PB = PEEK ( - 16286)
1045  VTAB 24: HTAB 10: PRINT "
      "1
1047  HTAB 10: PRINT X1
1050 Y = PDL (0)
1055 YV = AY * Y + Y0V
1056 YV =  INT (YV * 1000) / 1000

1057  HTAB 20: PRINT "    "1
1058  HTAB 20: PRINT Y1
1060  IF PB   127 THEN PTX(SN,0,
      PTN) = X:PTX(SN,1,PTN) = Y: VTAB
      (7 + PTN): HTAB 10: PRINT X1
      : HTAB 14: PRINT Y1: HTAB 20
      : PRINT XV1: HTAB 30: PRINT
      YV:PTN = PTN + 1
1065  FOR N = 1 TO 200: NEXT
1070  IF PTN > 127 OR PTN > 15 THEN
       GOTO 1200
1100  GOTO 1000
1200  REM  ** NEW SHEET
1203  IF PTN >  = 15 THEN  GOTO 1
     210
1205  FOR N = PTN TO 15
1207 PTX(SN,0,N) = 0:PTX(SN,1,N) =
     0
1208  NEXT
1210 SN = SN + 1
1220 PTN = 1
1240  PRINT " ": VTAB 23
1250  INPUT "ANOTHER SHEET ? (Y O
     R N) "1YN$
1260  IF YN$ = "Y" GOTO 800
1300  REM  ** SAVE FILE TO DISK
1310  HOME
1320  PRINT "     SAVE FILE TO DIS
     K"
1330  PRINT
1340  INPUT "IS STORAGE DISK IN T
     HE DRIVE ? "1YN$
1350  PRINT
1360  IF YN$ = "N" THEN  PRINT "P
     LACE THE STORAGE DISK IN THE
      DRIVE.": GOTO 1330
1370  PRINT
1380  INPUT "IS THIS A NEW FILE O
     N THIS DISK ? "1YN$
1390  PRINT
1400  IF YN$ = "N" THEN  PRINT D$
     "DELETE "1F$
1410  PRINT
1420  PRINT D$;"OPEN "1F$
1430  PRINT D$;"WRITE "1F$
1440  PRINT SN
1444  PRINT UX$: PRINT UY$
1446  PRINT X0V: PRINT XMV: PRINT
      Y0V: PRINT YMV
1450  FOR R = 0 TO SN
1460  FOR S = 0 TO 1
1470  FOR T = 0 TO 15
1480  PRINT PTX(R,S,T)
1490  NEXT : NEXT : NEXT
1500  PRINT "EOF"
1510  PRINT D$;"CLOSE "1F$
1520  GOTO 60
9999  END
```

The Metaphysical Exam

Peter Payack

I was feeling a bit gloomy for a few days
so I made an appointment with my doctor for a check-up.
Seeing me stumble into his office
with a blank expression, lowered jaw, and drooping shoulders
he escorted me into his examination room and began with
the most unusual type of medical procedure:
The Metaphysical Exam!

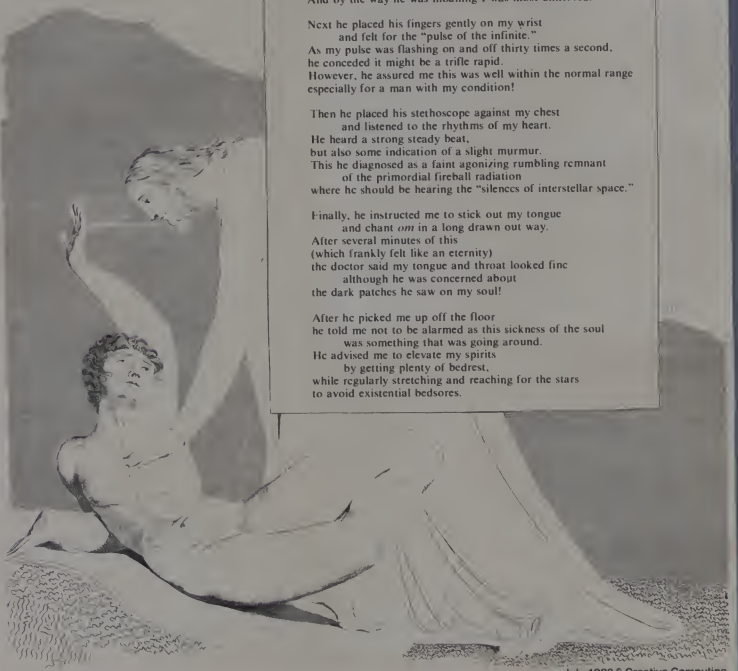
The first thing he did was to lower the lights
and look deep into the pupils of my no longer twinkling eyes
with the aid of a small telescope.
He stared with such astonishing intensity that he claimed
to see directly into the innermost essence of my being.
And by the way he was moaning I was most unnerved.

Next he placed his fingers gently on my wrist
and felt for the "pulse of the infinite."
As my pulse was flashing on and off thirty times a second,
he conceded it might be a trifle rapid.
However, he assured me this was well within the normal range
especially for a man with my condition!

Then he placed his stethoscope against my chest
and listened to the rhythms of my heart.
He heard a strong steady beat,
but also some indication of a slight murmur.
This he diagnosed as a faint agonizing rumbling remnant
of the primordial fireball radiation
where he should be hearing the "silences of interstellar space."

Finally, he instructed me to stick out my tongue
and chant *om* in a long drawn out way.
After several minutes of this
(which frankly felt like an eternity)
the doctor said my tongue and throat looked fine
although he was concerned about
the dark patches he saw on my soul!

After he picked me up off the floor
he told me not to be alarmed as this sickness of the soul
was something that was going around.
He advised me to elevate my spirits
by getting plenty of bedrest,
while regularly stretching and reaching for the stars
to avoid existential bedsores.



Target your savings on Creative Computing!

☐ Send me one year for $19.97—

20% OFF!

YOU SAVE $5.00

☐ Send me two years for $36.97—

26% OFF!

YOU SAVE $12.97

☐ Send me three years for $49.97—

33% OFF!

YOU SAVE $24.94

Savings based on full one-year subscription price of $24.97.

Mr. / Mrs. / Ms. _____
(please print full name)

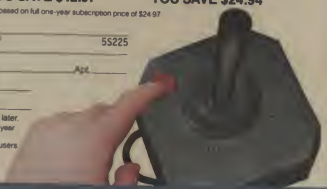
Company _____ 5S225

Address _____ Apt. _____

City _____

State _____ Zip _____

CHECK ONE: ☐ Payment enclosed. ☐ Bill me later.
Add $5 a year in Canada, all other foreign add $10 per year.
Please allow 30 to 60 days for delivery of first issue.
Would you like to receive special offers from qualified users of our mailing list? ☐ Yes. ☐ No



Special Money Saving offer!

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY CARD

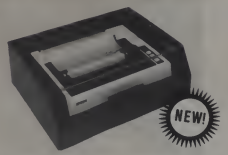
FIRST CLASS PERMIT NO. 66 BOULDER, COLORADO

POSTAGE WILL BE PAID BY ADDRESSEE

creative computing

P.O. Box 5214
Boulder, Colorado 80321

Epson, OKI, IDS, NEC, Diablo, Qume



ACOUSTIC ENCLOSURES

- Reduces Noise Up to 90%
- Heavy Duty Acrylic Cover
- Bottom Feed Capability
- Woodgrain Finish

SAVE! SAVE! FROM $99.00

Micro Printercenter™

Dealer & Ordering Info

800-343-4311

Master Charge and Visa Accepted
Shipping & Handling Charges Additional

CAB-TEK, Inc.

Riverside St. Nashua, NH 03062
CIVILIZING COMPUTERS

MPC I $99 (MX 80) MPC II $129 (OKI82)
MPC III $179 (83A, MX100) MCP IV $199 (Daisy Printer)
Power Control & Ventilation $80
Paper Rack $30 Bottom Feed Brackets $30
MPC I SHOWN

CIRCLE 131 ON READER SERVICE CARD

Continuous Checks, Statements, and Invoices

for Desk-Top Computers

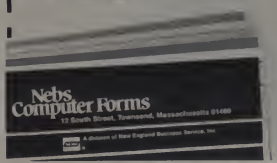
- Compatible with software from over 300 sources. Or program to NEBS standard forms yourself.
- Continuous Micro-Perf™ Letterheads and matching continuous Envelopes provide a clean, trim look.
- Also, diskettes, continuous labels, other supplies and accessories.
- Our policy is to process forms printed with your name within 6 working days. Then ship direct to you (We pay shipping charges on prepaid orders).

QUALITY PRODUCTS
SMALL QUANTITIES AT LOW PRICES
MONEY-BACK GUARANTEE

FREE Full-color, catalog

fast service by mail or phone
TOLL FREE 1 + 800-225-9550
(Mass. residents 1 + 800-922-8560)

NAME/TITLE | PHONE
COMPANY
STREET
CITY, STATE, ZIP
SOFTWARE BRAND | PACKAGE # | ☐ DO OWN PROGRAMMING
COMPUTER BRAND | MODEL | PLAN TO PURCHASE WITHIN
YOUR LINE OF BUSINESS | NUMBER OF EMPLOYEES
I MOST OFTEN USE MY COMPUTER FOR
☐ WORD PROCESSING ☐ ACCOUNTING ☐ OTHER



14106

CIRCLE 207 ON READER SERVICE CARD

The only name you need for your software products is EXPRESS

The only number you need when buying software is 800-327-7023

Perfect Software		InfoStar	$299
Perfect Writer	$249	SuperSort	$149
Perfect Speller	$149		
Perfect Writer/ Speller	$349	**Ashton Tate**	
Perfect Filer	$269	dBase II	$489
Perfect Calc	$149	dBase II Users Guide	$ 27
All Four	$700		
		Sorcim	
Micro Pro		SuperCalc	$189
WordStar	$295		
SpellStar	$149	**IUS**	
MailMerge	$149	Easy Writer II	$249
WordStar/ MailMerge	$429	Easy Filer	$269
		Easy Speller	$149
WordStar/MailMerge/ SpellStar	$539	Visa Calc (IBM PC)	$199

If you don't see a program listed, please call, maybe we can get it for you.

FOR ITEMS IN STOCK, GUARANTEED SAME DAY SHIPMENT.
NO COST FOR REPLACEMENT OF DEFECTIVE ITEMS.

CALL 800-327-7023 IN FLORIDA (305) 962-4990

EXPRESS SOFTWARE INC.

1518 Yale Drive • Hollywood, Florida 33021

CIRCLE 164 ON READER SERVICE CARD

e cart...apple cart...apple

John J. Anderson

I had the opportunity recently to attend the International Apple Core user's group conference in Santa Clara, CA. Apple footed the bill for attendance by representatives of over 90 user's groups in the U.S. and Canada. The IAC has a membership of over 80,000, all told, in some 4000 independent groups. I met representatives from as far away as West Germany and Australia.

IIe or not IIe

The reason for the three day party at the Marriott Hotel was to introduce the fold to the IIe, and the IIe into the fold. Apple personnel who were part of the development of the IIe were on hand to discuss the machine, highlight the differences between it and the older Apple, and provide insight into its improvements.

It is to Apple's credit that they reached out to the user's group level in the introduction of the IIe. "We recognize the contribution that user's groups have made to the success of our products, particularly the Apple II," said Paul Dali, general manager of the Personal Computer Systems Division, who was also the lead-off speaker. "Apple's growth can be attributed, in part, to the increase in the number of Apple user group members over the last few years. We want to continue this relationship by personally presenting the Apple IIe to our users."

An Apple van unloads goodies at the Santa Clara Marriott.

Would that other microcomputer manufacturers were likewise to acknowledge the importance of the user's group as an indispensable support system. Not to mention spending over $100,000 merely to introduce its new machine to members of those groups. Apple user's groups may have their complaints about Apple (and believe me, they do), but undeniably, Apple is providing tangible support.

Phil Roybal, communications manager now headed to an appointment as head of Apple Europe, gave a zealous overview of the computer age. Roybal is an inspiring and riveting speaker, nearly religious in his fervor. I had to fight the urge to shout "amen." Roybal reminded the group that the first Apple IIs, those groundbreaking "bicycles of the mind," as he called them, were delivered on May 10, 1977. It *is* rather dizzying to think how quickly the personal computer revolution has come upon us.

After 13 revisions to the Apple II, the IIe has arrived on the scene. It is priced below a comparably configured Apple II, and includes 64K, upper- and lowercase, and a selectric-style (as opposed to Teletype) keyboard standard. The system will accept a low-cost 80-column card, and is being introduced around the world with a variety of local-language keyboards. Danny Goodman made a first examination of the IIe in the March issue of *Creative Computing*.

It is Walt Broedner, IIe logic designer, who can be largely credited with lowering the chip count from 110 ICs in the original Apple, to 31 in the IIe. Two new LSI circuits replace approximately 80 separate circuits used in the earlier models. This feat lowers costs and increases reliability substantially, and is the single most impressive feature of the Apple IIe. The measured mean time between failures on the IIe is over 20,000 hours.

Phil Roybal cited Eniac as the first personal computer: only Mauchly and Eckert knew how to use it.

Broedner told the story of the LSI chips to the assembled hackers as follows:

"The Apple IIe project was started back in 1978, when I was working at Synertec. Woz, Jobs, and some other people at Apple were looking at possible competition from TI and Atari. They realized the need for a custom LSI design that would make the Apple II cheaper. They approached Synertec, and that's how I met Woz and Jobs.

"I soon after became a resident Synertec employee at Apple, and found out really quickly that it was nice working there. Woz was busy designing the disk controller at the time, and even though

CALL "THE COMPUTER-LINE" In Colorado.

"Committed to bringing computers within the reach of all Americans"

The Computer-Line believes that it is important to be competitive by offering low prices, however, we regard service as the most important aspect of a mail-order organization. All our lines are available so that you, the customer, are able to talk to fully qualified computer specialists trained to answer all your questions pertaining to our line of microcomputers. We are renowned for our excellent after-sales support and our promptness for delivery. Peace of mind and excellence in service is our pledge to all our customers.

PRODUCTS for the IBM PERSONAL COMPUTER

The Ultimate Peripheral for your IBM

MONTE CARLO™ CARD

Five Functions — Memory/Serial/Parallel/Clock/Joystick

- Up to 1 Megabyte Expandable Memory
- One IBM Compatible Centronics Parallel Port
- One IBM Compatible Asynchronous Communication Port
- Clock/Calendar (Battery-backed) with Alarm
- Dual Port Joystick Interface
- Future Upgrade Options Direct Connect Modem

. . . . . $CALL

And The Sensational

I-C — MAGIC

Prom Chip

Programmable Graphics Screen Dump

Print Spooling up to 64K

Terminal Emulation. . . . . $CALL

*** TANDON * THIN-LINE * TM-55**

$245.00

*** TANDON * DRIVE * Special**

Double Side/ Double Density 320K Bytes of Storage. TM-100-2

$245.00

*** Special * PRINCETON * GRAPHICS SYSTEMS**

- 300 Dots Hor.
- 16 Colors
- Non-Glare Screen
- Color at its finest

****** $CALL**

*** RAM * SPECIAL**

4164 Dynamic Ram

200NS $5.00 ea.

We can supply the quantity & price Dealers & Mant need. Call or write for volume pricing

QUADRAM CORPORATION

Quadboard: The memory board for the IBM. . $CALL

Microfazer: . . . . . $CALL

Call For Prices On Apple IIe

and

Franklin Ace 1000 / 1200 Computers.

Ashton-Tate: **SOFTWARE**

D Base II $475.00

Continental:

Home Accountant Plus $99.00

Lifetree Systems:

Volkswriter $149.00

Visicorp:

256K VisiCalc $185.00

Visidex $185.00

WE NOW CARRY:

Commodore 64 $ 379.00

Panasonic JR200 $ 399.00

Percom Hard Disk Prices:

5 Megabyte $1095.00

10 Megabyte $1395.00

15 Megabyte $1795.00

20 Megabyte $ 2195.00

I Call for the Best Prices on the IBM Personal Computer!

PRODUCTS for the APPLE COMPUTER

We are smashing the prices on Apple Compatible Disk Drives!

FOURTH DIMENSION Drives $225.00

FOURTH DIMENSION Drive with Controller $315.00

CALL FOR PRICES ON RANA ELITE I/ELITE 2/ELITE 3

~~DAVONG HARD DISKS: 5 Megabyte $1275 10 Megabyte $1775 15 Megabyte $2175~~

MBI VIP CARD

Dual Port Parallel/Serial Graphics Card $119.00

ASCII EXPRESS (The Professional) . . . . . $ 99.00

MBI APPLETIME CARD . . . . . $ 79.00

APPLE SOFTWARE

Continental:

The Home Accountant $ 54.95

Silicon Valley Systems:

Word Handler $119.95

List Handler $ 65.95

Stoneware:

DB Master $150.00

DB Utility 1, 2, 3 $69.00 ea

Visicorp:

Visicalc 3.3 $185.00

Visifiles $185.00

Visidex $185.00

Visitrend/Plot $229.00

RAM CARDS

Microsoft 16K $79.00

CP/M FOR APPLE

Microsoft Z80 Card $269.00

Advanced Logic $CALL

Kensington System Saver $69.95

T & G:

Joysticks $44.95

Select A Port $44.95

Game Paddles $29.95

Kraft:

Joysticks $49.95

Game Paddles $33.95

80 Column Cards

Videx with Softswitch $279.00

WORD PROCESSING SPECIALS

On Line Screenwriter $65 Pro $149

Silicon Valley Word Handler $119

CALL FOR ATARI COMPUTER PRICES.

For 24-Hour/7 Days a Week Ordering & Product Information, Call "Info-Line™", our computer modem line. 1-303-279-4218.

Operates at 300 Baud, Full Duplex

Monitors

Amdek	Color I	$299.00
	Color II	$499.00
	300G Green	$145.00
	300A Amber	$159.00
	310G Green	$169.00
	310A Amber	$179.00
BMC	15MHZ Green	$ 89.00
	20MHZ Green	$149.00
NEC	1201 Green	$145.00
	1212 Color Composite	$299.00
	1203 RGB Hi-Res Color	$509.00
Zenith	ZVM-121 15MHZ	$ 99.00
Taxan	Amber	$145.00

COMPUTER-LINE Is Now Open 7 Days a Week!

Product Information & Ordering Lines

Mon. - Fri., 7 a.m. to 6 p.m.; Sat. & Sun., 8 a.m. to 5 p.m.

(Mountain Standard Time)

Write or call for our comprehensive catalog.

Call "THE COMPUTER-LINE"

DISKETTES

Dysan: Outstandingly low priced

5¼" SS/DD (Box of 10)	$31.95
5¼" DS/DD (Box of 10)	$38.95
5¼" SS/DD (Box of 10)	$19.95
5¼" DS/DD (Box of 10)	$28.95

Verbatim Diskettes

5¼" SS/DD (Box of 10)	$23.95
5¼" DS/DD (Box of 10)	$43.95

Elephant Diskettes

5¼" SS/DD (Box of 10)	$22.95
5¼" DS/DD (Box of 10)	$29.95

MODEMS

***U.S. Robotics:**	2 year warranty	
	300 Baud	$179.00
	1200 Baud	$469.00
D.C. Hayes:	Micromodem II (Apple)	
	w Terminal Program	$399.00
	w o Terminal Program	$359.00
	Smartmodem 300 Baud	$209.00
	Smartmodem 1200 Baud	$525.00
Novation:	J-Cat RS232 Dirct Connect	$114.00
	Cat	$149.00
	Smart Cat 1200 Baud	$455.00
	Applecat II (Apple)	$289.00
	Smartcom II	$ 85.00

PRINTERS

TEC/CITOH Printers

Prowriter I Parallel	$379.00
Prowriter I Serial	$569.00
Prowriter II Parallel	$649.00
Prowriter II Serial	$699.00

FIO Starwriter Letter Quality 40 CPS Printer, Diablo Standard Daisywheel $1195.00

FIO Printmaster 55 CPS $CALL

OKIDATA

Microline 92: 160 CPS bidirectional with 40 CPS correspondence. 80 column $575.00

Microline 93: 180 CPS bidirectional with 40 CPS correspondence. 132 column $905.00

Pacemark 2350: 350 CPS bidirectional/2 color printing. 136 Column

Parallel	$2195.00
Serial	$2295.00

Pacemark 2410: 350 CPS bidirectional/2 color printing. 85 CPS correspondence

Parallel	$2495.00
Serial	$2595.00

Call For Prices On All OKIDATA Printers!!

Star Micronics **Price Is Too Low To Publish!**

Gemini 10 & 15

IDS Prism

132 Color $1495.00

Smith Corona

TP-1 Parallel or Serial $549.00

Call for Prices on Epson's New FX Series!!

Customer Service & Order Inquiry Line: (303) 278-8321

Product Information & Order Lines: (303) 279-2848 or (800) 525-7877

ORDER DEPARTMENT: COMPUTER-LINE, Inc. • 1019 8th Street • Golden, CO 80401

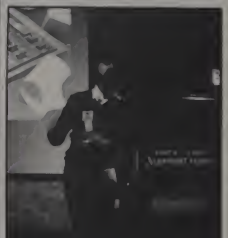
COMPUTER-LINE of Denver • 1136 So. Colorado Blvd. • Denver, CO 80222

We have leasing terms available on all our equipment. **Look for our "Computer-Line" Stores opening throughout the United States. Write for our Franchise Package.**

TERMS: All prices reflect a 2% cash discount. All orders are processed by U.P.S., or request by the customer. Due to the customer's or the request of many of our Mail Order Customers, it is our policy to ship C.O.D. This can make our quick alternative to bank checks. We reserve the right to reject any order. Orders received by mail, phone or telex will be processed and shipped within the same business day. Orders received on weekends will be processed and shipped on the following business day. Due to the uncertainty of the availability of many items, we cannot guarantee shipping dates. Please call for shipping dates on items that are critical. Prices are subject to change without notice. Please call for current prices. Shipping charges are not included in the prices listed. Shipping charges are additional. Please call for shipping charges. Minimum shipping charge is $5.00. Please allow 10 working days for your check to clear before shipping. Personal checks will delay shipment for 3 weeks. Cashier checks and money orders are treated as cash. We gladly accept Visa and MasterCard. There is a 3% charge for credit card orders. Please call for current prices

my desk was right outside his office. I hardly ever got a chance to see him. We would discuss the architecture of the new Apple machine a few minutes in the morning and a maybe a few minutes in the afternoon, if I could catch him.

"We were finally able to define a system, and I got approval from Woz to go ahead with it. So I went back to Synertec and started to design a breadboard. It was a humongous thing—it had over 400



George Johnson reminded us that the Apple II is a hard act to follow.

ICs, if you can believe it—and this was for only one of the two chips that would be part of the system. The project was code-named Annie, for Apple Annie, I guess.

"Annie was going to be totally NTSC compatible, by the way. We got the breadboard system running, and it was impressive to see. It did flicker, though, as all interlace systems do.

"We were more than halfway through with the drawings for the LSI chips by this time, when the project got shelved. TI and Atari hadn't materialized, and Woz had been very successful with the disk controller. At that point Apple decided that it would be better to try for a jump in the state of the art, than to introduce another Apple II. And that is how the Apple III was born.

"I almost had a heart attack then. After sticking with Synertec for another six months, I joined Apple, and went to work on the III. Meanwhile, some executives at Apple still felt that a cost reduction on the II was a good thing, and started doing an off-the-shelf type reduction. Woz had a lot to do with that—the project was called Alice, after Woz's wife, I believe. An engineer named Earl Smith took over the project, which then was named Diana, after his mother. This was essentially an Apple II, done with off-the-shelf components. It was starting by then to look a bit like a IIe. It had upper- and lowercase, and the language card was included.

"With my IC background, I knew there were better ways to reduce the chip count than just with off-the-shelf components. The problem with customizing, as everybody in the industry knows, is that turnaround is very long. I pushed a bit to see if I could be allowed to conduct a bit of research on customizing the Apple II, and got the OK to do a study on gate arrays. But gate arrays were overkill. The Apple doesn't have that much logic. The way to go was with customs.

"The idea of customs finally went over at Apple, for a number of reasons. First of all, Apple could own the chips, and retain all rights to them. Since Apple would own the masks, it could have the chips produced by more than one house. And since the IIe was a 6502-based machine, the custom chips could remain compatible as peripherals of the 6502.

"To that end we designed a new breadboard. We generated all the logic that we knew was going to be resident on the IOU and MMU custom chips, and simulated it with TTL components. We were able, therefore, to build an operational machine, plus or minus any special features, all the way through development of the IIe. That way it was always more than just a blueprint. It was a working model.

"The turnaround on the customs was only about 24 weeks. Adam came first, that was the MMU, and to everybody's surprise, it worked. We knew that Eve, the IOU, couldn't work, because the MMU had. Two weeks later, we were surprised again, because the IOU, which was much more complicated, worked too.

"At the time, we were working for 100% compatibility with the Apple II. Since the Apple IIe is really a different machine, that was a tall order. And not soon after, I discovered a bug in the MMU. This led to the revision B Apple IIe. In a way I was lucky to find this bug, because in fixing it I discovered how to generate double density hi-res.

"I decided to integrate into the IIe all of the functionality that was needed to support inexpensive 80-column capability. That is how the auxiliary slot was born. In fact, on an earlier model there were two slots: a 50-pin test slot, and a 30-pin 80-column slot. It became obvious that most of the signals were duplicated on the two slots, so we merged them into one 60-pin auxiliary slot. The slot can give you 80 columns, or another 64K plus 80 columns, and it also facilitates testing of IIes on the assembly line. Testing computers is a complicated affair. The more signals you can offer a tester, the easier it is to diagnose a board. That was a very important function that we gave to the auxiliary slot."

Broedner has begun his own company, Video-7, that is producing the first third-party auxiliary slot board for the Apple IIe. Beside being an 80-column card, the board provides color RGB output. "In the future all computer video output will be RGB," says Broedner. "And the Apple IIe will be among those to produce it." The introduction of the Video-7 80-Column Card caused a lot of interest at the conference. There on a IIe, alongside conventional NTSC color video, was clean, crisp and colorful RGB video. For more information, contact Video-7, 14550 Pike Rd., Saratoga, CA 95070.

Rich Auricchio, IIe firmware developer, had this to say about his own involvement in the IIe project:

"I've been with Apple since 1979, and I was the unfortunate soul selected to do the firmware for the Apple IIe. I got out of college in 1973 with a B.A. in computer science, and when I got into the software business, people didn't know I was for real. I was working with people who were science teachers, psychology majors, and ex-disk jockeys—it was rather strange. They asked things like 'You went to college to learn this stuff?' "

"I worked on mainframes for several years, and had no idea at the time that I was going to end up in the Disneyland of computing. I met Woz and Jobs in 1976, at the PC Festival in New Jersey, where I used to live. They were hawking the

Rick Auricchio spilled the secrets of IIe firmware.

Why Buy a Whole New System when what You Need is a Professional Keyboard?

FEATURES:

- Plug-in EPS PROMWARE™ Modules reconfigure keyboard for popular software packages, virtually eliminating complex command sequences.
- 12 Special Function Keys give up to 48 commands for popular software packages when used with EPS PROMWARE™ Modules.
- PROMWARE Modules available for WORDSTAR*, VISICALC*, APPLEWRITER II*, SCREENWRITER II*, and other packages.
- Configure your own function keys when writing your own software.
- Unit comes with special BASIC and DOS commands which saves keystrokes.
- Interface Board plugs into keyboard socket on motherboard, no I/O slot required.
- 6 ft. cord and telephone style jack provide convenient placement and portability.
- Latching cover secures extra PROMWARE™ Modules and Command Templates.
- Full Word Processing layout — convenient and time saving.
- Word Processing Edit Keys (Delete, Insert, Find, Replace).
- CAP-LOCK, Working SHIFT Key.
- Auto-Repeat on all keys.
- Full cursor control with UP and DOWN arrows improves speed in spread sheet and word processing applications.
- 21-key Numeric Pad allows easy data entry.
- Works with APPLE II + and most older versions, most 80 column cards and printers.
- Optional Softswitch allows added flexibility by enabling both the Apple and EPS keyboard to operate simultaneously.

Keyboard $349.95
PROMWARE $32.95

TECHNICAL SPECIFICATIONS

- Full ASCII character set
- Microprocessor controlled
- Pinout matches APPLE II requirements
- Parallel output
- No additional power required
- 19½ x 9" x 3"
- 5½ lbs.

Now IIe Compatible!

The EPS Keyboard... A New Life for Your Apple II!

To order, please call or write to:

Executive Peripheral Systems, Inc. 800 San Antonio Road, Palo Alto, CA 94303 (415) 856-2822

EPS and PROMWARE are trademarks of Executive Peripheral Systems, Inc
*Trademarks of Micro Pro International, Personal Software, Apple Computer Inc., and On-Line Systems

CIRCLE 163 ON READER SERVICE CARD

There is a word that describes your choices in flexible disks today. That word is "ordinary." The woods seem to be full of offerings of middling quality, neither good nor bad, not necessarily cheap but not overly expensive for the most part, products that are just so-so, just average, just...well, just ordinary.

But now there's a new word in flexible disks. Ultra Magnetics. A word that redefines the state-of-the-art in flexible disk price performance rather than reinforcing the current state-of-the-marketplace. By itself, *Ultra* means "extra ordinary." And by itself is where you'll place the Ultra Magnetics product when you have a chance to compare it to others.

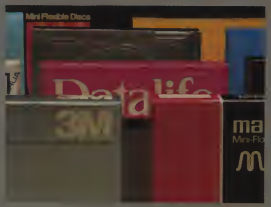
The superb engineering and meticulous manufacturing of each Ultra Magnetics disk clearly shows. A proprietary jacket provides more consistent jacket dimensions and lower torque that result in better auto-loading and longer life. A special lubricant built into each disk surface enhances both disk and head durability. And 100% surface testing of each and every Ultra Magnetics disk ensures the highest data reliability. Our Ultra Magnetics product line currently includes single- and double-sided 5.25-inch disks. Soon, it will feature 8-inch disks as well. For a fact, they are more expensive than some of the garden variety alternatives. But considering the performance and the reliability, Ultra Magnetics is a surprisingly attractive value.

Here's the bottom line. You no longer have to put up with what you may have sadly come to expect from flexible disks. And we encourage you to take the next logical step from the usual to the remarkable—from the ordinary to the extraordinary. Call your local supplies distributor and ask for Ultra Magnetics.

ULTRA MAGNETICS

Ultra Magnetics Technology, Inc.
7 Hangar Way
Watsonville, CA 95076
(408) 728-[illegible]

EXTRA ORDINARY



ULTRA Diskettes

Now...Diskettes you can swear by, not swear at.

Lucky for you, the diskette buyer, there are many diskette brands to choose from. Some brands are good, some not as good, and some you wouldn't think of trusting with even one byte of your valuable data. Sadly, some manufacturers have put their profit motive ahead of creating quality products. This has resulted in an abundance of low quality but rather expensive diskettes in the marketplace.

A NEW COMPANY WAS NEEDED AND STARTED

Fortunately, other people in the diskette industry recognized that making ultra-high quality diskettes required the *best* and newest manufacturing equipment as well as the best people to operate this equipment. Since most manufacturers seemed satisfied to give you only the everyday quality now available, an assemblage of quality conscious individuals decided to start a new company to give you a new and better diskette. They called this product the *Ultra* diskette, and you're going to love them. Now you have a product you can swear by, not swear at.

HOW THEY MADE THE BEST DISKETTES EVEN BETTER

The management of *Ultra* Magnetics then hired all the top brains in the diskette industry to make the *Ultra* product. Then these top bananas (sometimes called floppy freaks) created a new standard of diskette quality and reliability. To learn the "manufacturing secrets" of the top diskette makers, they've also hired the remaining "magnetic media moguls" from competitors such as Verbatim, Memorex, Dysan and many more. Then all these top-dollar engineers, physicists, research scientists and production experts (if they've missed you, send in your resume to *Ultra*) were given one directive...to put all their manufacturing know-how and create a new, better diskette.

HOW ULTRA DISKETTES ARE MANUFACTURED

The *Ultra* Magnetics crew then assembled the newest, totally quality monitored, automated production line in the industry. We know that some of Ultra's competitors are still making magnetic media on equipment that is old enough to vote. Since all manufacturing equipment at *Ultra* is new, it's easy for *Ultra* to consistently make better diskettes. You can always be assured of ultra-tight tolerances and superb dependability when you use *Ultra*. If all this manufacturing mumbo-jumbo doesn't impress you, we're sure that at least one of these other benefits from using *Ultra* diskettes will:

1. **TOTAL SURFACE TESTING** - For maximum reliability, and to lessen the likelihood of disk errors, all diskettes must be totally surface tested. At *Ultra*, each diskette is 100% surface tested. *Ultra* is so picky in their testing, they even test the tracks that are in between the regular tracks.

2. **COMPLETE LINE OF PRODUCTS** - For a diskette to be useful to you and your computer, it must be compatable physically. *Ultra* Magnetics has an entire line of 5¼-inch and 8-inch diskettes.

3. **SPECIALLY LUBRICATED DISK** - *Ultra* uses a special oxide lubricant which is added to the base media in the production of their diskettes. This gives you a better disk drive head to media contact and longer head and disk life.

4. **HIGH TEMPERATURE/LOW-MARRING JACKET** - A unique high temperature and low-marring vinyl jacket allows use of these product where other diskettes won't work. This special jacket is more rigid than other diskettes and helps eliminate dust on the jacket.

5. **REINFORCED HUB RINGS** - Standard on all *Ultra* mini-disks, to strengthen the center hub hole. This increases the life of the disk to save you money and increase overall diskette reliability.

6. **DISK DURABILITY** - *Ultra* disks will beat all industry standards for reliability at well over millions and millions of revolutions. They are compatible with all industry specifications as established by ANSI, ECMA, ISO and JIS.

7. **CUSTOMER ORIENTED PACKAGING** - All *Ultra* disks are packaged 10 disks to a carton and 10 cartons to a case. The economy bulk pack is packaged 100 disks to a case without envelopes or labels.

8. **LIFETIME WARRANTY** - If all else fails, remember, all disks made by Ultra Magnetics, (except bulk pack) have a lifetime warranty. If your *Ultra* disks fail to meet factory specifications, *Ultra* Magnetics will replace them under the terms of their warranty.

9. **SUPERB VALUE** - With Ultra's automated production line, high-quality, error-free disks are yours without high cost

SAVE ON ULTRA DISKETTES

Product Description	Part #	CE quant. 100 price per disc ($)
8" SSSD IBM Compatible (128 B/S, 26 Sectors)	81726	1.99
8" SSDD IBM Compatible (128 B/S, 26 Sectors)	81701	2.49
8" DSDD Soft Sector (Unformatted)	82701	3.19
8" DSDD Soft Sector (1024 B/S, 8 Sectors)	82708	3.19
5¼" SSSD Soft Sector w/Hub Ring	50001	1.79
5¼" Same as above, but bulk pack w/o envelope	00153	1.39
5¼" SSSD 10 Hard Sector w/Hub Ring	50010	1.79
5¼" SSSD 18 Hard Sector w/Hub Ring	50016	1.79
5¼" SSSD Soft Sector w/Hub Ring	51401	1.89
5¼" Same as above, but bulk pack w/o envelope	00096	1.49
5¼" SSDD 10 Hard Sector w/Hub Ring	51410	1.89
5¼" SSDD 18 Hard Sector w/Hub Ring	51416	1.89
5¼" DSDD Soft Sector w/Hub Ring	52401	2.79
5¼" Same as above, but bulk pack w/o envelope	00140	2.39
5¼" DSDD 10 Hard Sector w/Hub Ring	52410	2.79
5¼" DSDD 18 Hard Sector w/Hub Ring	52416	2.79
5¼" SSQD Soft Sector w/Hub Ring (96 TPI)	51801	2.49
5¼" DSQD Soft Sector w/Hub Ring (96 TPI)	52801	3.49

SSSD = Single Sided Single Density; SSDD = Single Sided Double Density; DSDD = Double Sided Double Density; SSQD = Single Sided Quad Density; DSQD = Double Sided Quad Density; TPI = Tracks per inch.
For less than 100 diskettes, add 10% to our quantity 100 price.
For additional compatibility info call Ultra Magnetics at 408-728-7777.

The Small Print

To get the fastest delivery from CE of your *Ultra* computer products, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on back order automatically unless CE is instructed differently. Minimum prepaid order $50.00. Minimum purchase order $200.00. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

For **shipping charges** add $8.00 per case or partial-case of 100 8-inch discs or $6.00 per case or partial-case of 100 5¼-inch mini-discs for U.P.S. ground shipping and handling in the continental United States.

Mail orders to: Communications Electronics, Box 1002, Ann Arbor, Michigan 48106 U.S.A. If you have a Master Card or Visa card, you may call and place a credit card order. Order toll-free by calling 800-265-4828. If you are outside the U.S. or in Michigan, dial 313-994-4444. Telex 810-223-2422. Order your *Ultra* diskettes from Communications Electronics today.

Copyright ©1983 Communications Electronics™ Ad #050583

MasterCard VISA MEMBER DIRECT MAIL MARKETING ASSOCIATION

Order Toll-Free!
800-521-4414
In Michigan 313-994-4444

ULTRA MAGNETICS diskettes

COMMUNICATIONS ELECTRONICS™

Computer Products Division

854 Phoenix ☐ Box 1002 ☐ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

CIRCLE 275 ON READER SERVICE CARD

Apple Cart, continued...

Apple I at the time, for $666. In 1977 I read Woz's article on the Apple II, the one that is now just about required reading for all Apple hackers. Two months later I bought an Apple II with the serial number 183. I went into the only Computerland in the country at the time, which was in Morristown, NJ, and saw the machine doing graphics. There was no documentation, but no mirrors or wires running under the table, so I put down my $1700 for a 16K machine.

"It was a Rev.0 board: there was only four-color hi-res, without red and blue; there were no cooling vents in the thing; it didn't reset when you powered on, as it had an old monitor ROM; and I stuck with cassette for almost a year. I didn't even get a reference manual with it. They gave you about 20 pages of Xeroxed documentation.

"I wanted a listing of the monitor ROM, so I wrote to Apple. I got a handwritten

Rick gave some rare looks at early prototypes. Note the cardboard monitor (never released).

thing back from (Mike) Markkula, with the listing. I began hacking in earnest. I disassembled Integer Basic, while waiting for a disk drive. I wrote to Apple again and asked them if they had a disassembly of Integer. They laughed and said no, Woz had assembled it by hand and typed it in directly in hex. Woz was like that—he would go to a party and type in 5K of Basic just to show somebody a little game program. That was Woz. The guy was a real believer.

"I ended up mailing them (Apple) a listing of Integer Basic as I saw it, with a lot of comments as to what I thought it did. This led to a correspondence, and finally a job...

"Well the Apple IIe came along as Walt said. And the important thing as we saw it was that its first name had to be II. That's one of the reasons why we couldn't go crazy with some of the weird Apple III stuff. So we got our hotshots going on the project. Around August 1981, the first IIe wire-wraps landed on my desk. 'Okay, write firmware,' they said. Each wire-wrap had its own flavor keyboard—we were experimenting with them. None was interchangeable with IIs, IIIs, or each other. If you screwed up one of those babies,

The other new member of the family, Lisa. Really sexy, and not overpriced, at least for the time being.

you had to build another one from scratch.

"So that's when it started, around August of 1981. As for when it will be finished, well, soon, I hope. The minute you go to ROM, of course, things get changed. We know that well. And I nearly went off the deep end in the process.

"One simple thing that helped was naming the machines. A friend of mine at an adjacent desk had a couple of these little cut-outs from a box of Crackerjacks or something. I stuck two of them on our prototypes, and they became Flash and Superman. And suddenly, we were able to name them to each other. We could say things like 'the Flash has a problem,' and 'Superman doesn't,' and thereby tell one emulator from another. It was a breakthrough.

"Back when we had the emulators, I was able to hit 94,000 on *Galaxian*. That was one of the things that kept my mind lubricated while I was working on software. I could go into the lab and get on one of the wire-wraps and run *Galaxian*. I had to make sure that the game I/O worked, and the color graphics were there, you see. So I tested these things periodically, and came out with welts on my fingers from this phase of the work.

"In December of '81, the real IOU and MMU arrived. We couldn't believe it—actually we were surprised that they worked. We paid tribute to the great god at Synertec."

Soon after Rick spoke, a blackout, probably caused by the atrocious weather California endured throughout my entire visit, marred the festivities, and fortunately was the only mishap at the conference. It lasted about two and a half hours, and obliterated IIe product manager Sue Berman's time at the rostrum. She made a brave go of it, however.

That evening the entire group was ferried to Fisherman's Wharf for dinner, drinks, and to meet Lisa, Apple's new high-end entry. Look for a review of this remarkable machine in the pages of *Creative* soon.

Lisa was designed to come apart without the need for a screwdriver. Changing boards is a literal snap.

My usually astute reporter's mind becomes as foggy as San Francisco Bay when I attempt to recall the events that followed. I do remember being herded with the others (you could recognize our group—we were the ones wearing straw hats with Apple logos on them), into some sort of cabaret on Green Street: Club Fugazi, it was called, and that's about the last hard fact I remember. The Guinness Stout I had been drinking and the extremely bizarre floor show then combined to cause my amnesia. The Queen of England was there, I remember, carrying a purse six feet long and wearing a box of Imperial Margarine on her head. Perhaps I should discontinue this train of thought.

The next morning, the somewhat haggard hack troops assembled quietly and without much esprit. That is until the sight of 40 fully-configured IIes began to perk them up. Apparently not even several hangovers could dilute the enthusiasm these folks felt for the hardware.

Sunday morning 40 IIe systems were available for "hands-on." Despite the toll of the previous night, enthusiasm prevailed.

That kind of loyalty can be found only in a die-hard user's group. It certainly bodes well for Apple to cultivate that loyalty, now and for the future. And the International Apple Core should be proud of the company it supports; Apple has set a fine precedent by supporting the IAC in this manner. I heard complaints about Apple during my time in Santa Clara, but none pertaining to the IIe Conference itself. It was a gracious and thoughtful christening for the new machine. □

YOU CAN MAKE A FORTUNE IN MICROS!

THE MICRO COMPUTER BUSINESS WILL GROW FROM $10 TO $100 BILLION IN THE NEXT EIGHT YEARS! ARE YOU READY TO CASH IN?

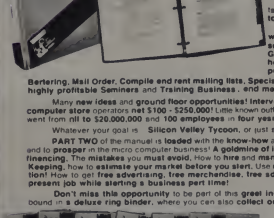
The **micro computer business** is predicted to grow from its present $10 billion to **$100 billion** before 1990! Imagine the possibilities this opens for you! No matter where you live, if you're starting up or presently in business, **no other industry offers you more opportunities!**

Now, finally, all the inside information you need to secure a prosperous future in this dynamic industry is available in **one place - THE COMPUTER ENTREPRENEUR MANUAL!** — An **immense** information source, compiled by our **inquisitive** research **team**, aided by a panel of **experts** and **business people** from **all areas** of the **computer industry!**

We present the inside story of **more than 100 lucrative computer businesses you can enter,** where you'll find the **real opportunities** for the eighties from one man operations like **Programming Author, Word Processing Center** or **Consulting,** to **Systems House, Service Bureau, Computer Store etc!** Many at little or no investment! All the invaluable facts and figures: **How to start, Capital needs, Profit estimates and Margins, How to Sell and Market, How missing** technical or business experience **need not stand in your way, Source of Suppliers, etc!** Details that could take **years** to find out on your own!

We'll show you **inside tricks,** like how to **never again pay retail** for computer products and consumer electronics, **even for one item - right now,** while you're starting your business! How to get **free merchandise** and trade show **invitations, etc. This alone** will **more than pay** for the **manual!** You'll read **actual case histories** of other computer entrepreneurs, so you can **learn** from **their mistakes,** and **profit** from their **success stories! Where** you'll be **one year** from now depends on **your actions today!** Let us **show you how** to take the **first crucial steps!**

Order now and take **advantage** of our **limited introduction special, THE COMPUTER ENTREPRENEUR MANUAL,** and a **six month subscription to THE COMPUTER ENTREPRENEUR REPORT/NEWSLETTER** (so you re **always up-to-date** with the industry), **both for only $29.95! You must be convinced** on how **easy** you can **strike it rich** in the micro computer business - or you may **return** the manual for a **full refund** within thirty days! **USE OUR TOLL FREE NUMBER TO ORDER!**



EVERYTHING YOU NEED TO KNOW TO SUCCEED IN THE COMPUTER BUSINESS IS ALL IN THIS MANUAL!

THE COMPUTER ENTREPRENEUR MANUAL has the **answers** to **all your questions** about **selecting, starting** and **succesfully running a computer business!** There has **never** been such a **comprehensive collection** of **know-how** and **information** about this business **in one place! All the facts you need** to **plan** and **achieve your goals** in **easy-to-follow, step-by-step instructions!**

These are some of the **100-plus businesses** covered in **PART ONE** of the manual! with the facts on **How to start and run, Start-up Cost** (**Even** how to operate **on a shoestring**), What **profits to expect, Wholesale prices, Mark-ups, Suppliers, future outlook, case histories** for **each, etc:**

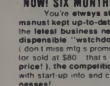
Systems House, Software Author (who to sell to and who to avoid), **Service Bureau, Software Publisher** (How to find programs that sell! **Word Processing Service, Consulting** and **Consultant Broker** (use your skills or those of others **make $150 - $1000 e day!), The incredible Games Business, Computer Store** (Franchises, Pro and Contra) or **low inventory store in your home!), OEM, Hardware Mfg, Data base** and **Teletext Service** (**big prospects!), Used Computers, Repairs, Rent-A-Computer, Promote Fests** and **Trade Shows, Turnkey Systems, Bartering, Mail Order, Compile and rent mailing lists, Specialized Date Hesdhunting** and **Temp Help Service, Tech Writer Shop, Custom Engineering,** The **highly profitable Seminars** and **Training Business . and many more!**

Many **new ideas** and **ground floor opportunities!** Interviews and **success stories** on **companies of all sizes!** Privy info on the profits made! How some **computer store** operators **net $100 - $250,000!** Little known outfits that made their owners **millionaires,** one of these low-key companies making sample boards went from **nil** to **$20,000,000** and **100 employees in four years!** Programmers that make **$300,000. Thousands** of **micro millionaires** in the making. etc!

Whatever your goal is **Silicon Valley Tycoon,** or just a **business at home - we guarantee** you'll find a **business to suit you - or your money back!**

PART TWO of the manual is **loaded** with the **know-how** and **"streetfighting" savvy** you need, both as a **novice** or business **veteran,** to get started to stay and to **prosper** in the micro computer business! **A goldmine of information** in clear and easy-to-use instructions How to prepare your **Business Plan, Outside financing, The mistakes** you must **avoid,** How to **hire** and **manage employees, incorporation** (when and how to do it **cheaply**), **Surviving bad times, Record Keeping,** how to **estimate your market before you start.** Use **multiple locations** to **maximize profits,** how to **promote** and stay steps **ahead of the competition!** How to get **free advertising, free merchandise, free advice, Power negotiating** with suppliers to **double** your **profit margins, etc!** Even how to **keep a present job while starting a business part time!**

Don't miss this opportunity to be part of this **great industry - the next success story** could be **your own! Order the manual today!** Part one and two bound in a **deluxe ring binder,** where you can also **collect our newsletter (free for six months with the manual! - a $32.50 value!) - all for only $29.95!**



THE COMPUTER ENTREPRENEUR NEWSLETTER — ALL THE LATEST INSIDE BUSINESS NEWS! NOW! SIX MONTHS FREE WITH YOUR MANUAL!

You're **always stunned** to the industry and **your manual kept up-to-date,** with our **newsletter!** Each issue has the **latest business news, ideas, new suppliers,** our **indispensible "watchdog" column** on **profits, discounts** (don't miss mfg's promo **six recently** when top video monitor sold at $80 - that's half wholesale **one third of the retail price!**), the **competition, the big deals, etc! Feature stories** with start-up info and case histories **on new micro businesses!**

You'll get **invitations** to trade shows and conventions the **usage** of our **advisory service** and our **discount buying service** for your purchases!

You'll find **many items** in our newsletter that will **save you the cost of your manual many times over!**

CALL TOLL FREE! CHARGE IT!
Credit Card Orders (MC, VISA only) accepted 24 hours/day
1-800-227-3800
Ask for extension 1135

MasterCard VISA

Order by phone (Credit cards only), or use the coupon:

Mail to **THE COMPUTER ENTREPRENEUR PUBLISHING CO. PO BOX 456, Grand Central Station, New York, N.Y. 10163**

Please send me **THE COMPUTER ENTREPRENEUR MANUAL,** and the **six month free subscription to THE COMPUTER ENTREPRENEUR REPORT/NEWSLETTER. All for only $29.95,** plus $3 for postage/handling (**NY residents:** add $2.64 for sales tax). If I decide not to keep the manual I may **return it within 30 days** for a **full refund.**

NAME: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

☐ **Check or M O enclosed** **Charge to** ☐ **VISA** ☐ **MC**

CARD # _____

Exp. Date _____

SIGNATURE: _____

CR0783

© **1982, THE COMPUTER ENTREPRENEUR**

CIRCLE 147 ON READER SERVICE CARD

outpost : atari

John J. Anderson

One of the cardinal rules I set for myself when I started writing the Outpost was never ever to report unconfirmed rumors. I am now going to enthusiastically break that rule, for the following reasons. First of all, the news is from an extremely reliable source: probably the best source I have. Unimpeachable, you might say. Second, the news is good. The news is really very good. It has got to be the best bit of Atari news I've heard in—jeepers—quite a while.

Scuttlebytes

If you have been following this column for the last three months or so, you know of my deep disappointment with the new 1200 machine. I, and many other Atari computer loyalists along with me, have felt that the 1200 XL was not only lackluster, but actually served to point the Atari Home Computer Division in a weak and uncompetitive direction. During my somewhat petulant visit to Sunnyvale some months ago, Atari voiced a commitment to at least listen to user suggestions concerning a redesign. I then made an effort to get everyone in the world who cares to help set Atari straight.

Well Atari has not only listened, but actually seems to have come around. It seems that the model 1200 redesign will be as extensive as we all hoped. Among other reforms, there will be a return to the *compatible operating system* of the 400 and 800; also, and brace yourself, an *expansion chassis* feature will be available. Seems almost too good to be true.

All I can say is yippee, yahoo, and thank the Lord above. I hope to report some very good news in next month's Outpost, detailing the enlightened features to be included in the redesign of the Atari 1200. I hope also to report on a batch of *new, compatible* Atari computers. If you are among the concerned Atarians that have made your feelings known to Atari, there is real cause to rejoice — you got through. My great thanks to all of you.

The last two columns of the Outpost have generated lots of mail, so I shall try to steer clear of further controversy this time around. We'll meet a real up-and-comer in the Atari software market, and also examine the full listing of a remarkable self-modifying title card generator, sent to us as an entry in our program contest.

A couple of quick comments about the mail before we get started. I cannot possibly answer all your letters individually. If you must have a personal response, please enclose a self-addressed, stamped envelope with your letter. That is about the only way you will hear from me. I still encourage you to keep the cards and letters coming in, especially those concerned with the future of Atari microcomputers.

I do hope you are letting Atari know your feelings too, though, and not just me. Let them know you are out there, and that you care enough to have gotten in touch.

Dewey Unto Others

I have visited quite a few fledgling software concerns in my time and met some interesting people. Many of them talk a literally "good game"; fewer can then back up their talk with original, high quality software. And in the area of educational packages, well, I don't have to remind you how many just plain lousy programs there are to be found hiding under a hat of high mindedness. Some established and well-advertised third-party education stuff for the Atari ranks among the most amateurish swill on the market today.

Coming to microcomputing from the field of education, as I do, that fact is especially lamentable to me. It makes it much harder to convince people of the power of computer graphics and sound as educational entertainment tools. As a result, the division between educational and entertainment software is strengthened in many minds. That's too bad, since to my mind there should be no such division.

When the rare somebody comes around who is really on the beam, therefore, it is especially exciting to me.

Trip Hawkins of Electronic Arts in San Mateo, CA, is one of these rare souls. He expounds the virtues of microcomputer games in education in much

Trip Hawkins, of Electronic Arts, with Pinball Construction Set.

INTRODUCING
ULTRATERM™
YOU'LL LOVE THE VIEW!
With UltraTerm, the revolutionary new card from Videx, you'll enjoy sweeping panoramas of spreadsheets that you've never seen before: 128 columns by 32 lines, 132 columns by 24 lines and even 160 columns by 24 lines. You'll revel in the scenics of a whole year of records stretching out across your screen.
You'll also delight in the new horizon of 80 columns by 48 lines—double the lines you normally have. So your word processing will reveal a depth of character never possible before!
Another breath-taking view of UltraTerm—it delivers absolutely flicker free state of the art display with 8 x 12 character matrix giving you preposterously clear readable characters. Not only will you see **more** characters on your screen (a whopping 4096 possible), but they'll also be larger and more readable than the characters you read every day in your news paper! And you can differentiate those characters in several modes: normal white on black, inverse (black on white), bright intensity and dim intensity.
UltraTerm features a built-in soft video switch and has complete firmware support for BASIC, Pascal and CP/M. Use it with the Apple II, Apple IIe, Apple III and Franklin.
UltraTerm. Come on over and enjoy the view.
Suggested retail price: $379
Videx INC. TM
2907 N.W. Grant Avenue, Corvallis, OR 97330
503-758-0521
Apple is a registered trademark of Apple Computer Inc. [illegible] Research Inc.
CIRCLE 283 ON READER SERVICE CARD

Design the best new M*A*S*H™ video game, and you'll get something money can't buy.

Fame.

That's right. F-A-M-E.

Because if the game you design is good enough, we'll make it and put your name on every one we sell.

And remember, you don't have to be a computer programmer to come up with a great game. You just have to have a great imagination, and give us a short description of your idea.

IF FAME ISN'T ENOUGH, HOW ABOUT A FORTUNE?

$25,000 to be exact. That's how much the game contract will bring you. Guaranteed. What's more, we're giving away a whole list of prizes for the other great game ideas we get.

- Four First Prize AMC Jeeps®.
- 400 Second Prize Texas Instruments 99/4A™ Home Computers.
- 4000 free Fox Video Games.

EVERYBODY WINS.

Because the new M•A•S•H game comes packaged with a smashing M•A•S•H T-shirt.

Absolutely free.

HOW DO YOU GET STARTED?

Just buy the original M•A•S•H game. The contest rules and entry blanks are in every package.

And if you win, you might say the rewards are monumental.

20th CENTURY FOX

Games of the Century

THE M•A•S•H™ CONTEST. IT'S A SMASH.

CIRCLE 170 ON READER SERVICE CARD

BYTEWRITER

DAISY WHEEL PRINTER

- Full Olivetti typewriter warranty
- U.L. Listed

$695
plus shipping

FEATURES
• Typewriter operation with nothing to disconnect • 10, 12 or 15 characters per inch switch selectable • Portable with carrying case • Entire interface mounted internally in the Olivetti Praxis 30 typewriter • Underlining • Cables available for most computers • Service from Olivetti dealers • Centronics compatible parallel input • Built in self test • Cartridge ribbon • 2nd keyboard switch selectable

BYTEWRITER

125 NORTHVIEW RD., ITHACA, N.Y. 14850
(607) 272-1132

CIRCLE 120 ON READER SERVICE CARD

MARKET ANALYST™

THE LEADER FOR WISE INVESTORS

The Complete Investment Analysis Package, Including:

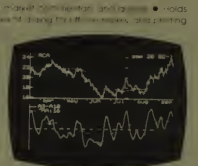
Technical Analysis — Fastest Charting • Dynamically changeable time scales • Daily, weekly and monthly charts • Moving averages • Trend lines • Pricey volume • Relative indicators • Oscillators • Custom formulas • Computer study of indicators • Search for and chart future charts • Up to five years of daily data per file • Automatic data capture from two databases

Portfolio Management — Automatic warning of positions about to go ... • Search for owners of positive ... • Eliminates out-of-pocket omissions for net investment gain • Tax ... accounting

Telecommunications — Access to all market data services and ... • Holds ... pages of ... library for ... review, ... printing

MARKET ANALYST... Available from selected dealers or from Anidata Includes WCS Password and sample stock database

Apple II/II+/IIe ...$395
IBM PC ...$495
Apple is a registered t.m. of Apple Computer Inc
Dealer inquires invited



ANIDATA

ANIDATA, INC
318 South Black Horse Pike
Blackwood, NJ 08012
(609) 228-3034

CIRCLE 315 ON READER SERVICE CARD

Outpost: Atari, continued...

the way that I do, even to the point of invoking the name of John Dewey in the process. And any friend of John Dewey is a friend of mine.

If you ever get the chance to discover the writings of John Dewey, I wholeheartedly encourage you to do so. His thinking has done much for the philosophy of education in this country. Within his many sensible and sensitive writings, he repeatedly expressed the belief that the best kind of learning involves the learner as active *participant*—that it is much more potent to *experience* as opposed to merely hear about a subject. If Dewey had lived into the microcomputer age, I am sure he would have advocated the use of the personal computer as a perfect tool to advance this kind of learning.

The vital difference between Trip Hawkins and many others who share Dewey's viewpoint is that Mr. Hawkins is actively pursuing the goal and amassing products consistent with it to inaugurate his software label. Make note of that name, *Electronic Arts*. It may well set the standard for sophisticated entertainment software in the 80's.

Hawkins, who applied his estimable intellect for two years to the development of the Lisa machine at Apple, clearly and unequivocally sees the microcomputer as a new artistic medium. The computer offers the potential for incredibly complex forms of entertainment that are at the same time extremely simple to play. "Hidden scaffolding" is the term Hawkins uses to describe the means by which a computer program can encompass more depth and realism than anything yet seen in the genre.

He sees it as the job of a software house such as his own to find, manage, and support software artists, in much the same way that a good film studio or record label would handle its performers. In fact, he intends to use some of the artists who do record album covers to aid in the packaging of Electronic Arts software.

Trip sees the contemporary microcomputer software business in a situation similar to the situation the film industry experienced back in the 1900's—at the very outset of its development. A great deal of software has derived appeal from sheer novelty, rather than content, and hundreds of folks from every walk of life are feverishly churning the stuff out; most of it is mediocre. But this is changing fast. The sophistication of the software buyer grows daily.

Carrying forth that analogy, Hawkins sees as his task the creation of an environment wherein a "software

Turn Computer Power into INSTRUCTION!

Self-instructional, easy-to-use, versatile, and well documented, THE AUTHOR™ Computer Authoring System helps you produce your own computer-assisted-instruction lessons in just a few hours.

THE AUTHOR™

- Requires no computer/programming skills
- Uses menu driven, highly prompted functions
- Permits design of multiple choice, fill-in-blank, sequencing, and true/false questions
- Prints/displays complete records of learner performance for lessons
- Includes free right to sell/distribute your own lessons

One-Time License Fee:

APPLE* II PLUS (48K -DOS 3.3)	$195
IBM-PC (64K - PC-DOS)	$195
BURROUGHS B20 (BTOS)	$600

Dealer Inquiries Invited

Want to know more about how you can turn Computing Power into Instruction?

Contact Us: Phoenix Performance Systems, Inc.
324 South Main Street, Suite #1
Stillwater, MN 55082 (612) 430-2980

WE TAKE THE COMPLEX AND MAKE IT EASY

THE AUTHOR™ is a trademark of Phoenix Performance Systems, Inc.
* Apple is a registered trademark of APPLE COMPUTER, INC

CIRCLE 235 ON READER SERVICE CARD

BASF DISKS

LIFETIME GUARANTEE	HUB-RINGED	CERTIFIED ERROR FREE
SSDD	**5¼"**	**DSDD**

$21.90 ea. — 1-9 Boxes — $30.90 ea.
$19.90 ea. — 10+ Boxes — $28.90 ea.

FREE PLASTIC CASE WITH EACH BOX

☐ SEND ME YOUR PRICE LIST
☐ SEND ME _____ BOXES AT $ _____ PER BOX
ADD 3% SHIPPING/HANDLING ($3.00 MINIMUM)
TWO WEEK DELAY FOR PERSONAL CHECKS
☐ PAYMENT ENCLOSED $ _____
(Texas residents add 5% sales tax.)
☐ CHARGE MY: ☐ MasterCard ☐ Visa

Card No. _____ Exp. Date _____
Signature _____
Name _____
(please print full name)
Address _____ Apt. _____
City _____ State _____ Zip _____

214-644-2611

Software t' Boot
2116 E. Arapaho #600
Richardson, Tx 75081

VISA MasterCard

CIRCLE 254 ON READER SERVICE CARD

Look what I've got for you

a $39.95 Light Pen

for
- **COMMODORE VIC 20/64**
- **ATARI 400/800**
- **APPLE II**

Now you can make your computer come alive and free yourself of many keyboard strokes. Touch my light pen to your TV screen and draw or paint multicolored pictures or pick from a menu. It's that easy!

My LP-10 low cost, no switch light pen is active at all times.

My LP-15 high resolution, high speed light pen has a push switch to activate the signal. It is supersensitive and can control the curser 6 inches from the screen.

LP-10 . . . $39.95 LP-15 . . . $119.95

Interface card required for Apple II with LP-10 & LP-15 . . . $99.95

FREE *All Light Pens are sold complete with Demo Cassettes & Instructions.*

A wide selection of software is available.

Order Toll Free 800-526-2514
In New Jersey (201) 227-7720

Dealers and Distributor inquiries invited. Commodore Atari, Apple are Reg. Tm's

TECH-SKETCH INC.

Tech-Sketch Inc. is a subsidiary of Ampower Instrument Company, Inc.
26 Just Road • Fairfield, N.J. 07006

Please send me ☐ _____ LP-10 Light Pens @ $39.95
☐ _____ LP-15 Light Pens @ $119.95
☐ _____ Apple II Interface Cards @ $99.95

For my ☐ Commodore 20/64 ☐ Atari 400/800 ☐ Apple II

Enclosed my check for $ _____ (allow 3 weeks)
Bill my ☐ VISA ☐ Master Card

Number _____ Expires / /
Signature _____
Name _____
Address _____
City _____ State _____ Zip _____

30 day money back guarantee CC-7

CIRCLE 269 ON READER SERVICE CARD

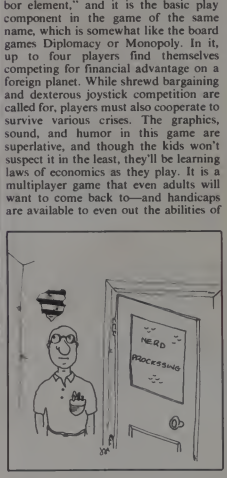
Outpost: Atari, continued...

Charlie Chaplin" can arise. This means support in terms of development, marketing, and public relations. Hawkins believes that software artists well deserve celebrity, and will soon be as famous as artists in any other medium. Sounds good to me, and certainly on the right track.

Terrific talk, granted. But what about the products? Well here are some of the top-quality Atari titles to look for from Electronic Arts:

Archon, a fantasy "board" game combines strategic elements of chess with adventure fantasy. Quality microcomputer games offering competition between two human players are few and far between. *Archon* involves competition for power points on a board where the color of the squares can change, depending on strategic factors. Conflict zooms to a close-up on the confrontation square, where players pit various joystick-controlled creatures against each other. This is the kind of game I have been waiting to see for the Atari, and even if you haven't, you are bound to fall for it. Imagine a chess game in which you can cast spells . . .

M.U.L.E. stands for "multiple-use labor element," and it is the basic play component in the game of the same name, which is somewhat like the board games Diplomacy or Monopoly. In it, up to four players find themselves competing for financial advantage on a foreign planet. While shrewd bargaining and dexterous joystick competition are called for, players must also cooperate to survive various crises. The graphics, sound, and humor in this game are superlative, and though the kids won't suspect it in the least, they'll be learning laws of economics as they play. It is a multiplayer game that even adults will want to come back to—and handicaps are available to even out the abilities of adults and children. After a few dozen games even adults will turn to the manual accompanying *M.U.L.E.* to get some background on the laws of supply and demand. And the animated characters in the game are thoroughly adorable.



Worms? is one of those games like Conway's game of Life, that in execution of colorful animated graphics, gives the player an intuitive feeling for hitherto unseen mathematical relationships. One round of the game, which embodies some of the best graphics and sound to be seen on Atari, will have you thinking of the mother ship in *Close Encounters.*

Players "train" streaks of light to move in patterns from one dot to another in a black background matrix. Every player has his own color, and every direction has its own musical tone. To score points, complete all the possible junctions on a node. Soon the screen is alight with tuneful worms marching by "decision points" to the beat of their respective drummers. The game holds a lasting and nearly hypnotic fascination. Winning worm patterns can be made to compete against new computer- or human-generated opponents. There is a deep satisfaction to be gleaned from *Worms?*, in seeing and hearing the harmonies of pattern. Dewey would have loved playing this one.

Pinball Construction Set is a tour de force by Bill Budge, who is quite arguably the Charlie Chaplin of microcomputing. Originally designed and marketed for the Apple computer, the Atari version includes several improvements not present in the original game. In the latest issue of *Video and Arcade Games*, I reviewed the Apple version, stating that the only thing conceivably more enjoyable than playing Budge's micro-pinball is creating your own micro-pinball machines. *Pinball Construction Set* makes doing so a joy, and to that end uses an icon-based menu system quite similar to the Apple Lisa's "mouse". Want to add a bumper or flipper? Use the joystick-controlled pointer to "pick it up" from the icon chart, and place it anywhere you please in your own pinball machine. Then save your creation to disk as a fully functional, stand-alone microcomputer pinball game. If you don't quite buy the versatility of mouse-based systems, this program is required booting for you. Bill Budge is an example of the caliber of software artist Electronic Arts seeks to solicit.

Watch your local software store, or contact Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. And other software houses, make note, take heed, watch out.

Title Bout

Ever since the first entries came in, I have been collecting features to include in a deluxe version of the Title Card Generator contest program begun early this year. My original plan was to combine as many features as possible into one big program, to be printed in its entirety this month. Then Kelly Phillips came along.

What Kelly did was to submit a program that took my original ideas and moved them in an entirely new direction, adding features that I hadn't believed possible, and saving screens in an entirely new manner. So instead of printing a mishmash of routines from many different programs, it is my pleasure to present in its entirety his superlative version of a self-modifying title generator program.

Mr. Phillips trades off some of the features I considered neat about my approach, such as sound, and the ability to watch each letter plot itself on the screen one at a time. But the rewards he reaps are fantastic. The most impressive is the scaling feature—the point size of the font is made user-programmable. This idea had, in fact, crossed my mind during a stray moment in first developing the super character set, but I had jettisoned it immediately, thinking the allied problems would be insurmountable. For me, I'm sure they would have been.

If you typed in the original program, you owe it to yourself to make Kelly Phillips's additions. If you never typed the original, an entire listing is presented here, and I guarantee that once you see the kinds of things you can do with it, you will want to use it to generate titles for all your own programs.

And so I shall hand the reins over so Kelly can take you through the program. If you wish to communicate directly with him, he can be reached at 346 West 400 North, Logan, UT 84321.

* * *

This version of John Anderson's "Self-Modifying Title Card Generator" is an expanded version of the one that appeared in the February 1983 issue of *Creative Computing.* It provides all of the features of the original program (except sound), and adds many more advanced and useful functions such as scaling and freehand joystick control. With the additional features of this version of the title card generator, you can easily make your own screen creations much more colorful and professional looking. In reading the following documentation, I suggest that you refer to Mr. Anderson's original article as well

At last, the first home video joystick that puts the firing button where it should have been in the first place.

The new Triga-Command is like no other home video joystick controller you've ever used.

The firing button is directly under your trigger finger, the finger with the fastest reflex action. Which means your thumb doesn't ache any more after playing long games, your firing is more accurate, and your scores are higher.

No other joystick gives you such a terrific grip either. That's because the handle is big and comfortable, not thin and spindly like the others. It's shaped to fit your hand, and has a diamond-cut textured surface to give you the "feel" of genuine Arcade-style joysticks.

Another unique feature are our removable suction cups under the base which clamp Triga-Command firmly to any smooth playing surface for total single handed operation.

And our joystick is tough. It's made from high impact plastic, so it won't crack under pressure.

Do you use an Atari 400 or 800 computer, the Atari 2600 system, Vic-Commodore computers, or Sears Tele-Games? No problem. Triga-Command fits them all.

All thumbs with ordinary home video joysticks? Get a grip with Triga-Command. It's the first joystick to put the firing button under your trigger finger.—And isn't that where it should have been in the first place?

TRIGA COMMAND

1983 Electra Concepts Corp. 125 Wilbur Place, Bohemia, New York 11716. Atari, Vic-Commodore and Sears Tele-Games are registered Trademarks.

CIRCLE 167 ON READER SERVICE CARD

as the headings that follow *Cursor Movement Controls* and *Control Commands* that follow.

Typing the Program

The title card generator is numbered in increments of ten for ease of entry. It was also designed to be added to the original version with minimal modification. If you already have the original program, load it and make the following changes: delete lines 160-230 and line 859. Change the DATA in line 1000 from END to R. Type in the NEW sections of the program (lines 0-150 and lines 2000-3040 of Listing 1). Do not change the line numbering in any way, and be especially careful when typing lines 3120-3340. This is crucial to the proper operation of the program. At this point, you should *save the program* on cassette or disk *before running it.* When the program is run, it will delete major portions of itself, so you will need to have that complete copy saved prior to any program run.

If you do not have a copy of the original program, a full listing of my modifications appears here as Listing 1.

The title card generator is a program that is used to enable the computer to actually "write" another shorter program which will be used for your title card display from that time on. It consists of two major phases: 1) the editing phase, in which you create the screen that you wish to have the computer incorporate into the program it will write, and 2) the program creation phase, in which the computer saves your screen along with some Basic commands for your title program to use later on.

These Basic commands will also be chosen by you—based on your answers to a few simple questions during this phase. At that time, the company will also delete the actual title card creation portion from memory, since it will not be needed in the display program that the computer writes.

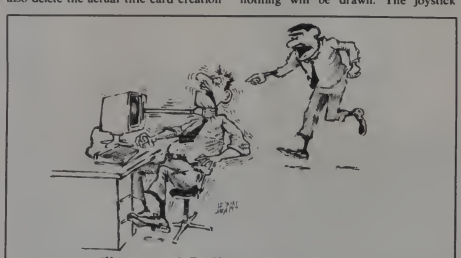
The "cursor" in the title card generator is a multi-colored flashing square which appears in the center of the screen. Unlike the original version of the title card generator, the cursor is by no means bound to three rows of seven columns each. You have complete control to put the letters anywhere on the screen, and then mix them up with borders, designs, or anything else you can dream up. In addition, the letters may be of almost any size you choose. For more information on the commands which change the cursor position, see the heading entitled *Cursor Movement Controls* up ahead.

Getting Letters on the Screen

To draw a letter on the screen, simply press the letter you wish to draw. Letters are always drawn with their top left edge at the current cursor position. The cursor will then automatically be moved to the next letter position, just like a super large text typing mode. If there is not sufficient room to draw a letter at the position at which you attempt to do so, you will hear a buzzer and the command will be ignored. You will also hear the buzzer if you issue a command that the title generator does not understand. Faulty commands will also be ignored.

Using the Joystick

In addition to automatically drawing letters on the screen and using the 12 control commands, you may use the joystick to draw any free-hand design you wish. To draw with the joystick, hold the red button down while moving the stick in the desired direction. If the joystick is moved without the red button depressed, the cursor will move, but nothing will be drawn. The joystick should be plugged into port number one, and may be used at any time during your screen editing (except when a control command is in progress).



"Your access code Tom! Input your access code!!"

Saving Your Screen

Pressing CONTROL-Q allows you to save your screen with a smaller title card display program that the computer will actually write to your specifications, based on your answers to a few questions. This process requires quite a bit of time, because the computer goes through many steps to write the display program.

The computer can create this program on cassette or disk, but keep in mind that you must have sufficient room to do so. For a disk, you will need at least 250 free sectors, and for cassette at least a 60-minute tape. This is your responsibility as the program does *not* check for sufficient room before starting the saving process. Following is a short explanation of the questions the computer asks before the saving gets under way, and what it expects for an answer.

WOULD YOU LIKE TO SAVE THIS SCREEN? This is to verify that you meant to press CTRL-Q. If you answer Y, the following additional questions will be asked. If you answer N, you will be returned to your screen just where you left off.

SAVE TO (1) CASSETTE OR (2) DISKETTE? This allows you to save the display program to either cassette or disk. Press 1 for cassette or 2 for disk.

TEXT WINDOW SECONDARY MESSAGE? You will be asked this question only if you have enabled the text window display with CTRL-T. If you have, you should now type in up to four lines of text that you want to appear in the text window of your display program. Each line may consist of no more than 38 characters.

SPECIAL EFFECTS? Here you may choose which type of special effect you wish to have in your display program. Effect #1 is the rainbow effect, as it was used in Mr. Anderson's original program. This effect causes all portions of your picture which are colored with pen #1 to cycle through the 128 Atari color variations.

Effect #2 is the flash effect which will cause all portions of your picture colored with pen #1 to flash on and off in your display program. Effect #3 is the random effect. This effect will cause *all* the colors on your picture to change randomly in your display program. To select a special effect, type the number corresponding to it. If you do not wish to have any special effects, simply press RETURN.

WHAT TYPE OF PLOTTING WOULD YOU LIKE? Pressing a 1 here will create

BMC. The logical choice.
Best for your system. Better for your budget.

If you choose your display monitor with the same care you've given to the other components of your business or personal computer system, you'll choose BMC

The BM-12AU features a P31 picture tube that gives you a large, bright 12inch diagonal green display with a bold 80×24 character format that is remarkably easy on your eyes. And each unit is given a careful underscan adjustment at the factory so even the corners are clear and sharp. The BM-12AU connects quickly and simply to most popular computers with no interface or modifications needed. But best of all the BM-12AU is designed to fit your budget. Compare specifications, quality and price. BMC is the logical choice.

BM-12AU

- Input Signal: Composite Video [illegible] Negative SYNC
- [illegible] P-P [illegible] ohm
- [illegible]
- Phosphor: P31 Green
- Semiconductor: IC 1 Transistor 14 [illegible] 4
- Video Amp Bandwidth [illegible]
- Display Format: 19[illegible] Character [illegible]
- Power Input [illegible]
- Power [illegible]
- Dimensions [illegible] LW [illegible]
- Weight: 6 kgs [illegible]

BMC USA INC

LOS ANGELES
16830 South Avalon Blvd Carson CA 90 46
*Telex 664 258 BMC USA TRNC Phone [illegible] 6005

NEW YORK
450 Barell Avenue Carlstadt N [illegible]
Telex 133 [illegible] BMC NY CARL Phone [illegible]

CIRCLE 125 ON READER SERVICE CARD

your program in such a way that the screen will be invisible until it is drawn. Then the whole screen design will be turned on at once. Pressing a 2 allows the picture to be seen the whole time it is being drawn.

CHAIN TO ANOTHER PROGRAM? If you are saving to cassette, you will *not* be asked this question. For disk users, this will allow you to have your title card display the title of a program, and then subsequently run that program automatically.

ENTER A FILE NAME FOR THIS PROGRAM? If you are saving to cassette, you will not be asked this question either. This is because the cassette does not recognize file names when saving programs. For disk users, this is where you will type the name you wish to use for your display program. Note that this is different from the previous question in that it names the display program itself, whereas the previous question provided a name that the display program could chain to if desired.

At this point, you insert the desired cassette or disk, and the computer creation process begins. Several functions are performed here. First, the screen data are saved in the form of Basic DATA statements. On disk, the file name is SCREEN.DAT. When complete, the screen data are re-entered into memory and many of the original program lines are deleted. Then portions of the display program are generated, based on your answers to the previous questions. When all these functions are complete, the program saves your new display program, returns to Graphics 0, and ends. You may now run your title display program and see how it looks. (During the saving process, cassette users should pay attention to the screen to see when to rewind the tape and when to press RETURN to save and re-enter portions of the program as needed.)

Programming Notes

From time to time, my Atari has had the problem of "keyboard lockup" during the computer creation phase. This is apparently due to the fact that many program lines are deleted, added, and edited. For some reason, the Atari may lock up, with no recourse except to turn off the computer. The title card generator was programmed with this problem in mind. Delays were strategically placed wherever a screen full of line numbers is to be deleted. This is to give the Atari time to re-arrange its memory fully before more deletions come.

But, should your computer lock up, fear not, your screen is still intact and safely saved in a file on disk or cassette. To retrieve it, turn off the computer for a while, then turn it back on and LOAD the title generator. Next, type: ENTER "D:SCREEN.DAT" (or ENTER "C:" for cassette). This will re-enter your screen data. Then type: 2025 GOSUB 100. You may now run the program, and you will be in the editor, ready to attempt the SAVE process again.

You may begin at that point and nothing will be lost. This may be repeated as many times as the problem persists, and no harm will be done to your masterpiece. The program does not delete the screen data from cassette at all and only deletes it from disk when all other functions are complete and successful.

Another problem was the speed at which Atari Basic could analyze and save the exact data currently on the screen. The screen saving routine was placed at the beginning of the program (lines 2-8), which approximately doubles the speed of this lengthy process.

Program Remarks

To keep the program as short as possible, the REMARK statements were left out in the final version of the title card generator. Figure 1 is a line by line description which may be used to follow the flow and design of the program.

Save screen data	2-8
Program skeleton	10-150
Letter data	650-1000
Rainbow routine	1010-1050
Initialization	2000-2020
Poll keys and stick	2030-2120
Cursor movement	2130-2240
Draw a border	2250
Change pen colors	2260-2350
Position cursor	2360-2390
Erase a letter	2400
Fill toggle	2410
Change pens	2420-2450
Set the scaling	2470-2500
Set text window	2510-2530
View coordinates	2540-2560
Quit, no save	2570
Draw letters	2590-2690
Buzzer	2700
Save verify	2710-2740
Cassette, disk	2750-2770
Text message	2790-2820
Special effect	2830-2890
Plot type	2900-2920
Create chain	2940-3000
Key in name	3010-3040
Delete data	3120-3160
Create skeleton	3170-3260
Delete utility	3270-3280
Save program	3290-3310
Delete routine	3320-3340

Figure 1.

Cursor Movement Controls

Figure 2 lists 11 special cursor movement keys that are available in the title generator. They allow you to move very small distances for greater accuracy or very large distances for greater speed.

Control Commands

There are 12 control commands available in the title generator. These commands allow you to manipulate the screen in several ways. The commands are invoked by holding down the CONTROL key while pressing the desired command letter. The only exception is the screen clear command, which is invoked with the SHIFT key instead. Following is a description of the intended use for each of the control commands and program "default" conditions where applicable.

SHIFT-CLEAR: Clears the screen and resets all parameters to their default settings.

CONTROL-B: Draws a border from the

Key Pressed	Cursor Moves
Spacebar	Right one letter position
Delete key	Left one letter position
Return key	Left of screen, down one letter
Right arrow	Right one pixel
Left arrow	Left one pixel
Up arrow	Up one pixel
Down arrow	Down one pixel
Shift right arrow	Right five pixels
Shift left arrow	Left five pixels
Shift up arrow	Up five pixels
Shift down arrow	Down five pixels

Note: To use the cursor movements with the arrow keys, *do not* press the CONTROL key at the same time. The arrows should be pressed alone (except those specifying the SHIFT key). Thus, the actual keys pressed are -, =, +, and * for the unshifted arrows, and _, :, \, and ^ for the shifted arrows.

Figure 2.

⇦ indicates price decrease
• indicates new item

COMPUTERS

Apple II-E STARTER SYSTEM	$1715⇦
Chameleon, Columbia, Compac	Our staff knows!!
Franklin ACE 1000 with color	$965•
Franklin ACE 1200 - 1 drive, 80 column, Z-80, software	$1735
IBM PC	Complete systems start at $2650
Kaypro II w/Software	$1595⇦
Kaypro II + - 400K drives	$1675
NEC APC HO2 – green/2 drives	$3050⇦
NEC APC HO3 – color/2 drives	$3750⇦
Osborne Double Density	$1735⇦
Slimline S-100 Z-80, CP/M, 64K, 2 MByte drives	Under $2000
Syscom II - Apple II Plus Emulator – not a ⌀@!! kit	$595⇦

PRINTERS

Epson MX-80FT Type III – STILL AVAILABLE	$505
Epson MX-100 – w/Graphtrax	$685
Epson FX-80 – 160cps, friction, sprocket	$585
Brother HR-1A 17cps daisywheel, enhanced	$715⇦
F-10 Starwriter – 40cps Diablo codes	$1195⇦
Graphic Printer – 50cps, 5 × 7 matrix, sprocket	$199⇦
Mannesmann-Tally 160L – uses Daisy software	$775⇦
NEC 3550	$1985
NEC 7730	$2145
Okidata – uses standard spool type ribbons	
u82A – serial/parallel/friction/sprocket	$405⇦
u84AP – 200cps, 132 column, parallel	$955
u92 – 160cps, 80 column, parallel	495⇦
u93 – 180cps, wide	$895⇦
Prowriter (C. Itoh 8510A) - 120cps, proportional	$372⇦
Prowriter II (C. Itoh 1550A) - wide carriage	$665⇦
Gemini 10 – 80 column, 100cps	$325⇦
Gemini 15 – 15" wide	$435⇦
Toshiba #1350 - top of the line dot matrix	$1555⇦

VIDEO MONITORS

Amdek 300G	$142⇦
Amdek 300A	$165
Amdek 310G - for IBM monochrome adaptor	$175
Amdek 310A - amber for IBM	$185
Amdek Color I - 13" color composite	$294⇦
BMC 12" Green - not fancy, but it works	$94
BMC 13" Color - composite	$294⇦
BMC 13" RGB with card for Apple II +	$395
Dynax 12" Green (GM-120) - BEST BUY	$129
Dynax 12" Amber (AM-121) - 970 line resolution!	$143
IBM MONOCHROME green	$345
Princeton Graphics HX-12 RGB for PC	$485⇦
Taxan VISION-III - hi-res for IBM & II-E	$533⇦

FOR APPLE & FRANKLIN

Advanced Logic Systems - high performance/low price	
CP/M Card - 2-64K, CP/M 3.0	$290⇦
Z-Card II - list $180	$135
Smartterm II - list $179	$145
dBase II (requires CP/M)	$419⇦
Devong 10 MByte hard disk - BEST BUY	$1865⇦
Devong 10MByte tape backup	$1465•
Dumpling GX - like Grappler +	$105⇦
Dumpling 16K - graphics and buffer, expandable	$180⇦
Grappler +	$125⇦
Hayes Microcomputer II	$275
Hayes Microcomdem II with Terminal Program	$295
Magic Window/WordCalc software pkg	$235
Microsoft MULTIPLAN	$192•
Rana Elite One - YES, it works	$265⇦
Rana Elite One Plus - with controller	$350⇦
Rana Elite Two - double storage	$435⇦
Rana Elite Three - quad storage	$595⇦
Serial Interface	$105
SSM Modemcard w/SOURCE	$285
SuperCalc	$185
VISTA QUARTET (2 drives, thin, 640K, controller)	$815
Vista V-1200, 64KB removable cartridge system	$1225
Wordstar	$185

MODEMS

Hayes Smartmodem 300	$215
Hayes Smartmodem 1200 - outsells the rest	$515⇦
Novation J-CAT	$110•
Novation 103/212 SMART (direct connect)	$385•
Novation 103 SMART (direct connect)	179•
RIXON R212A - 300/1200 SMART	$385•

64K RAM SETS

9 CHIPS, FOR IBM

$50

PROWRITER

⌀8510A PRINTER

$372

PC

64K / 320K DRIVE

$1975

XT

$4750

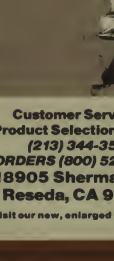
Some lead. Some don't. Some lurk in the shadows of "CALL" and "we'll beat any price." Being leaders, we've expanded our custom order handling, trained more technicians, and doubled and tripled inventory levels on popular items. Comparisons are welcome.

TELEVIDEO TERMINALS

TV-910-Plus	$565
TV-910	$565
TV-925	$725
TV-950	$915
TV-970	$1095

Verify prices by phone. Add 2½% for Visa or Mastercard. Add 8¼% on California orders. Orders prepaid with check, cashiers check, money order or wire transfer are shipped prepaid within the Continental U.S. COD's require 10% non-refundable deposit (re-stocking fee).

IRONSIDES COMPUTER CORP



Customer Service—
Product Selection Advice
(213) 344-3563
ORDERS (800) 528-9537
18905 Sherman Way
Reseda, CA 91355

Visit our new, enlarged showroom.

NEC APC

Advanced Personal Computer

We have the lowest price because we sell the most Or do we sell the most because we have the lowest price?

FOR IBM PC

AST I/O + II Serial, Game, Clock	$149⇦
AST ComboPlus with 64K, serial, parallel, clock	$257⇦
AST MegaPlus 64K, serial, parallel, clock	$292⇦
AST MegaPak 256K for MegaPlus	$245⇦
Devong 10MByte Hard Disk	$1735⇦
Devong 1MBYTE TAPE (PC or XT)	$1650⇦
dBase II - for PC-DOS	$429
Lotus 1-2-3	$335
Keytronics keyboard	$195⇦
RAM SETS (64K with parity) - EXPANDS ALL IBM	$50⇦
RIXON PC212A MODEM	$375⇦
Tandon TM100-2	$245⇦
Tandon TM100-4 - with DOS-FIX	$335
TEAC 320K Half-Height	$265

FOR ATARI

Printer Cable	$35
Rana Elite 1000 - single/double density floppy	$385•
Serial Cable	$35

S-100 THINLINE COMPUTER SYSTEM

- Sierra Data Master (Z-80 4MHz, 64K, 2 Serial, Parallel, CP/M)
- 2 Thinline 8" drives; 2MByte + 6 slot mainframe 12" × 19" × 10" high
- Add any standard video terminal and printer

COMPUTER	$1958
Mainframe only	$450

SIERRA DATA SCIENCES

Z-80 4MHz Master (64K/2 serial/floppy controller/hard disk port -	
SBC-100	$655
Z-80 4MHz Slave (2 serial/2 parallel/64K/EPROM programmer) -	
SBC-100S	$565
CP/M for Master with BIOS - CPM/BIOS	$150
Turbo-Dos for Master with Slaves - TURBO-DOS	$645

FOR COMMODORE 64

DATA 2D VideoPak80 - 80 column display	$165
Z-80 VideoPak - CP/M and 80 column	$275
Serial to Parallel Printer Cable	$75

CORONA DATA SYSTEMS

Systems include half-height 320K drives, 128K RAM expandable to 512K on-board, 640 × 325 graphics, green monitor with 16 × 13 matrix characters, serial port, parallel port, DOS, Basic, and spreadsheet software

PC-1 1 drive - list $2595	$2095
PC-2 2 drives - list $2995	$2375
PC-HD 10MByte hard disk - list $4495	$3495
PPC-1 Portable/1 drive - list $2395	$1950
PPC-2 Portable/2 drives - list $2795	$2250

WABASH DISKETTES

Single Side Single Density	5 boxes at $17 50/box
Single Side Double Density	5 boxes at $21/box
Double Side Double Density	5 boxes at $32/box

Chameleon "The Compatible Computer"

LOCAL SALES ONLY
$1995

FOR OSBORNE

Corvus 6MB hard disk	$1975
CSMOS 1 - double density mod	$175
OSMOS 2 - 370K drives - compatible with software	$855
OSMOS 3 - 750K drives	$999
OSMOS 4 - Disk Format/Convert - read/write 20 formats	$215
OSMOS 6 - 80 Column - select 52/80 display	$235
OsMOS 6 - Drive Diagnostics	$29

Outpost: Atari, continued...

current cursor position and centers it on the screen based on the cursor coordinates.

CONTROL-C: Sets the colors for each of the four "pens" available in the title generator. Equivalent to the Atari Basic SETCOLOR statement. Default setting is the same as the standard Atari default colors.

CONTROL-D: Direct cursor positioning. Places the cursor at the exact X and Y coordinates specified by the user. Equivalent to the Atari Basic POSITION statement.

CONTROL-E: Erases a letter-sized block. The cursor is placed at the top left of the letter to be erased, then CONTROL-E is pressed, erasing the letter (and everything else in its path, so be careful).

CONTROL-F: Fill toggle. Toggles the letter fill feature from on to off and vice versa. When the fill command is enabled, letters are filled with the color of pen #1. Default = fill on.

CONTROL-P: Selects the pen to draw with. There are three colored pens (1-3) and one "erase" or background colored pen (pen 0). Equivalent to the Atari Basic COLOR statement. Default pen = 2.

CONTROL-Q: Quits and saves the screen. Ends the editing phase and prepares for creating the title display program.

Listing 1.

```
0 GOTO 2000
5 A$=CHR$(125)+                    [illegible]                    :PLEASE WAI
ND BY:"!!P=65:FOR I=0 TO RMAX
4 POKE 77,0:POKE 656,                 :POKE 657,40:  FROM "!!I:FOR J=0 TO 19:LOCATE J,I,Z:Z=Z+6
41:F 7=64 THEN Z=68
6 A$(J+1,J+1)=CHR$(Z):NEXT J:IF A$=B$ THEN NEXT I:CLOSE #2:  CHR$(1,3):I=I+2:RET
URN
8 " #2!K1" DATA "!!I","!A$(1,80)!" #2!K!1" DATA "!A$(81,160)!P=P+2:NEXT I:CLOSE
 #2:? CHR$(125):I=P+2:RETURN
10 DIM A$(80),B$(80)
20 GOSUB 100
100 GRAPHICS 2?
120 RESTORE 650:TRAP 140
130 READ ROW,A$:POSITION 0,ROW: ? #6;A$:B$=A$:GOTO 130
140 REM
150 RETURN
600 REM "A"
652 DATA R.0,0,S.0,1
654 DATA P.2,7,2,13,4,16,6,18,8,19,25,19,25,13,F,19,13,F,6,9,F,6,11,F,7,12,F,8,1
,F,17,17,17,7
656 DATA R.7,7,8,6,9,F,19,17,19,7,25,7,25,1,F,8,1,F,6,2,F,4,4,F,2,7,2,13,F,15,7,
8,7,7,8,6,9
660 REM "B"
662 DATA R.0,22,S,1,7
664 DATA P.2,1,2,13,4,16,6,18,8,19,10,19,12,17,15,15,17,17,19,21,19,27,17,25,
15,25,1
666 DATA P.6,7,F,6,11,F,8,13,F,10,11,10,7,6,7,F,15,7,F,15,11,F,18,13,F,20,11,20,
7,16,7,F,25,1,F,2,1
670 REM "C"
672 DATA R.0,44,S,2,11
674 DATA P.2,7,2,17,4,16,6,18,8,19,8,13,F,6,11,F,6,9,8,7,19,7,21,9,F,19,19,21,19
,23,16,25,13
676 DATA P.21,9,F,21,11,F,19,13,19,19,F,25,12,25,7,F,23,4,F,21,2,F,19,1,F,8,1,F,
6,2,F,4,4,F,2,7
680 REM "D"
682 DATA R.0,66,S,7,13
684 DATA P.2,1,2,17,4,16,6,18,8,19,17,19,21,19,23,17,25,15,25,1,F,6,7,F,6,11,F,8
,15,F,18,15,F,20,11,20,7,6,7
686 DATA P.25,1,F,2,1
690 REM "E"
692 DATA R.0,88,S,0,15
694 DATA P.2,1,2,19,8,19,8,7,11,7,11,15,16,15,16,7,19,7,19,19,25,19,25,1,F,2,1
```


FRANKLIN

ACE PRO System
ACE 1000 w/Color, ACE 10 Drive, 80-Column Card, ACE Writer II, ACE Calc (80-Column Spreadsheet) $1395

ACE 1200 (128K, Dual Processor, 1 Drive, 80-Column, Parallel/Serial Ports) $1749

IBM ..... $CALL

COMPAQ ..... $CALL

COLUMBIA DATA PRODUCTS, INC.
128K RAM, Dual DSDD Drives (640K) Fully IBM PC Compatible. ..... $CALL

TOSHIBA
T100 (Z80A, CP/M, CBASIC II, TBASIC) ..... $CALL
T200 (8085A, CBASIC II, 560K) ..... $CALL
T250 (8085A, CBASIC II, 2 MB) ..... $CALL

Money Order, Personal Check & COD Honored. Please Add 1% for VISA or MC Order.

DARK HORSE?

COMPUTERS
Eagle II $1645
Morrow Designs (MD2) $1159
(MD3) ..... $CALL
Corona PC (New!) $2050
BASIS 108 ..... $2395
TeleVideo 803 ..... $2199
CompuPro ..... $CALL

PRINTERS
EPSON
MX-80 III F/T $499
MX-100 III F/T $675
FX-80 (New!) $535
IOS
Microprism 480 ..... $525
Prism 80 Color ..... $CALL
Prism 132 Color ..... $CALL
STAR MICRONICS
Gemini-10 ..... $329
Gemini-15 ..... $469
OKIDATA
Microline 92 ..... $509
C-ITOH
Prowriter 8510A $385
MANNESMANN TALLY
MT 160L (160 CPS) $699
DAISYWRITER
2000 EXP (48K Buffer) $1099
380Z (48K Buffer) ..... $CALL
QUME Sprint 11-40 ..... $1345

SILVER-REED EXP 550
(Daisy Wheel) $755
TRANSTAR
315 (Color Printer) ..... $CALL
130 (Letter Quality) ..... $CALL
BAUSCH & LOMB ..... **$CALL**
DATAROYAL
FACIT 4510 ..... $CALL

MONITORS
TAXAN
RGB Vision I $285
(w/Cable & Interface) $350
RGB Vision III $539

NEW!!!
RGB Vision I & Interface for Apple IIe (80 col.) — $449

KG 12N (12" Green) $125
KG 12N-UY (12" Amber) $135
USI
Pi-1 (9" Green) $119
Pi-2 (12" Green) $159
Pi-3 (12" Amber) $169
Pi-4 (9" Amber) $159
GENTECH
GT-09G (9" Green) $109
GT-09A (9" Amber) $115
GT-12G (12" Green) $115
GT-12A (12" Amber) $119

AMDEK
Video 300 (12" Green) $149
Color-1 (Composite) $299
Color-III (RGB) $380

DISK DRIVES
Rana Elite I $275
Fourth Dimension $159

FIRMWARE
Grappler Plus $119
Graphitti $99

Z-Card (CP/M)
$159 Fully Assembled & Tested for Apple & Franklin

80 Column Card
$159 Fully Assembled & Tested for Apple & Franklin

MODEMS
Hayes
Micromodem II $275
Smartmodem (300 baud) $215
Smartmodem (1200 baud) $519
SSM
AMC-300 (300 baud $249
AS10 (Serial Interface Card & Cable) $129
NOVATION ..... **$CALL**

GENTECH
150 Broadway (Suite 2212), NY, NY 10017
(800) 843-4302
Inquiries (401) 273-2429
274-8330
Mon.-Sat. 9 AM - 9 PM
TWX: 710-381-6483 GENTECH

```
700 REM "F"-----------------------
702 DATA R,0,110,S,1,18
704 DATA P,2,1,2,19,8,19,8,7,11,7,11,15,16,15,16,7,25,7,25,1,F,2,1
710 REM "G"-----------------------
712 DATA R,0,132,S,2,23
714 DATA P,2,7,2,13,4,16,6,18,8,19,8,13,F,6,11,F,6,9,8,7,19,7,21,9,F,19,19,21,19
,23,16,25,13
716 DATA P,18,19,14,19,14,11,F,18,11,F,18,13,F,19,13,F,21,11,21,9
718 DATA P,25,13,25,7,F,23,4,F,21,2,F,19,1,F,8,1,F,6,2,F,4,4,F,2,7
720 REM "H"-----------------------
722 DATA R,25,0,S,3,28
724 DATA P,2,13,2,19,25,19,25,13,F,16,13,P,2,7,11,7,F,11,13,F,2,13,P,16,13,16,7,
25,7,25,1,F,2,1,2,7
730 REM "I"-----------------------
732 DATA R,25,28,S,0,31
734 DATA P,2,1,2,7,25,7,25,1,F,2,1
740 REM "J"-----------------------
742 DATA R,25,44,S,1,38
744 DATA P,2,13,2,19,20,19,21,18,23,16,25,13,25,7,F,2,13,F,18,13,F,20,12,F,21,9,
19,7,F
746 DATA 19,1,F,20,1,F,22,2,F,23,4,F,25,7
750 REM "K"-----------------------
752 DATA R,25,66,S,2,42
754 DATA P,2,1,2,7,11,7,P,19,19,13,14,8,19,2,19,2,13,F,8,17,F,11,7,P,19,19,25,19
,25,13,F,19,13,F,16,7,25,7
756 DATA 25,1,F,2,1
760 REM "L"-----------------------
762 DATA R,25,88,S,3,47
764 DATA P,2,1,2,7,19,7,19,19,25,19,25,1,F,2,1
770 REM "M"-----------------------
772 DATA R,25,110,S,0,57
774 DATA P,2,1,2,7,5,10,2,13,2,19,25,19,25,13,F,10,13,13,10,F,10,7,25,7,25,1,F,2
,1,2,7,6,10,F,4,11,F,3,12,F,2,13
780 REM "N"-----------------------
782 DATA R,25,132,S,1,63
784 DATA P,2,1,2,7,8,13,2,13,2,19,25,19,25,13,F,19,13,F,13,7,25,7,F,25,1,F,2,1,2
,7,9,13,F,2,13
790 REM "O"-----------------------
792 DATA R,50,0,S,2,76
794 DATA P,2,7,2,13,4,16,6,18,8,19,19,19,21,18,23,16,25,13,F,8,7,6,9,F,6,11,F,8,
13,F,19,13,F,21,11,21,9,19,7,8,7
796 DATA P,25,13,25,7,F,23,4,F,21,2,F,19,1,F,8,1,F,6,2,F,4,4,F,2,7
800 REM "P"-----------------------
802 DATA R,50,22,S,3,86
804 DATA P,2,1,2,13,4,16,6,18,8,19,13,19,15,18,17,16,19,13,P,6,9,F,6,11,F,7,12,F
,8,13,F,13,13,13,7
806 DATA 8,7,7,8,6,9,P,19,13,19,7,25,7,25,1,F,2,1
810 REM "Q"-----------------------
812 DATA R,50,44,S,0,96
814 DATA P,2,7,2,13,4,16,6,18,8,19,19,19,21,18,23,16,P,8,7,6,9,F,6,11,F,8,13,F,1
9,13,F,21,11,21,9,19,7,8,7
816 DATA P,23,16,27,19,29,16,F,25,13,F,25,7,F,23,4,F,21,2,F,19,1,F,8,1,F,6,2,F,4
,4,F,2,7
820 REM "R"-----------------------
822 DATA R,50,82,S,1,103
824 DATA P,2,1,2,13,4,16,6,18,8,19,10,19,12,17,13,15,15,17,17,19,25,19,25,13
826 DATA P,6,7,F,6,11,F,8,13,F,10,11,F,10,7,6,7
828 DATA P,25,13,F,22,13,F,19,12,F,18,9,18,7,25,7,25,1,F,2,1
830 REM "S"-----------------------
832 DATA R,50,88,S,2,115
834 DATA P,2,7,2,13,4,16,6,18,8,19,8,13,F,6,11,6,9,8,7,10,9,10,13,12,16,14,18,16
,19
836 DATA 19,19,21,18,23,16,25,13,25,7,P,17,7,19,9,F,19,11,F,17,13,F,15,11,F,15,9
838 DATA P,25,13,F,25,7,F,23,4,F,21,2,F,19,1,F,17,1,17,7,P,15,9,F,14,7,F,12,4,F,
10,2,F,8,1,F,6,2,F,4,4,F,2,7
840 REM "T"-----------------------
842 DATA R,50,110,S,3,128
844 DATA P,2,1,2,19,8,19,8,13,25,13,25,7,F,8,7,8,1,F,2,1
850 REM "U"-----------------------
852 DATA R,50,132,S,0,146
854 DATA P,2,13,2,19,19,19,21,18,23,16,25,13,25,7
856 DATA P,2,19,2,13,19,13,F,21,11,21,9,19,7,2,7,2,1,P,25,7,F,23,4,F,21,2,F,19,1
,F,2,1
858 DATA P,20,13,F,2,13
860 REM "V"-----------------------
862 DATA R,35,25,S,0,153
864 DATA P,2,1,2,7,14,7,16,9,16,11,14,13,2,13,2,19,17,19,25,11,F,25,9,F,17,1,F,2
,1
866 DATA P,16,9,F,16,11,F,14,13,F,2,13
870 REM "W"-----------------------
872 DATA R,35,47,S,1,172
874 DATA P,2,1,2,7,19,7,16,10,19,13,2,13,2,19,25,19,25,13,F,22,10,25,7,25,1,F,2,
1
876 DATA P,16,10,F,19,7,P,2,13,F,19,13
880 REM "X"-----------------------
882 DATA R,35,69,S,2,191
884 DATA P,2,1,2,7,9,10,2,13,2,19,8,19,13,15,19,19,25,19,25,13,F,18,10,25,7,25,1
,F,18,1,F,13,5,F,8,1,F,2,1
886 DATA P,10,10,F,2,13
890 REM "Y"-----------------------
892 DATA R,35,91,S,3,205
894 DATA P,2,1,2,7,9,10,2,13,2,19,8,19,13,15,16,13,25,13,25,7,F,16,7,F,13,5,F,8,
1,F,2,1
```

INTEC
RAM BOARDS
Lifetime Warranty

ATARI

32K	400/800	**59.95**
48K	400	**84.95**
64K	400	**99.95**

PRINTERS

EPSON FX80 .	**529.95**
NEC 8023 . . .	**439.95**
Prowriter 8510	**369.95**

INTERFACES

Microbits MPP 1100 *Atari* **79.95**
Grappler + *Apple* . . . **129.95**

Ordering Information:

We accept M/C, VISA, Money Orders, and Cashier Checks. Sorry No C.O.D.'s.

SHIPPING: Add 3% UPS ($3.00 Minimum). APO/FPO 5% ($5.00 Minimum). International Orders 10% ($10.00 Minimum). Credit Cards add 3%. California Residents add 6% Sales Tax

MICRO MERCHANT
290 N. 10th Street
P.O. Box 1516
Colton, CA 92324

ORDERS ONLY
800-652-8391
Customer Service
714-824-5555

MasterCard VISA

CIRCLE 195 ON READER SERVICE CARD

Outpost: Atari, continued...

CONTROL-S: Sets the scaling factor with which the letters will be drawn. The factor must be no less than 0.25 and no more than 3.5. Some scaling factors may cause the fill feature to be inaccurate. Default scale=1.

CONTROL-T: Text window toggle (on/off). Enables (Graphics 7) or disables (Graphics 7 and 16) the four-line text window at the bottom of the graphics screen. Default= text window off.

CONTROL-V: View the current X and Y coordinates. The column (x) and row (y) coordinates are shown in the text window. Pressing any key returns to normal editing.

CONTROL-Z: Ends the program with no save. Ends the program completely, returns to Graphics 0, and *does not* invoke the screen saving routine.

Also note that control commands C, D, P, Q, S, V, and Z set the colors to the Atari default conditions while in progress. This is to ensure that all of the text prompts used in these commands will be visible in the text window, regardless of the actual colors selected for the screen display. At the conclusion of these commands, the colors will be set back to those specified by the user.

* * *

So there you have it. One addition you might want to make to Kelly's program is a fix to clip screen edge parameters. As it now stands, cursor movement off the usable screen will result in an error, blowing up whatever you are working on. I made a quick fix when first alerted to the problem by adding a TRAP and some clippers as shown in Figure 3. Because line 2100 is already at the maximum program line length, you'll need to split it, creating line 2105 in the process. As I say, this was a quick fix, I'm sure you can do better.

I know I had promised more for this month, but space considerations preclude anything else this time around. Next month, I promise we will address new software and hardware topics, as well as compacting data into graphics characters. Until then, keep up your computing. .

```
2082 IF X<0 THEN X=1
2084 IF X>159 THEN X=158
2086 IF Y<0 THEN Y=1
2088 IF Y>95 THEN Y=94

2100 TRAP 2082:X=X+(S=5 OR S=6
     OR S=7)-(S=9 OR S=10 OR
     S=11):Y=Y+(S=5 OR S=9 OR
     S=13)-(S=6 OR S=10 OR
     S=14)
2105 LOCATE X,Y,Z
```

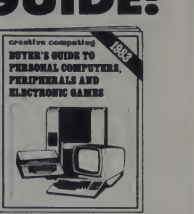
Figure 3. Lines to add for screen clipping. Addition of the TRAP to line 2100 necessitates splitting it into 2100 and 2105.

```
896 DATA F,10,10,F,2,13
900 REM "Z"
902 DATA R,35,113,5,0,255
904 DATA F,2,1,2,19,8,19,19,10,19,19,25,19,25,1,F,19,1,F,8,10,8,1,F,2,1
1000 DATA R
1010 RESTORE 1040
1020 FOR I=1 TO 32:READ C:C$(I)=CHR$(C):NEXT I
1030 RETURN
1040 DATA 104,104,104,72,162,57,160,0,173,0,210,101,20,141,22,208,141,10,212,136
,208,242,202,208,237,104
1050 DATA 56,233,1,208,228,96
2000 CLR :GRAPHICS 23:DIM A$(160),D$(3),B$(160),TW$(152),F1$(15),F2$(15),S(7)
2010 B$(1,1)="D":B$(160,160)="D":B$(2)=B$:TW$(1,1)=" ":TW$(152,152)=" ":TW$(2)=T
W$:X=79:Y=39
2020 C1=401:C2=202:C3=148:C4=01:C5=0:PEN=2:SS=16:RMAX=95:SCALE=1:FILL=1:POKE 65,0
CLOSE #1:OPEN #1,4,0,"K:"
2030 POKE 708,C1:POKE 709,C2:POKE 710,C3:POKE 712,C4:POKE 77,0:POKE 764,255
2040 X=INT(X+.5):Y=INT(Y+0.5):LOCATE X,Y,Z
2050 K=PEEK(764):S=STICK(0):IF S<15 OR K<>255 THEN 2080
2060 C=C+1:IF C<4 THEN C=1
2070 COLOR C:PLOT X,Y:FOR I=1 TO 5:NEXT I:GOTO 2050
2080 IF K<>255 THEN 2120
2090 COLOR PEN:PLOT X,Y:IF STRIG(0)=1 THEN COLOR 2:PLOT X,Y
2100 X=X+(S=5 OR S=6 OR S=7)-(S=9 OR S=10 OR S=11):Y=Y+(S=5 OR S=9 OR S=13)-(S=6
 OR S=10 OR S=14):LOCATE X,Y,Z
2110 GOTO 2050
2120 GET #1,KEY:IF KEY <64 AND KEY<91 THEN 2590
2130 COLOR 2:PLOT X,Y:IF KEY=125 THEN 2000
2140 IF KEY=32 THEN X=X+(SCALE*22)*(X/160-SCALE*22):GOTO 2030
2150 IF KEY=126 THEN X=X-(SCALE*22)*(X>SCALE*22):GOTO 2030
2160 IF KEY=155 THEN X=999:GOTO 2630
2170 IF KEY=42 THEN X=X+(X /159):GOTO 2030
2180 IF KEY=47 THEN X=X-(X >0):GOTO 2030
2190 IF KEY=61 THEN Y=Y+(Y RMAX):GOTO 2030
2200 IF KEY=45 THEN Y=Y-(Y >0):GOTO 2030
2210 IF KEY=94 THEN X=X+5*(X 155):GOTO 2030
2220 IF KEY=92 THEN X=X-5*(X 4):GOTO 2030
2230 IF KEY=124 THEN Y=Y+5*(Y<RMAX-4):GOTO 2030
2240 IF KEY=60 THEN Y=Y-5*(Y>4):GOTO 2030
2250 IF KEY=2 THEN COLOR PEN:PLOT X,Y:DRAWTO 159-X,Y:DRAWTO 159-X,RMAX-Y:DRAWTO
X,RMAX-Y:DRAWTO X,Y:GOTO 2080
2260 IF KEY= 3 THEN 2360
2270 GRAPHICS 39:POKE 752,1:? CHR$(125)#"WHICH PEN WOULD YOU LIKE TO CHANGE ?":?
 :POKE 657,17:? "(0-3)"
2280 GET #1,KEY:IF KEY 48 OR KEY 51 THEN GOSUB 2700:GOTO 2280
2290 POKE 752,0:#KEY-49:IF I 0 THEN I=4
2300 TRAP 2530:? CHR$(125)#" ALL VALUES MUST BE FROM 0 TO 15 ":? :
 ? " COLOR";I;"INPUT C
2310 IF C<0 OR C 15 THEN GOSUB 2700:GOTO 2300
2320 POKE 656,2:POKE 657,24:? "BRIGHTNESS";I;"INPUT C6
2330 IF C6 0 OR C6 15 THEN GOSUB 2700:GOTO 2320
2340 ? CHR$(125):GRAPHICS 39+SS:POKE 708,C1:POKE 709,C2:POKE 710,C3:POKE 712,C4:
SETCOLOR I,C,C6
2350 C1=PEEK(708):C2=PEEK(709):C3=PEEK(710):C4=PEEK(712):GOTO 2030
2360 IF KEY 4 THEN 2400
2370 TRAP 2370:GRAPHICS 39:? CHR$(125)#"ENTER A COLUMN NUMBER (0-159)":?:INPUT I:
IF I<0 OR I 159 THEN 2570
2380 ? :? "ENTER A ROW NUMBER (0-";RMAX;")":INPUT J:IF J<0 OR J>RMAX THEN 2370
2390 POKE 752,1:? CHR$(125):X=I:Y=J:GRAPHICS 39+SS:TRAP 40000:GOTO 2030
2400 IF KEY=5 THEN COLOR 0:FOR I=Y TO Y+27*SCALE+0.5:PLOT X,I:DRAWTO X+18*SCALE,
I:NEXT I:GOTO 2030
2410 IF KEY=6 THEN FILL=ABS(FILL-1):GOTO 2030
2420 IF KEY= 16 THEN 2460
2430 GRAPHICS 39:POKE 752,1:? CHR$(125)#" WHICH PEN WOULD YOU LIKE TO USE ?":?
POKE 657,17:? "(0-3)"
2440 GET #1,KEY:IF KEY 48 OR KEY>51 THEN GOSUB 2700:GOTO 2440
2450 PEN=#KEY-48:? CHR$(125):GRAPHICS 39+SS:GOTO 2030
2460 IF KEY=17 THEN 2710
2470 IF KEY 19 THEN 2510
2480 GRAPHICS 39:? CHR$(125)#"  SELECT A SCALING FACTOR ":? "  (S
CALE MUST BE FROM .25 TO 3.5)"
2490 ? :POKE 657,18:INPUT SCALE:IF SCALE<0.25 OR SCALE>3.5 THEN GOSUB 2700:GOTO
2480
2500 POKE 752,1:? CHR$(125):GRAPHICS 39+SS:GOTO 2030
2510 IF KEY<20 THEN 2540
2520 SS=ABS(SS-16):RMAX=95:IF SS=0 THEN RMAX=79
2530 GRAPHICS 39+SS:POKE 752,1:GOTO 2030
2540 IF KEY< 22 THEN 2570
2550 GRAPHICS 39:POKE 752,1:? CHR$(125)#"     CURRENT CURSOR COLUMN IS ";I;?
"     CURRENT CURSOR ROW IS ";Y
2560 GET #1,KEY:? CHR$(125):GRAPHICS 39+SS:GOTO 2030
2570 IF KEY=26 THEN GRAPHICS 39:? CHR$(125)#"          PRESS 'Y' TO QUIT":GET #1
,KEY:IF KEY=89 THEN GRAPHICS 0:END
2580 GRAPHICS 39+SS:GOSUB 2700:GOTO 2030
2590 COLOR 2:PLOT X,Y:COLOR PEN:RESTORE #EY+10+4:IF X>=159-SCALE*18 OR Y>RMAX-SC
ALE*27 THEN GOSUB 2700:GOTO 2030
2600 READ D#:IF ASC(D#)=64 THEN ROW=VAL(D$):READ COLUMN:GOSUB 2690:DRAWTO COLUMN
,ROW:GOTO 2600
2610 IF D#="P" THEN READ ROW,COLUMN:GOSUB 2690:PLOT COLUMN,ROW:GOTO 2600
2620 IF D#="R" THEN 2650
2630 X=X+22*SCALE:IF X 159 THEN X=0:Y=Y+27*SCALE:IF Y>RMAX THEN Y=0
2640 GRAPHICS 39+SS:GOTO 2030
2650 IF D#="O" THEN 2600
```

```
2660 IF D$="F" OR FILL=0 THEN 2600
2670 READ ROW,COLUMN:GOSUB 2690:POSITION COLUMN,ROW:POKE 765,1
2680 XIO 18,#6,0,0,"S:":PLOT COLUMN,ROW:GOTO 2600
2690 ROW=INT((ROW*SCALE)+0.5)+Y-2*SCALE:COLUMN=INT((COLUMN*SCALE)+0.5)+X-1*SCALE
:RETURN
2700 FOR I=1 TO 3:SOUND 0,25,12,10:FOR J=1 TO 6:NEXT J:SOUND 0,0,0,0:FOR J=1 TO
3:NEXT J:NEXT I:RETURN
2710 GRAPHICS 39:POKE 752,1
2720 ? CHR$(125);"WOULD YOU LIKE TO SAVE THIS SCREEN ?";:? :POKE 657,16:? "(Y OR
N)"
2730 GET #1,KEY:IF KEY=78 AND KEY<>89 THEN GOSUB 2700:GOTO 2730
2740 IF KEY=78 THEN ? CHR$(125):GRAPHICS 39+SS:GOTO 2030
2750 ? CHR$(125):POKE 657,16:? "SAVE TO:";:? "      (1) CASSETTE    (2) DISKETT
E"
2760 GET #1,KEY:IF KEY=49 OR KEY=50 THEN GOSUB 2700:GOTO 2760
2770 DISK=0:IF KEY=50 THEN DISK=1
2780 IF SS=16 THEN 2830
2790 POKE 752,0:? #1;FOR I=1 TO 115 STEP 38
2800 ? CHR$(125);"  ■ PRESS 1 TO PLOT BY MOUSE ■":? :? "LINE "1+I:
INPUT A$:J=INT((38-LEN(A$))/2)+1
2810 IF LEN(A$)<38 THEN ? CHR$(125);"                ■ PUSH  TO CONT■":GOSUB 27
00:FOR J=1 TO 200:NEXT J:GOTO 2800
2820 TW$(J,J+LEN(A$))=A$:I=I+1:NEXT I:POKE 752,1
2830 ? CHR$(125)"  ■ BLOCK  EFFECTS ■":" "(1) RAINBOW    (2) FLASH
    (3) RANDOM"
2840 ?:POKE 657,17:? "SELECT ONE OR PRESS ■ RETURN ■ FOR NONE.":
2850 GET #1,KEY:IF KEY=155 THEN 2900
2860 IF KEY=49 THEN RAINBOW=1:GOTO 2900
2870 IF KEY=50 THEN FLASH=1:GOTO 2900
2880 IF KEY=51 THEN RANDOM=1:GOTO 2900
2890 GOSUB 2700:GOTO 2850
2900 ? CHR$(125):"WHAT TYPE OF PLOTTING WOULD YOU LIKE":? :? "      (1) INVISIBLE
    (2) VISIBLE"
2910 GET #1,KEY:IF KEY=49 OR KEY=50 THEN GOSUB 2700:GOTO 2910
2920 INVISIBLE=0:IF KEY=49 THEN INVISIBLE=1
2930 IF DISK=0 THEN 3060
2940 ? CHR$(125);"      CHAIN TO ANOTHER PROGRAM ";:? :POKE 657,16:? "(Y OR N)"
2950 GET #1,KEY:IF KEY=78 AND KEY<>89 THEN GOSUB 2700:GOTO 2950
2960 IF KEY=78 THEN 3060
2970 ? CHR$(125):ENTER THE FILENAME (Dn:filename.ext)":? :? "FILE NAME: ";:POKE
752,0:INPUT F1$:POKE 752,1
2980 ? CHR$(125);:POKE 657,(25-LEN(F1$))/2:? "IS '";F1$;"' CORRECT?";:? :POKE 657
,16:? "(Y OR N)"
2990 GET #1,KEY:IF KEY=78 AND KEY<>89 THEN GOSUB 2700:GOTO 2990
3000 IF KEY=78 THEN 2970
3010 ? CHR$(125);"ENTER A FILE NAME FOR THIS PROGRAM.":POKE 657,12:? "(Dn:filen
ame.ext)":POKE 752,0
3020 ? :? "FILE NAME: ";:INPUT F2$:POKE 752,1:? CHR$(125);:POKE 657,(25-LEN(F2$)
)/2:? "IS '";F2$;"' CORRECT";:?
3030 POKE 656,2:POKE 657,16:? "(Y OR N)":GET #1,KEY:IF KEY<>78 AND KEY<>89 THEN
GOSUB 2700:GOTO 3030
3040 IF KEY=78 THEN 3010
3050 CLOSE #2:IF DISK THEN 3080
3060 ? CHR$(125);"      INSERT THE DESIRED CASSETTE.":? :? "PRESS ■ RECORD ■ PL
AY ■ THEN ■ RETURN ■":
3070 OPEN #2,8,0,"C:":FOR I=1 TO 65:? #2;CHR$(155):NEXT I:GOTO 3100
3080 ? CHR$(125);"      INSERT THE DESIRED DISKETTE.":? :? "                THEN PRESS ■ R
ETURN ■":":GET #1,KEY
3090 OPEN #2,8,0,"D:SCREEN.DAT":GOSUB 2
3100 POKE 77,0:? "      ■ ENTER  LIST  STMT ■":GOSUB 2700:FOR I=1 TO 200
:NEXT I:? CHR$(125):POKE 657,15
3110 ? "      ■ STMT  NO ■":? :? "■ INPUT  THE PROGRAM ■ ■ RECONFIGURE ■":G
OSUB 2700:FOR I=1 TO 200:NEXT I
3120 GRAPHICS 0:? :? :IF DISK=0 THEN ? "ENTER "CHR$(34)"C:"CHR$(34)
3130 ? "ENTER "CHR$(34)"D:SCREEN.DAT"
3140 ? :? :FOR I=0 TO 8 STEP 2:? I:NEXT I:IF RAINBOW=0 THEN FOR I=1000 TO 1050 S
TEP 10:I:NEXT I
3150 ? :? "CONT":FOR J=1 TO 100:NEXT J:POSITION 2,0:POKE 842,13:STOP


3160 POKE 842,12:RLINE=1:ELINE=904:S=20:GOSUB 3320
3170 GRAPHICS 0:? :? :J=50
3180 ? "100 GR.:17+SS:POKE 708,"CI1";POKE 709,"I2";POKE 710,"I3:"POKE 712
,"I4:"POKE 82,1:POKE 752,1:? :?
3190 IF RAINBOW THEN ? "40 DIM C$(32):TIME=10:GOSUB 1000:C$(15,15)=CHR$(22):Z=US
R(ADR(C$),TIME)"
3200 IF RANDOM THEN ? "40 FOR I=ITO10:POKE708,"I4:"FORJ=1TO100:NEXTJ:POKE708,"I
I1":FORJ=1TO200:NEXTJ:NEXTI"
3220 IF SS=0 THEN FOR I=1 TO 152 STEP 38:? J;"POKE 656,"IJ/10+41":?"CHR$(34)"TW
$(I,I+37)"CHR$(34)":"IJ=J+10:NEXT I
3230 IF F1$<>"" THEN ? "90 RUN "CHR$(34)F1$:? :GOTO 3250
3240 ? "90 CLR:GOTO 40"J"?
3250 IF INVISIBLE THEN ? "110 POKE 559,0";? "140 POKE 559,34"J?
3260 ? "CONT":FOR J=1 TO 100:NEXT J:POSITION 2,0:POKE 842,13:STOP
3270 POKE 842,12:RLINE=2000:ELINE=3260:S=10:GOSUB 3320
3280 GRAPHICS 0:? :FOR I=3270 TO 3340 STEP 10:? :? I:NEXT I
3290 IF DISK=0 THEN ? :? "CSAVE":GOTO 3310
3300 ? "XIO 33,#2,0,0,"CHR$(34)"D:SCREEN.DAT":? :? :? "SAVE "CHR$(34)F2$
3310 ? :? :? "POKE 842,12:GR.0":POSITION 2,0:POKE 842,13:END
3320 FOR I=RLINE TO ELINE STEP S:GRAPHICS 0:? :? :FOR J=I TO I+S-1 STEP S/10:? J
;" ";:IF J >ELINE THEN NEXT J
3330 ? "CONT":FOR J=1 TO 100:NEXT J:POSITION 2,0:POKE 842,13:STOP
3340 POKE 842,12:NEXT I:RETURN
```


NEED HELP BUYING A COMPUTER OR PERIPHERAL?

GET THE GUIDE!



BUYER'S GUIDE TO PERSONAL COMPUTERS, PERIPHERALS AND ELECTRONIC GAMES

Features include:

- Which computer is for you
- Evaluations of personal computers
- Tips on buying peripherals
- Peripheral product reviews
- Music synthesizers
- Comprehensive evaluation of joysticks, paddles and game port extenders
- Video game systems and software
- Roundup of electronic toys and games
- Electronic and computerized learning aids
- Video products for computer users
- Selected microprocessor-based consumer electronics products

ORDER YOUR COPY OF THIS COMPREHENSIVE GUIDE TODAY!

HERE'S HOW TO ORDER

Send your name, address and $5.00 ($3.95* plus $1.05 postage and handling) to:

Buyer's Guide to Personal Computers
P.O. Box 555, Morris Plains, N.J. 07950

Please make check payable to:

Buyer's Guide to Personal Computers

*NJ residents add 5% sales tax.
Price outside U.S.A. $6.00.

pt...commodore's port...co

Joel Swank

The Vic SPY routine is a machine language program for the Vic-20 that monitors the contents of any three consecutive memory locations. It is executed every sixtieth of a second as part of the Vic IRQ (Interrupt Request) routine. It allows you to see the value of memory locations change as another program runs. This can be of value for debugging programs or just understanding how the Vic works.

SPY takes advantage of the Vic IRQ feature to display memory on the Vic screen while another program is running. Normally IRQ is used for updating the "jiffy" clock and scanning the keyboard. At power up the Vic KERNAL (control program) sets up one of the 6522 VIAs (Versatile Interface Adapters) to interrupt the 6502 microprocessor automatically every sixtieth of a second . When this interrupt occurs, the 6502 suspends execution of the program that is currently running and executes the interrupt handling routine in the KERNAL. The routine saves all of the registers in the 6502 and then executes the routine whose address is stored in the IRQ interrupt vector at memory location 788 ($314).

This vector normally contains the address of the KERNAL routine that updates the jiffy clock and scans the keyboard. But the user can change the contents of the vector to the addresses of another routine and have that routine executed automatically every sixtieth of a second. Only machine language programs, not Basic, can be executed this way. To allow all Vic functions to operate properly, this user IRQ routine should jump to the KERNAL IRQ routine when it has finished executing.

Joel Swank, 12550 SW Colony #3, Beaverton, OR 97005.

Listing 1 is a Basic program, called SPY Loader, that contains the SPY routine in data statements. It reads the data and POKES it into memory at the proper location. It also adds all data to get a checksum, which it checks against the checksum in the data. If the checksums match, SUCCESS is displayed, otherwise CHECKSUM ERROR is displayed.

This simple checksum does not guarantee that the data are correct, since it is possible to have cancelling errors, but it will catch most typing mistakes. It also changes the top of Basic memory so that Basic will not overwrite SPY with its variables.

After typing in this program, be sure to save a copy on tape before trying to use SPY. An error in a machine language program can cause the 6502 to "hang up". The only way to recover is to turn the Vic off and back on, which erases everything in memory.

Once you have a good copy of SPY Loader, it can be used to load SPY whenever you want to use it. After SPY Loader has been saved on tape, RUN it, and then erase it with a NEW command.

The SPY routine is initialized with a SYS 7168 command. SPY prompts for the address of the first of the three locations to be monitored with ADDRESS. The address must be entered as a one to four-digit hexadecimal number. A full line of digits may be entered, but only the last four are significant. If an invalid digit is entered, a question mark (?) will be displayed immediately following the invalid character, and SPY initialization will be terminated.

So that SPY will not interfere with the information on the screen, the screen is expanded by adding another line at the bottom. The first six bytes of this line are used to display three bytes of memory in hexadecimal. The display is updated every sixtieth of a second until the STOP routine is executed with a SYS 7299 command.

This command turns off SPY and restores the screen to normal. Pressing the STOP/RUN and RESTORE keys will also restore the IRQ vector and the screen to normal. SPY can be re-initialized with the SYS 7168 command. It can also be re-initialized without first executing the STOP routine.

Listing 2 is the assembly listing for SPY. This listing is in standard 6502 assembly language and was generated on an Aim-65 computer. SPY has three entry points. The first at label SPY is the initialization routine. First it enlarges the screen by altering a register in the Vic 6560 TV controller chip. It then clears the unused portion of the bottom

DYNACOMP

The Leading Distributor Of Microcomputer Software

PRESENTS

DYNACOMP

APPLE

ATARI

IBM-PC

NEC

NORTHSTAR

OSBORNE

PET/CBM

TRS-80

SUPERBRAIN

CP/M DISKS FOR OTHERS

PERSONAL FINANCE SYSTEM:

One of the most complete financial management packages available. Keeps track of all tax deductible items, bank deposits, monthly charges, cash payments and more.

Personal Finance System automatically deducts check fees, gives complete financial summaries for any category on a per item, monthly or yearly basis, prints results in detail or summary form, and even plots results on a monthly bar graph. Available on diskette/disk only. ***Price $39.95 (diskette); $42.45 (disk).***

BRIDGE MASTER™

After years of success with BRIDGE 2.0, we have decided to not simply upgrade this popular card program, but to totally rewrite it! the result is BRIDGE MASTER, the best overall bridge package available.

BRIDGE MASTER *BIDS* according to the Goren point count system. It *PLAYS* following the conventions. It *SCORES* according to the rules of duplicate bridge. BRIDGE MASTER's features include continuous display of the bid and score during play, attractive screen display, score keeping and analysis, 1,000,000 different hands, and more!

BRIDGE MASTER has received rave reviews and an "A" for value (The Book of Atari Software 1983).

Available on diskette only. Requires 48K.

Price: $29.95 (diskette); $32.45 (disk)

THESE ARE ONLY TWO OF THE HUNDREDS OF PROGRAMS AVAILABLE FROM THE DYNACOMP LIBRARY OF SOFTWARE PROGRAMS:

- Business/Utilities
- Adventure
- Personal Finance
- Games
- Education
- Thought Provokers
- Statistics
- Card Games
- Engineering
- Hardware
- Supplies
- And Much, Much More!

Besides being the leading distributor of microcomputer software, DYNACOMP currently distributes software in over 60 countries. DYNACOMP provides FRIENDLY, ACCESSIBLE CUSTOMER SERVICE through our highly qualified and knowledgeable staff. WE'RE AS NEAR AS YOUR TELEPHONE.

DYNACOMP'S prices are highly competitive and we promise prompt processing of every order!

WRITE FOR A FREE, DETAILED CATALOG

Daytime Toll Free Order Phones:	*24 Hour Message and Order Phone:*	*Office Hotline:*
(800) 828-6772 (800) 828-6773	*(716) 442-8731*	*(716) 442-8960*

DYNACOMP, INC.

1427 Monroe Avenue • Rochester, NY 14618

CIRCLE 281 ON READER SERVICE CARD

line by storing the current screen color number in the color buffer locations for this line.

Next it prompts for and reads the address of the locations to be monitored. It then disables the IRQ interrupt in case an interrupt should occur during changing of the interrupt vector. It checks the current contents of the interrupt vector to see if the address of the SPY interrupt routine is already there. If it is not, the initialization routine saves the current contents of the vector and inserts that address of the SPY interrupt routine. Finally it enables IRQ interrupts and returns to Basic.

After the initialization routine has been executed, the routine SPYIRQ will be executed at each IRQ interrupt. SPYIRQ reads the contents of memory at the address entered at initialization, and displays three bytes in hexadecimal in the lower left corner of the screen. The three bytes of data are converted into six hexadecimal digits.

Then each digit is converted into its equivalent Vic screen code and stored in the proper location in the screen buffer. Finally, to allow normal Vic IRQ functions to work properly, SPYIRQ jumps to the routine whose address was originally in the IRQ vector.

The routine at label STOP is the routine that is executed with the SYS 7299 command. It disables interrupts and restores the original contents of the interrupt vector. It then enables interrupts, restores the screen to normal size, and returns to Basic. The SPY routine is then no longer active.

The Vic tape routines use the IRQ function, and SPY is not active during tape operations. SPY resumes normal operation after the tape operation has finished.

Once SPY is working properly, there are many interesting things that can be seen. First, use SPY to watch location $A0. This is the Vic jiffy clock. It is a three-byte number that is incremented every sixtieth of a second. You can clear it by typing TI$="000000". You will see that three bytes turn to zero and then start counting rapidly. Set TI$ to the current time (see the user's manual page 114) to see what it looks like in sixtieths of a second since midnight.

Another interesting location is $C5. This is the byte in which the keyboard scan routine stores the keyboard matrix code for any key that is currently pressed. It contains $40 when no key is pressed. SPY location $C5 and watch it change as you press keys. Notice that this is not the ASCII value of the character on the key but an internal code for that key.

Now enter the following statement: FOR t=1 TO 10000:NEXT, and press some keys. You will see the keycode at $C5 change as before, but you will also see the following byte at $C6 increment by one each time you press a key. Location $C6 is the index for the keyboard input buffer in which the Vic saves keystrokes as you enter them. This buffer is located at $277-$280, and can hold up to 10 keystrokes while the Vic is occupied with other tasks. When the above statement ends, you will see that the keys you pressed appear on the screen and that location $C6 returns to zero.

SPY can be used to watch the I/O (Input/Output) ports. If you have a joystick connected, Spy address $9111. This is the port where all joystick functions except RIGHT are read. Move the joystick and press the fire button, and you will see location $9111 change. If you have a set of game paddles, you can spy addresses $9008 and $9009. This is where the 6560 stores the digitized value from the paddles. If you have a light pen, you can spy locations $9006 and $9007 in which the 6560 stores the position of the light pen on the screen.

There are many other interesting things that can be discovered with SPY. It can be used while testing either machine language or Basic programs. Because SPY uses some of the processing power of the 6502 each sixtieth of a second, programs will run about 4% slower while SPY is operating. □

Listing 1. Basic program to load SPY. Machine language program is loaded from DATA *statements into memory. Checksum is used to verify correct data entry. SPY will run on a 5K or 8K Vic only.*

```
100 REM MACHINE LANGUAGE LOADER FOR SPY
200 REM
300 POKE52,28 POKE56,28 POKE51,0 POKE55,0 CLR
400 CK=0
500 READ SA,EA
600 READ BY
700 CK=CK+BY
800 POKE SA,BY
900 SA=SA+1
1000 IF SA<=EA THEN 600
1100 READ BY
1200 IF BY<>CK THEN PRINT "SUCCESS" END
1300 PRINT "CHECKSUM ERROR"
1400 DATA  7168, 7434
1500 DATA  169, 48, 141, 3, 144, 173, 1?, 144, 74, ?4
1600 DATA  74, 74, 41, 7, 162, 15, 157, 0, 148, 202
1700 DATA  16, 250, 162, 0, 189, 2, 29, 240, 6, 32
1800 DATA  210, 255, 232, 16, 245, 169, 0, 141, 13, 29
1900 DATA  141, 14, 29, 32, 207, 255, 201, 13, 1240, 21
2000 DATA  201, 32, 240, 17, 32, 100, 28, 160, 8, 10
2100 DATA  46, 13, 29, 46, 14, 29, 136, 16, 246, 48
2200 DATA  228, 120, 173, 21, 3, 201, 28, 240, 19, 141
2300 DATA  12, 29, 173, 20, 3, 141, 11, 29, 169, 153
2400 DATA  141, 20, 3, 169, 28, 141, 21, 2, 89, 96
2500 DATA  201, 48, 48, 19, 201, 71, 16, 15, 201, 58
2600 DATA  144, 6, 201, 65, 144, 7, 105, 8, 10, 10
2700 DATA  10, 10, 96, 169, 63, 32, 210, 255, 104, 104
2800 DATA  96, 120, 173, 21, 3, 201, 28, 208, 12, 173
2900 DATA  11, 29, 141, 20, 3, 173, 12, 29, 141, 21
3000 DATA  3, 88, 169, 46, 141, 3, 144, 96, 162, 4
3100 DATA  181, 139, 72, 202, 16, 250, 160, 5, 173, 134
3200 DATA  2, 153, 250, 151, 136, 16, 250, 169, 31, 133
3300 DATA  140, 169, 250, 133, 139, 173, 13, 29, 133, 141
3400 DATA  173, 14, 29, 133, 142, 160, 0, 177, 141, 152
3500 DATA  145, 139, 224, 28, 144, 143, 200, 192, 5, 144
3600 DATA  242, 162, 0, 104, 149, 139, 232, 224, 5, 144
3700 DATA  248, 108, 11, 29, 72, 24, 74, 74, 74, 74
3800 DATA  32, 28, 104, 41, 15, 201, 10, 144, 5
3900 DATA  56, 233, 9, 208, 2, 9, 48, 160, 0, 145
4000 DATA  139, 230, 139, 208, 2, 230, 140, 96, 65, 68
4100 DATA  68, 82, 69, 83, 83, 61, 0, 26386
READY.
```

Listing 2. Assembly listing of the SPY routine. Standard 6502 syntax is used.

```
0001  0000          ;  VIC-20 SPY ROUTINE ; DYNAMICALLY DISPLAYS THREE
0002  0000          ;       BYTES OF MEMORY IN THE SIX UNUSED BYTES OF
0003  0000          ;       THE VIC SCREEN BUFFER.
0004  0000          ;  ZERO PAGE STORAGE
0005  0000          SI      =$8B            ;TEMPORARY POINTERS
0006  0000          ADDR    =$8D
0007  0000          TEMP    =$8F
0008  0000          ;  6560 TV CHIP
0009  0000          TVCTL3  =$9003          ;SCREEN LENGTH REGISTER
0010  0000          TVCTLF  =$900F          ;SCREEN COLOR REGISTER
0011  0000          ;  VIC RAM LOCATIONS
0012  0000          CURCOL  =$286           ;CURRENT COLOR
0013  0000          SCRBUF  =$288           ;SCREEN BUFFER PAGE
```

50 easy new games, graphics and business programs for your Timex Sinclair 1000

Now you can start getting more fun, more challenge and more practical value from your computer with the clearest, most comprehensive book ever written for the TS 1000, compatible for use with Sinclair ZX-81.

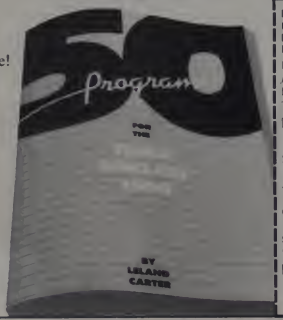
In *50 Programs for the Timex Sinclair 1000*, Leland B. Carter outlines exciting new ways to use your unexpanded Timex for games, graphics, math, physics, business, puzzles and more.

You'll find hours of sheer enjoyment. You'll instantly expand your software library. What's more, you'll permanently enhance your computer programming skills.

Step-by-step instructions in Sinclair Basic let you immediately type in and run programs like:

- Booby Trap
- 2-D Reversal
- Target Gallery
- Flight Graphic
- Stopwatch
- Calendar
- Calculator
- Blast-Um
- ESP
- What's the Pattern

And many, many more!



Each program has been thoroughly tested and re-tested for ease of entry. And you'll find the user-friendly statements extremely helpful in guiding your progress, and in suggesting further input.

Plus you'll enjoy better-quality graphic and screen display than you've ever achieved on your TS 1000. *50 Programs for the Timex Sinclair 1000* is truly the best software investment you can make right now. At just $6.95, you're getting each program for less than 14 cents. Compare that to the price of pre-packaged programs!

Start getting more from your computer by ordering your copy of *50 Programs for the Timex Sinclair 1000* today!

Compatible for use with Sinclair ZX81

For faster service, PHONE TOLL FREE
800-631-8112
(In NJ only: 201-540-0445)

MAIL TODAY TO
CREATIVE COMPUTING PRESS
Dept. HC5F, 39 East Hanover Avenue
Morris Plains, NJ 07950

Please send me_____ copies of *50 Programs for Timex Sinclair 1000* for only $6.95 each, plus $1.50 shipping & handling per book.

Total Amount $_____

☐ Payment Enclosed. (CA, NJ and NY State residents please add applicable sales tax.)

Name_____
(please print)

Address_____

City_____

State_____ Zip_____

*Outside U.S., add $3 for shipping and handling.

☐ Check here to receive a FREE catalog of computing books, magazines and guides.

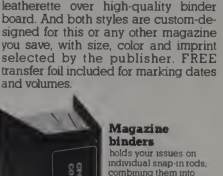
Also available in your local bookstore or computer store.

SHELF CONSCIOUS?

Now you can organize your copies of

CREATIVE COMPUTING

Now your magazines can be a handsome addition to your decor, well organized, and easy to find, thanks to these durable library-quality cases or binders. They're made of luxury-look leatherette over high-quality binder board. And both styles are custom-designed for this or any other magazine you save, with size, color and imprint selected by the publisher. FREE transfer foil included for marking dates and volumes.



Magazine binders
holds your issues on individual snap-in rods; combining them into one volume $7.95 each, 3 for $22.50, 6 for $42.95
Mixed titles OK for quantity prices

Open-back cases
store your issues for individual reference
$6.95 each; 3 for $19.75; 6 for $37.50. Mixed titles OK for quantity prices.

For fastest service, **CALL TOLL-FREE 800-526-0790** (In NJ only 201-540-0445)

Creative Computing
P.O. Box 5120, Philadelphia, PA 19141

Please send ☐ Cases ☐ Binders
TITLE: _____ QUANTITY
Creative Computing _____
Other _____

☐ PAYMENT ENCLOSED $_____* Add $1.00 *per order* for postage and handling. Outside USA add $2.50 *per unit* ordered; send US funds only.
☐ CHARGE (Minimum $10)
☐ American Express ☐ MasterCard
☐ Visa

Card No._____ Exp. Date_____
Signature_____
Print Name_____
Address_____
City_____
State/Zip_____
*Residents of PA add 6% sales tax

Commodore's Port, continued...

```
0014  0000          IRQVEC =$314                ;IRQ VECTOR

0015  0000          ;   SUBROUTINES

0016  0000          CHROUT =$FFD2               ;SEND CHARACTER TO SCREEN
0017  0000          CHKIN  =$FFC6               ;INPUT A CHARACTER

0018  0000          ;   EQUATES

0019  0000          SPYLEN =7                   ;BYTES TO SPY
0020  0000          BLANK# =$20                 ;BLANK
0021  0000          CR     =13                  ;CARRIAGE RETURN

0022  0000                 *=$1C00

0023  1C00          ;   ENTRY TO START THE SPY ROUTINE - SYS 7168

0024  1C00  A9 30   SPY    LDA ##30             ;ENLARGE SCREEN BY 1 LINE
0025  1C02  8D 05 90        STA TVCTL3
0026  1C05  AD 0F 90        LDA TVCTLF          ;SET LAST 16 BYTES OF LAST
0027  1C08  4A              LSR A               ;TO SCREEN COLOR
0028  1C09  4A              LSR A               ;TO MAKE THEM BLANK
0029  1C0A  4A              LSR A
0030  1C0B  4A              LSR A
0031  1C0C  29 07           AND ##07
0032  1C0E  A2 0F           LDX ##15
0033  1C10  9D 00 94 WHITEC STA $9400,X         ;STORE A BYTE
0034  1C13  CA              DEX                 ;NEXT
0035  1C14  10 FA           BPL WHITEC

0036  1C16          ;   GET ADDRESS TO SPY

0037  1C16  A2 00   GETADD  LDX #0              ;FIRST PROMPT USER
0038  1C18  BD 2D 1D MSGLUP LDA MSG,X           ;GET A BYTE
0039  1C1B  F0 05           BEQ INPUT           ;QUIT IF ZERO
0040  1C1D  20 D2 FF        JSR CHROUT          ;SEND A CHARACTER
0041  1C20  E8              INX                 ;NEXT
0042  1C21  10 F5           BPL MSGLUP

0043  1C23  A9 00   INPUT   LDA #0              ;CLEAR REPLY AREA
0044  1C25  8D 00 1D        STA SPYADD+1
0045  1C28  8D 0E 1D        STA SPYADD+1
0046  1C2B  20 CF FF ADDLUP JSR CHRIN           ;GET A CHARACTER
0047  1C2E  C9 0D           CMP #CR             ;CR?
0048  1C30  F0 15           BEQ ADDDUN          ;YES, DONE
0049  1C32  C9 20           CMP #' '            ;BLANK?
0050  1C34  F0 11           BEQ ADDDUN          ;YES DONE
0051  1C36  20 64 1C        JSR PAHEX           ;PACK INTO HEX NYBBLE
0052  1C39  A0 03           LDY #3              ;
0053  1C3B  0A        SHIFT ASL A               ;AND SHIFT INTO REPLY AREA
0054  1C3C  2E 00 1D        ROL SPYADD
0055  1C3F  2E 0E 1D        ROL SPYADD+1
0056  1C42  88              DEY                 ;ALL 4 BITS
0057  1C43  10 F6           BPL SHIFT
0058  1C45  30 E4           BMI ADDLUP

0059  1C47  78   ADDDUN SEI                     ;DISABLE INTERRUPTS
0060  1C48  AD 14 03        LDA IRQVEC+1        ;GET IRQ VECTOR HI
0061  1C4B  C9 1C           CMP #>SPYIRQ        ;IS IT OURS?
0062  1C4D  F0 13           BEQ SKIPUP          ;YES - SKIP VECTOR UPDATE
0063  1C4F  8D 0C 1D        STA SPYSA+1         ;NO, SAVE CURRENT VECTOR
0064  1C52  AD 14 03        LDA IRQVEC
0065  1C55  8D 0B 1D        STA SPYSA
0066  1C58  A9 9E           LDA #<SPYIRQ        ;SET VECTOR TO WATCH ROUTINE
0067  1C5A  8D 14 03        STA IRQVEC
0068  1C5D  A9 1C           LDA #>SPYIRQ
0069  1C5F  8D 15 03        STA IRQVEC+1
0070  1C62  58              CLI                 ;ALLOW INTERRUPTS
0071  1C63  60   SKIPUP    RTS                 ;RETURN TO BASIC

0072  1C64          ;   PAHEX : PACK ASCII HEX INTO HEX NYBLE

0073  1C64  C9 30   PAHEX  CMP ##30            ;LESS THAN '0'
0074  1C66  30 13           BMI ERRRET          ;YES, ERROR
0075  1C68  C9 47           CMP ##47            ;GREATER THAN 'F'
0076  1C6A  10 0F           BPL ERRRET          ;YES, ERROR
0077  1C6C  C9 3A           CMP ##3A            ;NUMERIC?
0078  1C6E  90 06           BCC NOADD           ;YES
0079  1C70  C9 41           CMP ##41            ;ALPHABETIC?
0080  1C72  90 07           BCC ERRRET          ;NO, ERROR
0081  1C74  69 08           ADC #8              ;ADD 8 PLUS CARRY
0082  1C76  0A   NOADD    ASL A               ;SHIFT TO HI NYBBLE
0083  1C77  0A              ASL A
0084  1C78  0A              ASL A
0085  1C79  0A              ASL A
0086  1C7A  60              RTS

0087  1C7B  A9 3F   ERRRET LDA #'?'           ;SEND ERROR MSG
0088  1C7D  20 D2 FF        JSR CHROUT
0089  1C80  68              PLA                 ;RESTORE STACK
0090  1C81  68              PLA
0091  1C82  60              RTS

0092  1C83          ;   ENTRY TO STOP THE SPY ROUTINE - SYS 7299

0093  1C83  78   STOP    SEI                     ;DISABLE INTERRUPTS
0094  1C84  AD 15 03        LDA IRQVEC+1        ;GET VECTOR HI BYTE
0095  1C87  C9 1C           CMP #>SPYIRQ        ;IS SPY ACTIVE?
0096  1C89  D0 0C           BNE NOREST          ;NO, DON'T RESTORE
0097  1C8B  AD 0B 1D        LDA SPYSA           ;YES, RESTORE ORIGINAL VECTOR
0098  1C8E  8D 14 03        STA IRQVEC
0099  1C91  AD 0C 1D        LDA SPYSA+1
0100  1C94  8D 15 03        STA IRQVEC+1
0101  1C97  58   NOREST   CLI
0102  1C98  A9 2E           LDA ##2E            ;RESTORE SCREEN SIZE
0103  1C9A  8D 05 90        STA TVCTL3
0104  1C9D  60              RTS

0105  1C9E          ;   SPYIRQ : SPY INTERRUPT ROUTINE

0106  1C9E          ;   ### THIS CODE IS EXECUTED IN THE IRQ INTERRUPT
0107  1C9E          ;           ROUTINE - DO NOT DALLY ###

0108  1C9E  A2 04   SPYIRQ LDX #4              ;SAVE POINTERS ON STACK
0109  1CA0  B5 B8   WSAVL  LDA $1,X
0110  1CA2  48              PHA
0111  1CA3  CA              DEX
0112  1CA4  10 FA           BPL WSAVL
```

```
0113  1CA6  A0 05          LDY #$FYLEN+SFYLEN-1
0114  1CA8  B9 B6 02      COLORI LDA CURCOL      ;STORE CURRENT COLOR
0115  1CAB  99 FA 97      COLOR1 STA $97FA,Y     ;IN ALL LOCATIONS
0116  1CAE  88             DEY
0117  1CAF  10 FA          BPL COLOR1
0118  1CB1  A9 1F          LDA #$1F               ;USE $1FFA AS POINTER TO
0119  1CB3  85 BC          STA S1+1               ;SCREEN BUFFER LOCATION TO
0120  1CB5  A9 FA          LDA ##FA               ;DISPLAY MEMORY
0121  1CB7  85 BB          STA S1
0122  1CB9  A0 9D 1D       LDA SPYADD             ;MOVE ADDRESS OF LOCATION
0123  1CBC  85 BD          STA ADDR               ;TO WATCH TO ZERO PAGE
0124  1CBE  A0 9E 1D       LDA SPYADD+1
0125  1CC1  85 BE          STA ADDR+1
0126  1CC3  A0 00          LDY ##0
0127  1CC5  B1 BD         SPYLUP LDA (ADDR),Y     ;DISPLAY ALL BYTES
0128  1CC7  84 BF          STY TEMP               ;SAVE INDEX
0129  1CC9  20 E0 1C       JSR HEXPOK             ;PUT ON SCREEN
0130  1CCC  A4 BF          LDY TEMP               ;RESTORE INDEX
0131  1CCE  C8             INY                    ;NEXT BYTE
0132  1CCF  C0 03          CPY #$FYLEN            ;ALL DONE?
0133  1CD1  90 F2          BCC SPYLUP
0134  1CD3  A2 00          LDX ##0                ;RESTORE POINTERS FROM STACK
0135  1CD5  68             WRESL  PLA
0136  1CD6  95 BB          STA S1,X
0137  1CD8  E8             INX
0138  1CD9  E0 05          CPX #5
0139  1CDB  90 F8          BCC WRESL
0140  1CDD  6C 9B 1D       JMP (SPYSA)            ;NOW DO NORMAL IRQ

0141  1CE0                ;   HEXPOK : POKE ACCUM INTO SCREEN BUFFER AT (S1)
0142  1CE0                ;          : IN HEX
0143  1CE0  48            HEXPOK PHA             ;SAVE A COPY
0144  1CE1  18                   CLC
0145  1CE2  4A                   LSR A
0146  1CE3  4A                   LSR A            ;GET HI NYBBLE
0147  1CE4  4A                   LSR A
0148  1CE5  4A                   LSR A
0149  1CE6  20 EC 1C            JSR HEXP1        ;SEND TO SCREEN
0150  1CE9  68                   PLA              ;RESTORE BYTE
0151  1CEA  29 0F               AND ##F          ;GET LOW NYBBLE

0152  1CEC  C9 0A          HEXP1  CMP ##A         ;ALPHA?
0153  1CEE  90 05                 BCC NUMBER       ;NOPE
0154  1CF0  38                   SEC
0155  1CF1  E9 09                SBC ##9          ;YES, SUBTRACT 9
0156  1CF3  D0 02                BNE HEXSKP       ;TO GET POKE CODE
0157  1CF5  09 30         NUMBER ORA ##30         ;ADD #30 TO GET POKE CODE
0158  1CF7  A0 00         HEXSKP LDY ##0          ;CLEAR INDEX
0159  1CF9  91 BB                STA (S1),Y       ;STORE POKE CODE ON SCREEN
0160  1CFB  E6 BB                INC S1           ;BUMP S1
0161  1CFD  D0 02                BNE NOCY
0162  1CFF  E6 BC                INC S1+1
0163  1D01  60           NOCY   RTS

0164  1D02                ;   PROMPT MESSAGE

0165  1D02  41 44         MSG    .BYT 'ADDRESS=',0
0166  1D04  00

0167  1D05                ; DATA AREAS

0168  1D0B                SPYSA  *=*+2           ;SAVE IRQ VECTOR
0169  1D0D                SPYADD *=*+2           ;ADDRESS TO SPY

0170  1D0F                LASTBY .END
0171  1D0F                ERRORS= 0000
```

SYMBOL DEFINED REFERENCES

```
A          0000   0148 0147 0146 0145 0085 0084 0083 0082 0053 0030 0029 0028 0027
ADDDUN     0059   0050 0048
ADDLUP     004A   0058
ADDR       00BD   0127 0125 0123
BLANKP     0020   0048
CHRIN      0017   0046
CHROUT     0016   0048 0040
COLOR1     0115   0117
CR         0021   0047
CURCOL     0012   0114
ERRRET     0007   0000 0076 0074
GETADD     0037   0039
HEXP1      0152   0149
HEXPOK     0143   0129
HEXSKP     0158   0156
INPUT      0043   0039
IRQVEC     0014   0100 0098 0094 0069 0067 0064 0060
LASTBY     0178   0039
MSG        0165   0038
MSGLUP     0038   0042
NOADD      0002   0078
NOCY       0163   0161
NOREST     0101   0096
NUMBER     0157   0153
PAKHEX     0073   0051
S1         00BB   0162 0160 0159 0136 0121 0119 0109
SCRBUF     0013   0037
SHIFT      0055   0057
SKIPUP     0070   0062
SPY        0024   0039
SPYADD     0169   0124 0122 0055 0054 0045 0044
SPYIRQ     0188   0095 0068 0066 0061
SPYLEN     0019   0132 0113 0111
SPYLUP     0127   0133
SPYSA      0168   0148 0099 0097 0065 0063
STOP       00F3   0053

TEMP       00B7   0130 0128
TVCTL3     00A9   0105 0025
TVCTLF     0010   0026
WAITEC     0033   0035
WRESL      0135   0139
WSAVL      0109   0112
X          0000   0136 0109 0078 0033
Y          0000   0159 0127 0115
```


The computer-age storybook for kids!

Katie and the Computer

By Fred D'Ignazio
Illustrated by Stan Gilliam

This wonderful storybook teaches young children how a microcomputer works. Katie ends up inside her dad's new micro…and has an adventure with Colonel Byte and the other characters who make a computer work. Her jou. ney follows the path of a computer command; her experiences are technically accurate yet easily understandable, right down to her encounters with a program bug. Additional material is included to help you relate the story to actual working parts of the computer. With truly exceptional color illustrations, this is an excellent first computer book for youngsters.

Hardcover, 11" x 8½", illustrated.

For faster service, PHONE TOLL FREE:

800-631-8112

(In NJ only: 201-540-0445)

Also available at your local bookstore or computer store.

CREATIVE COMPUTING PRESS
Dept. HBSC 39 East Hanover Avenue
Morris Plains, NJ 07950

Please send me _____ *Katie and the Computer* at $8.95* plus $2.00 postage and handling each. Outside USA add $3.00 per order. #12A

☐ **PAYMENT ENCLOSED $_____**
*Residents of CA, NJ and NY State add applicable sales tax.

☐ **CHARGE MY:**
☐ American Express
☐ MasterCard ☐ Visa

Card No._____

Exp. Date_____

Signature_____

Mr.
Mrs.
Ms._____
(please print full name)

Address_____Apt.____

City_____

State/Zip_____

☐ Send me a FREE *Creative Computing* Catalog.

mages...ibm images...ibm im

Susan Glinert-Cole

Last month I recall bemoaning the fact that my predecessor's desk, as opposed to my own, was probably overloaded with all manner of interesting items. In what must have been a fit of malicious glee, Will indulged in some thorough housecleaning. The end result of this arrived on my doorstep this week. The UPS deliveryman's back is improving every day, and he will be out of the hospital next week. The dining room has once again lost its epicurean elegance and has taken on an appearance usually associated with second-hand furniture stores.

There is an unexpected benefit to this situation; a typical social conversation now goes something like this: "We'd love to have you over for dinner next Friday; I hope you don't mind eating on the floor . . ." If the other party is on the ball, the response is "Um, well, why don't you guys come over here instead?"

So far we haven't had to do any baseboard entertaining, in fact, we haven't had to do any entertaining at all. Half of our friends commiserate with us in our loss of the dining room and the other half is afraid to visit lest they fall into a box of arcade games. I have assured everyone that we will honor our social backorders just as soon as I can get around to reviewing all that stuff. I think 1995 will be a real busy year for dinner parties.

In addition to the entire contents of Will's garage, a few quality utilities also arrived, and are well worth reviewing in detail; I will say a few intelligent words about a little-known aspect of the p-System, and wind up with a convenient method of labelling function keys. Before I get to these items, there is first . . .

The Big News of the Month

In case you have been worrying that IBM hasn't been keeping up with planned obsolescence, take heart. Your PC has become last year's good news, and DOS 1.1 is now another item for the yearly yard sale. (Our yard sale this year will unquestionably be the most unique in the history of South Windham, Maine.)

IBM has announced its newest version of the Personal Computer, the XT. The XT is, at heart, a PC, but sports such

Susan Glinert-Cole, RFD #2, Box 389A, South Windham, ME 04082. Correspondence can only be acknowledged when a stamped, self-addressed envelope has been provided.

FOR NEW SUBSCRIBERS ONLY

MAGAZINE

CREDITS:

The sum of $5 and 00 cts. or more

TO THE ACCOUNT OF:

MR. MS. _____ 8H19
(please print full name)

COMPANY _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

☐ Send me 12 issues (one year) for only $21.97—I save 19%!

☐ I prefer 24 issues for $40.97—I save 24%!

☐ Make that 36 issues for $55.97—I save 31%!

CHECK ONE

☐ Payment enclosed ☐ Bill me later

Savings based on full one-year subscription price of $26.97. Add $8 a year in Canada; all other foreign add $20 per year. Please allow 30 to 60 days for delivery of first issue

DISCOUNT SUBSCRIPTION CERTIFICATE

NON-NEGOTIABLE

FOR NEW SUBSCRIBERS ONLY

MAGAZINE

CREDITS:

The sum of $5 and 00 cts. or more

TO THE ACCOUNT OF:

MR. MS. _____ 8H19

COMPANY _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

☐ Send me 12 issues (one year) for only $21.97—I save 19%!

☐ I prefer 24 issues for $40.97—I save 24%!

☐ Make that 36 issues for $55.97—I save 31%!

CHECK ONE

☐ Payment enclosed ☐ Bill me later

Savings based on full one-year subscription price of $26.97. Add $8 a year in Canada; all other foreign add $20 per year. Please allow 30 to 60 days for delivery of first issue

DISCOUNT SUBSCRIPTION CERTIFICATE

NON-NEGOTIABLE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 47 MORRIS PLAINS NJ

POSTAGE WILL BE PAID BY ADDRESSEE

***PC*™ Magazine**
P.O. Box 598
Morris Plains, New Jersey
07950

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 47 MORRIS PLAINS NJ

POSTAGE WILL BE PAID BY ADDRESSEE

***PC*™ Magazine**
P.O. Box 598
Morris Plains, New Jersey
07950

Get all the facts about the IBM Personal Computer.

Get PC™ Magazine!

Whether you already own an IBM Personal Computer or you're thinking about buying one, you need *PC* Magazine.

PC Magazine is the independent guide to IBM Personal Computers. Each monthly issue is packed with the latest information for everyone who's interested in IBM Personal Computers.

This is *the* magazine for finding out how to put together the best IBM "PC" system...and how to get the most out of it. Every month you'll receive hundreds of colorful pages of evaluations, insights, and straight talk from respected experts—professionals in computer science as well as lawyers, businessmen, writers, educators and many others.

PC covers software, hardware, applications, and every other topic of importance to the thousands of IBM Personal Computer users who read it. To make sure that we give you the facts you need, we include a special "User-to-User" section, a "PC Wish List," and news about IBM Personal Computer clubs, events and publications.

Right now you can save up to 33% on an introductory subscription. And if you're ever dissatisfied with *PC*, just write and tell us—you'll receive a prompt refund for all the unmailed issues remaining in your subscription.

PC™ Magazine
P.O. Box 598, Morris Plains, NJ 07950

Yes! I want to subscribe to *PC*, the independent guide to IBM Personal Computers:

- ☐ One year (12 issues) only $19.97—20% off!
- ☐ Two years only $36.97—26% off!
- ☐ Three years only $49.97—33% off!

Savings based on full one-year subscription price of $24.97.

CHECK ONE: ☐ Payment enclosed. ☐ Bill me later. NH19

Mr./Mrs./Ms. _____
(please print full name)

Company _____

Address _____

City _____ State _____ Zip _____

Offer valid only in the U.S., its territories and possessions. Please allow 30 to 60 days for delivery of first issue

IBM Images, continued...

built-in features as a 10Mb hard disk (referred to as a fixed disk), 128K of memory, one dual-sided floppy disk drive, and an asynchronous communications adapter. The system unit housing of the XT has the same exterior appearance as the PC, but inside there are eight expansion slots, three of which come occupied by the floppy disk, hard disk, and asynch adapters. The cost of this wonderful system is (sigh) $4995.

Before you start gnashing your teeth and wishing you had waited just two weeks longer to purchase your computer, there were some more announcements at the press conference which will remove at least some of the sting from your semi-obsolesced unit. First, expansion units are now available for both the PC and the XT. The expansion unit for both computers comes with a 10Mb hard disk and eight expansion slots. Of these eight, six will accept full size option cards and two will take only smaller cards. Two of the six full size slots come already equipped with the hard disk adapter and the card which interfaces the system unit with the expansion unit. (Don't forget that one slot in the main system unit also needs an interface card.)

This leaves four full size and two less-than-full-size slots for you to fill up with an interesting assortment of option cards. The smaller slots will accommodate the IBM printer, asynchronous communications, game or prototype boards. The expansion units may not contain memory cards, main display adapters or diskette adapters, since the expansion unit accepts two hard disk drives only; any floppy disk drives you might have must remain resident in your system unit.

If you decide to upgrade your PC, there are a couple of ways to begin. The least expensive route is to buy the IBM hard disk and install it in your system unit. This will cost $1695 for the drive and $695 for the drive adapter, for a grand total of $2390. If you are feeling particularly expansive, both in the wallet and in your peripheral philosophy, an additional $1000 will get you the expansion unit for the PC. This includes the hard disk and adapter and the attachment cards necessary to connect the system and expansion units. If you already have a hard disk in the main unit, you will have to move it to the expansion unit.

IBM points out that the fixed drive is customer installable, which indicates that the set-up is simple enough for the average user to do with a minimum of effort. The technical data for the fixed drive are as follows:

10,240,000 bytes of storage
512 bytes per sector
17 sectors per track
306 tracks per surface, 4 surfaces
3600 RPM
5 megabit per second transfer rate
DC power only (+12V, +5V)

And Then...

IBM also announced a color display monitor which I have seen at Computerland; it is really beautiful. The price is amazingly low for an RGB monitor; $680 will buy you a 12" screen with 16 foreground and eight background colors for your aesthetic delight. It will display forty or eighty characters per line, 25 lines per screen and has brightness and contrast controls on the front panel. In size, it is slightly larger than the monochrome display, but this is noticeable only if the two units are compared side by side.

IBM has now begun international distribution of the PC and the XT. The happy byproduct of this decision is the availability of international versions of the keyboard. You may now type away in French, German, Italian, Spanish, or British. This last keyboard obviously must include the pound sign; my imagination leads me to think that other enhancements might include a T key which, in addition to blinking at 4:00, may also be used in conjunction with the Control key to allow the disk drives to accept single or dual sided 5¼" crumpets.

Price reductions were announced for several of IBM PC products; the price for a single sided disk drive plummetted to $289. By the time this column sees print, the prices may have been changed again, so see your distributor for the latest price list.

Quite a few new or upgraded software packages were released this month. I am embarrassed to admit that I haven't yet seen any of them, including the new DOS 2.0, which looks like an outstanding superset of DOS 1.1.

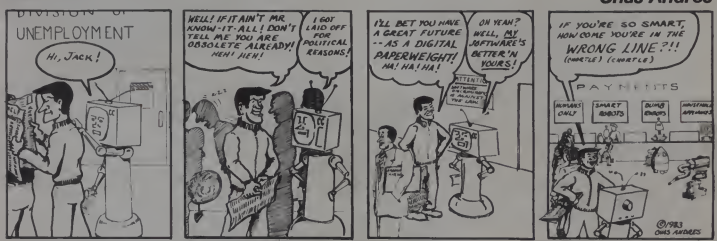
Programs running under standard DOS 1.1 will be upwardly compatible with 2.0, but software which uses absolute address calls will not be transportable across operating systems. DOS 2.0 includes many of the features already available in the UCSD p-System, such as "piping" (using the output of one program as the input to another), print spooling, and the ability to direct file input and output at will (for example, directing keyboard input to the printer or to a disk file). The new Advanced Basic which comes with DOS 2.0 has enhancements for the graphics, music, and function keys. The next Images column will look closely at the new DOS and Basic.

The UCSD p-System in Living Color

Despite all the boxes of canned soft-

Bit Pit

Chas Andres



ware that arrived this week, my curiosity is more piqued by operating systems, languages, and utilities which permit exploration of the underlying computer physiology. In particular, one of my more furtive indulgences is randomly banging keys in the hopes of uncovering a hitherto unknown feature of the software in question. Usually, the result of such techno-torture is an advanced case of computer hysterics, generally manifested by a lockup, disappearance of the operating system, or (rarely) a series of plaintive wails issuing from the speaker. Well, it finally happened; I stumbled upon a feature of the p-System that the folks at NCI didn't realize was available, although it is obliquely documented in the manual.

It seems that, with the proper keystrokes, it is possible to write a file in all the colors and attributes available in the BIOS and convert a visually tiresome program or text file into a dazzling alphabetic rainbow. The file can be handled almost exactly like the plain vanilla version, although there are a few important caveats which are described below. This technique is not just an idle conceit, I have put it to use in two ways, and I am sure there are other applications to discover.

I tend to write long, lyrical epistles in Pascal and, when paging quickly through a program I sometimes have a hard time locating specific procedure headings. Not any more. Procedure headings are now all in red, or blink, or have some other interesting attribute.

The second application is for inserting variable trace statements. These lines have an obnoxious habit of being difficult to locate when they are no longer needed, but if inserted in a contrasting color they are immediately apparent and a snap to delete. While a file sometimes looks like I threw a bucket of paint at it, it is much easier to locate specific areas for subtle alteration (read debugging). Monochrome display owners can, of course, use blink, highlight, and underline instead of technicolor.

The procedure is very simple. Control-\ is the prefix for the foreground colors, Control-6 is the prefix for the background colors and Control-X is the prefix for the border. For the decimal digits 1-9, use the top row of number keys; for numbers higher than 9, use ALT plus the desired number. To try it out, go into the editor and begin entering text. Press Control-\ and then 4. The text is now dark red. Control-\, ALT, 14 makes the foreground yellow. Control-6, 1 produces a blue background and Control-X, 4 gives a red border.

To make the characters blink, add 7 to the desired blinking color, and type Control-6 plus the number (again, use the top row of numbers for decimal digits and ALT plus the number for values greater than 9). There are a few precautions to observe when using this technique. First, if you are typing in a program, you must put these control characters inside comment brackets. The compiler will give an illegal character in text error if you do not.

Second, do not use the ALT key to enter numbers less than 10. This causes the editor in particular, and the operating system in general to do unpredictable and unpleasant things.

Thirdly, these codes are not invisible to the printer. If you run a colored file to the printer, the text must be filtered through some kind of formatting program to avoid any problems that the unusual signals might cause.

The Norton Utilities

In a word: wonderful. There are 14 programs in this package, all of which are useful, and most of which are outstanding examples of what a truly talented and imaginative program designer can do with a versatile system like the IBM PC. The set sells for $80.

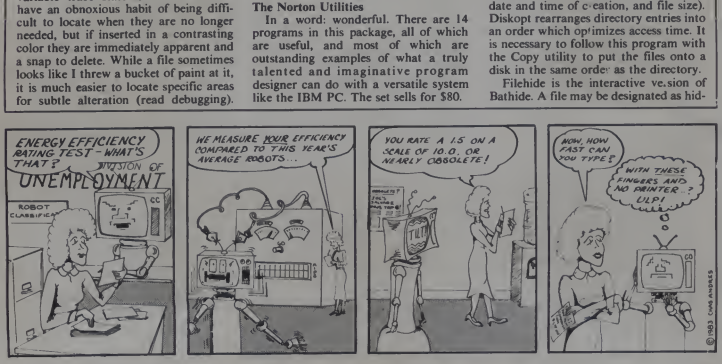
The programs function as external DOS commands and are accessed exactly like other external files such as CHKDSK. Some of these utilities provide the operating system with functions usually only available from Basic; other programs allow exploration and manipulation of disk files on an intimate level. The more extensive utilities are menu-driven and are so coherent and well done that they are, in most cases, completely self-explanatory.

All the menus make excellent use of the function and cursor keys and the keys are assigned consistently, when possible, across all the menus. The documentation is very well written and fits neatly into the DOS binder. The programs, together with the documentation, provide a thorough tutorial on disk organization and give useful insights into the operating system itself.

Seven of the programs were designed to be incorporated into batch files. Beep produces a loud noise and would be useful in rousing the operator from a stupor. Clear clears the screen, Reverse changes the display to reverse video, Timemark will display current or elapsed time and could be used to show the operator just how long he was dozing before Beep went off. Scratr sets the screen to any desired display mode, Bathide hides or unhides files during batch processing and Print is a simple utility designed to output a neat hard copy of an ASCII file.

Two of the programs allow quick and convenient rearrangement of files and utilities. Filesort sorts directories by four primary keys (file name, file extension, date and time of creation, and file size). Diskopt rearranges directory entries into an order which optimizes access time. It is necessary to follow this program with the Copy utility to put the files onto a disk in the same order as the directory.

Filehide is the interactive version of Bathide. A file may be designated as hid-



den, normal, system, or combinations of these, and the type of file is coded into an attribute byte associated with the file in the directory. Filehide allows the user access to this attribute byte and presents all the files with their attributes as listed in the disk directory. The function keys are used to switch files from hidden to normal, from normal to system, and so forth, and another function key will write the information to disk. This program would be useful in unhiding files which have been received this way, as well as protecting your own from accidental erasure or unwanted meddling by the cat.

Filefix and Unerase belong to the same class of objects as fire extinguishers: essential when needed, but the hope is that they will sit around forever providing tract housing for the spider community. Filefix will peruse a disk for damaged areas and try to recover those regions which have escaped the effects of the cup of coffee, pizza crumbs or what have you. Unerase is a sophisticated utility which requires some practice to use and good understanding of the finer points of disk organization (which can be obtained from a couple of hours of using this set of utilities).

The documentation section for this program is not as clear as the rest; in a panic situation it would be a disaster. I am reminded in a vague way of the instructions that came with our fire extinguisher . . .they appeared to make sense until the moment arrived when we needed to put out the toaster oven in a hurry, and then somehow neither of us could figure out how to make the extinguisher do the appropriate thing.

Fortunately, a file which has been accidently erased is not going to degenerate while sitting around the disk (unlike the situation on our kitchen counter), so ample time can be given to reading and rereading the directions and doing a few practice runs. The instructions which come with the program run on for eight pages. What is really needed is a step-by-step summary, with the theory and warnings omitted, placed somewhere for easy access in a time of trial.

The general concept relies on the fact that, when a file is erased, only two things really happen. First, the space which has been allotted to the file by the disk management utilities in the operating system is designated as free to be written over and second, the first letter of the file name is changed to indicate that this directory entry is now available for use by another file. This means that, if you have erased a file by accident and have done no writing to disk, Unerase will be able to recover the file for you. If you have done some disk manipulation since the erasure, Unerase may be able to save at least some of the parts of the file which have not yet been overwritten by other data.

The advanced programmer who is familiar with hexadecimal will be able to do intricate and specialized customization of files using the program Secmod. This utility enables the knowledgeable user to browse through a file sector by sector, modify code, and write the revised data back to the file. Each sector is displayed simultaneously in hex and ASCII, so programs which contain ASCII code can be modified by those who are not familiar with hex. The cursor keys are used to move from nibble to nibble or sector to sector, and the tab key will switch the cursor from the hex side of the display to the ASCII side.

Any changes that you make are highlighted until the information is written to disk. I used this program to change the start-up messages. It is possible (and also extremely advisable) to make a hard copy of the sector under scrutiny using the PrtSc key; any unprintable characters are stripped from the hard copy output. Since the changes are no longer highly visible after becoming permanent, it is difficult to locate exactly where the modifications began and ended unless a hard copy is kept.

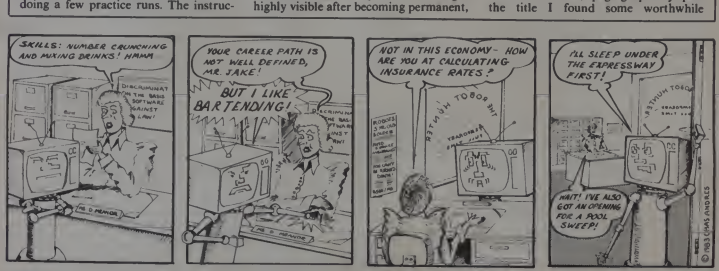
One further suggestion: this may seem obvious, but do make a copy of the program to be modified and make the changes on that before putting them into the library copy. It is easy to get carried away with this utility.

My favorite program in the set is without question Disklook. This utility is an educational and graphic masterpiece. It provides complete information for every file on a disk, including the name, size, attribute and creation date, plus a map which displays the sectors of the disk on which the file is located. One function key allows you to view a map of the entire disk, showing you what is occupying every sector, and giving textual information concerning the amount of space allocated to different types of files or bad sectors. The graphic presentation of these maps is absolutely outstanding.

You can also display the file sector by sector, using the function keys to stroll around the file at will. Disklook will also sort the directory ten different ways (five each for normal and erased files), which makes it very easy to locate what you are looking for. At first, it didn't appear that this program was going to be really useful for much more than a guided tour, but I have since used it to organize files, check the location of bad tracks, ascertain the fragmentation of various programs, and, in conjunction with Secmod, modify selected sectors of the disk.

Peeks and Pokes

The actual name of this utility package is (alas) *Peaks 'n Pokes*, but I couldn't bear to use that as a header. It took me a little while to reconcile the name with my lexicographical prejudices. However, paging quickly past the title I found some worthwhile



information and a pleasant package of over 50 programs which permit easy access to individual areas of the IBM memory.

This package might be better renamed "Bit Twiddling Made Easy." Some of the programs perform the same functions as a few of the *Norton Utilities:* Beep, CLS, and Reverse even share the same names. *PnP* includes a few additional batch-oriented functions of this kind: Mono switches from a color to a monochrome adapter, Color does the opposite, Page prints a Top of Form character to the printer and Wait is an even more effective variation of Beep—it honks every five seconds until someone presses a key, turns off the computer, or takes an axe to the thing.

The instruction manual is a little skimpy, but includes a good introduction to the PC Basic commands PEEK, POKE, BLOAD, BSAVE, INP and OUT. Individual sections describe which byte(s) of memory contain system information, precisely how these data are represented in the individual bits, and how to change each bit from inside a Basic program. Most of the programs in this set are subroutines which will read information from memory about the system status and write certain selected data back to the correct area. Each program deals with a specific component of memory.

The programs may be accessed for demonstration purposes from a main menu program. For example, Keyread will read the bytes associated with the keyboard which are at absolute memory locations 1047 and 1048. It then displays the current keyboard status. Keyset sets and clears selected bits in the keyboard status bytes, and Keyplug allows you to enter data into the keyboard buffer. The status of all I/O devices (disks, printers, displays, RS-232 adapters) may be similarly monitored and altered.

The real usefulness of these programs lies in the fact that you are permitted to merge them into your own Basic and Pascal programs, which adds a tremendous amount of power to these languages in a very convenient fashion. Instructions which describe how to locate and manipulate areas of memory not specifically covered in the manual are included. The curious and inventive will find this package very enjoyable. It is certainly reasonably priced; $30 buys the lot.

Where Did I Put That Template?

The function keys on the PC are wondrous items. Unfortunately, they do not gracefully lend themselves to easy identification. One word processing package I use comes with a little overlay for the keys which has the tiresome habit of flipping onto the floor or sliding under the system unit. I also realize that inevitably, it will get lost and render the word processor inconvenient (there is a great deal of information on that little overlay). I found another way to label the keys a while back which works well if there is a certain reassignment set that you use often.

Hewlett-Packard sells, for the delectation of 41-C calculator owners, sheets of tiny, adhesive labels which match, remarkably enough, the grey color of the PC function keys. They are somewhat expensive, since half the labels are preprinted with calculator functions, and the kit includes overlays for the 41-C keyboard. You end up with 350 blank labels, each costing around two cents apiece or twenty cents for a set of informative function keys. (If you are reassigning the cursor keys, add four to everything).

A very fine pen is required to letter these labels and they are best positioned on the front of the keys with a pair of tweezers. The don't stick well to the tops of the keys for some reason, but mine have clung grimly to the fronts for well over a year. They can be removed and/or replaced with other labels or used on a custom template which has been cut out of durable plastic with a mat knife.

I have conceived countless uses for the preprinted labels. One was the upgrading of our refrigerator to a high-tech machine by the simple addition of little LN 1 + X's and X > 0 ?'s all over the front. Another use, which has not been field tested yet, is to stick them on homemade jelly jars, fill the jars with the appropriate colloid and give them away. Any room in your house can be painstakingly redecorated in a mathematical fashion if you are tired of the same old wallpaper, and they would make interesting, if minute, Christmas tree decorations. □

Firms mentioned in this column

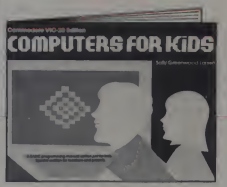
The Norton Utilities
1716 Main St.
Venice, CA 90291
$80 for the set

Data Base Decisions
14 Bonnie Lane
Atlanta, GA 30328

Hewlett-Packard
1000 N.E. Circle Blvd.
Corvallis, OR 97330

Network Consulting Inc.
Suite 110-3700 Gilmore Way
Burnaby, B.C.,
Canada V5G4M1

NEW COMMODORE VIC-20 EDITION!



By Sally Greenwood Larsen

Here's a brand-new edition of one of our most popular computer books—and it's written just for kids who use the Commodore VIC-20!

Computers for Kids is written for elementary-age children who are interested in computers…but too young to comprehend most programming books. With large, easy-to-read text, plenty of illustrations and complete instructions, *Computers for Kids* tells how to write programs that print, do calculations and draw pictures. It also explains how to save and load programs, write flow charts and use BASIC. A special section offers guidance to parents and teachers who are learning about computers with their children.

Softcover, illustrated, 11" x 8½". $6.95.

For faster service,
PHONE TOLL FREE:
800-631-8112
(In NJ only: 201-540-0445)

Also available at your local bookstore or computer store.

CREATIVE COMPUTING PRESS
Dept. ☐☐ , 39 East Hanover Avenue
Morris Plains, NJ 07950

Please send me _____ *Computers for Kids, VIC-20 Edition* at $6.95* plus $1.50 postage and handling each. Outside USA add $3.00 per order. #12V

☐ **PAYMENT ENCLOSED $_____**
(Residents of CA, NJ and NY State add applicable sales tax.)

☐ **CHARGE MY:**
(Charge and phone orders $10 minimum.)
☐ American Express
☐ MasterCard ☐ Visa

Card No. _____ Exp Date_____

Signature_____

Mr. Mrs. Ms. _____
(please print full name)

Address_____ Apt. ____

City_____

State Zip_____

☐ Send me a FREE *Creative Computing* Catalog

rings...trs-80 strings...trs-8

Previewing reel fifty-three of the epic film, "The Machine From Fort Worth," we see it includes scenes featuring the new PC-4 Pocket Computer, the *SuperScripsit* word processing program, a newsletter for lawyers who use the TRS-80, and a short music program for the Color Computer.

Stephen B. Gray

PC-4 Pocket Computer

Earlier this year Radio Shack introduced its lowest-cost Pocket Computer, the PC-4, at $69.95, to replace the PC-1.

The PC-4 (Figure 1), which seems to be a relabeled Casio PB-100, thus replaces a relabeled Sharp PC-1211. It has the same QWERTY keyboard plus numeric keypad, and is 6½" long, only a trifle shorter than the PC-1, but is about half as thick, only ¾".

The PC-4 displays 12 LCD characters at a time, half as many as the PC-1. Math functions on the PC-4 include trig and inverse trig, radians or gradians, log, exponent, square root, angular conversions, and absolute values.

An optional user-installable 1K RAM memory module is $19.95, for expanding the PC-4's 544-step, 26-variable-memory RAM to up to a maximum of 1568 possible steps or up to 222 variable memories.

A $39.95 cassette interface permits storing and loading programs at 300 baud using an optional cassette recorder. A PC-4 printer, at $79.95, prints 20 characters per line using an electro-thermal 5 by 7 dot matrix. The PC-4, printer and cassette interface plug together to form a unit 1 7/16" by 6¾" by 7", which fits into a $7.95 padded vinyl carrying case with zipper opening.

Although Sharp has marketed their PC-1211 separately, along with the PC-1500, which is the same as Radio Shack's PC-2, the PB-100 will not be sold with the Casio name nor through Casio dealers.

Word Processing

If you use a typewriter several times a week, or more, you should look into Radio Shack's word processing software. You can save a great deal of time and trouble, especially with form letters.

If you are a writer, you can avoid most of the problems of changes and corrections. You make them all on the screen and when the final version is ready, you can then print it out for the first (and last) time, unless intermediate versions are required. No more erasing, strikeovers, or messy correcting fluids.

Typing on a word processor is much

Figure 1. Radio Shack PC-4 Pocket Computer.

HARMONY VIDEO & COMPUTERS
800-221-8927

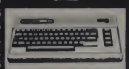
JVC ● PANASONIC ● SONY PROFEEL ● ZENITH ● HITACHI ● QUASAR

G.E. ● SANYO ● SONY PROJECTION ● TDK ● MAXELL ● FUJI ● SCOTCH ● SONY ● RCA

COMMODORE		ATARI		
VIC 20	89.95	ATARI	400 W16K	159.95
COMMODORE 64	369.95	ATARI	800 W48K	449.95
VIC 2N DATASETTE	59.95	ATARI	1200 XL W64K	589.95
COMMODORE DISC DRIVE	289.95	ATARI	410 RECORDER	76.95
1525P PRINTER	289.95	ATARI	1010 RECORDER	77.95
COMMODORE MONITOR	249.95	ATARI	810 DISC DRIVE	369.95
VIC TELEPHONE MODEM	89.95	ATARI	830 ACOUSTIC TEL. MODEM	159.95
RS 232 TERMINAL INTERFACE	CALL	ATARI	850 INTERFACE	169.95
IGEE-488 INTERFACE	CALL	ATARI	822 THERMOL PRINTER	CALL
VIC 8K MEMORY PAC	39.95	ATARI	1020 40 COL. PRINTER	219.95
VIC 16K MEMORY PAC	89.95	ATARI	1025 80 COL. PRINTER	379.95
MOTHER BOARD	89.95	ATARI	16K MEMORY EXPANDER	89.95
VIC 3K SUPER EXPANDER		ATARI	WORD PROCESSOR	89.95
VIC PROGRAMMER'S AID	CALL	ATARI	BASIC REF. GUIDE	CALL
VIC MON	CALL	ATARI	PROGRAMMER KIT	CALL
INTRO TO BASIC I & II	69.95	ATARI	ENTERTAINER KIT	29.95

APPLE 2 PLUS
999.95

APPLE 2E
CALL



EPSON
MX 80 PRINTER
399.95

EPSON
FX 80 PRINTER
599.95

WE CARRY A FULL LINE OF SOFTWARE FOR ATARI AND COMMODORE
CALL FOR LOWEST PRICES

ALL SONY T.V.'s IN STOCK CALL FOR LOWEST PRICES

ALL VCR's IN STOCK CALL FOR LOWEST PRICES

VIDEO TAPE (By case of 10 only)

	VHS T120	VHS T180	HIGH GRADE	BETA L500	BETA L750	BETA L830
TDK	8.85	14.75	10.75	6.50	7.99	10.25
FUJI	9.65	14.75	11.75	6.50	7.99	
MAXELL	8.40	13.50	10.25	6.50	7.99	10.25
MEMOREX	8.75	13.50	10.50	6.50	7.99	10.25
SCOTCH	8.50	13.50	10.25	6.50	7.99	
SONY			10.25	8.99	8.40	10.25
JVC	9.50	13.50	11.50			
RCA	8.90					
PANASONIC	8.50					

TDK PROFESSIONAL T120 15.95
MAXELL PROFESSIONAL L750 OR T120 15.95
MEMOREX PROFESSIONAL 16.95

FOR THE LOWEST PRICES ON VIDEO CALL 800-221-8927

To order simply dial toll free 800-221-8927 with your Master Card or VISA and your order will arrive via UPS or send certified check or money order only to: HARMONY VIDEO AND ELECTRONICS, 2357 Coney Island Ave., Brooklyn, N.Y. 11223, and add approximate shipping postage and insurance charges. Credit cards for phone order only. For customer service please dial (212) 627-8960. All pries and availability subject to change without notice. All orders shipped out of state. Dealer inquires invited!!! For sales info dial (212) 627-6989. Open Sun. 10-4 Mon.-Thur. 9-7 Fri. 9-3.

800-221-8927

COMMODORE ATARI APPLE TEXAS INSTRUMENTS EPSON

CIRCLE 175 ON READER SERVICE CARD

faster than using a typewriter, because you don't have to worry about making mistakes (unless you are a very poor typist). You can correct the mistakes later, add or delete words and sentences, move paragraphs around, and much more.

Radio Shack offers two word processing programs on disk for the Models III and I: the "affordable" *Scripsit* at $99.95; and the advanced $199 *SuperScripsit*, introduced last fall. There is also *Scripsit* for the Model II and 12 ($399), the Color Computer ($39.95 on cassette, $59.95 on disk), and on cassette for the Model III or I, for $39.95.

Scripsit

If your word processing needs are simple, you can do a great deal with *Scripsit* (June 1980, p. 166). I have been using the "affordable" version on a Model III since March, 1982, for these columns and the book reviews. Now I find it very difficult to go back to a typewriter, after having enjoyed the considerable advantages of word processing.

Using *Scripsit*, you can also right-justify text, center lines, hyphenate words at the end of lines, set tabs, number pages automatically, print headers and footers automatically, and that's only part of it.

With Global Replace, you can replace every occurrence of a word with another word, such as changing all "Democrat" references to "Republican." With just a couple of keystrokes, you can change the width of the text displayed on the screeen, which takes place before you can take your finger off the ENTER key.

SuperScripsit

For some users, *SuperScripsit* is the way to go, because of its many, many advanced document and printing features. It can handle true proportionally-spaced printing. And because it uses control codes embedded in the text, it can switch back and forth from one specification to another, such as changing line-spacing (including half spaces) as often as you wish.

SuperScripsit supports underlining, double underlining, boldface, superscripts and subcripts, and multiple-column printing, if you have the right printer. Documents up to 30,000 words long can be saved on a Model III disk.

The SuperScripsit Package

For $199, you get a training program of eight lessons on audio cassette, with an accompanying "Figures Book" text, plus a 158-page reference manual, *SuperScripsit* and TRSDOS on disk, a short summary of commands on a fold-out reference card, and Proofread disks for checking spelling with the $149 *Scripsit Spelling Dictionary*.

The audio cassettes provide a self-paced training course, with detailed, step-by-step instructions, and assume you have never even seen a TRS-80 Model III before. The narrator on the tapes refers often to the figures, which may recap an instruction you have just practiced, list the steps for entering an instruction, provide exercises to use during the lessons, illustrate the ideas being discussed, or provide a review at the end of a lesson.

The tape lessons take quite a while to use, because every now and then you are asked to turn off the recorder and either read some text, or do a typing assignment. It is possible to learn *SuperScripsit* from the reference manual alone, just as it is possible to build a Heathkit television set without following the manual, but the tapes are highly recommended.

May I See A Menu Please?

To use *Scripsit*, you are advised to put self-sticking decals on 17 keys on your keyboard, so you'll know which keys to press for inserting, deleting, exchanging, repeating, starting a block, tabbing, etc.

SuperScripsit eliminates the decals by using menus, which make everything much easier. The first menu (Figure 2) offers seven choices.

If you press the letter O, you get a second menu (Figure 3).

After you have identified and described your document in the first four lines, you can change the various options or leave them at their default values. After you lock in the options by pressing ENTER, the old document comes to the screen, or you are ready to create a new one.

The screen (Figure 4) shows a cursor at top left, and a tab line and status line at the bottom.

As the cursor moves along the typing line, a "ghost" cursor moves along the tab line, to let you know how close you are to a margin (left and right parentheses), a tab (+), or the indent tab (I).

The lower line is the status line, which displays the document name (PAGE) and tells you which page and line you are on, the horizontal cursor position in inches, the pitch at which the document will be printed, and the linespacing.

Added Niceties

The authors of *SuperScripsit* have added a great many sophisticated details that will be appreciated by anybody who has done a fair amount of word processing. Some of these features have been borrowed from dedicated word processing machines.

Once you start preparing text, you have 21 cursor movements available. In addition to the usual four (controlled by the four arrow keys), you can move the cursor to the end or beginning of the document, to the left or right margin, to the next tab, to the next (or previous) word, paragraph, page, or video page, or to a header or footer page, line number, or specific page.

Any time you are not sure what you are doing, just type @H and you get assistance in the form of seven Help screens that provide a complete list of

```
****************** SCRIPSIT WORD PROCESSING ****************

              <O> Open a document
              <D> Display disk directory
              <S> System setup utility
              <P> Proofread a document
              <C> Compress a document
              <A> ASCII text conversion utility
              <E> Exit to TRSDOS

              What is your selection?
```

Figure 2. The first menu of the SuperScripsit *word processing program (called* Scripsit *on the screens) is the Main Menu, which can be bypassed if you request a document by name when loading the program.*

```
************* SCRIPSIT - OPEN DOCUMENT OPTIONS ************

           Document name:  --------------------
                  Author:  ----------------------------
                Operator:  ----------------------------
                Comments:  ----------------------------
            Printer type:  DW2-----
          Lines per page:  54     (4-99)
                   Pitch:  P-     (1-20 or P)
    Line spacing (to 3+):  1-     ("+" = 1/2)
    1st page with header:  1--    (1-999)
    1st page with footer:  1--    (1-999)
```

Figure 3. Selecting 0 on the Main Menu brings up the menu of Open Document Options to be selected when opening a new or existing document.

```
-------------1------(---I-2------+-----3------+-----4------+
PAGE     Pg:1   Ln:1   Pos: 1.8 Pitch:PS LS:1
```

Figure 4. The SuperScripsit *standard screen format for displaying text includes a tab line to show where margins and tabs are, and a status line that keeps track of important data such as page and line.*

commands and functions.

With "align tabbing," *SuperScripsit* automatically lines up, for example, decimal points in a column of prices.

Deletions are performed fast and neatly. Just hold down @ and D, and the characters to the right of the cursor move left and disappear when they get to the cursor.

To move a block of text, *SuperScripsit* writes it to disk, then puts it where you have positioned the cursor. Using the same technique, you can copy a block to make it appear in more than one place.

A paragraph can be "frozen" so it can't be changed in any manner.

Fancy Printing

For me, some of the most attractive features of *SuperScripsit* are the advanced printing features. When I prepare this column to send it to Morris Plains, I've had to mark the text to indicate which words are in boldface, which in italic, etc.

With *SuperScripsit,* I just insert print-control codes in the text, and the codes take care of all that.

Before and after text you want to print bold, just press CLEAR and +. The printer automatically overprints each character three times.

To underline (for italics), just press CLEAR and −, and the printer backs up after printing each character and underlines it. For double-underlining, use CLEAR= (this feature is available only on the Daisy Wheel II printer).

Superscripts and subscripts are just as simple. For superscripts, press CLEAR and *, and the printer will move the paper down half a line and print until a CLEAR and a period are encountered. Subscripts are handled in just the opposite fashion: CLEAR. makes the printer move the paper up half a line and print until CLEAR* is reached. Thus you can easily print technical expressions that would otherwise have to be done by hand:

```
Technical.
Try this on for size:
X=C^2(W_o*L^23/(-T*_r-Vt)*W_o3)
```

Advanced Features

The first five audio-cassette lessons cover the essentials of Startup, Basic Document Preparation, Working With Blocks and Pages, Printing, and Finishing and File Management. In the course of these lessons, you prepare several documents, and thus learn while doing.

Lesson Six gets into saving and recalling tab lines (for typing documents with complicated format requirements, such as outlines, you can save up to 11 tab lines), and global changes; you can search an entire document for a word or phrase, and replace or delete it.

Lesson Seven teaches how to program user keys and prepare form letters. The ten number keys are user-programmable in *SuperScripsit;* each can recall up to 127 characters so that frequently used words or phrases can be displayed with a single keystroke.

To prepare form letters, you type a master document that contains the standard text, with code names where variables are to be inserted. Then type a variables document containing the list of codes and the variables (such as addresses and product names) for each letter. Merge the two documents and print one letter for each group of variables.

Lesson Eight, the last, on Advanced Utilities, shows how to write your own defaults for the Open Document options, how to edit user keys once they have been programmed, and introduces the reference manual.

Scripsit and SuperScripsit

Suppose you already have *Scripsit,* which saves files in ASCII code. Can you use your *Scripsit* files with *SuperScripsit,* which has its own file for-

mat? Yes; just use the ASCII Text Conversion Utility to change your *Scripsit* files from ASCII to *SuperScripsit* format. You can use the same utility if you want to convert a *SuperScripsit* file to *Scripsit* ASCII.

The Catch

As the Figures book puts it, "Although you can print with a printer other than the Daisy Wheel II, most other printers are not equipped to handle many of *SuperScripsit*'s advanced features, such as proportional spacing and double-underscore."

SuperScripsit also has drivers for Line Printers IV and VIII, and a serial (RS-232) printer; you have to specify which in the Open Document Options. If you have a non-Radio Shack printer, the reference manual says "you may need to write your own printer driver. If your printer is a serial printer, you can use the TRSDOS utility SETCOM to configure the serial port."

As one of the very helpful people in a Radio Shack Computer Center put it, *Scripsit* is "useful as a full-screen editor for Basic programs, because it saves things directly as ASCII files. Using *SuperScripsit*, you have to convert back and forth."

To use *SuperScripsit* on the Model I, you need two disk drives. Although Model III floppy disks hold up to 170,000 characters, the Model I floppies hold only 76,000. So on the Model I, *SuperScripsit* itself takes up an entire disk, and there is no room for documents. You need one drive for the program floppy, and at least one for the documents. You also need 48K of memory for the I or III.

Although *SuperScripsit* and the Model III support up to four disk drives, you can use the program with only one drive. To use the Proofread option with the *Scripsit Dictionary*, you must have three disk drives.

However, *SuperScripsit* has so many highly useful features that once you have used it a while, you may not want to go back to *Scripsit*. And if you have used only a typewriter before, you certainly won't want to go back to that.

Lawyer's Newsletter

"The Lawyer's Microcomputer" is a 16-page publication subtitled, "A Newsletter for Lawyers Using the TRS-80." A recent issue devotes ten pages to three major articles, on "Creating a Calendar Control System with Profile Plus," "Using WordStar, DataStar, SuperSort and CP/M," and "Using Scripsit's Merge Feature."

The remainder of the issue contains a Radio Shack news release on enhancements for *Profile Plus*, a list of 53 "Software Companies of Interest to Lawyers," an announcement of a "National Conference for Lawyers Using Radio Shack Computers" (held this last May in Fort Worth), a short tutorial on how to back up a data disk that doesn't contain an operating system, and "Bits and Bytes," short items about various publications and software products.

The newsletter is well written, although the computerized text looks a litle odd, having been right-justified by the insertion of more space between letters than you are likely to see elsewhere. However, it is quite neat, and does eliminate end-of-line hyphens (there is only one in the whole issue).

It is a publication that computer-toting lawyers of the TRS-80 may want to check out. It's from R.P.W. Publishing Corp., Box 1046, Lexington, SC 29072, telephone (803) 359-9941. A year's subscription, presumably for 12 issues, is $28 (U.S.); $37 (Canada); $43 (foreign).

Short Program #40: CoCo Piano

Back in May 1982 (p. 207) there was a short program that lets you play the Color Computer with a joystick, with the horizontal movement controlling pitch, and vertical movement controlling tone duration.

John Crager of West Islip, NY, sent a music program for the Color Computer that is a little different:

"I wrote this Short Program for my Radio Shack Extended Basic Color Computer. You use the numbers 1-9 for the tones, where 1 is the lowest and 9 is the highest, and use your right joystick for the duration, where the far left is a whole note and the far right is a 64th note.

"With some dexterity (enough to use the joystick in the left hand, and the right hand on the keyboard), you can use it as an electronic piano."

```
10 A$=INKEY$
20 IF A$="" THEN 10
30 IF ASC(A$)>49 OR ASC(A$)<57
   THEN 10
40 L=JOYSTK(0)+1
50 PLAY "L" + STR$(L)
60 PLAY A$
70 GOTO 10
```

"You can add the following lines 5, 15, 17 and 45 and use the spacebar to change octaves."

```
5 O=1
15 IF A$=" " THEN O=O+1
17 IF O=6 THEN O=1
45 PLAY "O" + STR$(O)
```

"I would also like to say that even though the Color Computer is fairly new, I have found very interesting little programs in the TRS-80 Strings dept., and I have found it easy to decipher the other programs in the magazine."

The joystick output isn't linear, so the change from whole note to 64th note isn't as gradual as you might like. Also, once you press a key while the joystick is at the far left, you get the maximum duration, even if you move the joystick to the far right immediately afterward.

Lines 10-30 ignore all keyboard input except numbers 1-9. Line 40 adds JOYSTK(0), the value of the horizontal coordinate of the joystick (which ranges from 0 to 63), to the Lnumber value for a whole note. Thus L ranges from 1 to 64, or from a whole note to a 64th note. To examine the JOYSTK(0) range, run this:

```
100 PRINT JOYSTK(0);
110 GOTO 100
```

and you'll see how much joystick movement there is between 0 and 1, and how very little between 62 and 63. This seems logarithmic rather than linear; the latter might be preferred for this particular application.

Lines 50-60 play a note whose duration is controlled by the position of the joystick, using the required L for note length and an Lnumber provided by STR$(1), and whose pitch is controlled by a keyboard number from 1 to 9, using A$.

Line 5 sets the pitch at octave 1. Line 15 moves the pitch up an octave if a space is keyboarded. If the pitch is at its highest range (octave 5), line 17 returns it to octave 1 if the spacebar is pressed. Line 45 contains the obligatory 0 plus the octave value.

Note that STR$ is required for L and 0 because PLAY is a string function. Note also that there is a space between the quotation marks in line 15; remove the space and you get some very peculiar results. Can you figure out why?

"All I want is a yes or no answer!"

MicroPrice SPECIALS OF THE MONTH!

INTRODUCING THE IMPROVED LNW 80 MODEL II . . . AT AN UNBELIEVABLE PRICE!

This computer has it all! TRS-80™ Model I and CP/M® software compatibility with two operating systems; DOSPLUS 3.4 and CP/M 2.2. The LNW 80 MOD II can read and write the 5¼" disk formats of several CP/M computers including: OSBORNE, KAYPRO, XEROX 820, CP/M 86 as well as standard 8" IBM format. Standard features: 96K of RAM, parallel and serial ports, cassette and joystick ports, RGB and Composite Color interfaces, HI-RES graphics and much more! Six month warranty.

~~$1995.~~
$1489.

SYSTEM SPECIAL!

Complete LNW 80 Model II system includes:

Enhanced LNW 80 MOD II	$1995.
2 TEC disk drives, 40 tracks	$660.
BMC 12A green phosphor monitor	$149.
Video and drive cables	$29.
	~~$2833.~~

SAVE $838! $1995.

PRINTER SPECIALS!

New TOSHIBA P1350 dual mode printer • 100 CPS letter quality and 160 CPS draft quality ..... $1595.

C. ITOH F10 40 CPS • bi-directional daisy wheel printer ..... $1379.

New SEIKO GX-100 • 50 CPS dot matrix printer with built-in tractor feed ..... $244.95 *This is a Price Breakthrough!

OKIDATA 83A ..... $669. • 120 CPS dot matrix printer with tractor feed.

PROWRITER parallel 10" ..... $469.

PROWRITER parallel 15" ..... $679.

EPSON MX-100 ..... $649.

SOFTWARE SPECIALS!

SUPER™ $244.95

Data base management system. • 13 times faster than dBASE II™ this is the most powerful, easy to use DBMS program that we have seen! For TRS-80 and CP/M.

THE FINANCIAL PLANNER . $479. • New from Ashton-Tate, this is the strongest financial modeling language available.

INFOSTAR ..... $387. • New from **MicroPro®**, now you can write custom applications with plain English and edit your reports with WORDSTAR!

THE BOTTOM LINE STRATEGIST ..... $295. • New from Ashton-Tate, this is the finest econometric tool available today for developing financial and marketing strategies.

ACCESSORY SPECIALS!

LNW ⅛ doubler	$159.
LNW ⅛ doubler with DOSPLUS 3.4	$175.
LNW expansion II	$329.
TEC DISK DRIVES: 5¼" double density drives w/case & power supply	$245.
MITSUBISHI DISK DRIVES: 2 thin line drives in one case w/power supply — **3.2 MEG OF STORAGE!**	$995.

MicroPrice

We're the helpful, friendly computer wholesalers that sell direct to users by mail only. No showrooms. No toll free numbers. Just the best prices you'll find anywhere.

All prices quoted are cash discounted prices. We also honor Mastercard, Visa, American Express and Company purchase orders.

MicroPrice
1100 EAST HECTOR STREET
CONSHOHOCKEN, PA 19428
215-664-5383

CIRCLE 188 ON READER SERVICE CARD

DISCOUNT

TRS-80®

TRS-80 MODEL III
$1950 48-K 26-1066
$819 16-K 26-1062

TRS-80 MODEL II
$3000 64-K 26-4002
TRS-80 8 4 MEGABYTE HARD DISKS (PRIMARY UNIT) $4000

TRS-80 MODEL 16
$4825 128-K 26-6002

TRS-80 COLOR
$309 16-K 26-3004
$425 16-K 26-3002
$525 32-K 26-3003

WE HAVE COLOR DISK DRIVES 0— $475 1-2-3— $315

WE ALSO CARRY EPSON AND OKIDATA PRINTERS,
XEROX 820 AND ALTOS COMPUTERS
NO OUT-OF-STATE TAXES T M TANDY CORP
Sold with the manufacturer s limited warranty Copies of such war ranty may be obtained for review from Perry Oil and Gas Co

PERRY OIL & GAS INC.

Dept No 4-8 137NORTH MAIN ST PERRY M CHIGAN 48872
PHONE (517) 625-4161 MICH
FOR OUR PRICES,
PLEASE CALL TOLL FREE
1-800-248-3823

WE ACCEPT CERTIFIED CHECKS,
CASHIERS CHECKS
AND MONEY ORDERS

CIRCLE 234 ON READER SERVICE CARD

PROGRAMS FOR A BUCK?

Apple II Plus / Apple IIe
Atari 400, VIC 20, TI-99/4a, Sinclair

PROGRAM OF THE MONTH CLUB

Each month, receive a disk or tape with 6-9 ready to run programs.
Cost is less than $1 per program

Games • Tutorial • Home Management • Utilities

	Tape	Disk
12 Months	$90.00	$95.00
6 Months	$50.00	$55.00
Single Issue — $15.00		

Program of the Month Club
Municipal Information Systems, Inc.
339 Bonney Street, New Bedford, MA 02744
(617) 997-4177

Atari, Vic 20, TI-99/4a, Apple II are trademarks of Atari, Inc., Commodore International, Inc., Texas Instruments, Apple Computer, Inc. respectively.

CIRCLE 198 ON READER SERVICE CARD

iews...book r

Steve Gray

Logo: An Introduction, by J. Dale Burnett. Creative Computing Press, Morris Plains, NJ. 67 pages, paperback $7.95. 1982.

The front cover says this book is "For teachers, students and other computer users new to the philosophy and methodology of Logo." The back cover says it's a "first-of-its-kind primer...specifically designed as a practical guide for the teacher using Logo in the classroom or computer lab."

Logo is a highly interactive language that uses a triangle-shaped cursor called a "turtle," and graphics that "teach logical thought processes and problem solving."

The book, meant for hands-on use, has large type like a child's book, but the language is more that of the elementary or junior high school teacher; for example, it says, of the turtle cursor, "its gender is in the eye of the beholder."

The book is divided into 16 sections, on Getting Started, Soft Saves (saving a procedure); Powerful Idea #1 (combining a simple pattern into a more complex pattern); Hard Saves (saving a Logo file on disk); Powerful Idea #2 (variable inputs); Rotating Polygons About a Vertex; Symmetry; Curves; Cartesian Coordinates and Polar Geometry: A 2-Person Game; Powerful Idea #3 (recursion); Arithmetic and Logic (plotting functions); Turtle Races; Literacy (creating large letters); Alphabets, Words, and Sentences (text manipulation); Question and Answer Procedures (creating a quiz).

The emphasis is on doing, right from the beginning; after four pages on the basics, the reader is asked to draw over a dozen figures, from a line to a circle to a picture. Each new concept is followed by ways of using it in Logo, with printouts, drawings, and callouts to help the reader understand exactly what he is doing. Hints are given for some exercises, but the majority ask only, for example, "How many ways can you make a checkerboard?"

Even without a computer, the reader gets a fine understanding of what Logo is and how to use it. With a computer, the book provides an excellent primer of Logo basics, by making the reader do most of the work.

Microcomputer Graphics, by Roy E. Myers. Addison-Wesley Publishing Co., Reading, MA. 296 pages, paperback $11.95. 1982.

The title of this latest of Addison-Wesley's Microbooks is somewhat misleading. It's not a general text on microcomputer graphics, but, as the slash on the corner of the cover indicates, it is "With Apple II Examples," which means that all the examples are written in Applesoft Basic. The back cover says the book "fully explains the graphics capabilities of the Apple II while introducing the mathematical and programming techniques central to computer graphics."

The nine chapters are divided into six parts: Introduction (The World of Microcomputer Graphics), The Computer

views...book

(Graphics Characteristics of the Apple II, Text on the Graphics Screen), 2-D Graphics (Software Tools for Computer Graphics, Analytic Geometry and Computer Graphics), 3-D Graphics (Basics of 3-D Graphics, Hidden Line and Hidden Surface Routines), Animation (Animated Images), and Peripheral Equipment and Software (System Components). Six appendixes provide information on number systems, shape tables, vectors, matrices, radian measure of angles, and program listings for the six images on the front and back covers.

As the chapter titles show, this is not like most of the personal computer graphics texts, which don't get much beyond what is in the first three chapters of this book, plus perhaps a little on animation. Myers assumes a knowledge of Basic, and starts right off with short programs for creating a bouncing ball and a space ship. Depending on the reader's knowledge of Basic and programming, he may find the going a little tough once he gets to the chapter on Software Tools. However, Myers gives about as much help with matrices as can be expected without presenting a course on the subject. And when he gets to the 3-D chapter, he starts with a notice, "Warning—read sowly, mathematics ahead," and adds, "The process of displaying three-dimensional images requires additional mathematics. As is usual when traveling in rough terrain, we will progress more rapidly if we move slowly and carefully."

This is the best book of its kind seen so far by this reviewer, who would like to see it "translated" for several other personal computers. Myers makes a difficult subject comparatively easy to understand, and writes as simply as possible.

The book includes 73 programs, and a disk containing them all is available from the author for $15.

My Computer Dictionary, by Jean Rice and Marien Haley. T.S. Denison & Co., 9601 Newton Ave. S., Minneapolis, MN 55431. 32 pages, paperback $3. 1981.

As the title indicates, this is a children's dictionary of computer terms, with several illustrations per page. Although most books with similar titles are for young children, this one is for children who can read. The 47 illustrations include photographs, drawings, flowcharts and brief programs.

The illustrations are all quite good, including photographs of computers, peripherals of media, and drawings of a joystick, light pen, keyboard, etc., although photographs could have been used in place of many of the drawings.

Most of the definitions are simple, straightforward and good. *Address* is defined as "a number or name that tells where to find a place in a computer's memory. It is like a house **address** that tells where to find the house." A bug is "a mistake in a computer program. The **bug** must be corrected before the computer can use the program properly."

Some definitions are a little misleading, although by very little. An acoustic coupler is said to "change information into signals," and a microprocessor is described as being "about the size of a band-aid."

However, all things considered, this dictionary is a useful tool

Man's Best Friend

Micro Management Systems, Inc.
2803 Thomasville Road East
Cairo, Georgia 31728
(912) 377-7120

Since 1978

- REPUTATION BACKED BY YEARS OF EXPERIENCE.
- PIONEER IN DIRECT TO CONSUMER SALES OF MICRO COMPUTERS AND ELECTRONICS
- MILLIONS OF DOLLARS IN SALES OVER THE YEARS
- TENS OF THOUSANDS OF CUSTOMERS
- HONEST
- RELIABLE
- LARGE INVENTORY
- NAME BRAND PRODUCTS

DISCOUNT PRICES

BUY DIRECT

It's simple. . .
CALL & SAVE MONEY

1-800-841-0860
CONVENIENT ORDER ENTRY
Ga. & Info 912-377-7120

COMPUTERS & EQUIPMENT

EPSON PRINTERS
MX-80..... $369
FX-80..... $CALL
MX-100.... $CALL
CALL - NEW PRODUCTS

SMITH CORONA
TP-1 DAISY WHEEL PRINTER
DISCOUNT PRICED FROM $499

TRS-80 COMPUTERS
FROM
Model 12..... $2639
Model 16..... $4012
Model III..... $588
Model IV..... $CALL
Portable..... $CALL
Color Computer $CALL
New Products.. $CALL
WE CARRY THE COMPLETE LINE OF TRS-80 COMPUTERS

OKIDATA PRINTERS
Complete line
DISCOUNT PRICED FROM $339

C. Itoh PRINTERS
FROM $397

brother.
$CALL

TRS-80 PRINTERS
Complete line
DISCOUNT PRICED FROM $199

Commodore COMPUTERS
FROM $139
VIC 20 COMPUTER
COMMODORE 64
VIC 1541 DRIVE
VIC 1525 PRINTER
VIC 1530 DATASETTE
VIC 1600 MODEM
SOFTWARE
$CALL

FRANKLIN
ACE 1000
ACE 1200
DISCOUNT PRICED FROM $898

ATARI

Novation

Hayes

STAR PRINTERS
GEMINI-10
GEMINI-15
DISCOUNT PRICED FROM $339

ALL PRODUCTS WE CARRY ARE BRAND NEW AND COVERED BY MANUFACTURER SPECIFIC WARRANTY PRICES AND PRODUCTS SUBJECT TO CHANGE WITHOUT NOTICE

FREE UPON REQUEST
• DISCOUNT PRICE LIST AND INFORMATION KIT
• COPY OF MFR'S WARRANTY
WRITE
MICRO MANAGEMENT SYSTEMS
TELEMARKET DEPT. NO. 3
2803 THOMASVILLE RD. E. • CAIRO, GA 31728

CIRCLE 194 ON READER SERVICE CARD

Commodore 64 Computer

over $300 Free Professional Software
when you buy a Commodore 64 computer

COMMODORE 64
PROFESSIONAL SOFTWARE

Name	List	Sale
word processing pack	$89.00	$69.00
Quick Brown Fox — word processor	$69.00	$59.00
complete Data Base pack	$89.00	$69.00
Electronic spreadsheet pack (like visicalc)	$89.00	$69.00
Accounting pack (personal & business)	$59.00	$49.00
Programmers Helper	$79.00	$59.00
Programming Reference guide	$20.95	$16.95
Basic Tutor	$24.95	$19.95
Typing Tutor	$24.95	$19.95
Fort Apocalypse (top selling arcade game)	$34.95	$29.95

80 COLUMN BOARD

80 characters per line on the screen at one time. Includes word processing pack, mail merge data base pack, Electronic spreadsheet. ALL FOR ONLY $179. (less $20 accessory purchase discount)

We have over 300 Programs for the Commodore 64 Computer

• 10 day free trial • We have the lowest prices
• One day delivery express mail • Free Catalogs
• WE LOVE OUR CUSTOMERS

• 10 day free trial • We have the lowest prices
• One day delivery express mail • Free Catalogs
WE LOVE OUR CUSTOMERS

PROTECTO
ENTERPRIZES (FACTORY DIRECT)
BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

CIRCLE 224 ON READER SERVICE CARD

iews...book r

for helping the student understand computer texts that have no glossary, or an inadequate one. The definitions are all quite reasonable, and aren't written, as in some other dictionaries, with words that must sometimes be looked up themselves.

This book is also useful to the average person who has heard some of these words and wants to know what they mean without getting a long, technical description. School libraries should also find it a help.

Computers are Fun, by Jean Rice and Sandy O'Connor. T.S. Denison & Co., 9601 Newton Ave. S., Minneapolis, MN 55431. 62 pages, paperback $3.95. 1981.

Teacher's Guide and Activity Book to accompany *Computers are Fun*, by Rice and O'Connor. T.S. Denison & Co. 92 pages, paperback $12. 1981.

Designed to introduce computer literacy to very young children (kindergarten through grade three), the student text is a hi-tech version of "See Spot run." The first paragraph starts:

> Here are Bill, Kim and Jan. They are all friends. They are playing a computer game. Jan's Dad, Mr. Hanson, is watching. "Look at the ball. It moves up and down on the TV," said Jan. Dad said, "This game has a computer inside. The computer makes the ball move. There are many other games that have a computer inside."

And so the book goes, with many large photographs of large and small computers and peripherals, and many drawings of teachers and students, of products that use computers (microwave oven, airplane, spaceship), flowcharts, etc.

The six chapters discuss how computers help us, computer history, parts of a computer system, microcomputers, flowcharts, and programs. One three-line Basic program prints the answer to two simple additions, and a two-liner prints the title of the book.

The guide contains day-by-day minimum-time-frame unit outlines for students in kindergarten and grades 1, 2, and 3. A third of the book is devoted to activities for each chapter, and includes objectives, tells which of the 27 full-page duplicating masters to use, gives words to learn, a detailed activity guide to the student-text pages, review questions, a chapter summary, and a crossword puzzle that uses new words introduced in that chapter.

However, many of the masters involve math exercises that aren't relevant and are of little educational value to the subject. Master F presents a maze; H and I involve counting with stones; L requires coloring several computer lights red; O requires printing your name as many times as you can in a minute, etc., etc.

The guide also contains 16 pages of reference material: films on computer topics; filmstrips and other multi-media, a bibliography; and a glossary. But most of the films and filmstrips listed are not for young children.

The text is a good introduction to computer technology, if the child can read it. But the activity guide isn't worth the $12; any competent teacher could read the text, learn from it, and come up with activities on her own.

Exploring the World of the Personal Computer, by Jack M. Nilles. Prentice-Hall, Inc., Englewood Cliffs, NJ. 249 pages, paperback $12.95.

The back cover says this is a "review of low-cost computers as their usage expands in the present, and a forecast of the potential implications inherent as they proliferate."

views...book

The 14 chapters are divided into three parts: Personal Computers and Personal Computing (the information society, personal computers, personal computers in the home), Uses (office computers, fun and games, learning via personal computers, more about home personal computers, medical uses), Reflections (Big Brother, the have-nots (personal computers as luxuries), international personal computers, standards, personal computers and mental health, blaming the computer). A brief epilog discusses whether the personal computer is friend or foe, followed by a glossary and "bibliography and recommended reading" section.

The author, a senior research associate at USC's Center for Futures Research, takes a middle-of-the-road approach, presenting the personal computer as neither a scary privacy-invading monster, nor a simple tool we can all easily cope with. In his last paragraph, he says, "As with all powerful technologies, we can use it for our ultimate good or we can do a great deal of harm with it. Almost as bad, we might do only trivial things with it."

Nilles uses the scenario technique to help the reader evaluate the personal computer as a factor for his lifestyle, and then keys dialogs to the scenarios, as a way of presenting arguments for and against a particular application.

This book is recommended to those who want a thoughtful, conservative, realistic look at the present and future of personal computers, presented quite well in just over 200 pages of main text.

Microcomputer Graphics and Programming Techniques, by Harry Katzan Jr. Van Nostrand Reinhold Co., New York, NY. 237 pages, hardcover $18.95. 1982.

The press release says this "first easy-to-understand reference offers a non-technical introduction to computer graphics technology." Well, it isn't all that easy, and the programs were written for the Apple II Plus computer, which has built-in graphics commands that simplify programming considerably.

Although the jacket says "it doesn't matter if you've never looked at a computer before," it would help to know something about computers before you tackle this book, which more closely resembles a college textbook than an easy guide.

For example, the introductory chapter includes a state diagram showing the "operational modes of the computer in response to various forms of input," which is much too technical for such a book, and isn't explained at all. The second algorithm in the next chapter, on applications and programming concepts, generates Fibonacci numbers; a program for doing the same starts off the fifth chapter, on Basic.

The book seems to have been written around the two dozen programs in the last four chapters, which are about lo-res and hi-res graphics, animation, and 2-D and 3-D transformations. They include the game of *Life*, stereo effect, generating "visual white noise" (random lines), string art, moving birds and dogs (animation), etc. The last chapter, on image transformation (translation, rotation, scaling), includes two fine programs for 2-D and 3-D transformations, but they aren't explained at all. And two important figure captions are transposed, adding to the complexity.

This book can be recommended if you have some knowledge of programming, and want to learn something about graphics, but aren't willing to learn enough about vector math and matrices to understand, for example, the outstanding $19.95 "Graphics Software for Microcomputers," by B.J. Korites (reviewed February 1982, p. 220). □

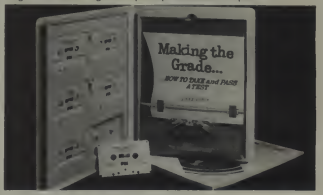
Taking the Scholastic Aptitude Test (SAT) isn't usually thought of as being like a game; but it should be, because it comes down to a battle of wits that's won as much with strategy as with "facts".

"Preparing For The SAT and Other Aptitude Tests" by PDI is a three-way interactive learning system that involves you, your computer and the text, in a process that makes you really SAT-ready.

You will learn:

- How to become a confident, successful test-taker from now on
- How test-makers think and what tests *really* measure.
- Why cramming doesn't help and why playing with puzzles does.
- Why and how to skip questions and increase your score.
- How to find the questions you can answer in a snap.

Once you've learned these tips and more — it's on to training in specific parts of the SAT procedure. Not only will you get all the practice you'll want from the programs, you'll also gain a thorough understanding of the principles *behind* the problems.



"Preparing For The SAT" contains the following.

- **Taking Aptitude Tests** — a program that demonstrates what to expect and not expect from the SAT.
- **Making The Grade** — a valuable guide to the world of test-making and test-taking. Includes strategies for many types of tests
- **A Course Book** which complements the computer programs.
- **Vocabulary Builders** — two courses that help develop your verbal skills
- **Analogies** — examples of many types of analogies and how to find their "keys"
- **Number Series** — theory and practice in supplying the missing numbers.
- **Quantitative Comparisons** — a review of mathematics from elementary arithmetic through algebra and plane geometry.

Packaged in a sturdy, attractive storage case, "Preparing For The SAT" is available for ATARI™ 24K Disk (Cassette and Joystick), 16K Cassette and Joystick and Apple™ 32K Disk and Cassette.

APPL is a trademark of Apple Computer Corp.
ATARI is a trademark of Atari Inc.

Available at fine stores or direct from PDI.

Program Design, Inc. 95 East Putnam Avenue, Greenwich, CT 06830

CIRCLE 215 ON READER SERVICE CARD

How to select the right software for your home or office computer.

The 1983 Software Buyer's Guide saves you time, trouble and money!

Today's explosion in computer technology has multiplied the software options for your personal or business computer. Without expert help, you can get lost in the jungle.

That's why the editors of **Creative Computing** have compiled the **1983 Software Buyer's Guide.**

Here—in one handy guide—is a comprehensive collection of up-to-date software reviews from our magazine. It's the one and only reference you need to select the software that's right for you.

In this guide, the latest software products are tested and evaluated by experts at **Creative Computing** who know computers inside out. You'll get their candid, unbiased recommendations on software for:

- –business
- –word processing
- –graphic displays
- –intellectual recreation: strategy, fantasy, adventure, action simulation and arcade games.
- –financial and investment analysis
- –real estate and property management
- –music
- –education

Each thorough, easy-to-read review contains:

- **Complete descriptions** of software programs and analysis of their strengths and weaknesses.
- **In-depth evaluation** of program efficiency. What tasks is it best suited for? How "user-friendly" is it? What is the screen display quality?
- **Photos and illustrations** so you can actually see how the software package works.
- **Quick-reference boxes**—an at-a-glance checklist of system requirements, formats, language, price, manufacturer, plus ratings for each program.
- **And more!** Including hard facts and figures to back up our opinions. And comments from people who actually own and use the programs.

Included in this new edition are practical programs like TK! Solver, Vision, Paint and Video Easel and Slide Show—plus the latest games for Color Computer, TRS-80, Apple, Atari, and more!

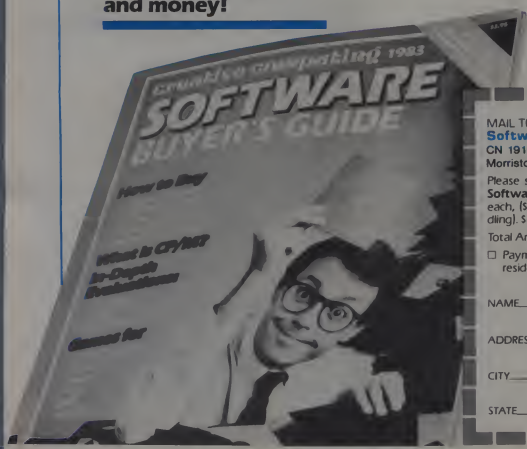
You'll also find step-by-step guidance on buying a word processor, database manager, educational or recreational software.

And once you decide on the programs you want, you can find out where to get them through the convenient directory of manufacturers that's included.

With the **1983 Software Buyers Guide,** everything you need to know about buying software will be right at your fingertips. That saves you time and trouble.

You'll also buy the **right** program the **first** time. That saves you money.

Get the hard facts about software in the **1983 Software Buyer's Guide.** Send for your copy today. Only $4.95!



MAIL TODAY TO:
Software Buyer's Guide
CN 1914
Morristown, N.J. 07960

Please send me _____ copies of the **1983 Software Buyer's Guide** for only $4.95 each, ($3.95 plus $1.00 for postage & handling). $6.00 outside U.S.A.

Total Amount $_____

☐ Payment Enclosed (CA, NJ and NY State residents please add applicable sales tax.)

NAME_____
(please print)

ADDRESS_____

CITY_____

STATE_____ ZIP_____

creative computing's RETAIL ROSTER

A DIRECTORY OF STORES AND THE PRODUCTS THEY CARRY
TO PLACE A LISTING CALL COLLECT: LOIS PRICE (212) 725-4215

ALABAMA

VILLAGE COMPUTERS, 1720 28th Avenue South, Homewood, 35209 (205) 870-8943. Apple, Vector, Graphics, Peripherals, Software, Training and Service

ALASKA

JUNEAU ELECTRONICS—1000 Harbor Way, 99801 (907) 586-2260 Apple, Osborne Hardware/Software/Peripherals. Full Service and Support

ARKANSAS

GAME SHOP — Ft. Smith 72902 Computer Software for personal computers. 7 days/week

CALIFORNIA

D E S DATA EQUIPMENT SUPPLY—8315 Firestone, Downey 90241 (213) 923-9361 VICVILLE (714) 778-5455 Commodore PET, Commodore-64, Vic-20 specialists Latest software, Hardware, Books, Supplies, Peripherals in stock

PC COMPUTERS, 10166 San Pablo Ave . El Cerrito 94530 (415) 527-8044 Commodore Pet, Vic 20 Specialists In House Maintenance

BEST COMPUTER STORES, INC 1122 B Street, Hayward 94541 (415) 537-2983 Apple, Compupro, Gimix, Osborne, Otrona, Panasonic

BYTE SHOP OF HAYWARD, 1122 B Street, Hayward 94541 (415) 537-2983 Apple, Compupro, Gimix, Os borne, Otrona, Panasonic

VANGUARD DATA SYSTEMS, 8696 South Atlantic Avenue, South Gate, 90280, 213-584-8402, Mon-Sat North Ster, Televideo, CPM Software

COMPUTER CHAMP, 1200 South Sunset Avenue, West Covina, 91720, (213) 960-8844 Franklin Ace 1000, DTC printers, software, peripherals and supplies

VALLEJO—COMPUTERIDEAS, 1029 Tennessee St.. (707) 552-5078 Commodore, Epson, Senyo. Software/Peripherals. Full Service/Support.

CAMPBELL—DATA BANK, 384 E. Campbell, (408) 370-0199. 1000+ Apple Software, 300+ Atari Software, 300+ VIC Software, plus NEC, TRS, PC, and more. Discount prices—Expert knowledge.

STOCKTON—STOCKTON COMPUTER, 4555 N Pershing, (209) 952-2028 Franklin, Software/Peripherals Discount prices with full service and training!

BERKELEY/OAKLAND—TECHNIKA COMPUTER CENTER, 2120 Dwight Way, Berkeley, (415) 841-5328 KAYPRO, Pied Piper, Northstar, Compupro. Services/Support/Training

GLENDALE—COMPUTER PALACE 1029 E Broadway, (213) 241-2551. Hardware/Software/Peripherals/Service Business/Home—Best Prices!

COMPUSALES— 16819 South Hawthorne Boulevard, Lawndale 90260 (213) 370-3224 IBM, Victor 9000, Besta 108 Osborne, NEC, Apple

AUBURN-AMERICAN MICROTEL 884 Lincoln Way, Suite 32B, 95603 (918) 885-1172 Apple/Franklin, Atari, Commodore, Corona, IBM. Software, Hardware, Peripherals, Books/Magazines Classes Research, Personalized consultation for systems tailoring. Atari Service, Factory Authorized Network

CONNECTICUT

COMPUTERWORKS—1439 Post Rd East, Westport 06880, (203) 255-9096 12-6 Tues -Fri., 12-8 Thu., 10-5 Sat.

EAST HARTFORD—COMPUTERIFICS, 358 Burnside Ave ,06108 (203) 528-9810. Atari, Epson, IBM, NEC, Okidata, Panasonic, Vector. Sales and Consulting

DELAWARE

COMPUTERLAND, ASTRO SHOPPING CENTER, Newark 19711, (302) 738-9658. Authorized Sales/Service— IBM, Apple, Osborne, Software, Peripherals, Training

FLORIDA

COMPUTER SYSTEM RESOURCES, INC., GAINESVILLE—Butler Plaza 32601, (904) 378-4276 Apple, Osborne, Atari, Software, Peripherals, Classes, Service

GRICE ELECTRONICS, Fort Walton, Panama City, Pensacola 32501, 800-342-4846 (800-874-8398). Apple, Hewlett-Packard, 24 Hour Service.

APPLE AND SANYO at fantastic savings Service, support, discount prices. Southern Micro Computer, 15945 NW 57th Avenue, Miami Lakes, FL 33014. (305) 621-4137 Serving south Florida for over 5 years.

FLORIDA BOOK STORE COMPUTER CENTER—1814 West University Ave. Gainesville, 32604 (904)378-5606 Commodore, Hewlett-Packerd Computers Software and Accessories.

FAMILY COMPUTERS—4047 Bee Ridge Rd ,SARASOTA 33582 (813) 921-7510 TDP-100 micro; SV-318 Computer. Peripherals/Software/Books

ORLANDO-SOFTWARE UNLIMITED, 3218 East Colonial Drive 32803. (305) 894-3304 Programs, Printers. Supplies for micro-computers. Discount Prices!

TAMPA—MICRO COMPUTER SYSTEMS, 144 South Dale Mabry Highway, 33609 (813) 875-0406 Authorized Level 1 Apple Dealer.

GEORGIA

FAYETTEVILLE—AI'S COMPUTER STORE, 105 Commerce Drive, 30214, (404) 461-3881 Franklin/Corona Computers Apple Accessories/Service Training

MENTOR TECHNOLOGY, 3957 Piesasntdale Road, Atlente, 30340, 404-447-8238 Franklin, Atari, Televideo, Sanyo, Altos, C ITOH Printers Software CP/M, Apple, IBM

ILLINOIS

COMPUTERLAND/DOWNERS GROVE—138 Ogden Ave., Downers Plaza 60515, (312) 964-7782 10-8 Mon.-Sat , 10-8 Tue , Thurs. IBM, Apple, Atari, Osborne, IBM Personal Computer, Fortune

VIDEO ETC., 465 Lake Cook Plaza, DEERFIELD, 60015, (312) 498-9689 Other locations SKOKIE (312) 675-3655, ORLAND PARK (312) 460-8980, BUFFALO GROVE, (312) 459-8677, strong Hard/Software support for Apple, Atari, Kay Pro, IBM-PC

LOMBARD—COMPLETE COMPUTING—890 E Roosevelt (312) 820-0808 Apple, Atari, NEC, Altos, Dynebyte, Software, Peripherals, Classes

FARNSWORTH COMPUTER CENTER—1891 N. Farnsworth Ave., Aurora 60505, (312) 851-3888 and 383 E. North Ave., Villa Park 60181, (312) 833-7100 Mon.-Fri. 10-8, Sat. 10-5 Apple, Fortune, Hewlett-Packard Series 80 Systems, HP Calculators, IDS Prism, SMC, Daisy Writer Printers

COMPUTERS ETC., 2515 West 147th Place, Posen 60469, (South suburbs of Chicago). Apple, Zenith Hardware/Software/Service. Complete learning center

DIGITAL WORLD—ADDISON, 711 Army Trail Rd , 60101, (312) 628-8222 Atari, Commodore, Franklin, NEC, Xerox, Zenith and more. Books/Magazines. Full Service and Training

COMPUTERLAND/NORTHBROOK—3060 Dundee Road 60062, (312) 272-4703. IBM, Apple, DEC, Osborne, Altos, Compaq, Software, Peripherals, Service.

THE SOFTWARE STORE—Glenview—1767 Glenview Road, 60025, (312) 724-7730. Microcomputer Software. Apple, IBM, CP/M, more. Special order Specialists! Open Mon.-Sun.

NILES—COMPUTERLAND—9511 N. Milwaukee Ave 60648, (312) 967-1714. Apple, IBM Personal, Cromemco, Fortune, Osborne, Otrona, Software.

DATA DOMAIN OF SCHAUMBURG, 1612 E. Algonquin Rd., Schaumburg 60195. (312) 397-6700. 12-9 Mon.-Fri., 10-5 Sat. Authorized Sales and Service for Apple II, Apple III, LISA, Osborne and Alpha Micro Computers. Hewlett-Packard Calculators and accessories. Largest Book and Magazine selection in Midwest. VISA, MC, Amer. Exp. accepted for phone orders.

INDIANA

INDIANAPOLIS—HEATHKIT ELECTRONIC CENTER, 2112 E. 82nd St., 46220, (317) 257-4321. Heath/Zenith Computers, Software, Peripherals, Service.

KANSAS

MISSION—HEATHKIT ELECTRONIC CENTER, 5980 Lamar Avenue 66202 (913) 362-4486 Heath/Zenith Computers, Software, Peripherals, Service

GAME SHOP—Wichita 82701. Computer Software for personal computers. 7 days/week.

KENTUCKY

SHELBYVILLE—SOUTHERN COMPUTER SYSTEMS—830 Main Street, 40065 (502) 833-5839 Microcomputers: Northstar, TRS-80, Kaypro, Besta 108, Atari Peripherals Okidata C Itoh, Smith, Corone, Corvus Software All major brands Turnkey Systems, we service all major brands and peripherals!

LOUISVILLE—HEATHKIT ELECTRONIC CENTER—12401 Shelbyville Road, 40243, (502) 245-7811 Heath/Zenith Computers, Hero Robots, Software, Peripherals.

LOUISIANA

COMPUTERLAND/LOUISIANA—312 St Charles, New Orleans 70130 (504) 522-2255 IBM, Apple, Osborne, Fortune, Vector #1 in service

THE COMPUTER PEOPLE—Apple, NEC, Osborne, Corvus Concept—Seminars, Sales, Service. Houma, Morgan City, Lafayette 70380. 1-800-352-5828.

HEATHKIT ELECTRONIC CENTER—KENNER 1900 Veterans Memorial Boulevard (504) 467-6321 Come in and see the robots!

MARYLAND

OLNEY COMPUTERS, 3414 First Ave , Olney 20832 Discount prices on Atari, NEC, Epson, Okidata, Commodore, Amdek

BASIK COMPUTERS INC 515 Firstfield Road, Gaithersburg 20878 (301) 840-0312 Epson HX-20 & RX-10, Franklin, Victor & others Hardware, Software, Books & Supplies; Apple & IBM compatibles Call for Discount prices

MASSACHUSETTS

SCIENCE FANTASY BOOKSTORE—18 Eliot St , Harvard Sq., Cambridge 02138, (617) 547-5917 11-8 Monday-Saturday til 8 Thursday. Apple, IBM and TRS-80 games.

THE GAME SHOP—ACTON, 427 Great Road (01720), (617) 263-0418 N E s largest selection of Game/Recreational Software

BURLINGTON/SOFT SUPPLY & SYSTEMS, 88 Middlesex Tpk., 01803 (617) 229-8666 Supporting, IBM, NEC, Digital, SEIKO, Chameleon

SAUGUS—ROUTE 1 LAND OF ELECTRONICS Walnut Place Shopping Center (617) 581-3133 Apple, Altos—Hardware/Software/Peripherals. Service, Classes, Seminars

MICHIGAN

DETROIT—HEATHKIT ELECTRONIC—E Detroit 48021, 18149 E Eight Mile (313) 772-0418—Detroit: 18645 W. Eight Mile (313) 535-8480

COMPUTERLAND, 22000 Greater Mack Avenue, St. Clair Shores, 48080 (313) 772-8540. Altos, Apple, Compaq, DEC, Epson, Fortune, IBM, Osborne

COMPUTER CONTACT—3017 East Hill, Grand Blanc 48439 (313) 694-3740 Apple, Altos, Software, Peripherals, Service Business/Education/Personal

COMTEC COMPUTER SALES—518 Adams Streets, Owosso, 48867 (517) 725-7328. For sales, service, consultation in IBM, Apple, Epson.

SOUTHFIELD—MICRO STATION SOFTWARE CENTER A large selection of Software, Supplies & Peripherals 24484 West 10 Mile, 48034 (313) 358-5820

MISSISSIPPI

COMPUTERLAND — IBM / OSBORNE / SOFTWARE / Training/Service/Books/Megazines 1852 Highway #1 South, Greenville, MS 38701

MISSOURI

COMPUTER ANNEX—411 South Campbell, Springfield 65806 (417) 864-7036. Franklin, Epson, Hardware/Software. Service, Supplies, Classes.

NEW HAMPSHIRE

COMPUTER MART OF NEW HAMPSHIRE, 170 Main St , Nashua, 03060, (603) 883-2388 THE Apple Specialists Full line Hardware/Software. Training/Service

NEW JERSEY

COMPUTERLAND OF CHERRY HILL—Prhe Tree Plaze, 1442 E. Rt 70 .Cherry Hill 08034 (609) 795-5900 Apple IBM Fortune

SOFTWARE MART—352 Bloomfield Avenue Caldwell 2/000 201-228-4949 Software for Apple Atari TRS-80, 10-20"-.ollist

WAYNE SOFTWARE. 1459 Route 23, Wayne Tile Center Wayne 07470. ecross from Pecknenck Center Computers Programs Books Peripherals Discount Prices. 201-628-7318

EARTHRISE COMPUTER CENTER. 6 Green Village Rd. Madison, NJ 07940. (201) 377-4084 Atari, Frenkin, Epson Software/Peripherals/Classes/Service

RED BANK—FELICE'S FOLLIES. 86 Broad St. 07701 (201) 842-2862 Atari: VIC20 84. T199. Time/Sinclair. Hardware . Software . Peripherals-Demonstrations. Books/Magazines Mod-Complete Micro Store in Monmouth County • Competitive prices.

BAYONNE PARTS UNLIMITED. 433 Broedwey, (201) 339-5009 Apple Olivetti Peripherals, Software, Full professional support

COMPUTERLAND/EATONTOWN—I B M P.C. Compaq, Apple, DEC. Service; Leesing; Treining. Software 288 Route 35 (201) 389-2333

PARSIPPANY—COMPUTER NOOK. New location!—160 Route 46 West, (201) 575-9488. Apple DEC. Orrone Sales/Service/Support

ENTRE COMPUTER CENTER—312 Route 4 East. Peramus. 07652 (201) 342-0080 IBM. Digitel, Televideo. Osborne ENTRE—"Your Logical Choice

COMPUTERLAND. 35 Plaza Rt. 4 West Paramus. 07652 (201) 845 9303 Apple, IBM, DEC. etc We know small computers

TRANSNET COMPUTER STORE—1945 Route 22, Union, NJ 07083 (201) 888-7812 1111 Route 35 N. Ocean, NJ (201) 531-7020 Apple, DEC, TI HP, Osborne • Herdware/Software/Peripherals/Accessories Full on-site service Training

NEW YORK

COMPUTER WORLD—5464 W Quoker St., Orchard Park, 14127 (716) 662-4141 M-F 9-9 Sat 9-5 Atari, Commodore—VIC-20, 84 Epson HX20, QX10 computers. end printers Hardware/Software

COMPUTER DISCOUNT SERVICES 448 West 55th St New York. 10019 212-757-8698 iTimex Sinclair, Atari, Texas Instruments Hardware, Software, Peripherals

LEIGH S COMPUTERS. 212 East 85 Street, New York City 10028 (212) 879-8257 Apple, Atari, Franklin, VIC 20, Commodore 64.—Hercware/Software IBM Software All Peripherals Discount prices

ROCHESTER—MICRO AGE COMPUTER STORE—1707 Monroe Avenue 14618 (716) 244-9030 Personal/Business Systems CP/M, MP/M Specialists Unusual applications. Expert Service Books/Periodicals

PLATTSBURGH—U-COMPUTE. 582 Cornelie Street, 563-1679 Apple Vector, Kaypro School, Full Service Support. Full-Time Technician

MERRICK—VIDEO CONNECTION. 27 Merrick Ave. (518) 548-5050 Ateri, TI, Penesonic Herdwere/Softwere Books/Magazines Software try-out eveilable!

STATEN ISLAND—S. I. COMPUTER CENTER. 1660 Richmond Rd .(212) 979-6283 Atari, Franklin, Epson, Xeros, Altos-Hardware/Software/Peripherals for Business and Home Full Service/Training

SOFTWARE EMPORIUM—151 Mineola/Wiffs Ave Roslyn Heights, (518) 825-0550 LARGEST SELECTION OF SOFTWARE ON L.I Apple, Atari, TI Commodore, IBM and more • hardware/peripherals/books/megazines

BUFFALO—DEPEW COMPUTER SYSTEMS, 4891 Transit Rd., (716) 688-5995 Complete line of Apple Computers, Software and Peripherals Service end Classes!

FARMINGVILLE-DATASCAN COMPUTER SYSTEMS. 2306 N. Ocean Ave., (518) 698-8285. Ateri, NEC, KAY-PRO, APPLE Compatibles Business Systems Software/Peripherals/Service/Classes.

JERICHO—HEATHKIT ELECTRONIC CENTER. 15 Jericho Turnpike. (518) 334-8181 Heath/Zenith Computers. Software. Peripherals. Educetionel Classes.

WATERTOWN—MCDASNY COMPUTERS, Steteway Plaza. (315) 782-8608 Apple—Software/Peripherals. Full Service Training is our specialty!

ALPHA STEREO—345 Cornelia Street, Plattsburgh 12901. (518) 581-2822. Atari computers end software Weekdays 10-8, Sat. 10-6, Sun. 12-5.

COMPUTERWARE—2384 Hempstead Turnpike, East Meadow. 11554. (518) 731-7939 Large selection of Apple, Atari, Commodore software Featuring business, utility and games Call for the latest software releases Authorized Franklin Ace service

NORTH CAROLINA

PERSONAL COMPUTER CENTER. 2605 Chapel Hill Boulevard, Durham 27707, 919-493-5488, Raleigh 919-833-2240 Full Line of Apple Hardware/Software for Business, Education & Lisle

COMPUTER & VIDEO CENTER—1902 Clerendon Blvd., New Bern 28560. (919) 838-5030 Vic-20. Northster, Alios Specializing in Small Business Systems.

HICKORY—SIMPLIFIED SOFTWARE. 118 Third Avenue, N.W. 28601; (704) 328-2386 Authorized Zenith Data Systems Dealer Software for Z100, IBM/PC Custom Programming

OHIO

ABACUS II—1417 Bernath Pkwy., Toledo 43615, (419) 865-1009 4751 Monroe St. (419) 471-0082. 10-8, 10-7 Thurs Osborne, Adam, NEC, Ateri, Epson & IDS Printers.

BARNHART STORES—548 N. Main, Urbane 43078. (513) 653-7257 8AM-5PM Ateri/Commodore at discount prices. Timex/Sinclair.

NORTH COAST COMPUTERS. 850 Dover Center, Bay Village 44140 (216) 835-4345. 10-8 Mon-Fri, 10-8 Tuesday, 9:30-5 Seturday. Apple, Osborne. Vector Grephics, Altos

TOLEDO—HEATHKIT ELECTRONIC CENTER. 48 South Byrne Rd. 43615, (419) 537-1887. Heath/Zenith Computers. Software. Peripherals.

COLUMBUS—HEATHKIT ELECTRONIC CENTER, 2500 Morse Rd., (614) 475-7200 Heath/Zenith Computers. Software. Peripherals, Robotics, Training

AKRON—DATA MANAGEMENT SYSTEMS, 3979 W Market St., (216) 666-3224 Ateri, Commodore, OSI, NEC & more Factory authorized dealer/repairs. Software development marketing. systems analysis

NORTH CANTON—COMPUTER STORE, 118 7/h St. N.W. 44720 (218) 497-0299 Franklin, Atari, Televideo, Epson, IDS Full Service/Classes

OKLAHOMA

TULSA—ABS COMPUTER CENTER—8518-E East 71st (74133), (918) 252-1604: Atari, Apple, Hewlett-Packard. Software, Peripherals, Training.

GAME SHOP—Norman, Stillwater, Oklahoma City, Tulsa Computer Software for personal computers. 7 days/week

OREGON

CONTEMPORARY COMPUTERS—1478 Willamette, Eugene. OR 97401 KAYPRO, Chemeleon, Vector Grephic, Altos, Molecular, NEC APC.

PENNSYLVANIA

CALDWELL COMPUTER CORP., 8720 Rising Sun Ave. Philadelphie 19111 (215) 742-8900. Apple, Commodore, Percom, Zenith Sales/Service

INTEGRATED MICRO COMPUTER SERVICE. 188 Medison, Rochester 15074. (412) 728-8331, authorized dealer of Ateri, also selling Televideo, Quasar, Cesio.

THE TOY STORE AND COMPUTER CENTER, 104 S. Washington Rd., McMurray 15317, (412) 941-2029 Whatever is evelable for the Ateri 400/800, Vic-20, Texas Instrumenta, hardware/software is here!

HARRISBURG AREA—1-STOP COMPUTER SHOPPE, 65 N 5th St., LEMOYNE (717) 761-8754. Full line dealers for Osborne, Osborne, Zenith. Software/Peripherals—Service/Training

MARKETLINE SYSTEMS INC., 975 Jeymor Rd., Southampton, PA 18966. (215) 355-5400. We sell and service MicroComputers and peripherels. Related books/megezines evailable

CITY SOFTWARE CENTER—2712 Grant Ave., PHILADELPHIA. (215) 969-3330. Largest selection of 3rd party software discounted up to 20%: Ateri, Apple, TRS-80 I/III/color, IBM, Commodore & more.

PERSONAL SOFTWARE, 148 Peoli Pike, Paoli, 19355. (215) 298-2728 Software Specialists. Custom Programs, Canned Programs and Peripherels

RHODE ISLAND

COMPUTOPIA. 853 North Main Street, Providence, RI 02908, (401) 274-0330. Computer end peripherals specialist Full Service, Classes

SOUTH CAROLINA

OPTEC COMPUTER SYSTEMS: PO Box 210548, Columbie, SC 29221, (803) 731-9731. Systems Service, Software, Data Processing

VERMONT

MONTPELIER, TIRONE'S INC. 22 Langdon Street 05602. (802) 223-6063. Ateri, TI 99/4A Peripherels, Software, Training Authorized Ateri Service Center

VIRGINIA

VIRGINIA BEACH, UNITED COMPUTER CENTER—IBM, Apple, Osborne, Vector Grephics, Olivetti, Alpha Micro, 2929 Virginie Beech Blvd. 23452 804-340-1977; 1107 South Military Highway, 804-424-1075

WASHINGTON

TACOMA-COMPUTERS +, 2504 Jefferson Avenue 98402 (208) 272-2329 Ateri/Commodore Computers Ateri/Commodore/TRS-80 Software. Supplies.

SEATTLE—PROGRAMS PLUS. 16850 Southcenter Pkwy. (206) 575-1375. Apple, Ateri, IBM, TRS-80, CP/M, Commodore—Software/Peripherals/Books. Open 7 days/wk.

CREATIVE COMPUTERS-KENT, 1415 West Meeker, 98031, (206) 854-7629; SEATTLE, 10732 Fifth Sreet, 98124, (206) 365-6502 ATARI, KAYPRO 2, FRANKLIN. Peripherels, software. SERVICE, TRAININGI

YAKIMA—ROB ROY COMPUTER SHOP—1109 West Yekime Avenue 98902 (509) 575-7704 Northstar, Ateri, Software, Peripherals, Magezines.

WISCONSIN

MILWAUKEE—HEATHKIT ELECTRONIC CENTER, 5215 W Fond du Lec,(414) 873-8250 Heath/Zenith Computers. Software, peripherels, robotics.

MAGIC LANTERN. 406 South Park Street, Madison 53715. (608) 251-9112 Apple, Ateri, Commodore, Texas Instruments 700 programs in store

CANADA

ARKON ELECTRONICS LTD.—409 Queen St. West, Toronto M5V 2A5, (416) 593-8502 Apple dealer, Software/Herdwere for Apple, Ateri, VIC-20, TRS-80, end more. Books/Megazines. U.S. Inquiries

SOFTRACK SOFTWARE, 519 King Street West, TORONTO M5V 1K4, (418) 596-8911, Apple, IBM, Atari, TRS-80, CPM: Business/Educatio ;?raphics/Gemes Service and Treining. U.S. Inquiries

BYTE SHOP—VANCOUVER, 2151 Burrerd Street, V6J 3H7, (604) 738-2181. Apple Authorized Netione! Account Dealer DEC, IMS, Morrows. Herdwere/Software, Service/Treining. U.S. Inquiries.

MICRO SHACK OF WESTERN CANADA—PARK ST. REGINA SK S4P 3N8 (306) 543-4079 Commodore Computers/Supplies, Epson Printers, Service/Training. VISA/MC accepted. U.S. Inquiries.

MISCELLANEOUS

FREE CATALOG!

Just let us know and we'll mail you a FREE *Creative Computing* Catalog—16 pages filled with books, buyer's guides, magazines, and more!

To get your FREE catalog, write to: *Creative Computing* Catalog, Dept NA1X 39 East Hanover Ave., Morris Plains, NJ 07950.

creative computing CLASSIFIED

CLASSIFIED RATES: Per Word, 15 Word Minimum. **REGULAR:** $2.00. **EXPAND-AD®:** $3.00. Ads set in all bold type at 20% premium. Ads set with background screen @ 25% premium. **GENERAL INFORMATION:** Prepayment discounts available. Payment must accompany order except credit card—Am. Ex., Diners, MC, VISA (include exp. date)— or accredited ad agency insertions. Copy subject to publisher's approval; must be typewritten or printed. First word set in caps. Advertisers using P.O. Boxes MUST supply permanent address and telephone number. Orders not acknowledged. They will appear in next available issue after receipt. Closing date: 5th of the 3rd month preceding cover date (e.g., April issue closes Jan. 5th). Send order & remittance to: Classified Advertising, **CREATIVE COMPUTING** Magazine, 1 Park Avenue, New York, N.Y. 10016. Direct inquiries to: Kenneth L. Novotny (212) 725-3927.

SOFTWARE

FREE SOFTWARE DIRECTORY. Database manager, mailing list, inventory, accounting, payroll. TRS-80, x-or, IBM-PC. Long SASE: 376 Micro Architect, 96 Dothan, Arlington, MA 02174

LIBRARY MATE. Filing/keyword retrieval system for books, articles, excerpts, etc. Supports multi-volume database CONTOUR MAPPING. High quality contouring system for printer, plotter, CRT. Includes data editor, file manager. Accepts irregular/gridded data. Manual and Hi-Res demo disk $15.00. Consulting/Development of Geological/Geographical Software for Apple and others. Geosystems, Inc., 802 E. Grand River, Williamston, Michigan 48895 (517) 655-3726

VIC-20 TRS 80 SOFTWARE. HARDWARE—Morse code. RTTY EPROM, programmer memory. FRANK LYMAN PO. Box 3091. Nashua. NH 03061

OPTION-INVESTING PROGRAM MAXIMIZES PROFIT. For Apple, TRS-80, IBM. $125 Free Brochure. OPTIONS-80, Box 471-C, Concord, MA 01742.

FREE CATALOG—PET, VIC, Commodore 64 software, Books. TIS, Box 921 Dept. CC7, Los Alamos, NM 87544.

OSBORNE™ GRAPHICS—Create graphics images, movies. Features: graphics and text, half-intensity, block move underlining, automatic program generation. 55 page manual. shipping $29.95. MC. Visa. (613) 881-0194. SuperGraphics from RUFF SOFTWARE. Box 98. Plant City, FL 33566

SOFTWARE CATALOG. We carry brand names at discount—Accounting, Payroll, Inventory/Job Control, Wordprocessing, Financial Management, Data Base, Taxes, Stock Market, Real Estate, Medical, Mailing List, Home, Education and Entertainment. If you're a serious Apple/IBM/PC/Osborne user, send for our free catalog. American Computer Stores, P.O. Box 808, Freehold, NJ 07728.

SELECT SOFTWARE and books at discount. Atari-TRS-80-TI-VIC-more. Send $1.00 extended base for list. Selective Marketing, Box 298, Freeport, IL 61032.

DISCOUNT SOFTWARE—Available for Apple, TRS-80, IBM-PC, and TI 99/4 Personal Computers. Professional applications for the doctor, dentist, attorney, school administrator, teacher, contractor and general office personnel. Catalog $1.00. Write for MONTHLY SPECIAL OFFERS! Creative Discount Software, 256 S. Robertson Blvd., Suite 2156, Beverly Hills, CA 90211.

TI 99/4A MOON TRIP animated graphic program on cassette. Guide module through asteroid belt. Then land on moon. Speech synthesizer and joyst cepability $12.00 postpaid. JAG Software. P.O. Box 2225, Dept. CC. Ocean, NJ 07712

VIC-20 OWNERS send for your free animated catalog cassette M. Pescal Software. Box 1143-C. Santoe. CA 92071

VIC PET. 64 PROGRAMS: Free catalog. Low Prices Top Quality. Write CAG. Inc. Box 2308. Midland. MI 48640

SOLAR SOFTWARE. Vendor DIRECTORY of programs linking the power of the SUN to your computer and hand-held calculators. Harness the SUN to APPLES, IBM PC, and TRS-80 computers, TI-59, HP-97/67/41C calculators. Design solar systems. Determined SOLAR SHADING, SOLAR FLUX, HEAT LOSS/GAIN, COST BENEFIT ANALYSIS, INSULATION, and MUCH MORE. DATA BASES and COMPUTER SERVICES are also listed. Capture the energy of the SUN with alternate energy saving devices and appliances from over 450 businesses and manufacturers. With your check or money order receive 8 PROGRAMS FREE. Send $12.95 to ASTRAL ENTERPRISES, PO Box 153 Dept CCf, Carpenterville, IL 60110

TI PROGRAMS on cassette. Large selection and variety, over 700. 4 sample programs and catalog $3.00. KS SOFTWARE, Box 27130, Cincinnati, OH 45227.

VERY INEXPENSIVE Apple Educational and Recreational programs VOCKELL SOFTWARE. Dept. C. 8927 Knickerbocker, Hemmond, IN 46323

TI-99/4A owners. Send for free list of new and exciting, low cost software. Dynamo Soft. 124 Hicksville, NY 11801.

LOW SOFTWARE PRICES! Check out our fantastic prices on Apple Software. Write for our "FREE" price list. KERR SOFTWARE, Box 5301-CC, Long Beach, CA 90805.

STOCK PORTFOLIO Software. Apple, IBM PC. Includes Portfolio maintenance, inquiry, graphs and reports. MICRO-LOGIC DATA SYSTEMS, Box 37351, Omaha, NE 68137

VIC-20 TURTLE GRAPHICS 23 commands including right (any number of degrees), forward, pencolor, penup. Requires Super Expander. $19.95 cassette from MGM Computers, Box 412, Boulder. MT 59632

XFORTH—FORTH-79 standard sub-set plus extra utilities. 10K+ available for user code. On cassette for 16K ZX-81 $25.00 + $1.00 P & H. Arkansas residents add $1.00 HAWG WILD Software. Box 7668-C, Little Rock, AR 72207

TURN YOUR TV SET INTO AN IFR FLIGHT SIMULATOR using your Apple II and this program. $50.00 at your computer store or order direct from PROGRAMMERS SOFTWEAR, Box 199, Cabot, AR 72023. (501) 843-2988.

MEMOTECH PERIPHERALS. SOFTWARE for word processing, business, education, and other uses at reduced prices. Make your Timex/Sinclair more than a game machine! For further information write SKT Enterprises, P.O. Box 23955, Washington, D.C. 20026

ATARI, APPLE, IBM-PC: Extensive line-educational, entertainment, business. FREE BROCHURE. New Dimension Software, 39010 Baroque, Mt. Clemens, MI 48044.

WORD PROCESSOR! Guess the price: upper/lower case, word wrap, search/replace, preview printed version, page numbering, right justification, block text movement, file linking, alternative (non-QWERTY) keyboards. $200.00? WRONG!! The Cheapsuit Word Processor is $30.00. Apple II 48K DOS 3.3 Non-copy-protected. Cheapsuit Software, Dept. CC-1, Box 923, Iowa City, IA 52244

FREE TI-99/4A software plus informative newsletter. Sample $2.00. Glen Dobbs, Box 801 CC, Santa Maria, CA 93456

COMMODORE 64, VIC-20 Programs. Home management & Educational Software designed by Teachers & Business Professionals $19.95 each. Special Introductory Pre-Pack of 5 H/M or ED Software $79.95 (specify C64 or V20 & H/M or ED. Catalog $1.00. VISA. MC, or Money Order BEST Systems, Div Data Innovators, Inc., PO Box 36573, Bhem, AL 35236-8573.

PREDICT NFL FOOTBALL GAMES accurately up to Superbowl. Easy to type in data. Apple Disk $19.95. Vector Moser, 3504 N. W. 27 Terr., Gainesville, FL 32605.

TI-99/4A PROGRAMMERS: Affordable Software! Catalog, only $1. PROGRAMS SOFTWARE, 1435 Burnley Square North, Columbus, OH 43229.

APPLE TRS-80. STOCK MARKET SOFTWARE FREE INFORMATION. Stock Market Computers, 235 Mesa Avenue. Newbury Park, CA 91320. (213) 884-8700.

GUARANTEED LOWEST SOFTWARE PRICES FOR ALL SYSTEMS! Write for quotes and FREE CATALOG. Specify systems. N.Y.S.E., P.O. Box 722, Newtown, PA 18940.

FIN PAK I: Amortization and Accumulated Depreciation Software. Available on APPLE, ATARI, TI and TRS-80. Includes hard copy feature. $39.95 check, m.o. Send for FREE BROCHURE. MICROAGE ASSOC., 21211 N.E. 2nd Avenue, Miami, FL 33179.

8500/8809/COLOR COMPUTER SOFTWARE including compatible single-user, multi-user and network operating systems, compilers, accounting and word processing packages. Free catalog. SOFTWARE DYNAMICS, 2111 W Crescent, Suite G, Anaheim, CA 92801. (714) 835-4760.

COMMODORE VIC-20. FREE SOFTWARE CATALOG. Write Stone Cold Engineering, 9600 East Girard Ave., Suite 9-A. Denver, CO 80231

BLACKJACK—Cassette game teaches best strategy as you play. For TI 99/4A. Send $12 to Robert Holloway, 383 Tamerack, Henderson, NV 89015.

APPLE-ATARI-COMMODORE SOFTWARE. Price list $1.00. Please specify which computer. 20/20 VIDEO, Box 80132-A, Chicago, IL 80660.

FREE money saving bulletin on popular brand name programs and books for your small computer. Superior, Dept. CR, 8030 Westchester Road, Westchester, OH 45089

EXCHANGE TI-99/4A cassette programs you've created with others. Also, 8-10 GREAT cassette programs only $5 "THE EXCHANGE", CC-1, P.O. Box 48, Sterling, VA 22170.

THE BEST OF PUBLIC DOMAIN CP/M SOFTWARE! Utility Programs, Processor of Words, Catalog Disks, MUCH MORE! Includes Complete User's Manual, 8" SS/DD only $28.95 or CPM/80 FREE information. UNITECH, BOX 98, MANCHESTER, NY 14504

HARDWARE

ATARI, VIC-20, all peripherals. Printers, Modems, Monitors. Diskettes. Apple/Atari Voice box. Software for Atari, Apple. VIC-20, TRS 80. Catalogue available. We'll beat most prices. Its a Micro World, P.O. 17636, Rochester, New York 14817.

NEW EPSON FX-80 Printer $545. Gemini-10 Printer $360. All orders sent COD. Team Computer. (203) 288-5772 P.O. Box 8304. Hamden, CT 06517.

NEC and OKIDATA PRINTERS. AMDEK MONITORS. Free Price List. Lowest Prices! Tech-Systems. P.O. Box 565, Spring, TX 77383

COMPUTER EQUIPMENT/SUPPLIES

EPROM ERASER $49.95. Erases six UV Eproms. 90 day warranty. send orders to LOGICAL DEVICES INC. 781 W. Oakland Blvd., Ft. Lauderdale, Florida 33311, (305) 778-5870

VIC-20 CASSETTE ADAPTOR saves, loads programs on portable audio cassette recorder. $21.95. LOG, 8871 Eighth Street Lane, Oakdale, MN 55119.

WANT A PLEASANT SURPRISE? Call or write for quotes: Atari, Commodore, Timex, TI. Corona (IBM work-alike), Amdek, Anadex, Apple & IBM accessories, Hayes, More. GET SURPRISED! HARDWARE SOFTWARE ANYWARE CO., 10 Colin Street, Brooklyn, NY 11231 (212) 596-3592.

DOUBLE YOUR STORAGE CAPACITY and save 30 to 50% on disk costs. Use precision-edged diskettes on any single sided 5¼ inch disk drive. Simple five minute procedure with complete and easy-to-follow instructions. Send $5.95 to Palmetto Asylum, P.O. Box 4023, Spartanburg, NY 29432.

SUPPLIES! SUPPLIES! SUPPLIES! Diskettes, Ribbons, Computer Paper, ETC.—at VERY competitive prices. FREE DELIVERY IN NYC (COD Outside). BOOT-UP—(212) 888-8141.

DISK DRIVES (APPLE COMPATIBLE): Normal 35 track drive. $219.95 ea., Half Height 40 track drive, $264.95 ea., Controller Card, $59.95 ea. CALL (203) 324-4928 (3:30-4:30 EST) or WRITE FOR OTHER PRODUCTS. WHOLESALE COMPUTER PRODUCTS, P.O. Box 2247, STAMFORD, CT 06906. Dealer inquiries invited.

DOUBLE DENSITY DISKETTES—10/$18. BASF Cassettes-10/$7. Prowriter $400, Micro-Sci, Rana, 4th Dimension Drives from $270. Complete Computers. 737 Empire Ave., Far Rockaway, NY 11691. (212) 471-2438.

NEW! COLOR YOUR COMPUTER'S SCREEN! VideoTex Color Transparency Kit transforms harsh B&W into stimulating Laser Red, Cybernetic Blue, and Phosphor Green. Boosts fun and efficiency for all computer users. Easy installation on B&W screens to 13". Order now receive FREE Amber Sightsaver. Send $8.00: VideoTex-3B, Box 149, Netcong, NJ 07857. Money-back.

COMPUTER PAPER—SAVE $$$—Top quality. Low single-carton prices. Free shipping via UPS. Call A-1, (800) 828-8738 or (213) 804-1270

LOWEST PRICES on Computer Supplies and Accessories. WABASH SS/SD, 10/$17.75. $2 shipping. Price List Computer Accessories Unlimited, P.O. Box 189, Elmont, NY 11003

COMPUTER PUBLICATIONS

FREE! COMPREHENSIVE MICROCOMPUTER BOOK-GUIDE 619 titles, critically annotated, 64pp. Including information on fast, personal service for book ordering. Send $2, refundable with first book purchase, to: Yes! 1035-C3, 31st., Washington, DC 20007. (202) 338-2727

$2 FOR TS 10000, ZX81 string search listing and catalog from PEAK, P.O. Box 8005, Suite 231, Boulder, CO 80308-8005

DISCOUNT COMPUTER BOOKS. Over 80 best selling computer books available at discount prices. Send for free brochure. Computer Books, Box 288, Lompoc, CA 93438

MAKE MONEY NOW with microcomputer and related products! The best monthly newsletter tells how. Let us help you plan, start, grow! How. Box 218, Washington, IL 61571

NEW GUIDE How I make a comfortable living using my micro computer—$3.50 p.p. Embee Press, PineGrove, Kingston, NY 12401

FREE AND INEXPENSIVE SOFTWARE. Monthly Newsletter. Vic-84. Pet/Com 8 months $12.00 12 month $20.00 Send $3.00 for sample. Pearl Products, 3840 Truro Drive, Anchorage, Alaska 99507

COMPUTER CLUB

JOIN THE BIG RED APPLE CLUB, a national Apple user's group with benefits including monthly newsletter and large library of free software. Annual membership $12. Sample newsletter $1. BIG RED APPLE CLUB. 1301 N. 19th, Norfolk, NE 68701 (402) 379-3535

VIC CLUB. Send programs for $1 postage. Send cassette or disk to VIC CLUB, P.O. Box 225, 291 Huntington Ave., Boston, MA 02115

FOR SALE/BARTER

DIAMOND NEEDLES and STEREO CARTRIDGES AT DISCOUNT PRICES for SHURE, PICKERING, STANTON, EMPIRE, GRADO, AUDIO TECHNICA, ORTOFON, ADC, SONUS, MICRO-ACOUSTICS AND LAST. Send S.A.S.E., free catalog. LYLE CARTRIDGES, Dept. C, Box 69, Brooklyn, NY 11218. For fast COD service TOLL FREE 1-800-221-0906. NY state (212) 871-3303. 9AM-8PM except Sunday.

WILL TRADE FACTORY SEALED COMPUTER EQUIPMENT for your McIntosh, Marantz and other quality audio equipment. Martin Gassman, 779 Worcester St., Wellesley, MA 02181. (817)CEL-TICS.

BUSINESS OPPORTUNITIES

MAILORDER OPPORTUNITY! Start profitable home business without experience or capital. Information free. MAIL ORDER ASSOCIATES, Dept. 734, Montvale, NJ 07645

MAKE MONEY IN COLLEGE—Sell consumer audio, video, car stereo and computers. Over 10,000 items in stock of name brand merchandise. Call 800-241-8270 for information and 200-page catalog. ask for Kay.

COMPUTER CASH—101 exciting, new, sparetime home businesses. Report, $4.50. Associated Research, Box 22485, Houston, TX 77227.

MAKING MONEY WITH PERSONAL COMPUTERS! Book only $5.95. Book AND Tapes $25.00. Computer Resources, 1859 Mills Street, Chula Vista, CA 92010.

MULTI LEVEL MARKETING 994/A Home computer 'Ground Floor' Opportunity No Distributor Fees or Inventory costs. Free Information, Call Frank (405) 357-9293.

COMPUTE PROFITS $$$ Create Computer Video Games Sell through mailorder. Guaranteed. Rush $12.95 for complete guide and sample games. TY Enterprises, Inc., P.O. Box 35421, Detroit, MI 48235

EARN BIG DOLLARS SELLING SOFTWARE FROM YOUR HOME/OFFICE! A proven marketing system: Opportunity to make $2,000—$3,000/month. Write off your micro, business expenses—increase your tax deductions. Work full/part-time. (218) 727-1175. NOVATRONICS, P.O. Box 6104, Duluth, MN 55807.

COMPUTE$$-EARN SUBSTANTIAL INCOME WITH your microcomputer. Potential for new career, wealth. Special report details getting started, money-making ideas, marketing strategies. Send $5.00 ELAN, Box 803-CC, Menomonee Falls, WI 53051.

MLM OF HOME COMPUTERS SOFTWARE (Apple, Vic, TI, TRS-80, IBM-PC) Discount Prices. Minimal investment. CWMOA. 164 Colorado Ave. Montrose, CO 81401 (303) 249-9324

GAMES

IBM GAMES!! Compu-Vegas Line: Black Jack, Craps, Slots, Roulette. $4.50 or all 4, $15.00. Compu-Soft, 1928 S. Sieger, Springfield, MO 65804.

WASTELAND ESTATE- An all new text adventure. Defeat the magic and free the town. 48K Disk Applesoft $23.99 CA Residents add 6.5% tax. Evergreen Software. 1409 Mt Diablo #201, San Jose, CA 95127.

TRS-80 MODEL III GAME CASSETTES—Four exciting networks Cards, Space, Sports, Strategy. Write for info, or send $9.95 per network. Mike Goldberg, P.O. Box 321, Farmingdale, NJ 07727.

VIC-20 WINNERS! Super games at super prices! Astroblitz-$33.00-8 star racing in Deep Space! Creative Computing. Write for free catalog. Ask about free game offer. Merrill's, P.O. Box 3381, Irving, TX 75061

IBM PC PRODUCTS

FREE PC INFORMATION, RGB Color Cables, Graphics Software and Booklet—"CHOOSING COLOR MONITORS" J.C. Strick & Associates, 949 S. Southlake Drive, Hollywood, Florida 33019. Or call (305) 925-7004

STUDY any subject on your IBM-PC: program motivates quick efficient memorization. LEARN, Box 512, Rochester, MN 55903 (507) 281-3189 VISA $20.

BANNER PROGRAM PRINTS banners and signs (3" high letters) on your IBM PC. $32.95. SW & A, Box 37085, Houston, TX 77237

STARTREK—THE GAME. An old classic. 64K, 80 column monitor. $24. Richard Waskel, 743 Walnut, Ft. Wayne, IN 46804.

TIMEX/SINCLAIR

FREE CATALOG games, business, science, household software, also hardware. JPR Software, P.O. Box 4155, Dept-C, Winter Park, FL 32793

KROK, STAR SEARCH, NOAH'S ARK, finest programs available. Machine language action, graphics. SASE Brown Cottage, 5488 Bright Hawk, Columbia, MO 21045.

"MUST-HAVE"! UTILITY SOFTWARE. Cassettes-relocatable machine language. SASE for information SIRIUS WARE, 8 Turning Mill Rd., Lexington, MA 02173.

TS/1000-ZX 81 SOFTWARE: Scientific/Games/Customsend $25 to Scientific Techniques, 21810 Ideal Avenue, Forest Lake, MN 55025

INSTRUCTION

UNIVERSITY DEGREES BY MAIL! Bachelors, Masters, Ph.D.s... Free revealing details. Counseling, Box 389-CE7, Tustin, CA 92680.

COMPUTER INSTRUCTION

PC-1 OWNERS! Learn machine language fundamentals. Includes a machine monitor, editor, assembler, and binary calculator with tutorial/manual. $30 ppd. Also have Program catalog utility, $25 ppd, and the Pocket Banner for vertical/horizontal messages. $10 ppd. Structured MicroSyst, 3402 Fernandina Road, Columbia, SC 29210.

TEACH COMPUTER SKILLS $20,000-$70,000. No degree required. Details $2.00. Hi Tech, P.O. Box 4427A, Pittsburgh, PA 15205.

COMPUTER SHOWS

NEW JERSEY MICROCOMPUTER SHOW AND FLEA-MARKET June 11-12, Meadowlands Hilton—new location. For information (201) 297-2526

COMMODORE 64

ARCADE ACTION—MOVIE THRILLS—"Lightcycles" futuristic motorcycle chase-fast machine language for Commodore 64 on Disk or cassette. Send $15.95 to UNICORN Box 7L, Graysummit, MO 63039

COMMODORE 64—Cassettes Mazeman, Blackjack, Backgammon, $9.00 each, three/$22.00. Adventure Games and Mortgage Package available. FREE BROCHURE. Designacom, 5122 Lakeshore, Burlington, Ontario, Canada inquiries (418) 832-7911. US Inquiries.

MAILING LISTS

MAILING LISTS of over 250,000 microcomputer owners for rent. By machine: Apple, IBM, TRS-80, etc. Plus stores, clubs and much more. Write for catalog or call. Irv Brechner, Box 453, Livingston, NJ 07039. (201) 731-4382.

CURRENT MAILING LISTS—TARGET MARKETING 1500 Software/Hardware buyers in 170 computer publications & 100 software vendors. Sorted zip on self-adhesive labels US & Canada. $99.00 to CRT. POB 3151. Redwood City, CA 94064. (415) 595-5595

PROGRAMS

TI-99/4A BUSINESS PROGRAM Provides main index of 3 programs. Specify TI Basic, or printer version. Cassette Based full use instructions easy to use 7 mins per day input needed. Fully guaranteed. $150.00 No CODs Send check or money order to Electronics Lab C14, Box 7, Hudson, NC 28528

T/S-1000 BOOKKEEPING, GENERAL LEDGER 15 Expense columns Monthly, Year to Date Balances. All Basic Easily modified. Includes checkbook transactions. 16K Cassette. $12.00 Stout, Box 4093, Sheridan, WY 82801.

PROGRAMS, HARDWARE. ETC New/Used 5% over cost. Listings considered! $1 for biweekly list (refundable). Specify computer (calculator) R/Qys. 545 W Belden, Elmhurst, IL 80126

IBM-PC, FAST Cross-reference program to BASICA with listings of SUBROUTINES, VARIABLES, FUNCTIONS, and KEYWORDS including FORMATTED program listing. US $28.00 SIS, Inc. P.O. Box 301, Unionville, Ontario, Canada L3R2V3 (418) 224-2694 U.S. Inquiries

SERVICES

LOST AND FOUND National Service Computer Security Products. Save Now, Call (800) 424-5800 Finders, Box 2500-CR, Chesapeake, VA 23320

HELP WANTED

COMPUTER CLUB MANAGEMENT. Firm organizing national student computer club program in elementary and secondary schools, seeks director. Would help establish clubs, supply teachers with organizational materials, and provide follow up with newsletter, visits and related activities. Experience as Editor, Publicist or Manager in computer-related activity desired. Also seeking club administrator to assist in general administration and customer service. Experience with direct mail desired. Competitive salary and benefits with both positions. Contact: Computer Club Project NCS, 217 Jackson Street, PO Box 948, Lowell, MA 01853

USERS GROUPS

VIC-20 USERS GROUP, receive newsletter, programs, discounts and more. Send SASE for information. PO Box 459, Dept. B. Ladson, South Carolina 29458

THE NATIONAL VIC-20 USERS GROUP has the help you've been looking for. NUGGETS, the best VIC-20 newsletter, with in-depth reviews, answers to your programming questions, free programs, and ONLY VIC-20 information! Special member discounts on hardware & software, too! Don't be fooled by cheap imitations! Free details—Dept. B. Box 34575, Omaha, NE 68134

FREE SOFTWARE DOCTORS, DENTISTS, VETS. M.A.S.H.-Medical Applications Software Hardware. "MicroMed/MicroDent" 6389 Colby Way. Virginia Beach, VA 23484 (804) 424-5800

VIC-20 USERS GROUP NEWSLETTER, Programs. Discounts. SASE. National VIC-20 Program Exchange, 102 Hickory Court, Portland, IN 47371.

MISCELLANEOUS

BETTER THAN GAMES—with computer access (or without), meet friends everywhere for hobbies, sports, vacations, business ventures. Write Electronic Exchange, Box 66C21, Manhattan Beach, CA 90266

Creative Computing BUYER'S GUIDE TO PERSONAL COMPUTERS, PERIPHERALS AND ELECTRONIC GAMES

Send $5.00 ($3.95* plus $1.05 postage and handling) to

Creative Computing Buyers Guide to Personal Computers

P.O. Box 649, Holmes, PA 19043

*NJ residents add 5% sales tax

Outside U.S.A. $6.00

the creative computer mart

SOFTWARE AND HARDWARE SHOPPERS GUIDE

ARE YOUR INSTRUCTION MANUALS AND BOOKS PRINTED IN WORD-PROCESSOR TYPE?

Problem: Word Processed and Batch type can be unpleasing to the eye.

Solution: We *convert word-processed type into Phototypeset* camera-ready copy.

Solution: We print, bind, and publish your manuals and books. Our rates are the lowest in the nation!

References — Will be furnished upon request. Our clients are among the major companies in the computer industry.

CompuPrint
152 S. Sepulveda
Los Angeles, CA 90049
Att: D. Paul Cohen
(213) 476-7697

CompuCover

COVER YOUR INVESTMENT

- Static Free
- Cloth Backed Vinyl
- Custom Fitted
- Clear Plastic

WE COVER ALL SYSTEMS
FROM ADDS TO ZENITH

1-800-874-6391
ORDER LINE
Dealer Inquiries Invited

CompuCover
P.O. Box 324 Dept. B
Mary Esther FL 32569

Customer Service
(904) 243-2762
Telex 469782

CALL TOLL FREE

$450.00 WEEKLY

working one or two hours a day with your personal computer. GUARANTEED. Simple program process. No special skills or experience. Free details/application.

BOND INDUSTRIES
7115 Blanco Road
Dept. 114-178
San Antonio, TX 78216

IBM® DISKETTES

5¼" Diskette 1D	5¼" Diskette 2D
Single Side Double Density	Double Side Double Density
$29.95	$39.95
Soft* Box of 10	Soft* Box of 10

* Add $1.75 for Plastic Library Case 8" and other brands also available.

COD ACCEPTED

DEALER INQUIRIES INVITED

CALL TOLL FREE
800-848-1101
In N.Y.S. (716) 631-3925
BETSY BYTES Division
BB International, Inc.
P.O. Box 564
Buffalo, N.Y. 14221

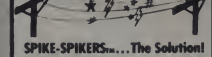
TERMS: Prepaid orders receive free shipping within continental U.S.A. Add 3% ($2.00 minimum) shipping and handling charge on all COD and credit card orders N.Y. res add 7% tax

CHECK BALANCE PROGRAM FOR AN APPLE II+

- MENU DRIVEN
- UNLIMITED ACCOUNTS
- MULTIPLE SEARCH OPTIONS
- HELPFUL PROMPTS
- EDIT FACILITIES
- CHECK PRINTING

FOR BASIC PROGRAM ON DISK
SEND $24 (CHECK OR M.O.)
TO:
WAI ASSOCIATES
2109-L POWERS FERRY ROAD
MARIETTA, GA 30067
(404) 955-6064

POWER LINE PROBLEMS?



SPIKE-SPIKERS™... The Solution!

Minimize equipment damaging spikes and conducted RF noise to or from sensitive equipment. Transient surge protection plus low pass RFI hash filtering. All units 120V 15A.

MINI II $44.95
Wall Mount
3-stage filter
2 sockets

QUAD II $59.95
Wall mount. Dual 3-stage filter
4 sockets & light

DELUXE $79.95
Dual 5-stage filtered ckts. 8 switch sockets main switch, fuse, light

Kaigle Electronics Co., Inc.
65-84 Rush Rd. Dept. C C
Bethlehem, PA 18017

Order Factory Direct
215-837-0700
Out of State
800-523-9685

DEALERS INVITED
PA Res. Add 6% + COD add $3.00 + Shipping

The First and Only System to Backup Diskettes Protected by Bad Sectoring without modification to your drive.

ATARI DISK BACKUP SYSTEM $49.95

Superclone is the only ATARI diskette copier system that lets you backup just about ANY copy protected diskette in including those protected by bad sectoring. Bad tracks and sectors are created without modifications to or adjustments of your hardware. Each backup diskette generated by Superclone functions exactly like the original - self-booting, etc. (In fact, we suggest that you use the backup and save the original.)

SYSTEM INCLUDES:
SCAN ANALYSIS - Map of diskette contents (Location of data, bad sectors, etc.)
FORMATTING BAD SECTORING - Non ATARI DOS for making and bad track/sector creation
BACK-UP - Copies just about everything we can find regardless of protection scheme
SINGLE DRIVE - Easy to operate to use
PIRATES TAKE NOTE: SUPERCLONE only allows two copies to be made of any specific diskette. Sorry!!!

SYSTEM REQUIREMENTS
Atari 400 or 800 Computer, 48K Memory
One Atari 810 Disk Drive, Printer Optional

Available at your computer store or direct from:
FRONTRUNNER (10 Jul 14 thru 31 Jul 84)
TOLL FREE ORDER LINE: (24 Hrs.) **1-800-848-4780**
IN Nevada call for assistance: Call **(702) 786-6800**
Ph. Hours for order assistance 9-5 Pacific
M.C. and VISA accepted
Include $2.00 (US) 07 Foreign orders) for shipping
FRONTRUNNER 218 California Ave. Suite #12
Reno, Nevada 89509 (702) 786-6800

Others Make Claims SUPERCLONE makes copies!!!
ATARI is a Trademark of ATARI, Inc.

ONLY $19.95!

AMPOTRONIC JOY STICK FOR APPLE COMPUTER

- **Self Centering**
- **360° Cursor Control**
- **Full X-Y Coordinate Control**
- **2 Firing Buttons**
- **30 Day Money-Back Guaranty**
- **Dealer Inquiries Invited**

Send check or money order for $19.95 each plus $2.50 for postage and handling. New York State residents add sales tax

AMPOC ENTERPRISES, INC.
9 BEEKMAN ST. SUITE 720
NEW YORK, N.Y. 10038

A REAL KEYBOARD FOR YOUR TIMEX-SINCLAIR.

- Many features not found in other keyboards
- Full-size contoured keyboard
- Sturdy aluminum chassis
- 46 Sculptured keys
- No soldering

PRE-PRODUCTION OFFER $69.95
Save $30.00!

KOPPK
Inc.
118 Prater St.
Union City, NJ 07087
(201) 864-4410

RADIO SHACK TRS-80's™

We offer Special Discounts, Free Shipping and a Toll Free Order Number

1-800-531-7466 TOLL FREE

Pan American Electronics

Dept. P.E. - 1117 Conway Avenue
Mission, Texas 78572
(512) 581-2766 Telex 767339

VERSACALC!™

VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!

TUTORIAL UTILITIES AND FILE MANAGER
ENHANCEMENTS TO VISICALC'

- SORT any number of rows labels, values, formulas. You select the extent of the sort
- CONDITIONAL TESTING to several levels
- PRINT OUT THE LIST OF COMMANDS
- AUTO BATCH UPDATE e.g. running year to date forms
- MENU—DRIVEN MODULES for your own application programs
- AUTO CATALOG from within Visicalc
- AUTO SCREEN FORMAT saves hundreds of keystrokes

YES! We said, "SORT VISICALC"

VERSACALC runs within Visicalc

Apple	100.00
Commodore	121.00
IBM Personal Computer	150.00
Apple	150.00

Dealer Demo Disk Available

Anthro-Digital, Inc.
103 Bartlett Avenue
Pittsfield, MA 01201
413-448-8278

Radio Shack and TDP-100

COMPUTERWARE®

Box 668 •
6809 Specialists Encinitas, CA 92024
(619) 436-3512

DAISY WHEEL PRINTERS
SMITH-CORONA TP-1

$529

• BROTHER HR-15(2 colors)	$AVE
• BROTHER HR-1(16k)	$749
• DAISY WRITER 2000(48k)	$999
• C-ITOH F-10(40 cps)	$1295
• COMMODORE 64 Computer	$AVE
• OSBORNE Computer	$1595
• SANYO MBC-1000(incl sftwre)	$1595
• KAY-PRO II	$CALL
• ZORBA	$AVE
• Wordstar/Spellstar/Mailmerge	$349
• Franklin-Ace	$899

MICRO MART
5375 Kearny Villa Rd #115, San Diego CA 92123
(619) 268-0160

DISK DRIVE for Apple II
only $ 225.00

5¼" totally apple compatible SUGART drive. Runs DOS 3.3 Pascal & CP/M. 90 days manufacturers warranty. Disk controller card $65.00.

Verbatim Diskettes

5¼" SS/DD softsector $ 27.00 plastic box of 10
8" SS/DD softsector $ 38.00 box of 10

Monitors, Printers (Okidata, C. Itoh, Epson) $ call for lowest prices.

To order send check or money order VISA/MC accepted. Calif. res. add 6½% tax.

FREE shipping

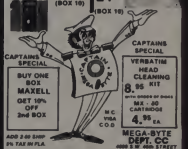
Universal Computer Products
671 Aldo Ave. #21
Santa Clara, Ca. 95050
Tel. (408) 748-9327

DISKETTES

maxell | **VERBATIM**

100% ERROR FREE
5¼ SS/DD
28.95 (BOX 10)

DATALIFE
5¼ SS/DD
24.95 (BOX 10)



CAPTAINS SPECIAL
BUY ONE BOX MAXELL GET 10% OFF 2nd BOX

CAPTAINS SPECIAL
VERBATIM HEAD CLEANING KIT
8.95
MX - 80 CARTRIDGE
4.95 EA

MC VISA COD

ADD 2.00 SHIP
5% TAX IN FLA.
800-327-1013

MEGA-BYTE
DEPT. CC
4000 S.W. 40th STREET
FORT LAUD., FLA 33314
305-587-1130

COMPUTER MART FORMAT
2" X 3"

PICTURE YOUR AD HERE!

NEXT CLOSING DATE:
JULY 3

★MICROCOMPUTER★
BUSINESS SOFTWARE

MEDICAL MGMT...
DENTAL MGMT...
INSURANCE AGENT
LEGAL BILLING.....
PROPERTY MGMT..
AND MUCH MORE !

UNIVAIR INTERNATIONAL
9024 St. Charles Rock Road
ST. LOUIS, MISSOURI 63114

(314) 426-1099

DISC DRIVE HEAD CLEANER DISCS
MAIN FEATURES:

- Non-abrasive *dry* cleaner; no liquid, no mess.
- Easy to use . . . insert as a regular disc.
- Cleans automatically without chemicals.
- Protective plastic folder—prevents contamination of cleaner.
- For use with single or double sided drives.
- Available for 5¼" and 8" flexible disc drives.
- Two discs per box;
  - **Thirty cleanings for sided drives
  - **Fifteen cleanings for double sided drives

RETAIL PRICE
$24.95

ZOLMAN INTERNATIONAL, INC.
600 Montgomery St. 45th Fl.
San Francisco, CA. 94111
Dept. C
or Call (415) 421-5340

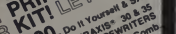
QUALITY LETTER QUALITY PRINTER KIT! LETTER QUALITY PRINTER KIT!

From $200. Do It Yourself & SAVE! TRAKS™ 32 & 35

FOR THE OLIVETTI PRAXIS™ 30 ELECTRONIC OFFICE TYPEWRITERS

Full KSR with RS-232 Serial/Parallel Combo or Centronics Compatible Parallel Only

Assembled & Tested with Easy-to-read Instructions!



COMPARE... THEN CALL

(615)727-6000

VISA

SYSTEMED CORPORATION

P.O. Box 800 Mountain City, TN 37683

TIMEX-SINCLAIR ZX81 1000

1983 Directory

- Where to find: Osk Drives, RAM Extensions, Printers, Modems, Keyboards, Game & Serious Software Books, Periodicals, Programming Aids, and other Exciting Accessories!
- Articles on: Special applications like Control Circuitry, Enhanced Graphics, Voice Generation, Music Synthesis, Video Inversion, Light Pens, Joysticks, etc.
- Complete Descriptions: We'll tell you what it is, what it does, how much it costs, and where to buy it.
- Jam-packed w/photographs: We knew you'd want to see what these products look like. So, we got pictures and put them in!

Only $5.95 ... Postpaid!

Sent First Class in the U.S.A.

To Order: Send check, money order, or VISA/MC number and expiration date. MN residents add 6% sales tax.

Dealer Inquiries Welcome.

E. Arthur Brown Company

Dept. TE-5 1702 Oak Knoll Drive

Alexandria, MN 56308 Ph. 612/762-8847

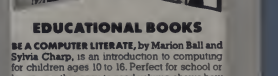
BOOKS FROM CREATIVE COMPUTING

GAME BOOKS

BASIC COMPUTER GAMES, Microcomputer Edition, edited by David H. Ahl. Here's a great collection of 101 fascinating games, all written in easy-to-use Microsoft BASIC. Play Craps, Combat, Super Star Trek, Lunar LEM Rocket, Gomoko, Checkers, Boxing, Bowling—and 93 others! With an introduction, notes on Microsoft BASIC, and conversion instructions for other BASICs. 8½" x 11", softcover, illustrated, with an index. 183 pp. $7.95 ($1.50). #6C

MORE BASIC COMPUTER GAMES, edited by David H. Ahl and Steve North. In this sequel to *Basic Computer Games* you'll find 84 challenging new games, complete with sample runs, program listings and illustrations. All run in Microsoft BASIC. Race your Ferrari, become a millionaire, joust with a knight, crack a safe, and more! Conversion table to other BASICs included. 8½" x 11", softcover, illustrated, 200 pp. $7.95 ($1.50). #6C2

TRS-80® Microcomputer Edition, $7.95 ($1.50). #6C4



EDUCATIONAL BOOKS

BE A COMPUTER LITERATE, by Marion Ball and Sylvia Charp, is an introduction to computing for children ages 10 to 16. Perfect for school or home use, this easy-to-read volume shows how to use computers and introduces programming concepts. Illustrated in full color with diagrams and photos on every page. 8½" x 11", softcover, 66 pp. with glossary of terms. $6.95 ($1.00). #6H

TRS-80 is a registered trademark of the Radio Shack Division of Tandy Corp.

creative computing Dept HS4C
39 East Hanover Avenue, Morris Plains, NJ 07950

Send me the books listed below.

ITEM NO.	QTY	TITLE	PRICE EACH	P & H* ( )	TOTAL
		CA. MI and NY residents add applicable sales tax			
				TOTAL AMOUNT	

*Add foreign orders (except Canada and Mexico) add $3 to regular postage and handling. Shipped airmail only.

CHECK ONE:
☐ PAYMENT ENCLOSED $_____
☐ CHARGE MY:
☐ American Express ☐ MasterCard ☐ Visa
(Charge and phone orders $10 minimum.)

Card No._____ Exp. Date_____

Mr./Mrs./Ms._____
(please print full name)

Address_____ Apt_____

City_____

State_____ Zip_____

For faster service CALL TOLL FREE: 800-631-8112. (In NJ call 201-540-0445)

Institutions only—purchase orders under $50 not accepted.

pc pipeline

Low, direct prices • Fast, direct service

2532-450	$4.75
2716-450	3.69
2732-450	3.99
2764-250	9.79
2764-350	8.99
4164-200	4.75
6116-P3	4.30
6116-LP-3	5.48

Add $2.95 shipping to all orders

OEM • Quantity discounts available • POs on approval • C.O.D. OK • Credit cards • Ft. residents add 5% tax • All new, no surplus, no seconds

Prices subject to change

4920 Cypress St., Suite 100, Tampa, FL 33607

In FL, and for info., call 813-875-0299

FOR ORDERS ONLY, 800-237-8910

8AM-5PM EDT

SELL THIS MAGAZINE

in your store for BIG PROFITS!

FOR DETAILS:

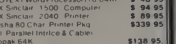
CALL COLLECT (212) 725-6851

DIRECT RETAIL SALES DEPT.
4th FLOOR, ONE PARK AVENUE
NEW YORK, NY 10016

TIMEX-SINCLAIR

MEMOCALC MEMOTEXT

TS1000 TS1500



MEMOCALC Spreadsheet (16-64K, Up to 99 cols. X 250 rows)	$ 48.95
MEMOTEXT Word Processor (16-64K)	$ 48.95
TIMEX Sinclair 1500 Computer	$ 94.95
TIMEX Sinclair 2040 Printer	$ 89.95
Seikosha 80 Char. Printer Pkg. (Incl. Parallel Intrfc & Cable)	$339.95
Memopak 64K	$138.95
32K $89.95 16K	$54.95
Memotech Keyboard	$89.95
TIMEX Sinclair 16K RAMactivity	$ 90.00

WE Pay Shipping on all USA Orders

To Order: [illegible] VISA MC

[illegible]

Write For Our Free Descriptive Catalog

E. Arthur Brown Company

Dept. ZE-5 1702 Oak Knoll Drive

Alexandria, MN 56308 Ph. 612/762-8847

$1,295.00

Z-80-6502 COMPUTER SYSTEM

DISK DRIVE, DRIVE CARD, MONITOR

SYSCOM*	$550.00
ORANGE*	$650.00
FRANKLIN	CALL
GEMINI 10	$375.00

Hayes Micromodem	$275.	Incredible Jack	$100
Slimline Drive	$255.	Regular Drive	$245
80 Col. Card	$110.	Z-80 Card	$100
Cooling Fan	$55.	Syscom* Bare Board	$55.
Disk Drive Card	$65.	16K Card	$65.
Parallel Printer Card	$65.		

!! WE WILL BEAT ANY PRICE!!

Softsell Systems

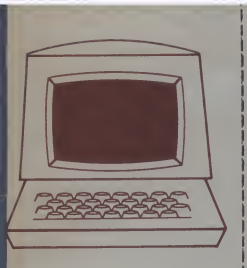
9600 Roosevelt Blvd., Suite 100, LL

Philadelphia, Pa. 19115

(215) 665-5639

• index to advertisers •

Reader Service No.	Advertiser	Page
101	Aardvark	102
107	AB Computers	208
102	Abacus Associates	247
*	Accent Software	46
104	Access Unlimited	123
103	Adventure International	59
106	Adwar Video Corp	18
*	ALF Products	239
108	Allenbach Industries	143
287	Alpha Byte Computer Products	229
111	Amdek	45
110	American Small Business Computers	207
315	Andata	264
109	Anthro Digital	151
113	Apple Computer Inc	90-91
115	Appleware, Inc	232
114	Archive	38
*	Artworx	17
116	Atari	57
117	Atlantic Computer Accessories	144
118	Ballantine/Del Rey Books	217
119	Beagle Brothers	203
122	Big Five Software	2
121	Blythe Valley	10
125	BMC/USA, Inc	269
154	The Book Company (Continental Software)	163
123	Broderbund Software	42
124	BRS/After Dark	23
127	Byte-Back Company	207
120	Bytewriter	264
131	Cab-Tek	251
128	Calsoft	193
129	Carolina Microsystems	147
180	Century Micro	58
136	Chasin Industries	98
288 & 130	C-Load Magazine	79
140	Commodore Business Machines	85
132	Communications Electronics	105
134	CompuPrint	247
142	CompuServe	118-119
141	Computer Advanced Ideas	29
133	Computer Book Club	199
144	Computer Discount Products	223
147	Computer Entrepreneur Publishing Company	259
135	Computer Exchange	74-75
137	Computerline	253
138	Computer Mail Order East/West	106-107
139	Computer Outlet	194-195
145	Computer Plus	207
151	Computer Store	132
143	Computronics	C3
153	Comstar	44
146	Cosmic Computers Unlimited Counterpoint Software	82 84
149	Cowtown Software	247
186	Creative Video	172
150	Data, Design & Development	36
157	Datamost	86
158	Datamost	173
155	Datasoft	160
156	DDL Software, Inc	18
159	Decision Support Software	243
152	Designware	120
*	Digital Equipment Corp	15
169	Discwasher	159
281	Dynacomp	277
171	Educational Media Associates	148
160	Edu-Ware Services	181
167	Electra Concepts Corp	267
161	Electronic Arts	126-127
126	Electronic Protection Devices	153
172	Electronic Specialists	234
205	Epson America	220-221
176	EPYX	39
163	Executive Peripheral Systems	255
164	Express Software	251
165	Fastrack Computer Products	69
166	Finetech, Inc	189
178	FlipTrack Learning Systems	81
170	Fox Games	262-263
168	Franklin Computer Corp	32
173	General Technology	272
174	General Videotex	191
189	Greenwood Manufacturing	198
183	Happy Hands	148
175	Harmony Video & Electronics	289
177	Hayes Microcomputer Products	60-61
179	Indus-Tool Corp	234
181	Infocom	52-53
182	Interactive Structures	126
184	Ironsides Computer Corp	271
185	Jade Computer Products	186-187
199	JRT Systems	92
203	Kensington Microware	156
187	Koala Technologies	113
190	Leading Edge	C4
188	Leading Edge	9
201	LNW Research	140
202	LNW Research	47
191	Lyben Computer Systems	18
192	Lyco Computer	170-171
*	Macmillan Book Clubs	65-67
230	Magic Computer	236
209	Marymac Industries	72
211	Micro D	19
193	Micro Lab	137
223	Micro Learningware	151
194	Micro Management Systems	295
195	Micro Merchant	273
196	MicroPrice	293
197	Micro Sense	129
221	Microwara Distributing	183
222	Micro Works	78
198	Municipal Information Services	294
200	Muse Software	95
204	National Computer Products	247
206	National Education Corp	145
207	NEBS Computer Forms	251
208	Nonagon	118
218	Odesta	149
210	Ohm/Electronics	50
212	Okidata	114
*	Omega Sales	174
236	Pacific Exchanges	151
236	Pacific Exchanges	152
236	Pacific Exchanges	158
236	Pacific Exchanges	225
213	Peachtree Associates	158
234	Perry Oil & Gas	294
235	Phoenix Performance Systems	265
214	PMI, Inc	54
240	Practical Peripherals	1
215	Program Design	297
216	Programmer's Institute	101
217	Programmer's Institute	73
219	Protecto Enterprises	77
220	Protecto Enterprises	213
224	Protecto Enterprises	296
225	Quadram Corp	20-21
249	Quark Inc	40-41
226	Radio Shack	31
228	Refco	152
229	Reston Publishing	35
231	Reston Publishing	62
232	Reston Publishing	184
233	Reston Publishing	164
237	R H Electronics	233
282	R H Electronics	235
238	Robographics	192
255	Roland Corp	178
239	Royal Software	93
289	Safeware	225
241	Sakata, U S A	30
242	Howard W Sams & Company	71
243	Sierra On-Line Inc	5
244	Sierra On-Line Inc	167
245	Sierra On-Line Inc	94
246	Sirius Software	25
247	SJB Distributors	215
248	Snave Systems	83
250	Snave Systems	158
251	Snave Systems	225
252	Softent	198
253	Software Services	152
254	Software T'Boot	265
257	Southern California Research Group	237
256	Southern California Research Group	232
258	SouthWest Microsystems	207
259	Special Video	177
261	Spectre Video Sonmaker Software	C2 12-13
276	SSM Microcomputer	70
284	SSM Microcomputer	88
285	Star Micronics	134
263	Strategic Simulations, Inc	51
262	Strobe, Inc	168
263	Sub Logic	125
266	Sydney Data Products	150
264	Synapse Software	11
265	Synapse Software	133
266	Systems IV Limited	108
267	Systems Group	245
268	Tactical Design	129
269	Tech Sketch	265
270	Tecmar	7
272	Thorn EMI Video, Inc	210-211
273	Transtar	110
274	Tronix	26-27
275	Ultra Magnetics	256-257
277	United Computer Corp	49
278	Universal Software	97
283	Videx	261
296	Warlock Software	145
280	Xerox Service Center	138-139



FREE INFORMATION SERVICE

Learning more about a product that's advertised or mentioned in an article in this month's issue is as simple as 1-2-3. And absolutely free.

1 Print or type your name and address on the attached card. Use only one card per person.

2 Circle the numbers on the card that correspond to the numbers at the bottom of the advertisements or articles for which you want more information. (Key numbers for *advertised products* also appear in the Advertisers' Index.)

3 Simply mail the card, and the literature will be mailed to you free of charge by the manufacturer.

The address on the attached card is for product information only. Editorial inquiries should be directed to CREATIVE COMPUTING, 39 East Hanover Avenue, Morris Plains, New Jersey 07950.

FREE INFORMATION SERVICE

creative computing

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125
126 127 128 129 130 131 132 133 134 135 138 137 138 139 140 141 142 143 144 145 148 147 148 149 150
151 152 153 154 155 156 157 158 159 180 181 182 183 184 185 188 187 188 189 170 171 172 173 174 175
176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200
201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225
226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 246 249 250
251 252 253 254 255 258 257 258 259 280 281 282 283 264 285 288 287 288 289 290 291 292 293 294 295
296 297 278 279 280 281 282 283 284 285 288 287 288 289 290 291 292 293 294 295 296 297 298 299 300
301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325
326 327 328 329 330 331 332 333 334 335 338 337 338 339 340 341 342 343 344 345 348 347 348 349 350
351 352 353 354 355 356 357 358 359 360 381 382 383 364 365 366 387 388 389 370 371 372 373 374 375
376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400
401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 418 417 418 419 420 421 422 423 424 425
426 427 428 429 430 431 432 433 434 435 438 437 438 439 440 441 442 443 444 445 448 447 448 449 450
451 452 453 454 455 456 457 458 459 480 481 482 483 484 485 488 487 488 489 470 471 472 473 474 475
476 477 478 479 480 481 482 483 484 485 488 487 488 489 490 491 492 493 494 495 498 497 498 499 500

PLEASE PRINT CLEARLY—Use only one card per person

NAME_____PHONE # (____)_____

COMPANY_____

ADDRESS_____APT_____

CITY_____STATE_____ZIP_____

(Zip code must be included to insure delivery.) Void after September 30, 1983 CC7833

4 ☐ **Send me one year of *Creative Computing* for $19.97 and bill me. (Full subscription price $24.97.)**

creative computing

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125
126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 148 147 148 149 150
151 152 153 154 155 156 157 158 159 180 181 182 183 184 185 186 187 188 189 170 171 172 173 174 175
176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200
201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225
226 227 228 229 230 231 232 233 234 235 238 237 238 239 240 241 242 243 244 245 246 247 246 249 250
251 252 253 254 255 256 257 258 259 280 281 282 283 264 265 266 267 268 269 270 271 272 273 274 275
276 277 278 279 280 281 282 283 284 285 288 287 288 289 290 291 292 293 294 295 296 297 298 299 300
301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 318 317 318 319 320 321 322 323 324 325
326 327 328 329 330 331 332 333 334 335 338 337 338 339 340 341 342 343 344 345 348 347 348 349 350
351 352 353 354 355 356 357 358 359 360 381 382 383 384 385 386 387 388 389 370 371 372 373 374 375
376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400
401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 418 417 418 419 420 421 422 423 424 425
426 427 428 429 430 431 432 433 434 435 438 437 438 439 440 441 442 443 444 445 448 447 448 449 450
451 452 453 454 455 456 457 458 459 480 481 482 483 484 485 488 487 488 489 490 491 492 493 494 495 496 497 498 499 500

PLEASE PRINT CLEARLY—Use only one card per person

NAME_____PHONE # (____)_____

COMPANY_____

ADDRESS_____APT_____

CITY_____STATE_____ZIP_____

(Zip code must be included to insure delivery.) Void after September 30, 1983 CC7832

4 ☐ **Send me one year of *Creative Computing* for $19.97 and bill me. (Full subscription price $24.97.)**

creative computing

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 118 117 118 119 120 121 122 123 124 125
128 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 148 147 148 149 150
151 152 153 154 155 156 157 158 159 180 181 182 183 184 185 188 187 188 189 170 171 172 173 174 175
176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200
201 202 203 204 205 208 207 208 209 210 211 212 213 214 215 218 217 218 219 220 221 222 223 224 225
226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 246 249 250
251 252 253 254 255 258 257 258 259 260 261 282 283 264 265 268 267 268 269 270 271 272 273 274 275
278 277 278 279 280 281 282 283 284 285 288 287 288 289 290 291 292 293 294 295 296 297 298 299 300
301 302 303 304 305 308 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325
328 327 328 329 330 331 332 333 334 335 338 337 338 339 340 341 342 343 344 345 348 347 348 349 350
351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375
376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400
401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 418 417 418 419 420 421 422 423 424 425
426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 448 447 448 449 450
451 452 453 454 455 458 457 458 459 480 481 482 483 484 485 488 487 488 489 470 471 472 473 474 475
478 477 478 479 480 481 482 483 484 485 488 487 488 489 490 491 492 493 494 495 498 497 498 499 500

PLEASE PRINT CLEARLY—Use only one card per person

NAME_____PHONE # (____)_____

COMPANY_____

ADDRESS_____APT_____

CITY_____STATE_____ZIP_____

(Zip code must be included to insure delivery.) Void after September 30, 1983 CC7831

4 ☐ **Send me one year of *Creative Computing* for $19.97 and bill me. (Full subscription price $24.97.)**

PUT STAMP HERE
THE POST OFFICE
WILL NOT DELIVER
MAIL WITHOUT
POSTAGE

creative
computing

P.O. BOX 13010
PHILADELPHIA, PA. 19101

PUT STAMP HERE
THE POST OFFICE
WILL NOT DELIVER
MAIL WITHOUT
POSTAGE

creative
computing

P.O. BOX 13010
PHILADELPHIA, PA. 19101

PUT STAMP HERE
THE POST OFFICE
WILL NOT DELIVER
MAIL WITHOUT
POSTAGE

creative
computing

P.O. BOX 13010
PHILADELPHIA, PA 19101

FREE
FREE
FREE

FREE INFORMATION

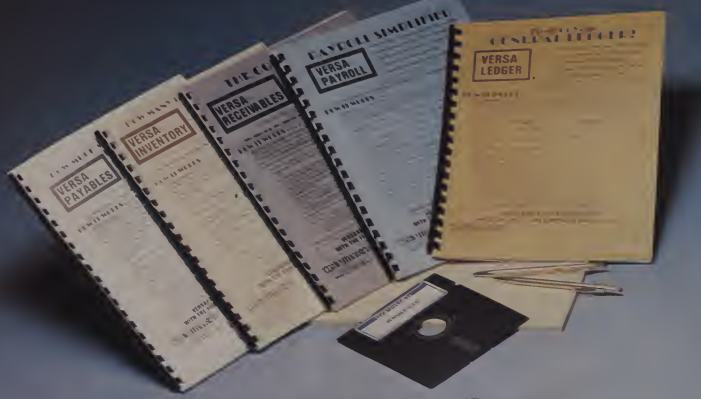
about the products and services advertised in this issue of

creative computing

See other side for directions

Introducing the Most Powerful Business Software Ever!

TRS-80™ (Model I, II, III, or 16) • APPLE™ • IBM™ • OSBORNE™ • CP/M™ • XEROX™



The VERSABUSINESS™ Series

Each VERSABUSINESS module can be purchased and used independently, or can be linked in any combination to form a complete, coordinated business system.

VERSARECEIVABLES™ $99.95

VERSARECEIVABLES™ is a complete menu driven accounts receivable, invoicing, and monthly statement-generating system. It keeps track of all information related to who owes you or your company money, and can provide automatic billing for past due accounts. VERSARECEIVABLES™ prints all necessary statements, invoices, and summary reports and can be linked with VERSALEDGER II™ and VERSAINVENTORY™.

VERSAPAYABLES™ $99.95

VERSAPAYABLES™ is designed to keep track of current and aged payables, keeping you in touch with all information regarding how much money your company owes, and to whom. VERSAPAYABLES™ maintains a complete record on each vendor, prints checks, check registers, vouchers, transaction reports, aged payables reports, vendor reports, and more. With VERSAPAYABLES™ you can even let your computer automatically select which vouchers are to be paid.

VERSAPAYROLL™ $99.95

VERSAPAYROLL™ is a powerful and sophisticated, but easy to use payroll system that keeps track of all government required payroll information. Complete employee records are maintained, and all necessary payroll calculations are performed automatically, with totals displayed on screen for operator approval. A payroll can be run totally automatically, or the operator can intervene to prevent a check from being printed, or to alter information on it. If desired, totals may be posted to the VERSALEDGER II™ system.

VERSAINVENTORY™ $99.95

VERSAINVENTORY™ is a complete inventory control system that gives you instant access to data on any item. VERSAINVENTORY™ keeps track of all information related to what items are in stock, out of stock, on backorder, etc., stores sales and pricing data, alerts you when an item falls below a preset reorder point, and allows you to enter and print invoices directly or to link with the VERSARECEIVABLES™ system. VERSAINVENTORY™ prints all needed inventory listings, reports of items below reorder point, inventory value reports, period and year-to-date sales reports, price lists, inventory checklists, etc.

VERSALEDGER II™ $149.95

VERSALEDGER II™ is a complete accounting system that grows as your business grows. VERSALEDGER II™ can be used as a simple personal checkbook register, expanded to a small business bookkeeping system or developed into a large corporate general ledger system **without any additional software.**

- VERSALEDGER II™ gives you almost unlimited storage capacity (300 to 10,000 entries per month, depending on the system),
- stores all check and general ledger information forever,
- prints tractor-feed checks,
- handles multiple checkbooks and general ledgers,
- prints 17 customized accounting reports including check registers, balance sheets, income statements, transaction reports, account listings, etc.

VERSALEDGER II™ comes with a professionally written 160 page manual designed for first-time users. The VERSALEDGER II™ manual will help you become quickly familiar with VERSALEDGER II™, using complete sample data files supplied on diskette and more than 50 pages of sample printouts.

SATISFACTION GUARANTEED!

Every VERSABUSINESS™ module is guaranteed to outperform all other competitive systems, and at a fraction of their cost. If you are not satisfied with any VERSABUSINESS™ module, you may return it within 30 days for a refund. Manuals for any VERSABUSINESS™ module may be purchased for $25 each, credited toward a later purchase of that module.

To Order: **Write or call Toll-free (800) 431-2818**
(N.Y.S. residents call 914-425-1535)

* add $3 for shipping in UPS areas
* add $4 for C.O.D. or non-UPS areas
* add $5 to CANADA or MEXICO
* add proper postage elsewhere

DEALER INQUIRIES WELCOME

All prices and specifications subject to change / Delivery subject to availability.

COMPUTRONICS

50 N. PASCACK ROAD, SPRING VALLEY, N.Y. 10977

* TRS-80 is a trademark of the Radio Shack Division of Tandy Corp. *APPLE is a trademark of Apple Corp. *IBM is a trademark of IBM Corp. *OSBORNE is a trademark of Osborne Corp. *CP/M is a trademark of Digital Research. *XEROX is a trademark of Xerox Corp.

CIRCLE 143 ON READER SERVICE CARD

History will record as a profound irony
that the most powerful word processing package
ever created for the IBM Personal Computer
wasn't created by IBM.

LEADING EDGE.

CIRCLE 190 ON READER SERVICE CARD