

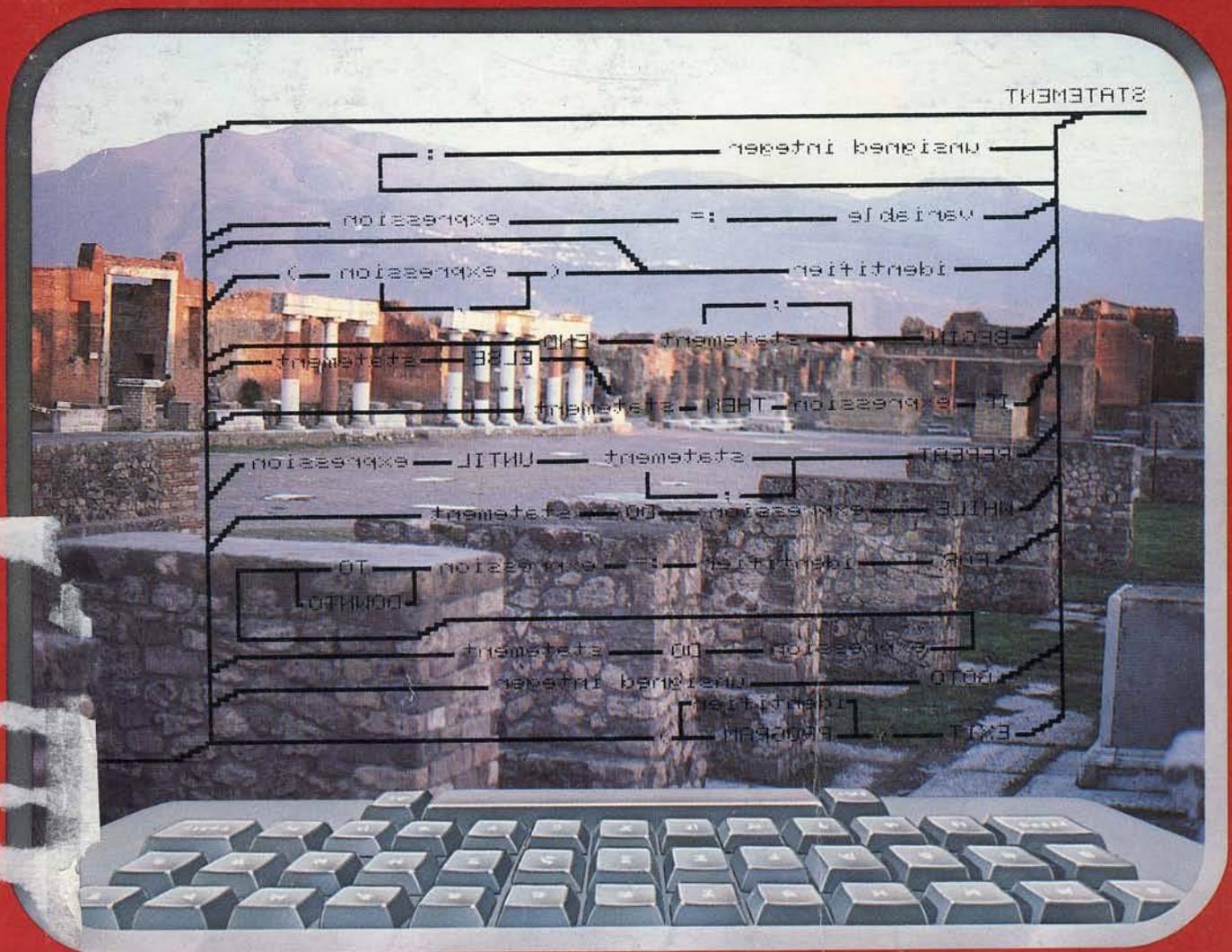
NO. 44

\$2.50

JANUARY 1982

MICRO™

THE 6502/6809 JOURNAL



Pascal Feature

Experimenters and the Color Computer

RELOC for the Apple

Atari 800 Player/Missile Graphics



TASC.™ The Applesoft* Compiler. It turns your Apple into a power tool.

Step up to speed. TASC, the Applesoft Compiler, converts a standard Applesoft BASIC program into super-fast machine code. By increasing program execution speed up to 20 times, Microsoft gives you a power tool for Applesoft BASIC programming.

Highest capacity available.

TASC will compile and run larger programs than any other Applesoft Compiler. As a disk-based system, it doesn't require the simultaneous presence of compiler and program in memory. The memory you save allows you to compile significantly bigger programs.

Power without bulk. Code expansion of up to 100% severely restricts other compilers. TASC's special code compression schemes typically limit code expansion to only 25%. You'll really appreciate that with complex programs or programs that utilize Apple's hi-res graphic pages.

More BASIC power. TASC's powerful new commands increase Applesoft BASIC programming capability. Chain with COMMON allows compiled programs to share variables, so a main menu

*Applesoft is a trademark of Apple Computer, Inc.



supports several programs in a single runtime environment.

TASC's True Integer Arithmetic and Integer FOR...NEXT capabilities maximize the execution speed of compiled programs. TASC's near total compatibility

with Applesoft speeds compilation of existing programs with little or no modification.

What about mistakes? You perfect your programs interactively with Applesoft. If something does slip by, TASC recovers

from errors discovered in compilation and traps all runtime errors. It even permits graceful interruptions during compilation.

See for yourself. Ask for a demonstration of TASC at your Microsoft dealer. Discover the software package that turns your Apple into a power tool.

MICROSOFT

CONSUMER PRODUCTS

A Division of Microsoft Inc.
10700 Northup Way • Bellevue, WA 98004



JUDGE THE REST, THEN BUY THE BEST

Only GIMIX offers you **SOFTWARE SWITCHING** between **MICROWARE's OS-9** and **TSC's FLEX**. Plus you get the power of the **GMXBUG** system monitor with its advanced debugging utility, and memory manipulation routines. A wide variety of languages and other software is available for these two predominant 6809 Disk Operating Systems.

You can order a system to meet your needs, or select from the 6809 Systems featured below.

JUDGE THE FEATURES AND QUALITY OF GIMIX 6809 SYSTEMS

GIMIX' CLASSY CHASSIS™ is a heavyweight aluminum mainframe cabinet with back panel cutouts to conveniently connect your terminals, printers, drives, monitors, etc. A 3 position keyswitch lets you lock out the reset switch. The power supply features a ferro-resonant constant voltage transformer that supplies 8V at 30 amps, + 15V at 5 amps, and - 15V at 5 amps to insure against problems caused by adverse power input conditions. It supplies power for all the boards in a fully loaded system plus two 5 1/4" drives (yes! even a Winchester) that can be installed in the cabinet. The Mother board has fifteen 50 pin and eight 30 pin slots to give you the most room for expansion of any SS50 system available. 11 standard baud rates from 75 to 38.4K are provided and the I/O section has its own extended addressing to permit the maximum memory address space to be used. The 2 Mhz 6809 CPU card has both a time of day clock with battery back-up and a 6840 programmable timer. It also contains 1K RAM, 4 PROM/ROM/RAM sockets, and provides for an optional 9511A or 9512 Arithmetic Processor. The RAM boards use high speed, low power STATIC memory that is fully compatible with any DMA technique. STATIC RAM requires no refresh timing, no wait states or clock stretching, and allows fast, reliable operation. The system includes a 2 port RS232 serial interface and cables. All GIMIX boards use gold plated bus connectors and are fully socketed. GIMIX designs, manufactures, and tests in-house its complete line of products. All boards are twice tested, and burned in electrically to insure reliability and freedom from infant mortality of component parts. All systems are assembled and then retested as a system after being configured to your specific order.

56KB 2MHZ 6809 SYSTEMS WITH GMXBUX/FLEX/OS-9 SOFTWARE SELECTABLE

- With #58 single density disk controller \$2988.59
- With #68 DMA double density disk controller \$3248.49
- to substitute Non-volatile CMOS RAM with battery back-up, add 300.00
- for 50 Hz export power supply models, add 30.00

Either controller can be used with any combination of 5" and/or 8" drives, up to 4 drives total, have data recovery circuits (data separators), and are designed to fully meet the timing requirements of the controller I.C.s.

5 1/4" DRIVES INSTALLED IN THE ABOVE with all necessary cables

	SINGLE DENSITY		DOUBLE DENSITY		
	Formatted	Unformatted	Formatted	Unformatted	
40 track (48TPI) single sided	199,680	250,000	341,424	500,000	2 for \$700.00
40 track (48TPI) double sided	399,360	500,000	718,848	1,000,000	2 for 900.00
80 track (96TPI) single	404,480	500,000	728,064	1,000,000	2 for 900.00
80 track (96TPI) double	808,960	1,000,000	1,456,128	2,000,000	2 for 1300.00

Chart shows total capacity in Bytes for 2 drives.

Contact GIMIX for price and availability of 8" floppy disk drives and cabinets; and 5" and 8" Winchester hard disk system.

128KB 2Mhz 6809 DMA Systems for use with TSC's UNIFLEX or MICROWARE's OS-9 Level 2

- (Software and drives not included) \$3798.39
- to substitute 128KB CMOS RAM with battery back-up, add 600.00
- for each additional 64KB NMOS STATIC RAM board, add 639.67
- for each additional 64KB CMOS STATIC RAM board, add 988.64
- for 50 Hz export power supply, add 30.00

NOTE: UNIFLEX can not be used with 5" minifloppy drives.

GIMIX has a wide variety of RAM, ROM, Serial and Parallel I/O, Video, Graphics, and other SS50 bus cards that can be added now or in the future. Phone or write for more complete information and brochure.

THE SUN NEVER SETS ON GIMIX USERS

GIMIX Systems are found on every continent, except Antarctica. (Any users there? If so, please contact GIMIX so we can change this.) A representative group of GIMIX users includes: **Government Research and Scientific Organizations** in Australia, Canada, U.K., and in the U.S.; NASA, Oak Ridge, White Plains, Fermilab, Argonne, Scripps, Sloan Kettering, Los Alamos National Labs, AURA. **Universities:** Carleton, Waterloo, Royal Military College, in Canada; Trier in Germany; and in the U.S.; Stanford, SUNY, Harvard, UCSD, Mississippi, Georgia Tech. **Industrial users** in Hong Kong, Malaysia, South Africa, Germany, Sweden, and in the U.S.; GTE, Becton Dickinson, American Hoechst, Monsanto, Allied, Honeywell, Perkin Elmer, Johnson Controls, Associated Press, Aydin, Newkirk Electric, Revere Sugar, HI-G/AMS Controls, Chevron. **Computer mainframe and peripheral manufacturers,** IBM, OKI, Computer Peripherals Inc., Qume, Floating Point Systems. **Software houses;** Microware, T.S.C., Lucidata, Norpak, Talbot, Stylo Systems, AAA, HHH, Frank Hogg Labs, Epstein Associates, Softwest, Dynasoft, Research Resources U.K., Microworks, Analog Systems, Computerized Business Systems.



GIMIX Systems are chosen by the Pros because of quality, reliability and features.

GIMIX inc.

The Company that delivers Quality Electronic products since 1975.

1337 WEST 37th PLACE, CHICAGO, IL 60609
(312) 927-5510 • TWX 910-221-4055

TO ORDER BY MAIL

SEND CHECK OR MONEY ORDER OR USE YOUR VISA OR MASTER CHARGE. Please allow 3 weeks for personal checks to clear.
U.S. orders add \$5 handling if order is under \$200.00. Foreign orders add \$10 handling if order is under \$200.00.
Foreign orders over \$200.00 will be shipped via Emery Air Freight COLLECT, and we will charge no handling. All orders must be prepaid in U.S. funds. Please note that foreign checks have been taking about 8 weeks for collection so we would advise wiring money, or checks drawn on a bank account in the U.S. Our bank is the Continental Illinois National Bank of Chicago, account #73-32033 Visa or Master Charge also accepted.
GIMIX INC. reserves the right to change pricing and product specifications at any time without further notice.
are registered trademarks of GIMIX Inc.
FLEX AND Uniflex are trademarks of Technical Systems Consultants Inc. OS-9 is a trademark of Microware Inc. See their ads for other GIMIX compatible software.

DATA CAPTURE 4.0[®]

The most advanced and easiest to use telecommunications program for use with the MICROMODEM II[™] or the Apple COMMUNICATIONS CARD[™].

If you use your Apple II[™] computer to communicate with other Apples or with timesharing systems, then you need Data Capture 4.0.

If you want to save stock quotes, airline schedules, electronic mail, or other data from a remote computer system for future use, then you need a smart terminal program for your Apple II[™]. Data Capture 4.0 is the most user friendly and most flexible program of this type. It is specifically designed to take advantage of all the features of the Micromodem II[™], but it works equally well with the Apple Communications Card[™] and several other popular serial interface cards.

Data Capture 4.0 is the only Apple II[™] smart terminal program available which is fully copyable and modifiable. This means that you don't have to worry about backup. Go ahead and make all the backup copies you need.

The unprotected format and helpful documentation make modifications to Data Capture 4.0 very easy to perform. In addition, full technical support is available by phone from Southeastern Software.

Data Capture 4.0 has many other features. Incoming data files are automatically captured regardless of length. Data in the memory buffer can be viewed, edited, printed, saved to or loaded from disk, or transmitted to the remote system at any time. An unattended mode of operation is provided so that you can call your Apple from another location and send data to it or load data from it. Data Capture 4.0 is fully compatible with the Apple III[™] in

Select One Of The Following:

- A) wait Call
 - C) atalog Disk
 - D) elete Text
 - E) nter Phone Number
 - H) angup Phone
 - I) nsert Text
 - L) ist Text
 - M) erge From File
 - P) rint Text
 - O) uit Program
 - S) end Text
 - T) oggle
 - A) lternate Drive (1/2)
 - B) aud Rate (110/300)
 - C) apture (ON/OFF)
 - D) uplex (FULL/HALF)
 - L) ocal Carrier (ON/OFF)
 - S) pecial Characters (ON/OFF)
 - T) ransmit
 - W) rite To File
- Which ? (Press **RETURN** to Abort)

```
Drive = 1          Capture ON          Transmit ON
Lines = 15         Sp. Char. ON        Duplex FULL
Baud = 300        Carrier ON
```

Data Capture 4.0

```
Terminal =
@ C 123 45
```

```
XYZ-Network Connected
Please Sign-on
#ID ABC123
```

```
Welcome to the XYZ-Network
Time on 12:35:41
```

Requires DISK II[™], Applesoft II[™] and 48K of Memory

DATA CAPTURE 4.0[®] 1980-Southeastern Software

*Apple[™], Apple II Plus[™], Disk II[™] and APPLESOFT II[™] are trademarks of Apple Computer Company.

SOURCE - Source Telecomputing Corporation.

*Micromodem[™] is a trademark of D.C. Hayes Associates, Inc.

emulation mode. It is also compatible with all popular lower case adapters for the Apple II[™], including the widely used shift key modification. An automatic logon utility for use with the SOURCE is provided with Data Capture 4.0. Also included is a HELP text file containing the latest tips and suggestions on using Data Capture 4.0 effectively (many of these are the result of feedback from customers).

See your local Apple dealer today for a demonstration of Data Capture 4.0 or order direct from Southeastern Software at the address below.

(Please include \$2.50 for postage and handling.)

If you presently own a previous version of Data Capture you may upgrade to the new version for the difference in price plus \$2.50 for postage and handling. MASTER CARD or VISA orders may be placed by phone.

DATA CAPTURE 4.0\$65.00
DATA CAPTURE 4.0 / 80*\$90.00

*Specify either Videx, Smarterm, Double Vision or Sup 'R' Terminal version

— Dealer Inquiries Invited —

Southeastern Software

6414 Derbyshire Drive • New Orleans, Louisiana 70126
(504) 246-8438 or (504) 246-7937



MICRO™

THE 6502/6809 JOURNAL

STAFF

Editor/Publisher
ROBERT M. TRIPP

Associate Publisher
MARY GRACE SMITH

Associate Editors
MARY ANN CURTIS
FORD CAVALLARI

Special Projects Editor
MARJORIE MORSE

Production Coordinator
PAULA M. KRAMER

Typesetting
EMMALYN H. BENTLEY

Advertising Manager
CATHI BLAND

Circulation Manager
CAROL A. STARK

Dealer Orders
LINDA HENS DILL

MICRO Specialists
APPLE: FORD CAVALLARI
PET: LOREN WRIGHT
OSI: PAUL GEFFEN

Comptroller
DONNA M. TRIPP

Bookkeeper
KAY COLLINS

Advertising
Sales Representative
KEVIN B. RUSHALCO
603/547-2970

DEPARTMENTS

- 5 Editorial
- 6 Letterbox
- 78 MICRO Dealers
- 115 Bibliography
- 121 Software Catalog
- 125 Hardware Catalog
- 127 Advertiser's Index
- 128 Next Month in MICRO

TUTORIAL / OVERVIEW

- 9 Atari 800 Player/Missile Graphics..... Mike Dougherty
New applications and utility programs
- 18 Experimenters and the Color Computer..... Ralph Tenny
A look at the TRS-80C's capabilities
- 25 Sweet-16 Revisited..... Charles F. Taylor, Jr.
Programming hints and a description of the instruction set

I/O ENHANCEMENTS

- 45 Epson MX80 Interface for SYM-1..... Richard H. Turpin
A description of the hardware and software needed for a parallel interface
- 57 List Scroller..... Colin Macauley
Scroll forward or backward without keyed LIST commands
- 69 Some Help for KIM, Part 3..... Wayne D. Smith
Hardware and software for an improved single-step function

PASCAL

- 85 Pascal Tutorial, Part 3..... Victor R. Fricke
Programming Pascal vs. BASIC
- 95 RELOC..... Robert D. Walker
Easily edit BASIC text files
- 100 Apple Pascal Textfile Lister..... Robert D. Walker
Produce neatly paged output with titles and numbered pages
- 103 Elementary Pascal Internals..... Arnie Lee
Introduction to internal structure of P-machine and P-code implementations

SHORT SUBJECTS

- 75 KEYSORT for BASIC 4.0..... Gordon Campbell
An update to a powerful PET utility
- 75 A Disk Menu Program..... David C. Oshel
An elegant but short disk directory management program
- 76 Auto-Run-Wedge for the PET..... Werner Kolbe
Avoid extra keystrokes

COLUMNS

- 50 Pet VET..... Loren W. Wright
Review of Pascals for PET/CBM
- 55 From Here to Atari..... Jim Capparell
More on using the interrupts
- 63 The Single Life..... Brad Rinehart
The single board's place in a world of sophisticated computers

A TEAM OF 6809 SUPERSTARS: Smoke Signal's Chieftain™ Computer, and Software by Microware®



HERE'S THE TOTAL 6809-BASED SYSTEM FOR THOSE WHO DEMAND UNSURPASSED POWER, FLEXIBILITY AND RELIABILITY

After years of worldwide use in diverse and challenging applications, the outstanding performers in 6809 computer operations are SMOKE SIGNAL and MICROWARE. These leading companies are recognized as the undisputed choices **when there is no room for compromises.**

WHY SMOKE SIGNAL AND MICROWARE LEAD THE 6809 FIELD

Smoke Signal began pioneering research and development on 6800/6809-based computer systems back in 1977. Microware worked three years to perfect OS-9™ and BASIC09.™

Both companies have evolved outstanding 6809-based products from early engineering research, **and both pay almost fanatical attention to detail.** For example . . .

SMOKE SIGNAL'S 6809-based Chieftain™ computer series has **proven** its superiority in hundreds of demanding tasks. From gold-plated connectors to highest-quality materials throughout, each Chieftain™ is built to deliver absolute dependability from day one, and **stay** that way through years of service.



Every Chieftain™ is meticulously **ENDURANCE-CERTIFIED** at 2.2 MHz. That's SMOKE SIGNAL's endorsement of product perfection.

MICROWARE's state-of-the-art OS-9 UNIX*-like operating system and the BASIC09 language have been developed in close coordination with computer manufacturers to maximize optimum system performance. The finest possible support and

*UNIX is a trademark of Bell Telephone Laboratories.



**SMOKE SIGNAL
BROADCASTING**



MICROWARE
P.O. Box 4865
Des Moines, Iowa 50304

31336 VIA COLINAS
WESTLAKE VILLAGE, CA 91362
TEL (213) 889-9340

documentation further ensure satisfaction. Microware software performance is best summed up in this remark by a 25-year computer veteran:

"BASIC09 IS THE FINEST HIGH-LEVEL LANGUAGE I'VE EVER SEEN IN THE INDUSTRY!"

Thousands of engineers and programmers use MICROWARE software products as their standard time-saving tool . . . to execute process-control applications . . . and for other vital functions. COBOL and PASCAL are also available under the OS-9 operating system.

HOW THIS REMARKABLE TEAM OF COMPUTER SUPERSTARS CAN SERVE YOU

SMOKE SIGNAL'S Chieftain™ computer provides an array of configurations ranging from 5¼-inch drives for single-user applications to multi-user, multi-tasking capabilities. Winchester hard-disk drive systems are also available.

In other words, **breath-taking power** with as little as 48k memory; Microware's OS-9 Level Two can access up to one full megabyte that your Chieftain™ can address!

One more sampling of the awesome processing potential at your fingertips with the Smoke Signal Chieftain™ computer:

MICROWARE'S Stylograph screen-oriented word processing package instantly makes Chieftain™ an easy-to-use document preparation system with comprehensive editing commands.

THERE'S MUCH, MUCH MORE! Call or write SMOKE SIGNAL for details on Chieftain™ computers and MICROWARE software.

SMOKE SIGNAL Dealer opportunities are still available . . . please request information.

- Send information about Chieftain™ computers and Microware software.
- Provide information about Smoke Signal's Dealer program.

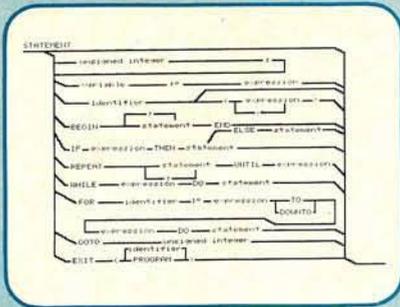
Name _____

Address _____

City _____ State _____ Zip _____

Telephone (_____) _____

About the Cover



The photo depicted on the cover is of the ancient Roman city of Pompeii. Located at the foot of Mt. Vesuvius, Pompeii was destroyed, yet preserved, by an eruption of that volcano in 79 AD. The Roman architecture in those days depended heavily on the use of blocks, grouped together to form buildings and villas. Similarly, the present-day programming language Pascal takes advantage of block structure to form logical, well-defined programs. Could the Romans have invented Pascal? (For the answer, see PET Vet.)

Cover photo by Ford Cavallari.

Graphic produced with the cooperation of Computer Mart of Nashua, NH.

MICRO is published monthly by:
MICRO INK, Inc., Chelmsford, MA 01824
Second Class postage paid at:
Chelmsford, MA 01824 and additional
entry pending at Framingham, MA 01701
USPS Publication Number: 483470
ISSN: 0271-9002

Send subscriptions, change of address, USPS
Form 3579, requests for back issues and all
other fulfillment questions to

MICRO
34 Chelmsford Street
P.O. Box 6502
Chelmsford, MA 01824

or call
617/256-5515
Telex: 955329 TLX SRVC
800-227-1617

Subscription Rates	Per Year
U.S.	\$24.00
	2 yr. / \$42.00
Foreign surface mail	\$27.00
Air mail:	
Europe	\$42.00
Mexico, Central America, Middle East, North Africa, Central Africa	\$48.00
South America, South Africa, Far East, Australasia, New Zealand	\$72.00

Copyright © 1982 by MICRO INK, Inc.
All Rights Reserved

MICRO

Editorial

Well before the days of microcomputers, a new programming language entered the growing ranks of software options. This language was not altogether revolutionary; it embodied many concepts already available in other languages. And, it did not pretend to be inexhaustible or all-purpose, as did some of its contemporaries, the monoliths known as FORTRAN V, PL/I, and Algol-68. This new language was designed to be simple, yet complete, and concise rather than verbose. The new entry's name was Pascal.

The Pascal language did not gain immediate popularity. It had no world council or multi-national corporation backing its implementation. However, it did have a beauty, a structured simplicity, which attracted many top educators and analysts in the field of computer science. Thus, Pascal achieved quick acceptance within educational and research communities. California's University of California at San Diego (UCSD) was one of the earliest institutions to latch onto Pascal. Pascal's small size and straightforward implementation ensured its availability to other communities. But, Pascal's foothold remained in the institutional communities only.

The advent of microprocessor technologies changed the character of computers — from necessarily large to conveniently small. BASIC was picked as the high-level language of choice for the micros, partially because of its small size. Notably absent from the first-generation microcomputers were implementations of the monoliths — they were not feasible. Among the more advanced, structured languages, Pascal alone could be completely and efficiently implemented on a micro. Today, Pascal is available on virtually all 6809-based machines and on most of the 6502-based computers as well.

Pascal boasts many features which set it apart from the primitive BASICs found on most machines. Pascal embodies the four basic control structures which eliminate the need for GOTO statements, and hence line numbers. These structures, known as the *sequence* (a line or sequence of statements), the *if-then-else* conditional, the *do-while* loop, and the *for-next* loop, form the basis for Pascal. See the "Precision Programming" article in

MICRO (42:06) for a complete discussion of these constructs. Using these structures, program development time is reduced and code readability is enhanced.

Pascal is also a procedure-oriented language. Analogous to the sections of BASIC code called by the GOSUB statement, procedures are used in Pascal to separate logically distinct functions and to perform repetitive tasks without duplicating code. The advantage over BASIC is that procedures are defined with a list of formal parameters. Thus the procedure is able to modify only those variables which the programmer explicitly instructs it to modify. This feature, almost a necessity for larger program development, is not available in most BASICs.

The final major advantage of Pascal is its strong but flexible typing of variables. Each variable used in a Pascal program must be declared as a type. The standard types are Boolean, integer, character, and real. Further types may be user-defined. All these types may be combined into a structured type; i.e. an array or a record. The "Pascal Tutorial" article in this issue (page 85) discusses variable types, as well as procedures.

The availability and popularity of Pascal is sure to increase as time goes on. Apple Computer has been supporting UCSD Pascal for two years. Commodore has recently announced availability of Pascal on their SuperPET and standard PET computers. The popular FLEX and OS-9 operating systems, built around the 6809, both offer implementations of standard Pascal. Even IBM has opted for Pascal over its own PL/I on their personal computer. The development of ADA, a large Pascal-like language, has also boosted Pascal's attractions. ADA is much larger than Pascal, and will be well-suited to large computer implementation. The more succinct Pascal will most probably remain the microcomputer counterpart of ADA.

MICRO's coverage of languages will continue next month with FORTH. More Pascal material will be appearing in later issues. And, of course, coverage of the microcomputer workhorses, BASIC and machine language, will continue in each issue of MICRO. But for now, turn to the Pascal feature and survey the benefits of structured programming.

Ford Cavallari

MICRO

Letterbox

On Games

Dear Editor:

A few notes on your editorial comments about games.

This is a nation of game players, particularly if the definition is broadened to include all forms of escapism. This does not seem to me an unreasonable amplification. Television watching alone must consume enough hours to awe even Carl Sagan. And watching television is an activity usually lacking in any social value. Producers of television fare have learned to produce a mind-deadening, sense-tickling product which does little other than murder time.

Nor is television the only enterprise dedicated to making the days pass. Much of sports, motion pictures and what passes for literature these days is equally dedicated to this end.

Games too, of course, serve to mute the ticking clock. But games at least require some participation. Games are the almost universal introduction to personal computers, and thus have the potential for drawing minds into the realm of computing, where they may be refreshed and expanded by the whole range of the computer's capability. There is, it seems to me, a real place for games.

Whether that place is being realized is, however, an open question. Much of the current crop of games has no more real value than a drugstore's crop of paperbacks: lurid covers and dull interiors. The tack taken to protect this software denies the purchaser its real value; not the running of the program, but the reading of it. And the understandably sympathetic treatment software developers have received from their special medium denies the customer any voice.

I seem, finally, to have come to the conclusion that computer games represent another failed medium. Again, a

medium of great potential power has been perverted to provide cheap thrills and Hi-Res graphics. Something seems to be wrong with our level of maturity. Maybe you're right.

Bob Crafts
Edgartown, MA

Dear Editor:

Your editorial regarding games for computers is straightforward and to the point. Software vendors, especially, often seem to be top-heavy with games.

In my own opinion, though, total disregard for games is a bit heavy handed. Please consider the following:

1. The "tools" for classic games such as Chess and Bridge are simple devices, yet these games have, for centuries, provided challenge and enjoyment. When the tool used in a game is a computer, the possibilities become mind-boggling.
2. Modern quality control statistics is an outgrowth of gaming mathematics (not the other way around). A good game program can likewise teach good programming technique and computer capability, as well as entertain.
3. Recreation, in itself, is socially redeeming. Computers labor hour after hour without complaint; but as a human, I enjoy an hour of Star Trek after work.

Perhaps you could compromise and put in one game per issue. You would still have plenty of room for more serious articles.

Jim Haboustak
South Euclid, OH

What's What in "What's Where"?

Dear Editor:

Last week I received my copy of *What's Where in the Apple*. It's a great book and a valuable source of reference material, but something is missing!

There is no explanation for the codes used in the `\Use-Type\` column. What is `\HB\`? What is `\P2\`?

Ray Badowski
Stratford, CT

Editor's Note: The following guide will help clarify the Use-Type symbols.

"What's Where" Use-Type Guide

/SE/

1st letter — type information

2nd letter — usage/length information

Type Codes:

S — Subroutine

P — Parameter

H — Hardware

B — Buffer

Usage/Length Codes:

E — Entry

B — Block

n — n-Byte Long

L — Label

F — Flag

Some Common Combinations:

P1: 1-Byte Parameter

Pn: n-Byte Parameter

PB: Parameter Block

H1: Hardware Location

HB: Hardware Block

FF: Hardware Flag

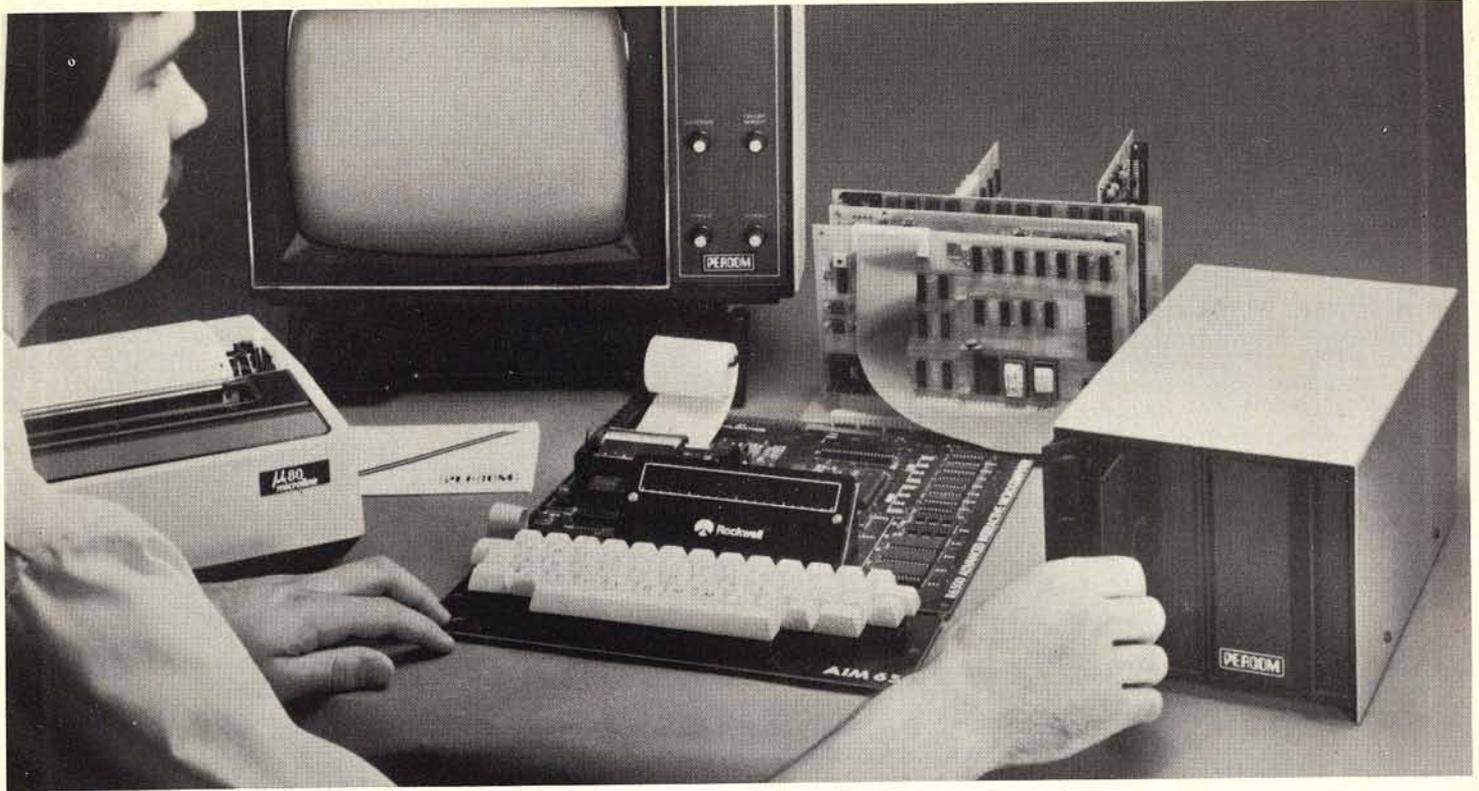
SE: Subroutine Entry Point

SB: Subroutine Block

SL: Subroutine Label

BB: Buffer Block

(Continued on page 47)



Introducing the **M** line . . .
Now! Drive Systems for AIM, KIM and SYM Computers
— from PERCOM.

Assembled and tested systems start at only \$599.95, including the drive controller circuit card, disk-operating system, interconnecting cable, drive and comprehensive users manual.

- **The right storage capacity** – Available in 1-, 2- and 3-drive systems, with either 40- or 80-track drives.
- **Flippy storage** – Flippy drives (optional) let you flip a diskette and store data and programs on the second recording surface.
- **High Storage Capacity** – Formatted, one-side storage capacity is 102 Kbytes (40-track drive), 205 Kbytes (80-track drive).
- **Proven Controller** – The drive controller design is the same as the design used in the Percom 680X LFD mini-disk system. This system – introduced in 1977 – has given reliable service in thousands of applications. Two versions are available: the MFD-C65 for the AIM-65 expansion bus, and the MFD-C50 for the System-50 (SS-50) bus.
 - Includes an explicit data separator circuit that's reliable even at the highest bit densities.
 - Provides for on-card firmware.
 - Includes a motor inactivity time-out circuit.
 - Capable of handling up to four drives.
 - Capable of reading both hard- and soft-sectored diskettes.



PERCOM DATA COMPANY, INC.
 11220 PAGEMILL RD. DALLAS, TX 75243
 (214) 340-7081

Toll-Free Order Number: **1-800-527-1222**

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

© 1981 PERCOM DATA COMPANY, Inc.
 PERCOM, MFD-C50, MFD-C65 and M65/50 are trademarks of Percom Data Company, Inc.
 AIM-65 is a trademark of Rockwell International, Inc.
 KIM is a trademark of MOS Technology Corporation
 SYM is a trademark of Synetek, Inc.

No. 44 – January 1982

- **DOS included** – The MFD disk-operating system works with the AIM monitor, editor, assembler, Basic and PL/65 programs, interface is direct, through user I/O and F1, F2 keys. Diskette includes DOS source code and library of 20 utility commands.
- **Reliability assurance** – Drives are burned-in 48 hours, under operating conditions, to flag and remove any units with latent defects.
- **Full documentation** – Comprehensive hardware and software manuals are included with each system.

Now! Expand your AIM-65 with Low-cost System-50 Modules.

The Percom M65/50 Interface Adapter connects your M-65 bus to Percom's System-50 (SS-50) motherboard, allowing you to expand your AIM, KIM or SYM with proven System-50 modules. You can add disk storage, memory modules, even a video display system. The M65/50 provides buffer-amplification of address, data and control lines. On-card decode circuitry lets you allocate address space either to the computer or to the expansion motherboard. Price: only \$89.95, including System-50 motherboard.

System Requirements: AIM-65, KIM or SYM computer with expansion bus and four Kbytes RAM (min).

Yes . . . I'd like to know more about Percom MFD drive systems. Rush me free literature.

Send to
PERCOM DATA COMPANY, Inc., Dept. 65-M
 11220 Pagemill Rd. Dallas, TX 75243

name _____
 address _____
 city _____ state _____
 zip _____ phone number _____

MAIL TODAY!

ARTSCI explains why some word processing systems are better than others.

Let's begin with an easy to understand explanation of what a word processor is and how ARTSCI has created a professional system.

A word processing system is simply an easier, faster and less expensive way to type. With a modern word processor, documents are entered on a video screen instead of paper.

You can enter your first rough draft without concern about errors or spelling. Simply go back and insert letters, delete words and even move paragraphs with a few keystrokes. No document will ever have to be retyped.

WORD PROCESSING AND THE APPLE II

The APPLE II is the most expandable, inexpensive micro-computer available today. It can perform almost any task, including word processing.

The standard APPLE II however, uses a 40 column video display. This display causes a serious word processing problem: How do you display a full sized 80 column letter? Most word processing programs available today do not solve this problem.



THE MAGIC WINDOW

ARTSCI has developed the MAGIC WINDOW word processing system that incorporates the full power of a professional word processor and solves the APPLE'S display problem without expensive hardware.

The first feature of a professional word processing system is the ability to enter and edit data in a fast and friendly manner. The MAGIC WINDOW operates just like a standard typewriter. The electronic paper moves to the left across the video screen as you type. Almost any size document can be represented on the video screen. You can see the edges

of the paper through this MAGIC WINDOW as you type.

The rule is: What you see on the screen is what you'll get in print. However, if you print using proportional spacing, the result will look even better than the screen.



Apple is a trademark of Apple Computer Inc.

the standard APPLE II computer system.

This typewriter simulation, together with simple to use menu selection of functions and electronic editing abilities, creates the finest word processor available on the standard APPLE II.

MAGIC SPELL

The second feature of an advanced word processor is the ability to find and correct mistakes. The most common mistakes in most documents is the misspelled word.

ARTSCI's MAGIC SPELL program will take any document you can create and find spelling errors. Over 14,000 commonly misspelled words are known to MAGIC SPELL. You can also add new words to the vocabulary at any time.

CUSTOM LETTERS

The third feature of a professional word processing system is the ability to alter a document by replacing names and other related data from mailing lists.

Form letters, invoices, and almost any document can be individualized by replacing names, addresses or any other personal data anywhere in the document using ARTSCI'S BASIC MAILER.

By using the BASIC MAILER you can take any mailing list and sort through the list by different criteria and print personalized letters with a few simple keystrokes.

A COMPLETE SYSTEM

These three programs, THE MAGIC WINDOW, MAGIC SPELL AND THE BASIC MAILER, together form the only complete and professional word processing system available on

ARTSCI TAKES THE WORK OUT OF WORD PROCESSING



For a more thorough explanation of the ARTSCI word processing system send for our free booklet.

artsci INC

Mail to:
ARTSCI INC.
10432 Burbank Blvd.
North Hollywood,
California 91601-9990
(213) 985-2922



Name _____
Company _____
Address _____
City _____ State _____ Zip _____
Phone _____

ST PE ML CC BY CA

Atari 800

Player/Missile Graphics

"Player/Missile Graphics" can be applied to more than players and missiles. The author explains all and provides utility programs for the Atari 800.

Mike Dougherty
7659 West Fremont Ave.
Littleton, Colorado 80123

The hardware for the early Atari computing systems was designed for the video arcade market. To compete in this market, Atari made use of some very specialized chips. These video chips are able to combine several images on a television raster image simultaneously through direct memory access (DMA) techniques. Fortunately, for Atari computer owners, the Atari 800 hardware is basically the same. Thus, whatever an Atari raster-based arcade game does, the Atari 800 can do. The trick lies in learning how to program these specialized video chips.

Hardware

A comprehensive discussion of the Atari 800 Personal Computer System may be found in the two manuals available from Atari, *Operating System User's Manual* and *Hardware Manual*. This article will concentrate on the graphics mode called "Player/Missile Graphics."

A player or a missile is a small pattern that can be moved rapidly across the television screen. This terminology was first used when these small objects represented aircrafts, bullets, rockets, etc., in the original Atari video games. The usage of players and missiles, of course, is not limited to games.

Player/Missile Graphics allows the final television image to be constructed from a main background bit map of normal display memory (e.g. GRAPHICS 8) superimposed with up to four players (Player0, Player1, Player2, and Player3) and four missiles (Missile0, Missile1, Missile2, and Missile3). Each player consists of a bit map one byte (8 bits) wide and 128 or 256 bytes high. Each missile consists of a bit map two bits wide and 128 or 256 bytes high. (Different Player/Missile Graphics modes use different amounts of memory, but in either case, the full vertical extent of the television screen may be covered.)

Every player and corresponding missile may be set to a separate Atari color, independent of the normal background color. Thus, by setting a bit to one in a player or missile bit map, that color will be displayed on the television screen. By setting a pattern of bits to one in a player or missile bit map, a Player/Missile Graphics object is created.

Player/Missile Graphics may be constructed on either a "single line playfield" or a "double line playfield."

The single line playfield maps each player byte (two bits for a missile) onto one line of the television image, requiring 256 bytes for the complete bit map. The double line playfield maps each player byte (two bits for a missile) onto two consecutive lines of the television image, requiring only 128 bytes for a complete bit map. In addition, both double and single playfields may be one of three overall television screen widths: narrow, regular, or large. Each width affects the amount of memory required by graphics modes.

The width of individual Player/Missile objects may be normal size (GRAPHICS 8 resolution), twice normal size, or four times normal size. Each player may be set to any allowed size, independent of the other player's size. However, all of the missiles must be the same size. If all four players are set to four times normal size and lined up side by side, the total width is that of the narrow playfield. In addition, all four missiles may be treated as a single fifth player — lined up this way they will cover a standard playfield.

Table 1: Memory Map of Player/Missile Graphics

Playfield Mode	Offset to Base	# Bytes	Function
Single Line	+0	768	Unused by Player/Missile
	+768	256	All 4 missiles, 2 bits each
	+1024	256	Player0 bit map
	+1280	256	Player1 bit map
	+1536	256	Player2 bit map
	+1792	256	Player3 bit map
Double Line	+0	384	Unused by Player/Missile
	+384	128	All 4 missiles, 2 bits each
	+512	128	Player0 bit map
	+640	128	Player1 bit map
	+768	128	Player2 bit map
	+896	128	Player3 bit map

Player/Missile Graphics enforce a programmable "image priority" scheme to handle the case of overlapping player bit patterns. If Player0 has a higher priority than Player1, Player0 will overlap (hide) Player1 when the two bit patterns collide. The display chips also contain specialized collision registers to keep track of which players have overlapped or collided. These specialized hardware functions of the display chips allow the program the luxury of ignoring some very difficult problems. Specifically, as two player bit maps cross paths, no images have to be redrawn after the collision, and the background and players will maintain their programmed shapes.

During the collision, the overlapped image will be automatically generated by the hardware. Further, due to the collision registers, the program does not need to compute if arbitrarily irregular images overlap — simply check the appropriate bit in the appropriate collision register.

The horizontal positions of the players and missiles are determined by a set of horizontal registers. To move a player or missile to a specific horizontal position on the television image, the desired position is POKEd into the appropriate horizontal position register. Vertical movement must be accomplished by shifting the actual bit map in the player's or missile's display memory, up or down the desired number of bytes. Rapid vertical movement may be accomplished through assembly level programming.

To use Player/Missile Graphics, the following steps must be performed:

1. Memory space for the Player/Missile bit maps must be reserved. For single-lined playfields, 2048 bytes are required, beginning on an even 2K address boundary. For double-lined playfields, 1024 bytes are required, beginning on an even 1K address boundary.
2. The page number (high order byte of the address) of that reserved memory must be POKEd into the Player/Missile Page Pointer to define to the hardware where the bit maps are located.
3. Individual player and missile patterns must be POKEd into the appropriate bit maps as detailed in table 1: a bit equal to 1 turns on a pixel, a bit equal to 0 turns off a pixel.

Table 2: Register Description of Atari 800

Address	Player	Function	
53248 (\$D000)	Player 0	POKE horizontal position of Player/Missile bit map. (POKE will set horizontal register and PEEK will read collision registers described next.)	
53249 (\$D001)	Player 1		
53250 (\$D002)	Player 2		
53251 (\$D003)	Player 3		
53252 (\$D004)	Missile 0		
53253 (\$D005)	Missile 1		
53254 (\$D006)	Missile 2		
53255 (\$D007)	Missile 3		
53256 (\$D008)	Player 0	POKE size of displayed bit map 0 - normal size 1 - twice normal size 2 - normal size 3 - four times normal size	
53257 (\$D009)	Player 1		
53258 (\$D00A)	Player 2		
53259 (\$D00B)	Player 3		
53260 (\$D00C)	All Missiles		
53248 (\$D000)	Missile 0	PEEK collision with Playfield PEEK collision with Playfield	
53249 (\$D001)	Missile 1		
53250 (\$D002)	Missile 2		
53251 (\$D003)	Missile 3		
53252 (\$D004)	Player 0		
53253 (\$D005)	Player 1		
53254 (\$D006)	Player 2		
53255 (\$D007)	Player 3		
53256 (\$D008)	Missile 0		
53257 (\$D009)	Missile 1		
53258 (\$D00A)	Missile 2		
53259 (\$D00B)	Missile 3		
53260 (\$D00C)	Player 0		
53261 (\$D00D)	Player 1		
53262 (\$D00E)	Player 2		
53263 (\$D00F)	Player 3		
53278 (\$D01E)	--- all ---	Reset all collision registers by POKeing 0 into this register	
704 (\$02C0)	Player/Missile 0	POKE color of 1 bit in displayed bit map: color = 16*hue + luminence, defined by Atari BASIC setcolor command. POKE color of 0 bit in bit map	
705 (\$02C1)	Player/Missile 1		
706 (\$02C2)	Player/Missile 2		
707 (\$02C3)	Player/Missile 3		
708 (\$02C4)	Playfield 0		
709 (\$02C5)	Playfield 1		
710 (\$02C6)	Playfield 2		
711 (\$02C7)	Playfield 3		
712 (\$02C8)	Background		
559 (\$022F)	--- all ---		POKE to specify Player/Missile graphics mode: 61 - narrow playfield 62 - regular playfield 63 - large playfield 45 - double line narrow playfield 46 - double line regular playfield 47 - double line large playfield
54279 (\$D407)	--- all ---		Page of Player/Missile display memory
Let the base address of the Player/Missile display memory be: B = PEEK(54729)*256			
B + 0 (\$0000)	--- not used ---	Display memory offset for Player/Missile playfields 61, 62, 63 0 bit - color of background 1 bit - color of player	
B + 768 (\$0300)	All Missiles		
B + 1024 (\$0400)	Player 0		
B + 1280 (\$0500)	Player 1		
B + 1536 (\$0600)	Player 2		
B + 1792 (\$0700)	Player 3		

(Continued)

Communications Software from the Utility Specialists

What do you really need in good communications software? We think the most important thing is using the equipment YOU have to transfer data easily and accurately. When Ascii Express made its first appearance in 1979, it was immediately recognized as the finest program of its kind available. Since that time, other programs have appeared with one or two flashy new features, but not a single one of them offers as many choices in terms of hardware compatibility and data transfer modes as the SDS line of communications software.

ASCII EXPRESS II™

If a versatile and accurate data transfer program is what you're after, Ascii Express II is for you. It offers more data transfer modes than any other program of its kind. In fact, we have yet to find a computer system it can't be used with.

In addition, Ascii Express II offers a built-in editor that allows you to produce or modify files before and after transfer, a built-in directory for your most frequently called numbers, and keyboard macros which allow you to send entire sign-on sequences or other host commands with a few simple keystrokes. All these features are designed to help reduce on-line time, and that saves you money.

Z-TERM™

For CP/M users, Z-Term offers all the above, and more...

- Support of all 80-column boards and external terminals
- Large copy buffer (41K)
- Unlimited download capacity - no file is too large

For special applications, Z-Term will even allow your Apple to emulate most popular types of terminals for maximum compatibility with your system.

Z-TERM "THE PROFESSIONAL"™

The ultimate communications package. This is the finest program we offer, and it is certain to set the standard for all communications software for years to come.

Z-Term "Pro" provides the solid performance that the truly serious user demands. Many of our users find Z-Term "Pro" to be so valuable that it more than justifies the purchase of the Z-80 Softcard.

Z-Term Pro's special features include:

- Support of the new Novation Apple CAT modem
- Support of specialized transfer protocols, e.g. PAN and Christensen
- Automatic answer and send/receive modes for unattended operation
- Special buffer for parallel printers to ensure no lost characters

We are so convinced that all the SDS programs are the finest available that we've compiled a detailed point-by-point comparison of our programs and those of our leading competitors (for your copy, send a stamped, self-addressed envelope to us at the address below). This comparison of more than 50 items clearly shows what our customers have known all along - that SDS software is the finest. Amen.

SDS

southwestern
data systems

P.O. Box 582-M
Santee, CA 92071 Tel. 714-562-3670

TRYING TO MAKE CONTACT?



Table 2 (Continued)

B + 0	(\$0000)	--- not used ---	Display memory offset for Player/
B + 384	(\$0180)	All Missiles	Missile playfields 45, 46, 47
B + 512	(\$0200)	Player 0	0 bit - color of background
B + 640	(\$0280)	Player 1	1 bit - color of player
B + 768	(\$0300)	Player 2	
B + 896	(\$0380)	Player 3	
53277	(\$D01D)	--- all ---	POKE a 3 to enable Player/Missile DMA

Listing 1: The BASIC Program Listing

```

1000 REM ...      D O D G E
1001 REM
1002 REM ... DEMONSTRATION OF VIDEO
1003 REM ... PROCESSORS IN THE ATARI
1004 REM ... COMPUTER SYSTEM
1005 REM
1006 REM ...      by Mike Dougherty
1007 REM
1008 REM
1009 REM
1100 REM .....
1101 REM
1102 REM ... READ AND POKE THE USR FUNCTIONS
1103 REM ... INTO PAGE 6 MEMORY.
1104 REM ... READ THE OBJECT AS HEX STRINGS
1105 REM ... AND CONVERT TO DECIMAL.
1106 REM
1107 REM
1108 DIM BYTE$(2)
1110 ADDR=256*6:REM FREE BASIC MEMORY
1115 GRAPHICS 0:POKE 752,1:POSITION 10,5:PRINT "POKEing USR functions."
1120 READ BYTE$
1130 IF BYTE$="*" THEN 2000
1140 GOSUB 1500
1150 POKE ADDR,BYTE
1160 ADDR=ADDR+1
1170 GOTO 1120
1500 REM
1501 REM
1502 REM ... CONVERT BYTE$ TO BYTE
1503 REM
1504 REM
1510 BYTE=0
1520 VALUE=ASC(BYTE$(1)):GOSUB 1600
1530 VALUE=ASC(BYTE$(2)):GOSUB 1600
1540 SOUND 0,0,0,0
1550 RETURN
1600 REM
1601 REM
1602 REM ... CONVERT ASCII TO HEX
1603 REM ... AND ACCUMULATE IN BYTE
1604 REM
1605 REM
1610 IF VALUE<58 THEN BYTE=BYTE*16+VALUE-48
1620 IF VALUE>57 THEN BYTE=BYTE*16+VALUE-55
1630 SOUND 0,BYTE,10,8
1640 RETURN
1700 REM
1701 REM
1702 REM ... OBJECT DATA FOR USR
1703 REM
1704 REM
1710 DATA 68,68,85,D1,6B,85,D0,A0,FF
1720 DATA B1,DO,48,C8,B1,DO,AA,68
1730 DATA 91,DO,8A,48,C8,DO,F5,68,60
1750 DATA 68,68,85,D1,6B,85,D0,A0,01
1760 DATA B1,DO,48,88,B1,DO,AA,68
1770 DATA 91,DO,8A,48,88,DO,F5,68,60
1780 DATA **
2000 REM
2001 REM
2002 REM ... PROGRAM THE VIDEO HARDWARE
2003 REM
2004 REM
2010 GRAPHICS 8:REM SET TO MODE WITH SPARE RAM
2020 POKE 752,1:REM NO CURSOR
2030 SETCOLOR 2,0,0:REM NO BACKGROUND
2110 POKE 559,45:REM DOUBLE LINE NARROW PLAYFIELD
2120 POKE 704,88:REM INITIAL COLORS

```

- Player/Missile colors, sizes, image priorities, and horizontal positions must be POKEd into the appropriate video chip registers.
- The Player/Missile graphics DMA must be enabled by POKeing a three into the Player/Missile Enable register.

These video chip registers are detailed in table 2.

A word of caution: use of Player/Missile Graphics occasionally interacts with BASIC memory causing unexpected Atari behavior. When this occurs, simply turn the power off and on to reset all of BASIC memory. While developing Player/Missile programs, save new versions prior to execution. Once run, BASIC may not operate correctly!¹

Demonstration

The program DODGE, listing 1, demonstrates the use of Player/Missile Graphics and may serve as a basis for practical applications. This program utilizes the four players to form vertically-moving barriers, along with a single missile, to dodge across the screen under joystick #1 control [STICK(0)]. Each time the missile collides with a moving barrier, the round is started over with all new player colors. Horizontal missile movement is controlled through BASIC statements, while the vertical barrier movements must be done *via* USR functions, due to the slow speed of the BASIC interpreter.

A major problem with Player/Missile Graphics is finding free memory on the correct address boundary to locate the player and missile bit maps. This memory should be protected from modification by the program and BASIC. One such method is to use GRAPHICS 8. This graphics mode occupies the top 8112 bytes of memory, including overhead. Of this 8112 bytes, 256 bytes are reserved for the display list, 6400 bytes are reserved for the GRAPHICS 8 image, 1296 bytes are unused, and 160 bytes are reserved for the text window. The trick is to set

¹ Specifically, I have had trouble in adding new variables to a program after executing a Player/Missile Graphics program. Although the variable was recognized, the value could not be changed from zero. Apparently the variable table pointers were inadvertently modified by my use of Player/Missile Graphics.

```

2130 POKE 705,88
2140 POKE 706,88
2150 POKE 707,88
2210 SPACE=PEEK(106)-8:REM PAGE # OF FREE RAM (SORT OF)
2220 POKE 54279,SPACE:REM POINT HARDWARE TO IT
2230 POKE 53277,3:REM ENABLE DMA TRANSFER
2310 POKE 53256,1:REM DOUBLE SIZE FOR PLAYERS
2320 POKE 53257,1
2330 POKE 53258,1
2340 POKE 53259,1
2350 POKE 53260,0:REM NORMAL SIZE FOR MISSILE 0
2410 P0=SPACE*256+1024/2:REM PLAYER BIT MAPS
2420 P1=SPACE*256+1280/2
2430 P2=SPACE*256+1536/2
2440 P3=SPACE*256+1792/2
2450 M0=SPACE*256+768/2:REM MISSILE BIT MAP
2510 POKE 53248,96:REM HORIZONTAL POSITION OF PLAYERS
2520 POKE 53249,168
2530 POKE 53250,132
2540 POKE 53251,60
2600 REM
2601 REM
2602 REM ... SET UP THE PLAYER PATTERNS
2603 REM ... BY SETTING ALL 128 BYTES TO
2604 REM ... THE DESIRED PATTERNS.
2605 REM
2606 REM
2610 BYTE=0
2620 FOR PATTERN=1 TO 8
2630 FOR BAR=1 TO 8
2640 POKE P0+BYTE,255
2650 POKE P1+BYTE,255
2652 POKE P2+BYTE,255
2654 POKE P3+BYTE,255
2682 POKE P0+BYTE+8,0
2684 POKE P1+BYTE+8,0
2686 POKE P2+BYTE+8,0
2688 POKE P3+BYTE+8,0
2690 BYTE=BYTE+1
2692 NEXT BAR
2694 BYTE=BYTE+8
2695 NEXT PATTERN
2900 REM
2901 REM
2902 REM ... SETUP SOUND, MISSILE, AND THE
2903 REM ... PLAYER COLOR -- ENTRY POINT
2904 REM ... FOR EACH NEW ROUND.
2905 REM
2906 REM
2910 SOUND 0,10,100,8
2920 POKE M0+60,3:REM INSERT MISSILE PATTERN
2930 MISPOS=50:POKE 53252,MISPOS:REM MISSILE HORZ POSITION
2940 POKE 707,INT(RND(1)*15)*16+8:REM RESET PLAYER COLORS
2950 POKE 704,INT(RND(1)*15)*16+8
2960 POKE 706,INT(RND(1)*15)*16+8
2970 POKE 705,INT(RND(1)*15)*16+8
3000 REM
3001 REM
3002 REM ... MAIN LOOP:
3003 REM ... MOVE THE MISSILE ACCORDING TO THE JOYSTICK
3004 REM ... MOVE EACH PLAYER PAIR UP OR DOWN WITH USR
3005 REM ... IF THE MISSILE HAS COLLIDED, THEN START OVER
3006 REM ... NEXT LOOP
3007 REM
3008 REM
3010 FOR LOOP=0 TO 1 STEP 0
3020 IF STICK(0)=11 THEN MISPOS=MISPOS-4:POKE 53252,MISPOS
3030 IF STICK(0)=7 THEN MISPOS=MISPOS+4:POKE 53252,MISPOS
3040 X=USR(256*6,P0):X=USR(256*6+26,P2)
3050 IF PEEK(53256)<>0 THEN SOUND 0,100,10,10:POKE 53278,0:GOTO 2900
3060 NEXT LOOP

```

Listing 2: USR Functions to Move Players

```

*=$0600 FREE MEMORY
;
; USR FUNCTIONS USED BY DODGE TO MOVE TWO CONSECUTIVE
; PLAYERS (256 BYTES) DOWN OR UP THE TELEVISION SCREEN.
; NOTE THAT MOVING A PLAYER UP IN MEMORY WILL MOVE THE
; DISPLAY DOWN THE SCREEN. USE:
;
; X=USR(1536,address of players)
; X=USR(1562,address of players)
;
00D0 PLAY=$00D0 ZERO PAGE POINTER TO PLAYERS
(Continued)

```

the base and mode of the Player/Missile Graphics in such a way as to force the desired bit maps into the 1296 bytes of unused memory. One solution is to set the Player/Missile base at 2K (eight pages) bytes below the top of memory in the GRAPHICS 8 image and use a single line playfield. This will allow the undisturbed use of all four missiles, Player0, and Player1.

A second solution, the one used in DODGE, is to set the Player/Missile base at 2K (eight pages) bytes below the top of memory in the GRAPHICS 8 image and use a double line *narrow* playfield. This will allow the use of all four missiles and all four players. (Specifying a narrow playfield reduces the normal 6400 bytes of GRAPHICS 8 allowing the missile fields to be used.)

In order to move a DODGE player upwards (downwards), 128 bytes must be rotated. Since BASIC is far too slow for this task, two USR functions were POKED into the page of free memory at \$0600 - \$06FF. The USR function starting at decimal 1536 (\$0600) rotates 256 bytes (two consecutive players) downward on the television screen (upward in memory). The USR function starting at decimal (\$061A) rotates 256 bytes (two consecutive players) upward on the television screen (downward in memory). By controlling the horizontal position of the four players, an alternating pattern of vertical movement can be established.

By using simple variations of color, size, position, etc., the reader should be able to use DODGE to master Player/Missile Graphics through simple experimentation.

Mike Dougherty graduated from the University of Tennessee in 1977 with an M.S. degree in Computer Science, and is currently working at Martin Marietta Aerospace in Denver, Colorado. His home-based system presently consists of an Atari 800 with 24K bytes of memory, the Atari 410 recorder and the Atari 850 Interface Module for future communication with single-board computers.

BUY! SELL! TRADE

COMPUTER & HAM EQUIPMENT

**COMPUTER®
TRADER**

Mailed 1st class, 1st and 15th of every month
SEND ADS FIVE DAYS BEFORE MAILING DATE

— RATES —

Subscriptions Ads

One Year \$10.00 Hobby ... 20* Word/Number
Six Months \$6.00 Business ... 55* Word/Number
Per Copy \$1.00 (Non-Subscriber ... Add 15*
Foreign (Air Mail) . \$25.00 yr. Word/Number)

Send Ads and Subscriptions with remittance to:

COMPUTER TRADER®

Chet Lambert, W4WDR
1704 Sam Drive • Birmingham, AL 35235
(205) 854-0271

For ads count name and address, words and numbers
(zip/area code free)

Please include your name, address, call sign or phone number

Listing 2 (Continued)

0600 68	↓	PLA		NUMBER OF USR ARGUMENTS (1)
0601 68	DOWN	PLA		GET ADDRESS OF PLAYER BIT MAP
0602 85 D1		STA	PLAY+1	HIGH ORDER BYTE
0604 68		PLA		
0605 85 D0		STA	PLAY	LOW ORDER BYTE
0607 A0 FF		LDY	#\$FF	POINT TO END OF BIT MAP
0609 B1 D0		LDA	(PLAY),Y	SAVE ONTO STACK
060B 48		PHA		
060C C8		INY		POINT TO FIRST OF BIT MAP
060D B1 D0	DOWNLP	LDA	(PLAY),Y	SAVE CURRENT BIT PATTERN
060F AA		TAX		TEMPORARILY
0610 68		PLA		FETCH PREVIOUS BYTE
0611 91 D0		STA	(PLAY),Y	PUT INTO CURRENT POSITION
0613 8A		TXA		RECOVER OLD CURRENT
0614 48		PHA		PUSH ONTO STACK
0615 C8		INY		NEXT PLAYER BIT PATTERN
0616 D0 F5		ENE	DOWNLP	DO ALL 256 BYTES
0618 68		PLA		CLEAN UP STACK
0619 60		RTS		RETURN TO BASIC
061A 68	↑	PLA		NUMBER OF USR ARGUMENTS (1)
061B 68	UP	PLA		GET ADDRESS OF PLAYER BIT MAP
061C 85 D1		STA	PLAY+1	HIGH ORDER BYTE
061E 68		PLA		
061F 85 D0		STA	PLAY	LOW ORDER BYTE
0621 A0 01		LDY	#\$01	POINT TO BEFORE FIRST
0623 B1 D0		LDA	(PLAY),Y	SAVE ONTO STACK
0625 48		PHA		
0626 88		DEY		POINT TO FIRST OF BIT MAP
0627 B1 D0	UPLP	LDA	(PLAY),Y	SAVE CURRENT BIT PATTERN
0629 AA		TAX		TEMPORARILY
062A 68		PLA		FETCH PREVIOUS BYTE
062B 91 D0		STA	(PLAY),Y	PUT INTO CURRENT POSITION
062D 8A		TXA		RECOVER OLD CURRENT PATTERN
062E 48		PHA		PUSH ONTO STACK
062F 88		DEY		NEXT PLAYER BIT PATTERN
0630 D0 F5		ENE	UPLP	DO ALL 256 BYTES
0632 68		PLA		CLEAN UP STACK
0633 60		RTS		RETURN TO BASIC
		.END		

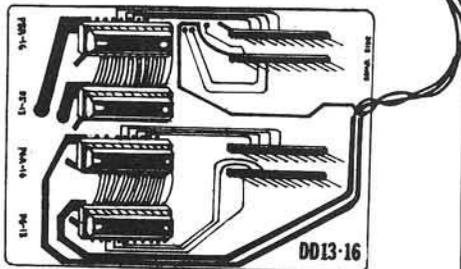
MICRO

NEW
DEALER INQUIRIES INVITED!!

DOUBLE DOS PLUS

for Apple Computers

\$39.00



201-839-3478



DOUBLE DOS Plus—a piggyback board that plugs into the disk-controller card so that you can switch select between DOS 3.2 and DOS 3.3. Works with the language system eliminating the need in many cases to boot the BASICs disk. Also eliminates the chore of converting all of your 3.2 disks to 3.3
NOTE: APPLE is a registered trademark of APPLE Computer, Inc., Cupertino, CA.

WHY IS DOUBLE DOS Plus better?

- Nothing needs to be soldered, just plug in and go.
- Since all four ROMs are used, all software will work, even early 3.1 DOS.
- Because the ROMS fit on the back of the board, it has the thinnest configuration allowing full use of slot #7
- One set of ROMS is powered up at a time, thus saving power. DOUBLE DOS Plus requires APPLE DOS ROMS
- Full 90-day warranty from TYMAC.



MICRO-WARE DISTRIBUTING INC.
P.O. BOX 113
POMPTON PLAINS, N.J. 07444

OTHER UNIQUE PRODUCTS FROM MICRO-WARE DISTRIBUTING INC.

THE APPLE CARD—Two sided 100% plastic reference card for the Apple computer. Loaded with information of interest to all Apple owners **\$3.98**

PARALLEL PRINTER CARD—PPC-100—A Universal Centronics type parallel printer board complete with cable and connector. This unique board allows you to turn on and off the high bit so that you can access additional features in many printers. Use with EPSON, ANADIX, STARWRITER, NEC, SANDERS, OKI, and other with standard Centronics configuration **\$139.00**



THE DOUBLE BOOTER ROM—Plugs into the empty D8 Socket on the Apple motherboard or the Integer ROM Card to provide a 13 sector boot without using the BASICs Disk. DoubleBooter may also be used in the MOUNTAIN HARDWARE ROM PLUS board. This chip will not work in a plus machine unless it contains an Integer board or a ROM Plus board **\$29.00**

DISK STIX—Contains 10 dozen diskette labels with either 3.3 or 3.2 designation. Room for program names and type also **\$3.98**

*******SOFTWARE*******

- SUPER SEA WAR**—Hires battleship type simulation **\$13.95**
- ULTIMATE XFER**—A telephone software transfer program, uses DC Hayes Assoc. micromodem **\$25.00**
- ROAD RALLY**—Hires driving game with 5 different full screen tracks **\$15.00**
- MISSILE CHALLENGER**—Hires arcade type game where you defend your cities from falling missiles. 8 levels & writes name & high score to disk **\$19.95**
- SUPER PIX**—Hires screen dump for the EPSON MX-80, inverse or normal, larger than full page graphics in 2 orientations. Needs Tymac PPC-100 Printer board or we will upgrade your EPSON board for \$25 **\$39.95**
- GRAPH-FIT**—A hires graphing program that produces bar charts, pie charts and line graphs. Has auto scaling feature too **\$25.00**

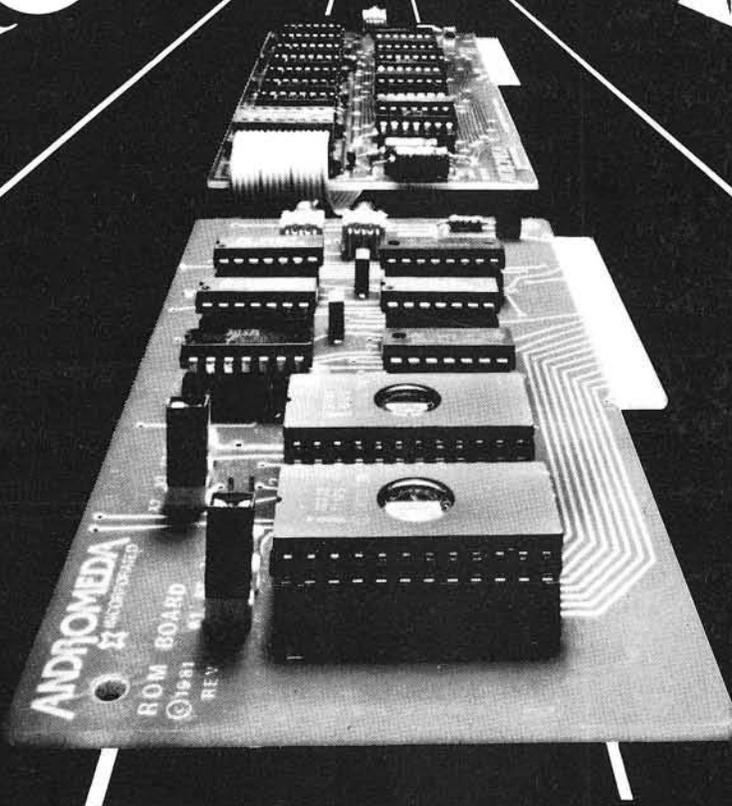
STILL MORE APPLE GOODIES

- APPLE KEYBOARD SYNTHESIZER**—49 note (C to C) AGO Keyboard with 3 sawtooth sq wave shapers, 3 audio oscillators, 3 low pass filters, 4-64 point shape controllers, 2 envelope generators. Complete system **\$995**
- KEYBOARD ONLY** with Apple Interface **\$649**
- GRAPHIC NOTEWRITER**—Hires note write for synthesizer system **\$99**
- SUPER PIX OKI**—Hires screen dump for OKI Microline 80, 82, 83 Printers. Same features as super pix. Needs Tymac PPC-100 Board **\$24.95**
- NIBBLES AWAY**—The best disk back up program to date. Allows you to make backups of most every disk ever produced for the Apple. Over 10 user defined parameters including synchronized & unsynchronized copies as well as automatic half tracking and raw date transfer **\$59**

Call 201-839-3478 for Dealer & Distributor Inquiries.

A BRIGHT NEW STAR FROM
ANDROMEDA!

ROM * RAM



NEW ROM BOARD FOR THE APPLE II* \$125.00 WITH UTILITY ROM.

With Andromeda's new ROM Board, you can plug many useful utility programs into your Apple II. Because ROM memory never forgets, you can access these utilities instantly without having to load them from disk.

The ROM Board comes with the utility ROM, which gives you five powerful options to apply to your Applesoft* programs. With the Utility ROM, you can do automatic line numbering, control a program list with a page mode, restore a crashed Applesoft* program in memory, alphabetize a disk catalogue and create a disk without DOS, giving you an extra 8K on your disk. Any of Soft Control Systems' other ROMS can be used, such as the Dual DOS in ROM, and Your'ple ROM.

You can install 2K PROMS, 4K PROMS, or even 2K RAM chips in each of the two memory sockets. So you can even have the Read - Write capability of RAM to develop PROM Programs yourself, or just have an extra 2K RAM for your machine - Language programs. Two 2732 PROMS allow a total of 8K of memory on the Board.

Now with One Year Warranty.

ANDROMEDA



INCORPORATED
Greensboro, NC. 27410
P.O. Box 19144

919 852-1482



Price for Andromeda 16K RAM expansion board now only \$120.00. Please add \$5 for shipping and handling. North Carolina residents add 4% sales tax.

*DEALER INQUIRIES WELCOME.



We'd like your apple[®] to meet The **Executive Secretary[™]**

The professional
 word processing system
 for the Apple[™] computer

GENERAL		check this chart:	
Editing, printing, form letters, mail-merge, and electronic mail all in one package at one price?	✓	INTEGRATED CARD FILE FEATURES	
User's manual designed for the user?	✓	Allows multiple card files per disk?	✓
User-controlled configuration of printers, slots, drives, and 40/80 column editing?	✓	Allows user to define size and content of 'cards' in each file?	✓
THE MANUAL		Generates new subset card files based on search or sort criteria for an existing file?	✓
Complete index included?	✓	Incorporates one/multiple line report printer for card files?	✓
Organized as a set of lessons?	✓	Allows totals and subtotals during report printing?	✓
Easel-bound for ease of use?	✓	THE DOCUMENT EDITOR	
THE DOCUMENT PRINTER		Keeps up with professional typing speeds?	✓
Integrates files from DB MASTER's Utility Pack [™] , The Data Factory [™] , Visicalc [™] , Information Master [™] , and most DIF [™] files.	✓	User-defined phrase abbreviations?	✓
Accepts keyboard input at print time?	✓	40 or 80 character edit modes user-selectable?	✓
Supports all major printers, including Centronics 737 and IBM ET-series?	✓	Supports Smarterm [™] , Superterm [™] , Videoterm [™] and Full View 80 [™] .	✓
Has IF and related commands to allow conditional printing of information based on the contents of a database or on keyboard input?	✓	Uses real shift key?	✓
Prints page headers of arbitrary complexity?	✓	Supports file merge and unmerge?	✓
Prints page numbers wherever you want them?	✓	Global search and replace?	✓
Automatically generates alphabetical index for words you specify?	✓	Block operations: move, transfer, delete?	✓
Supports file chaining and file nesting?	✓	Character/word/line: insert/replace/delete?	✓
Has multi-level outline indenting?	✓	Allows embedded commands to control special printer functions?	✓
Has left- and right-justified tab stops?	✓	ELECTRONIC MAIL SYSTEM	
Gives full control of all margins, dynamic text reformatting, centering, and justification?	✓	Menu driven?	✓
Supports Thunderclock [™] and the CCS clockcard for automatic dating?	✓	Multiple document queuing?	✓
		Fully automatic with Hayes modem?	✓

Published by:



4306 Upton Avenue South
 Minneapolis, Minnesota 55410
 Phone (612) 929-7104

Distributed
 by:

Aurora Systems
 2040 East Washington Ave.
 Madison, WI 53704
 (608) 249-5875

Eastern Software
 17 Commerce Street
 Baltimore, MD 21012
 (301) 539-5022

Software Express
 2615 Miller Avenue
 Mountain View, CA 94041
 (415) 949-1118

consumer computers Mail Order DISCOUNTS

ORDER TOLL-FREE



NEC Microcomputer

PC-8001A 32K Computer CALL
 PC-8012A I/O Unit w/32K RAM CALL
 PC-8013A Dual Mini-Disk Drive Unit CALL
 PC-8001 Multi Cardware (FDI/O & 32K) CALL
 CP/M 2.2 Operating System for NEC 129
 WordStar configured for NEC 299
 SuperCalc configured for NEC 279
 NEC Wordprocessor & Accounting Software CALL
 Many more software packages and languages;
 (Pascal, Fortran, Cobol, etc) are available configured for
 the NEC 8001A Computer.
 Please call or write for a product price list.



ATARI 800 16K \$749

Atari 400 w/16K 349
 410 Program Recorder 65
 810 Disk Drive 449
 825 80 col. 7x8 Dot matrix impact printer 699
 822 40 col. Quiet Thermal Printer 349
 850 Interface Module 159
 Atari 16K Ram Module 69
 Axlon Ramcram 32K Module 189

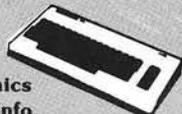
Video Monitors

Amdek/Leedex Video 100 12" B&W 155
 Amdek/Leedex Video 100G 12" Green Phosphor 179
 Amdek (Hitachi) 13" Color w/audio output 389
 NEC 12" Green Phosphor Display JB-1201M CALL
 NEC 12" Lo-Res Color Display CALL
 NEC 12" Hi-Res RGB Color Display CALL
 Sanyo 9" B&W Display 185
 Sanyo 9" Green Phosphor Display CALL
 Sanyo 12" B&W Display 269
 Sanyo 12" Green Phosphor Display 285
 Sanyo 13" Color Display 449
 Zenith 12" Green Phosphor Display ZVM-121 149

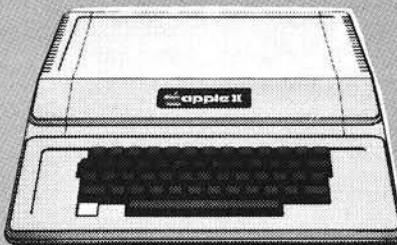


ZENITH 12" GREEN \$149

VIC20™ \$259
 Personal Computer
 Color * Sound * Graphics
 Call or write for more info.
 Disk drives available soon!



Apple Computer
 Authorized Dealer



APPLE II PLUS
 16K NOW \$1025
 48K NOW \$1089
 64K* NOW \$1199
 *48K Apple with 16K RamBoard



APPLE DISK DRIVES \$439

w/controller and DOS 3.3 \$499

Apple Cards and Hardware

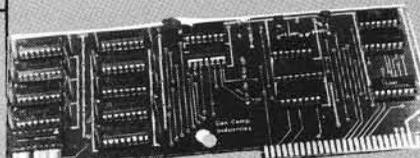
Language System w/Pascal & BASICS 379
 Silentype Printer w/Interface card 349
 Hayes Micromodem II 299
 Novation Apple-Cat 339
 Videx Videoterm 80 column card 269
 Videx Keyboard Enhancer 115
 Z-80 Softcard by Microsoft 299
 16 K RamCard by Microsoft 169
 CPS Multi-function card 189

Software for the Apple

VisiCalc version 3.3 159
 VisiFile (NEW data base manager) 199
 VisiTrend/VisiPlot 219
 DB Master 169
 WordStar (Apple 80 col. version) 249
 Dow Jones Portfolio Evaluator 45
 Apple Post 45
 Apple Writer 65
 Dow Jones News & Quotes Reporter 85
 Apple Plot 60
 Tax Preparer 99
 Real Estate Analyzer 129

16K RAMBOARD by ConComp for Apple II Computers

FOR ONLY \$129⁹⁵



AVAILABLE NOW

S-100

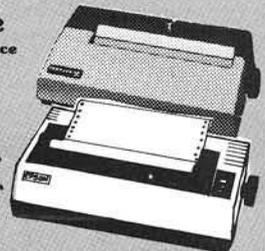
California Computer Systems

Floppy Disk Controller \$369
 64K Dynamic Ram Board, 200ns \$499
 Z-80 CPU board w/monitor ROM \$269
 16K Static memory board, 200ns 369
 32K Static memory board, 200ns 599
 S-100 12 Slot Mainframe 475
 4-Port Serial Interface 299
 2-Port Serial/2-Port Parallel Interface 299
 4-Port Parallel Interface 229

Printers

Silentype w/Apple II interface \$349

Epson MX-80 or MX-80 FT CALL



Anadex 9501 w/2K Buffer 1349
 C. Itoh Starwriter 25 CPS daisywheel 1449
 C. Itoh Starwriter 45 CPS daisywheel 1649
 Epson MX-70 CALL
 Epson MX-80 & MX-80 F/T CALL
 Epson MX-100 CALL
 NEC 8023 Impact Dot Matrix 695
 NEC Spinwriters (Latest models) CALL
 Paper Tiger IDS-445G w/graphics 699
 Paper Tiger IDS-460G w/graphics 949
 Paper Tiger IDS-560G w/graphics 1249
 Silentype Printer w/Apple Interface 349
 Qume Sprint Daisywheels (Latest models) CALL

ORDER TOLL FREE 800-854-6654

In California and outside continental U.S.
(714) 698-8088
 Telex 695-000 Beta CCMO

Send Orders To:

Ordering information: Phone orders using VISA, MASTERCARD, AMERICAN EXPRESS, DINER'S CLUB, CARTE BLANCHE, bank wire transfer, cashier's or certified check, money order, or personal check (allow ten days to clear). Unless prepaid with cash, please add 5% for shipping, handling and insurance. (minimum 5.00). California residents add 6% sales tax. We accept CODs. OEM's, Institutions and corporations please send for a written quotation. All equipment is subject to price change and availability without notice. All equipment is new and complete with manufacturer's warranty (usually 90 days). Showroom prices may differ from mail order prices.

consumer computers Mail Order

8314 Parkway Drive La Mesa, Calif. 92041

Experimenters and the Color Computer

A brief summary of the normal capabilities of the TRS-80 Color Computer, and an examination of the unit's I/O capability. Detailed instructions are given for home-brew software expansion via the Program Pack port, and a list of vendors of software and hardware expansion provided.

Ralph Tenny
P.O. Box 545
Richardson, Texas 75080

An Overview

Radio Shack's TRS-80C Color Computer is two machines in one: it is a really fine games machine with good color graphics capability, and it is the start of a very powerful, low-cost experimenter's computer. Unless you are really into color graphics, however, the graphics capability could get in your way.

That last statement deserves a bit of explanation. When you first get your Color Computer, it is a real shake-up to enter ?MEM and get the answer "8487". 8K bytes out of 16K? What gives? The answer is that the machine automatically reserves four screens (1.5K per screen) of space for color graphics, whether or not you plan to use *any* graphics! Most of this memory can be recovered using the command "PCLEAR 1". This forces the computer to reserve only one screen for graphics. A second procedure gets it all back:

```
POKE 25,6;ENTER;NEW;ENTER
```

As you look at the machine, you will notice that the keyboard isn't a full, professional keyboard. What is there is actually quite good for the overall cost/features trade-off. The

back panel of the machine has a number of openings for printer cable, joysticks, RF outlet to the color TV set, and cassette cable. On the right side you'll find a slot to accept the Program Packs, which are Radio Shack's major software distribution media. This same slot is also the computer's expansion port, which is already being taken advantage of by some manufacturers selling expansion hardware packages. Some of these manufacturers and their products are listed later in this article, but the field is expanding so rapidly that publication deadlines prevent inclusion of the newest ones.

One of the major features of the machine is the internal architecture, which is superbly laid out with very cost-efficient design. The details of this architecture have been thoroughly described¹, and most will not be repeated here. The major advantage of the Color Computer may well be the fact that the memory map is software selectable to a great degree. Also, the expansion port has a decode defeat line which allows an external peripheral to re-assign the entire memory map except for the display and I/O hardware which are located above \$FF00.

Much of the joy in working with the Color Computer is finding all the built-in "hooks" which were left for future expansion, but I have also greatly enjoyed working with the 6809 processor. As MICRO editor Robert Tripp has already pointed out, the 6809 is really what all us 6502 buffs have wished for but couldn't have until now!

Modification Ideas

Two items are an absolute "must" for anyone contemplating modification of the Color Computer: a copy of Reference 1, and the Service Manual for the Color Computer. The stock number for the Manual is 26-3001/3002, and it most likely will have to be ordered by your local Radio Shack store. The manual gives schematics, service information, and a description of operation

for most of the circuits. Even with these resources, I recommend that you not attempt hardware modifications unless you have considerable experience with computers and digital hardware.

One of the most obvious areas for changing the Color Computer is *via* the Program Pack port. New software can be installed in 2716 or 2732 EPROMs, by modifying one of the cheapest Program Packs. It is possible to (carefully!) unsolder the masked ROM present in these packs and replace it with a socket. If this is done, the original ROM should work in the socket, in case you want to restore the original function.

If you compare the EPROM pinouts vs. the socket connections in the Program Pack, you will see that the Intel format 2716's and the 2516 and 2532 EPROMs from Texas Instruments will (almost) drop into the sockets. A few minor etch cuts (summarized in figures 1 and 2) will allow proper operation of these EPROMs in place of the original masked ROM. The etch cuts required for the 2716/2516 (essentially identical parts) are shown in photos 1 and 2. However, if you want to run two EPROMs, some additional address decoding will be required so that the two ROMs do not interfere with each other. This decoding can be done by using a single quad NAND gate as shown in the circuit in figure 3, and further detailed in photos 1 and 2. A few more changes would be required to adapt the Intel 2732 to the address connections used in the Program Pack, and these are detailed in figure 4. Photos 3 and 4 show the modified PC card installed in the Pack, and the Pack installed in the computer.

You need to consider one additional modification to the Program Pack before you can use it without interference from the BASIC ROMs installed in the computer. The regular BASIC (not Extended BASIC) checks for the presence of a Program Pack and vectors into the Program pack if it is installed.

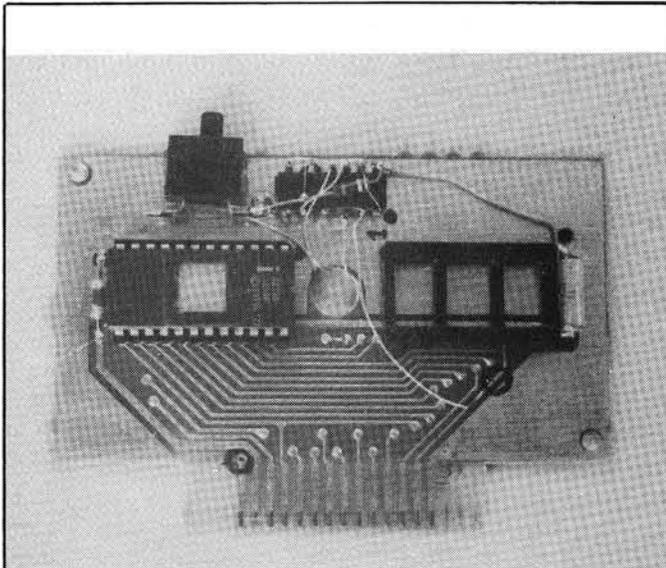


Photo 1: Component side view of Program Pack card, with two-ROM modification, defeat switch and decoding installed. Black circles mark etch cuts; the left one inhibits pack autostart. The other etch cut isolates A12 which, in turn, is used as Block Select by the decoder.

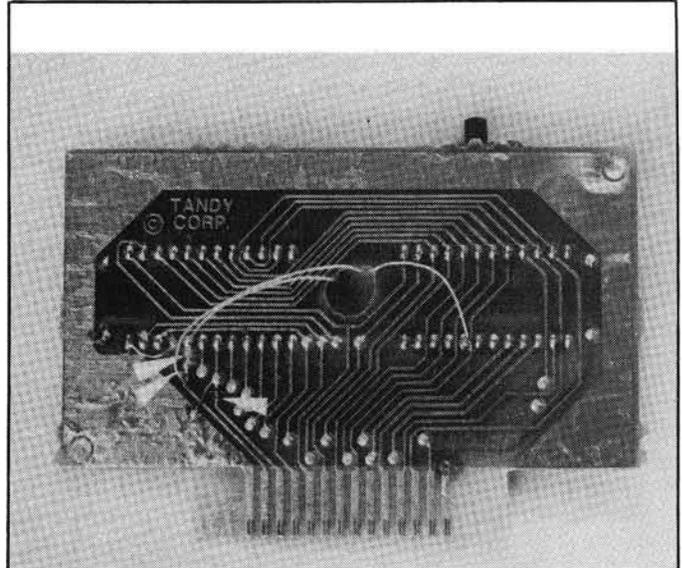


Photo 2: Back side of Program Pack card. White arrows show etch cuts; bottom one isolates all; adjacent jumper grounds pin 18 on ROMs for 2716/2516 use. Restore this connection for 2532 EPROMs. The other two etch cuts isolate incoming decode signal lines to allow separate decoding.

We review products from every source and carry ALL OF THE BEST



We offer products from
 Mark Data • Micro Works
 Radio Shack • Book Publishers
 NEC • Centronics • Moore
 Color Invaders • Color Pac Attack
 Monitor • Adventure Games • Text Editors
 Assemblers • PASCAL • Magikube
 Finance Programs • Color Data Organizer
 Graphic Games • Disassembler
HARDWARE: 32K RAM Expansion Board • 16K RAM Set
 Cables • Interfaces • Power Pack ROM Cartridge • Printers
ACCESSORIES: Books • Cassettes • Supplies • Service Manuals
 Look to **COMPUTERWARE** for **DISK SOFTWARE**

*** NEW PRODUCTS ***

16 PLUS BOARD — Just plug in to expand from 16K to 32K
PAC ATTACK — graphics action game — **PAC ATTACK**
 32K versions of Editor, Assembler, Monitor, PASCAL, BERSERK game —
 Micro Text (communications) — **STAR BLASTER**

Shipping from stock

CALL
 OR
 WRITE
 FOR
 COMPLETE
 INFORMATION



Dept. C • Box 668
 6809 Specialists Encinitas, CA 92024 • (714) 436-3512
 Computerware is a trademark of Computerware.

TRS-80 COLOR COMPUTER SOFTWARE

FORTH FOR THE TRS-80 COLOR COMPUTER DISK SYSTEM

Trying to get control of your Color Computer?? Tired of translating HEX to decimal?? Tired of remembering where the VDG and SAM are and how to program them?? Want to write machine language code with assembly language mnemonics instead of POKES??

Want to write programs in half the time?? Want to write lots of small pieces of code that you can put together in seconds to do BIG JOBS??? Want a language that is at least 5 to 10 times faster than BASIC??? Want to learn everything there is to know about FORTH, with the best manual on the market, including lots of examples of FORTH applications, and detailed explanations of how everything works??

CC FORTH IS THE ANSWER!!
 Includes Editor, 6809 Assembler, String Functions, Disk Data File Operations and Much Much More! **\$99.95**

THE COLOR TOOLKIT

Utility and Diagnostic Disk Programs by Dick Bartholomew

The COLOR Toolkit is a set of Disk diagnostics and Disk utilities for the TRS-80 Color Computer Disk System. Dick Bartholomew, well known for his utility programs for FLEX systems, has created a package of invaluable tools for the serious programmer. These include: Reading FLEX disks, Writing FLEX disks, Repairing Radio Shack disks, Extended directory, and many, many more.

PRICE ONLY \$49.95 on RS disk.

U.S.A. ADD \$2.00 FOR STANDARD UPS SHIPPING & HANDLING
 FOREIGN ORDERS ADD 10% SURFACE, 20% AIRMAIL

FRANK HOGG LABORATORY

130 MIDTOWN PLAZA, SYRACUSE, NY 13210 (315) 474-7856

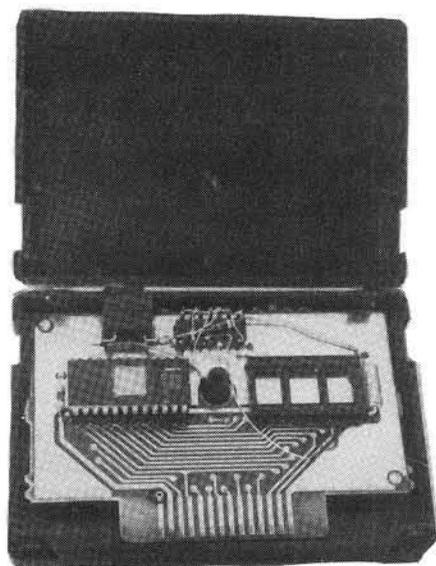


Photo 3: Modified Program Pack card installed in carrier. Center post in carrier holds screw to secure lid; case also snaps together along edges. Lower half of case must be notched for switch.



Photo 4: Program Pack installed; note case cutout and protruding defeat switch handle.

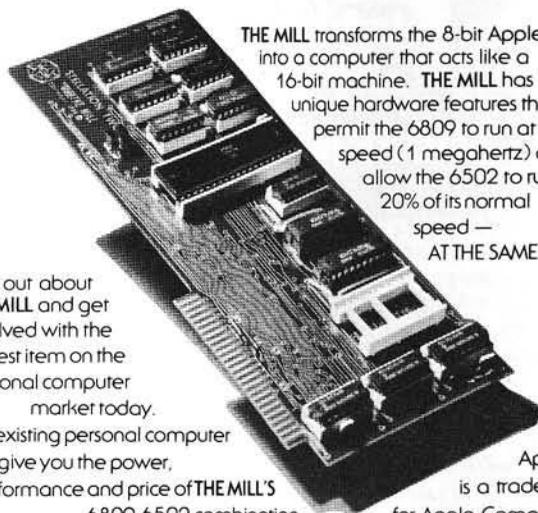
Your Apple too slow? Not anymore...

Now you too can write 6809 programs for your Apple II that are DOS 3.3 compatible. But you don't have to stop there, you can also program your Apple II's 6502 and the 6809 of THE MILL to run SIMULTANEOUSLY.

THE ASSEMBLER DEVELOPMENT KIT, including THE MILL, is a full feature assembler, designed to use the text editing system of your choice. The system will also boost your computer programming productivity, since the 6809 is today's easy to learn and program computer. Take advantage of the 8-bit 6502 and the 16-bit abilities of the 6809 running at the same time, create your own MULTIPROCESSING ENVIRONMENT on the Apple II.

Put THE MILL into your Apple II and get power, performance and price matched by no other personal computer. STELLATION TWO offers a full 1 year warranty and a 60 day money back guarantee, if you're not completely satisfied with the power of THE MILL.

Shop around, then compare the service, quality, price and power of THE MILL. Take this ad to your local Apple Dealer and see the endless possibilities of adding THE MILL to your Apple II.

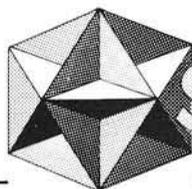


THE MILL transforms the 8-bit Apple II into a computer that acts like a 16-bit machine. THE MILL has unique hardware features that permit the 6809 to run at full speed (1 megahertz) and allow the 6502 to run at 20% of its normal speed —
AT THE SAME TIME!

Find out about THE MILL and get involved with the hottest item on the personal computer market today.

No existing personal computer can give you the power, performance and price of THE MILL'S 6809-6502 combination.

Apple II is a trademark for Apple Computer, Inc.



**STELLATION
TWO**

P.O. BOX 2342 -N7
SANTA BARBARA, CA. 93120
(805) 966-1140

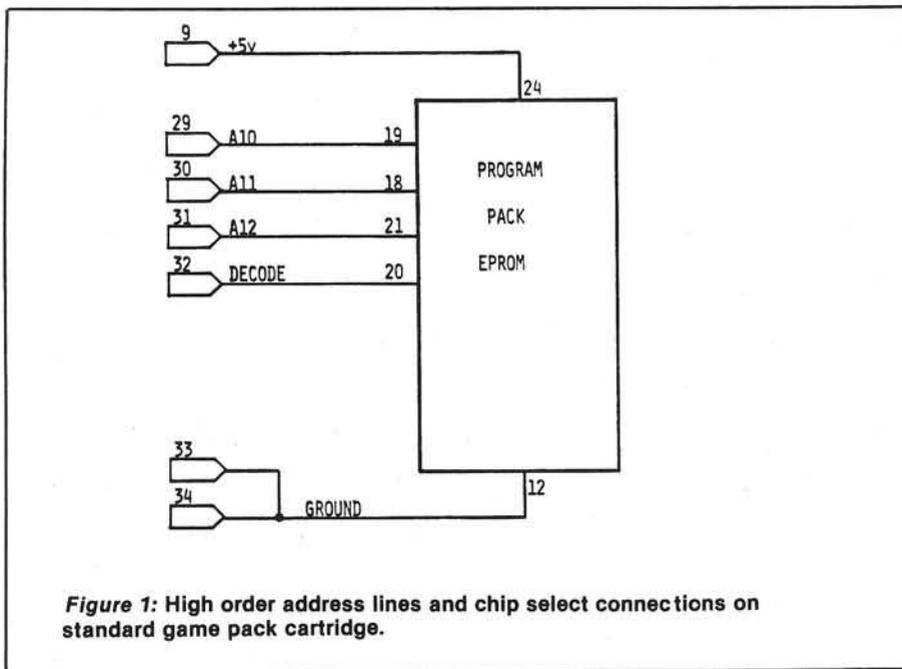


Figure 1: High order address lines and chip select connections on standard game pack cartridge.

strictly limited to five volts maximum, the computer will digitize the input with a resolution of six binary bits or 78 millivolts, which is adequate for many applications. Another use for these voltage ports could be to sense mechanical positions, if suitable potentiometers are attached to the moving machinery and powered from pins 5 and 3 of the port.

Printer Port — One RS-232 output line, two RS-232 input lines and ground. The input lines will "read" digital signals, but the output line will swing nearly 24 volts peak-to-peak, and would require an external current-limiting resistor and diode clamping if it were used to drive something such as CMOS logic. This last experiment should not be undertaken without a thorough understanding of circuit design techniques and the limitations of the IC's used, both inside the Color Computer and in the external circuitry.

Cassette Recorder Port — In general, only low-level audio signals can be handled at this port, but you may be able to think of some way to apply such signals. In addition, an isolated relay closure is available for external on-off functions. For the safety of the computer, it would be best to limit this application to circuitry requiring not more than 100 mA of DC current.

(Continued)

This is accomplished by interconnecting two pins on the PC board in the Pack. Pin 7 of the port is connected to pin 6 of the port only when the pack is in place. This path must be interrupted if you do not want the Pack to take over automatically. In photo 1, the left-hand card edge pin is circled, indicating the required etch cut on top the board.

The switch shown in this series of photos is shown also in the circuit of figure 3, along with a necessary pull-up resistor. Normally, the Pack can be accessed from BASIC using "EXEC 49152". If this switch is open, entry into the Program Pack is blocked.

External I/O

The Color Computer does not have any kind of external I/O capability except for the ports intended for use with the regular peripherals — printer, cassette recorder and game paddles. If an applications program is placed in the Program Pack, some of these ports can be made available for external I/O of a limited form. Let's examine the I/O capability of these various ports:

Game Paddle Ports — One discrete switch closure to ground and two voltage inputs at each port. Although these voltages must be

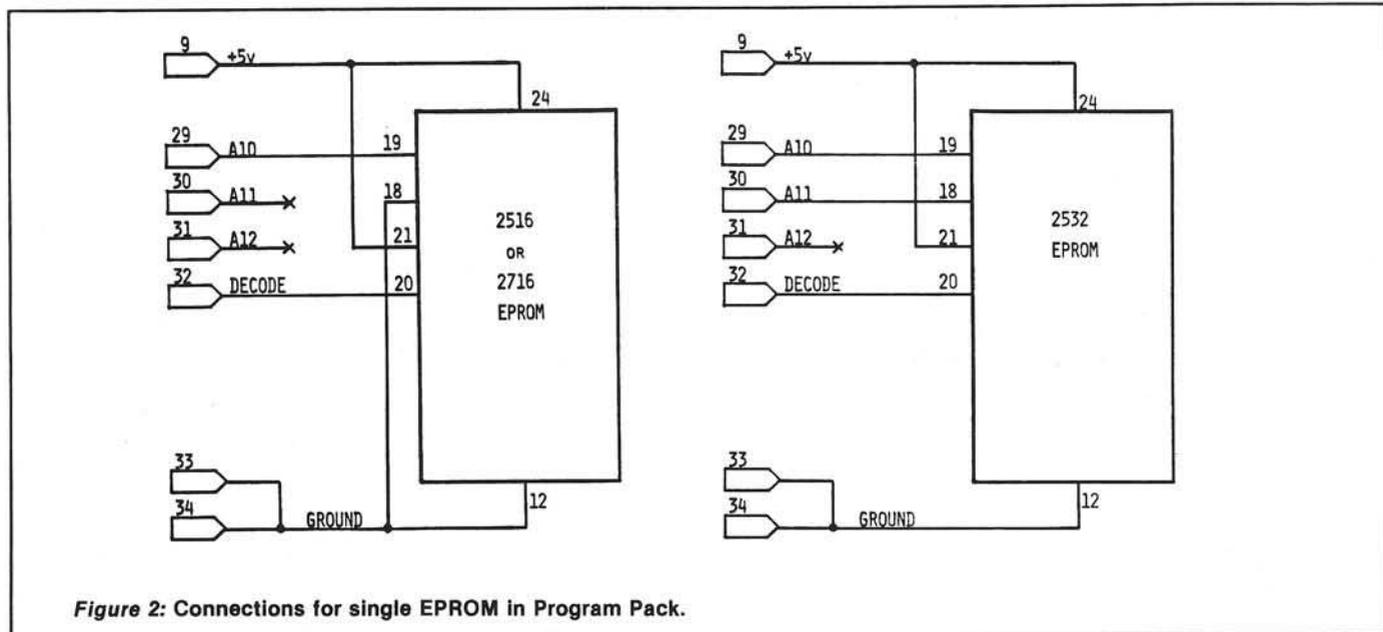


Figure 2: Connections for single EPROM in Program Pack.

DATASOFT, Inc.: Monitor, Assembler, Disassembler, Debugger, Editor.

Vendor Addresses

Datasoft, Inc.
16606 Schoenborn St.
Sepulveda, CA 92343

Exatron
181 Commercial St.
Sunnyvale, CA 94086

The MICRO WORKS
P.O. Box 1110
Del Mar, CA 92014

Nelson Software Systems, Inc.
P.O. Box 19096
Minneapolis, MN 55409

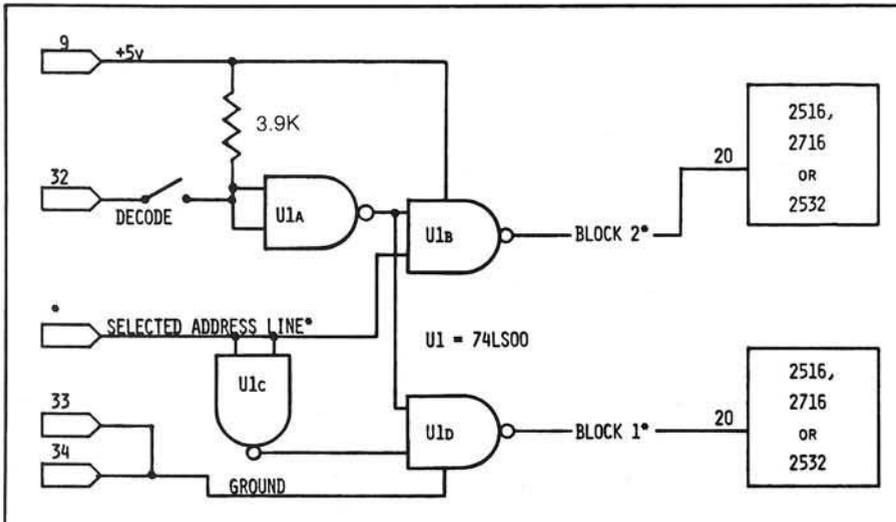
Spectral Associates
141 Harvard Ave.
Tacoma, WA 98466

SSM Soft Sector Marketing, Inc.
6250 Middlebelt
Garden City, MI 48135

Tallgrass Technologies Corp.
9009 W. 95th St.
Overland Park, KS 66212

Reference

1. "What's Inside Radio Shack's Color Computer?," *BYTE*, March 1981, p. 90.



*If A11 (pin 30) is used, Block 1 = \$C000-\$C7FF and Block 2 = \$C800-\$CFFF. If A12 (pin 31) is used, Block 1 = \$C000-\$CFFF and Block 2 = \$D000-\$DFFF.

Figure 3: Schematic of address decoding required to support two EPROMs in one Program Pack.

Commercial Expansion Hardware and Software

So far, only a limited amount of expansion hardware has been announced, with much of it being related to floppy disk and memory expansion. It is possible to expand the Color Computer to 32K internally, using suggestions from reference 1. However, this will invalidate your warranty, so plan accordingly. The following items are currently advertised in various home computer journals, and a list of addresses for the manufacturers is provided at the end of this article.

EXATRON: Plug-in cartridge containing 32K of dynamic read/write memory and provision to accept a plug-in disk controller. ROM-based software furnished to drive either configuration.

The MICRO WORKS: Memory expansion to both 16K and 32K internal and a serial-to-parallel adapter to drive serial printers. Assembly-language monitor, Disassembler, and software described as a software development system — assembler, editor and monitor in one package.

TALLGRASS: Double-density floppy disk controller, 64K internal memory expansion, ROM-based disk driver + monitor.

SPECTRAL ASSOCIATES: EPROM Programmer, Editor/Assembler, Monitor, Disassembler, games.

NELSON SOFTWARE: Memory conversion kits, Word processor software, games.

SSM, Inc.: Disassembler, Games, software keyboard expansion.

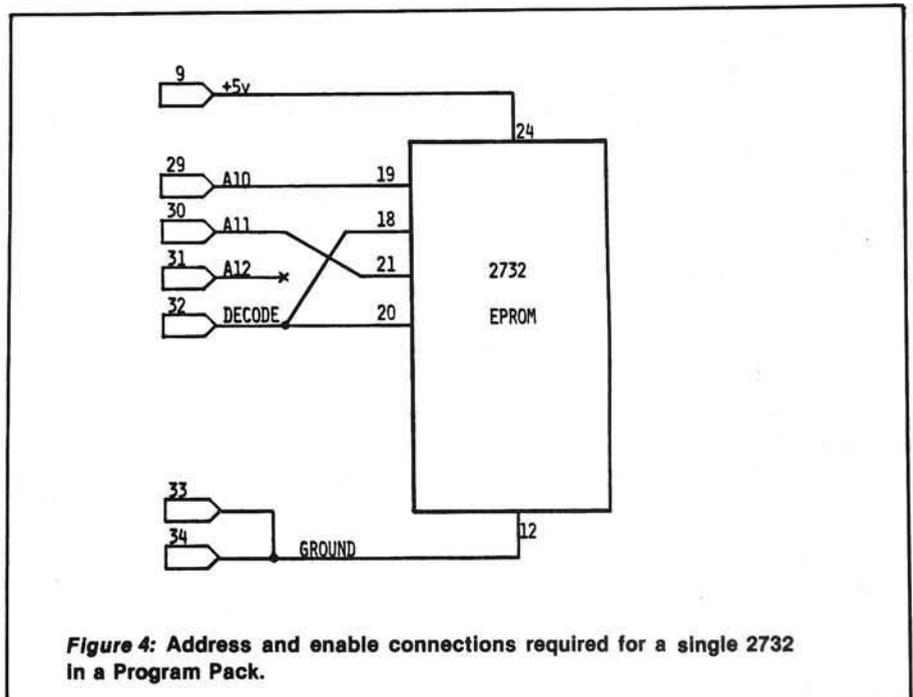


Figure 4: Address and enable connections required for a single 2732 in a Program Pack.

OSI

TRS-80

COLOR-80

OSI

GALAXIAN - 4K - One of the fastest and finest arcade games ever written for the OSI, this one features rows of hard-hitting evasive dogfighting aliens thirsty for your blood. For those who loved (and tired of) Alien Invaders. Specify system - A bargain at \$9.95 OSI

LABYRINTH - 8K - This has a display background similar to MINOS as the action takes place in a realistic maze seen from ground level. This is, however, a real time monster hunt as you track down and shoot mobile monsters on foot. Checking out and testing this one was the most fun I've had in years! - \$13.95. OSI

THE AARDVARK JOURNAL

FOR OSI USERS - This is a bi-monthly tutorial journal running only articles about OSI systems. Every issue contains programs customized for OSI, tutorials on how to use and modify the system, and reviews of OSI related products. In the last two years we have run articles like these!

1) A tutorial on Machine Code for BASIC programmers.

2) Complete listings of two word processors for BASIC IN ROM machines.

3) Moving the Directory off track 12.

4) Listings for 20 game programs for the OSI.

5) How to write high speed BASIC - and lots more -

Vol. 1 (1980) 6 back issues - \$9.00

Vol. 2 (1981) 4 back issues and subscription for 2 additional issues - \$9.00.

ADVENTURES!!!

For OSI, TRS-80, and COLOR-80. These Adventures are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer commands like "Look in the Coffin" and "Light the torch".)

Adventures require 8K on an OSI and 16K on COLOR-80 and TRS-80. They sell for \$14.95 each.

ESCAPE FROM MARS (by Rodger Olsen)

This ADVENTURE takes place on the RED PLANT. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

PYRAMID (by Rodger Olsen)

This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

TREK ADVENTURE (by Bob Retelle)

This one takes place aboard a familiar starship. The crew has left for good reasons - but they forgot to take you, and now you are in deep trouble.

DEATH SHIP (by Rodger Olsen)

Our first and original ADVENTURE, this one takes place aboard a cruise ship - but it ain't the Love Boat.

VAMPIRE CASTLE (by Mike Bassman)

This is a contest between you and old Drac - and it's getting a little dark outside. \$14.95 each.

OSI NEW-NEW-NEW TINY COMPILER

The easy way to speed in your programs. The tiny compiler lets you write and debug your program in Basic and then automatically compiles a Machine Code version that runs from 50-150 times faster. The tiny compiler generates relocatable, native, transportable machine code that can be run on any 6502 system.

It does have some limitations. It is memory hungry - 8K is the minimum sized system that can run the Compiler. It also handles only a limited subset of Basic - about 20 keywords including FOR, NEXT, IF THEN, GOSUB, GOTO, RETURN, END, STOP, USR(X), PEEK, POKE, -, =, *, /, <, >. Variable names A-Z, and Integer Numbers from 0-64K.

TINY COMPILER is written in Basic. It can be modified and augmented by the user. It comes with a 20 page manual.

TINY COMPILER - \$19.95 on tape or disk OSI

SUPERDISK II

This disk contains a new BEXEC* that boots up with a numbered directory and which allows creation, deletion and renaming of files without calling other programs. It also contains a slight modification to BASIC to allow 14 character file names.

The disk contains a disk manager that contains a disk packer, a hex/dec calculator and several other utilities.

It also has a full screen editor (in machine code on C2P/C4) that makes corrections a snap. We'll also toss in renumbering and program search programs - and sell the whole thing for - SUPERDISK II \$29.95 (5 1/4") OSI

BARE BOARDS FOR OSI C1P

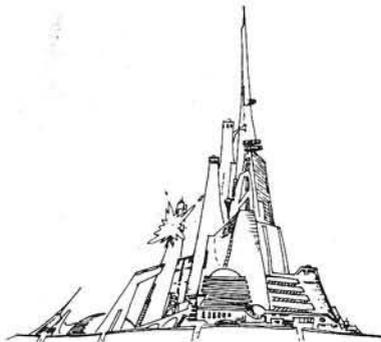
MEMORY BOARDS!!! - for the C1P - and they contain parallel ports!

Aardvarks new memory board supports 8K of 2114's and has provision for a PIA to give a parallel port! It sells as a bare board for \$29.95. When assembled, the board plugs into the expansion connector on the 600 board. Available now!

PROM BURNER FOR THE C1P - Burns single supply 2716's. Bare board - \$24.95.

MOTHER BOARD - Expand your expansion connector from one to five connectors or use it to adapt our C1P boards to your C4/8P. - \$14.95.

16K RAM BOARD FOR C1P - This one does not have a parallel port, but it does support 16K of 2114's. Bare Board \$39.95.



Please specify system on all orders

This is only a partial listing of what we have to offer. We offer over 120 games, ROMS, and data sheets for OSI systems and many games and utilities for COLOR-80 and TRS-80. Send \$1.00 for our catalog.

AARDVARK TECHNICAL SERVICES, LTD.
2352 S. Commerce, Walled Lake, MI 48088
(313) 669-3110

WORD PROCESSING THE EASY WAY - WITH MAXI-PROS

This is a line-oriented word processor designed for the office that doesn't want to send every new girl out for training in how to type a letter.

It has automatic right and left margin justification and lets you vary the width and margins during printing. It has automatic pagination and automatic page numbering. It will print any text single, double or triple spaced and has text centering commands. It will make any number of multiple copies or chain files together to print an entire disk of data at one time.

MAXI-PROS has both global and line edit capability and the polled keyboard versions contain a corrected keyboard routine that make the OSI keyboard decode as a standard typewriter keyboard.

MAXI-PROS also has sophisticated file capabilities. It can access a file for names and addresses, stop for inputs, and print form letters. It has file merging capabilities so that it can store and combine paragraphs and pages in any order.

Best of all, it is in BASIC (OS65D 51/4" or 8" disk) so that it can be easily adapted to any printer or printing job and so that it can be sold for a measly price.

MAXI-PROS - \$39.95. Specify 5 1/4" or 8" disk.

SUPPORT ROMS FOR BASIC IN ROM MACHINES

- C1S/C2S. This ROM adds line edit functions, software selectable scroll windows, bell support, choice of OSI or standard keyboard routines, two callable screen clears, and software support for 32-64 characters per line video. Has one character command to switch model 2 C1P from 24 to 48 character line. When installed in C2 or C4 (C2S) requires installation of additional chip. C1P requires only a jumper change. - \$39.95

C1E/C2E similar to above but with extended machine code monitor. - \$59.95 OSI

ARCADE GAMES FOR OSI, COLOR-80 AND TRS-80 (8K OSI, 16K TRS-80 AND COLOR-80)

TIMETREK - A REAL TIME, REAL GRAPHICS STARTREK. See your torpedoes hit and watch your instruments work in real time. No more unrealistic scrolling displays! \$14.95.

STARFIGHTER - This one man space war game pits you against spacecruisers, battlewagons, and one man fighters, you have the view from your cockpit window, a real time working instrument panel, and your wits. Another real time goody. \$9.95

BATTLEFLEET - This grown up version of Battleship is the toughest thinking game available on OSI or 80 computers. There is no luck involved as you seek out the computers hidden fleet. A topographical toughie. \$9.95

QUEST - A NEW IDEA IN ADVENTURE GAMES! Different from all the others, Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time. 16K COLOR-80 OR TRS-80 ONLY. \$14.95

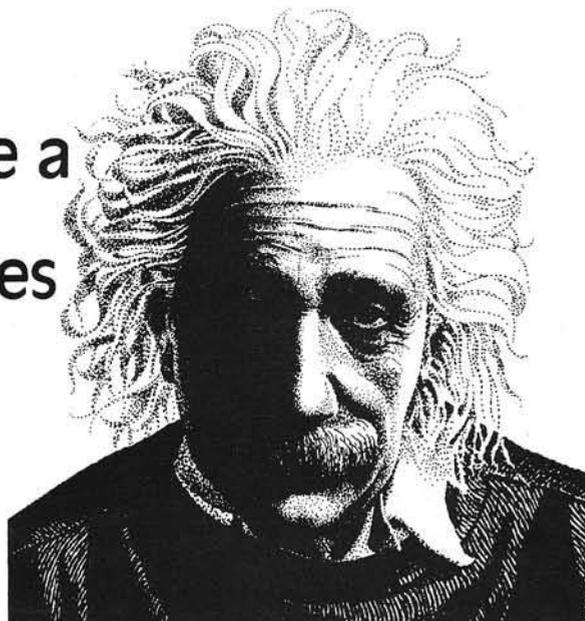


OSI

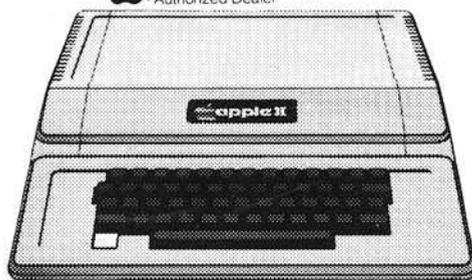


COLOR-80

“ You don't have to be a genius to figure out that the lowest prices on computers and peripherals are at **The Place Where You Go To Buy Computers, Inc.** ”



 **apple computer**
Authorized Dealer



APPLE II PLUS
APPLE III
DOS 3.3
APPLE PLOT
APPLE PASCAL
APPLE FORTRAN

APPLE WRITER
GRAPHICS TABLET
PEACHTREE
DC HAYES ASSOC.
NEC
MICROSOFT

EPSON
AMDEX
ZENITH
THE SOURCE
VISICALC
VISITREND

AUTHORIZED DEALER AND SERVICE CENTER

MAIL ORDER SPECIALS

QTY.	DESCRIPTION	TOTAL
_____	EPSON MX 80	\$444.99
_____	EPSON MX 80 F/T	\$574.95
_____	EPSON MX 100 F/T	\$724.95
_____	EPSON INTERFACE	\$ 79.99
_____	NUMERIC 24 KEY MULTIFUNCTION PAD	\$139.95
_____	NEC GREEN MONITOR 12"	\$219.95
_____	AMDEX COLOR MONITOR 13"	\$349.99
_____	ZENITH GREEN SCREEN 12"	\$124.95
_____	COOL STACK W/FAN	\$ 59.95
_____	COOL STACK WITHOUT FAN	\$ 32.95
_____	MICROSOFT RAM CARD	\$159.95
_____	MICROSOFT Z-80 CARD	\$284.99
_____	GRAPPLER INTERFACE	\$159.99
_____	GRAFTRAX 80	\$ 89.99
_____	SUP "R" TERM	\$319.95
_____	VIDEX	\$279.95
_____	Apple Sider™	\$ 29.95

**TO ORDER CALL
(213) 78-THINK**

Calif. Residents Add 6% Sales Tax
Add 4% for shipping & handling **TOTAL**

Name _____
Address _____
City, State, Zip _____
Phone _____
Credit Card # _____
 VISA MASTERCARD Exp. Date _____
Signature _____

Just In Time For Christmas!!

Apple Sider™

Apple Sider is the only device that makes the outside of your apple as useful as the inside.

This versatile little unit, which plugs into the game I/O and attaches to the side of your APPLE allows you to operate in one of two modes. The first mode enables you to easily select between one of two devices that plugs into your computer (for example joysticks and paddles). You will never have to open your APPLE again to change game devices. The second mode enables you to take advantage of your APPLE'S ability to handle up to four game controllers at one time. In either mode *Apple Sider™* can be configured to meet your specific needs, such as exchanging the X for the Y axis or changing push button numbers.

Apple Sider™ makes a great stocking stuffer, and is available exclusively from, **"THE PLACE WHERE YOU GO TO BUY COMPUTERS, INC."**

ORDER NOW

only **\$29⁹⁵**

**the place where you go to buy
Computers**
incorporated 

"the complete communications and computer store"
5848 Sepulveda Blvd., Van Nuys, CA 91411
(213) 78-THINK

APPLE II, APPLE III, APPLE WRITER, APPLE PLOT, APPLE PASCAL & APPLE FORTRAN ARE ALL REGISTERED TRADEMARKS OF APPLE COMPUTER INC.

Sweet-16 Revisited

The Apple II's Integer BASIC ROM supports a powerful and seldom used pseudo machine known as Sweet-16. In this article, the Sweet-16 instruction set is described and programming hints, using a macro-assembler, are presented. Ways to use Sweet-16 on an Apple II Plus are also discussed.

Charles F. Taylor, Jr.
587F Sampson Lane
Monterey, California 93940

Steve Wozniak had a great idea in Sweet-16. Manipulating 16-bit quantities on an 8-bit 6502 in assembly language is inherently tedious. The Sweet-16 interpreter is a solution to that problem. It presents, to the programmer, a virtual 16-bit machine with a convenient set of instructions and sixteen 16-bit registers. The programmer using Sweet-16 can thus pretend that he or she is programming a 16-bit computer! The interpreter performs the necessary translations.

It appears that Sweet-16 has never really caught on. I base this statement on the general absence I've noticed, of non-trivial Sweet-16 programs in the popular microcomputer magazines. Perhaps the problem is that Sweet-16 code is relatively slow (up to ten times slower than the equivalent 6502 code, according to Wozniak). For many applications, the loss of speed would be unimportant, particularly if the programmer jumps in and out of Sweet-16, using Sweet-16 code only for 16-bit operations.

I suggest that there are several other, more significant reasons why Sweet-16 hasn't caught on.

1. The lack of readily available documentation;
 2. The inconvenience of hand-assembling Sweet-16 code; and
 3. The fact that the Sweet-16 interpreter is not supplied with the Apple II Plus (as it resided, along with the miniassembler, in the Integer BASIC ROM of the Apple II).
3. Illustrate the use of Sweet-16 with a non-trivial programming example ("Quicksort");
 4. Show how Apple II Plus owners can use Sweet-16;
 5. Show how to use the power of a macroassembler more fully to decode the Sweet-16 mnemonics, thus producing a program which executes considerably faster.

Richard C. Vile, Jr., in his article "Sweet-16 Programming Using Macros" (MICRO 20:25), made a significant contribution by showing how the use of macros (with an appropriate macroassembler) can totally eliminate the inconvenience of hand assembly when using Sweet-16. For those readers unfamiliar with the subject, macros in assembly languages are a bit like abbreviations in ordinary language. The meaning of the macro (a series of instructions or an arbitrary sequence of bytes) is defined at the beginning of a program and associated with an identifier. Then, during assembly, the macroassembler substitutes the expanded meaning of the macro wherever the associated identifier occurs in the source code. Vile used this procedure to permit Sweet-16 programming using a set of mnemonics rather than raw op-codes.

Scope of this Article

In this article I propose to do the following:

1. Add to the store of Sweet-16 documentation, correcting some earlier errors in the process;
2. Provide a corrected set of macros;

Sweet-16 Described

The Sweet-16 virtual machine consists of sixteen 16-bit registers, R0-R15. These are implemented in the first 32 bytes of page zero (locations \$00-\$1F). Page zero was chosen to take advantage of the 6502's zero page addressing modes, and the greater speed of zero page operations. R0 is at locations \$00-\$01, R2 at \$02-\$03, and so on. The virtual machine architecture is illustrated in figure 1. All data in the registers is stored low byte first; i.e., R0L (the low-order byte of R0) is at location \$00, and R0H (the high-order byte) is at location \$01. This permits the contents of any register to be treated as an address, consistent with the usual 6502 storage convention. All arithmetic operations are implemented with this in mind.

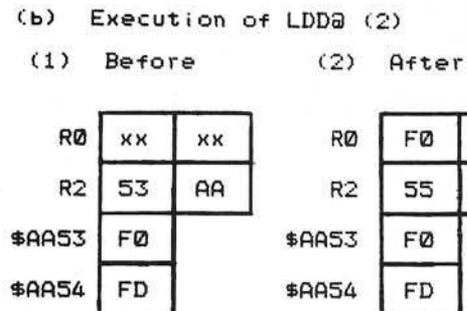
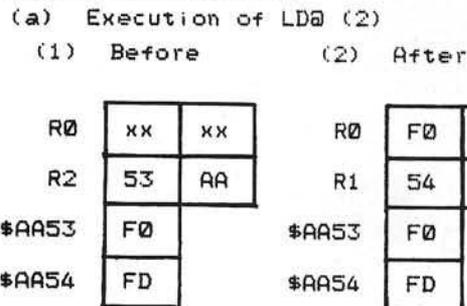
Several registers have special functions. R0 serves as a 16-bit accumulator. R15 serves as the program counter for the Sweet-16 interpreter. R12 serves as a stack pointer for Sweet-16 subroutine calls. R13 serves as a result register for the CPR (compare) instruction. The high-order byte of R14 (R14H) is used as a status register to point to the last register affected, and to store the carry bit for use by conditional branching instructions. R1 through R11 are general-

Figure 1: Sweet-16 Architecture

Register	LO	HI	Memory Location
R0			\$00-01
R1			\$02-03
R2			\$04-05
R3			\$06-07
R4			\$08-09
R5			\$0A-0B
R6			\$0C-0D
R7			\$0E-0F
R8			\$10-11
R9			\$12-13
R10			\$14-15
R11			\$16-17
R12			\$18-19
R13			\$1A-1B
R14			\$1C-1D
R15			\$1E-1F

Accumulator: R0
 Return Stack Pointer: R12
 CPR Result Register: R13
 Status Register: R14
 Program Counter: R15

Figure 2: Auto-Incrementing



purpose registers and may be used for holding data, addresses, or user-defined stack pointers.

Sweet-16 has three basic addressing modes: immediate, register direct, and register indirect. There is only one instruction which uses the immediate mode: the SETR instruction. SETR (2 \$1234), for example, stores the quantity \$1234 in R2. The register direct instructions each specify a register as the operand, and act upon that register and possibly also upon the accumulator (R0). Examples are LD (3), which takes the contents of R3 and loads them into the accumulator, and ST (3), which does precisely the opposite. The arithmetic instructions are also register direct. ADD (4), for example, adds the contents of R4 to the contents of R0 and leaves the result in R0. INCR (5) increments the contents of R5 by one.

In register indirect addressing, the operand is not a register, but an address pointed to by a register. Before a memory location can be accessed, its address must be loaded into a register. For example, the sequence of instructions

```
SETR (2 $AA53)
LD@ (2)
```

would load the contents of memory location \$AA53 into R0L (and would set R0H to 0). This is an example of an 8-bit operation. The instructions

```
SETR (2 $AA53)
LDD@ (2)
```

would load the contents of memory locations \$AA53 and \$AA54 into R0. This is, of course, a 16-bit operation.

A distinctive characteristic of these register indirect instructions is that they provide automatic incrementing of the register containing the address. After the LD@ (2) instruction, for example, the contents of R2 will be \$AA54, the address of the next 8-bit quantity. After the LDD@ (2) instruction, the contents of R2 will be \$AA55, the address of the next 16-bit quantity. This auto-increment feature is usually convenient, especially since many operations involve sequential memory accesses. Figure 2 illustrates the effects of these instructions.

The Sweet-16 branching instructions are conventional except that all branches, including the unconditional branch and the subroutine call, are relative. Although this restricts the range of branches to between -128 and +127 bytes, it is not a serious restriction because Sweet-16 code is so dense. In any case, an absolute jump can be simulated by storing the destination address (less one) in the program counter (R15). (It is necessary to subtract one from the destination address because Sweet-16, like the 6502, increments the program counter before fetching the next op-code.)

The Sweet-16 instruction set makes it easy to implement stacks. In fact, three different kinds of stacks are

directly supported, and any register can be used as a stack pointer (although I wouldn't try R14 or R15!). The three types of stacks are as follows:

1. An 8-bit stack which grows upward in memory, which I will call "type 1." The sequence

```
ST@ (Rn)
POP@ (Rn)
```

alternately pushes the contents of R0L onto the stack pointed to by Rn and pops the value from the top of the stack to R0L (setting R0H to 0). The stack pointer is always left pointing to the next available (vacant) stack location. Figure 3 illustrates these actions.

2. A 16-bit stack which grows upward, which I will call type 2. Its operation is illustrated by example in figure 4. Note that its pointer, like that of the type 1 stack, is always left pointing to the next available stack location.
3. An 8-bit stack which grows downward in memory, which I will call type 3. Its operation is illustrated by example in figure 5. Note that, in contrast to the other two types, the type 3 stack pointer is always left pointing to the "top" element of the stack, not the next available location.

The Sweet-16 instruction set is summarized in table 1. Parentheses are used around each operand because they

Figure 3: Stack Operations (Type 1)

(a) Push: ST@ (1)

	(1) Before	(2) After
R0	23 xx	R0 23 xx
R1	00 01	R1 01 10
\$1000	xx	\$1000 23
\$1001	xx	\$1001 xx
\$1002	xx	\$1002 xx

(b) Pop: POP@ (1)

	(1) Before	(2) After
R0	xx xx	R0 49 00 (note carefully!)
R1	02 10	R1 01 10
\$1000	72	\$1000 72
\$1001	49	\$1001 49
\$1002	33	\$1002 33

Conditional assembly is, therefore, not needed. The correct version of the macro is as follows:

```
!!!RELBR .MD (LOC)
        .BY LOC - = - 1
        .ME
```

That this is the correct computation for both forward and reverse branches can be verified by stepping through the code. You should note that, at the time of the branch, the program counter is pointing at the displacement byte. Following the branch, the program counter should point to one byte before the destination address.

One other macro in the set needs to be modified slightly. The "BRK" macro is assembled to op-code "00" (the 6502 BRK op-code, but the Sweet-16 RTN op-code). This is easily fixed by changing the mnemonic to "BK" to avoid confusion with the 6502 mnemonic.

The corrected set of Sweet-16 macros is shown in listing 1, at the beginning of the demonstration program, which will be discussed soon. The reason that the "@SW16" macro shows address "\$7689" rather than "\$F689" will be explained later in the article.

are required by the syntax of the macro-assembler. Parentheses in the "effects" column are used to represent indirect addressing. The symbol ":" = " is used to mean "is replaced by." The symbol "Rn" is used to represent any register, R0-R15. The expression "ROL := (Rn)" thus means that the contents of the memory location pointed to by Rn is loaded into ROL, the low-order byte of the accumulator. Each entry in the table has been verified by stepping through the code.

The macroassembler then takes care of substituting the appropriate Sweet-16 machine code for the mnemonics. This certainly makes life simpler! The savings are even greater for the relative branch instructions, because the macroassembler can take care of computing the relative displacement from the addresses.

(Because I use the ASSM/TED Macroassembler from Eastern House Software, I will use its mnemonics in the following discussion.)

Sweet-16 Demonstration Program

In selecting a demonstration program, I wanted to choose a program that demonstrates some of the characteristic features of Sweet-16, and at the same time, is perhaps useful. The Quicksort algorithm, invented by the eminent British computer scientist C.A.R. Hoare, seemed an ideal choice.

Quicksort is usually implemented in a language such as Pascal, using recursion. Unfortunately, recursion is not available to us in low-level languages such as 6502 assembly language or Sweet-16, so we must simulate it. The simulation of recursion in this case requires a 16-bit stack. The algorithm also requires numerous 16-bit comparisons and data manipulations. As Sweet-16 makes the implementation of all of these operations easy, it is a good choice for this application.

The specific problem to be solved is to sort a list of 16-bit addresses into ascending order. Briefly, here is how the program works: suppose the first element in the list is located at address L and the last element at address R. We choose an element from the list, say the element located at address (L + R)/2, and call its value X. Starting from

Sweet-16 Macros

Suppose that we want to, as discussed before, load the contents of locations \$AA53 and \$AA54 into the Sweet-16 accumulator. By consulting table 1, we see that the proper sequence of bytes to accomplish this is

```
12 53 AA 62.
```

The "12" is the op-code for SETR when the affected register is R2, the "53 AA" is the address in low-high format, and the "62" is the op-code for the LDD@ instruction when the register affected is R2. The Sweet-16 macros allow us to write instead

```
SETR (2 $AA53)
LDD@ (2).
```

There was, unfortunately, one serious error in the previously published set of Sweet-16 macros. The RELBR (relative branch) defined there does not compute relative displacements correctly for forward branches. Conditional assembly was used to compute displacements separately for reverse and forward branches. The displacement for reverse branches was given as "LOC - = -1", which is correct. "LOC" is a parameter of the macro and is the destination address. The "=" stands for the current location. The displacement given for forward branches was "= -LOC + 1", which cannot be correct because it is a negative quantity. The correct forward displacement is "LOC - = -1", which is the same expression as that for reverse branches.

GOSUB'S MX80/70 FRICTION FEED KIT
Only \$49.95 ppd

- Use Single Sheet Paper
- Use Inexpensive Roll Paper
- Use Your Own Letterhead
- Does Not Affect Pin-Feed Use

Printers

Epson MX80.....\$515 ppd Epson MX100.....\$825 ppd
Microtek's BYTEWRITER-1\$299 ppd

The Printer Stand **\$29.95**

SAVE MONEY AND SPACE: Holds almost any printer that uses 9 1/2"-size paper or forms. Made from 1/4" acrylic, allows 3" of paper or forms to be stacked under printer. Great for use with bottom load printers! Fits MX80/70, Microline 80's, BASE 2-850, Bytewriter-1 and many more!

Software for the VIC 20 and PET

Math Huddler and Monster Maze	\$14.95
Household Finance Parts 1 and 2	\$34.95
Seawolf, Bounce Out and VIC Trap	\$24.95
VIC 20 Biorhythm Compatibility	\$ 9.95
VIC Lemonade	\$14.95
AMOK	\$18.95
ALIEN BLITZ	\$18.95
VIC Music and Joypainting	\$ 9.95

PET Apple Atari TRS-80*

Nukewar	Tanktics	B1-Bomber
Midway Campaign	Planet Miners	

All just \$14.95 each!

(Kansas residents add 3% sales tax)

GOSUB
P.O. Box 275
Wichita, KS 67201
(316) 265-9992

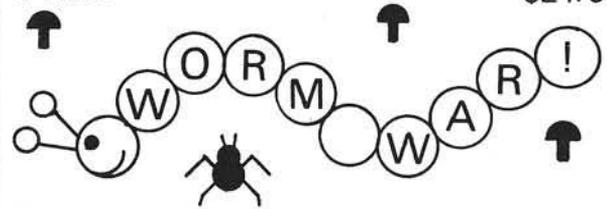
GOSUB Int'l, Inc.
501 E. Pawnee, Suite 430
Wichita, KS 67211
(316) 265-9858

*(TRS-80 is a trademark of Tandy Corp.)

Interesting Software

OSI presents OSI

C4PMF **\$21.95**



All machine code and fast! Our finest arcade game. Where it's you against the mean, menacing worm!

LIGHTNING BOLT **\$29.95**

The most extensive D&D adventure/fantasy for the OSI! You must traverse through the evil land of NOD, fighting and killing monsters every step of the way! Your goal is to search out a certain treasure that will allow you to free the land from the evil Demi Gods. Takes up the entire disk and uses full color graphics.

Send to:
Interesting Software
15856 Ocean Avenue
Whittier, CA 90604

Send for our free catalog of the finest OSI software. 10% off with this ad.

WHY YOU NEED THE INSPECTOR.

If you're serious about programming, you need to set all your utilities together in one place — *inside* your Apple. The Inspector comes on an Eprom that simply plugs into the D8 socket, or on a disk ready to merge with Integer Basic for automatic loading on boot. Either way, it stays at your fingertips, ready to call without disturbing your current program.

The Inspector puts you in total control of both memory and disks. You can search forward and backwards, edit, read nibbles, map disk space, dump the screen to a printer, examine every secret of your Apple. Use The Inspector to repair blown disks, undelete files, input "illegal" commands,

read and alter files, locate strings in memory or on disk. The uses are endless. The manual, alone, is an education. And it's always *there* when you need it.

You need the most powerful disk and memory utility available for your Apple. You need the Inspector.

See your local dealer, or order direct for just \$49.95. Mastercard and Visa holders order toll-free, 1-800-835-2246.



OMEGA MICROWARE, INC.
222 SO. RIVERSIDE PLAZA
CHICAGO, IL 60606
312-648-1944

Apple is a registered trademark of Apple Computer, Inc.

Figure 4: Stack Operations (Type 2)

(a) Push: STD@ (1)
 (1) Before (2) After

R0	34	12	R0	34	12
R1	00	10	R1	02	10
\$1000	xx		\$1000	34	
\$1001	xx		\$1001	12	
\$1002	xx		\$1002	xx	
\$1003	xx		\$1003	xx	

(b) Pop: POPD@ (1)

(1) Before (2) After

R0	xx	xx	R0	34	12
R1	02	10	R1	00	10
\$1000	34		\$1000	34	
\$1001	12		\$1001	12	
\$1002	xx		\$1002	xx	
\$1003	xx		\$1003	xx	

Figure 5: Stack Operations (Type 3)

(a) Push: STP@ (1)
 (1) Before (2) After

R0	23	xx	R0	23	xx
R1	00	80	R1	FF	7F
\$7FFD	xx		\$7FFD	xx	
\$7FFE	xx		\$7FFE	xx	
\$7FFF	xx		\$7FFF	23	
\$8000	xx		\$8000	xx	

(b) Pop: LD@ (1)

(1) Before (2) After

R0	xx	xx	R0	23	00
R1	FF	7F	R1	00	80
\$7FFD	xx		\$7FFD	xx	
\$7FFE	xx		\$7FFE	xx	
\$7FFF	23		\$7FFF	23	
\$8000	xx		\$8000	xx	

L and moving toward the center of the list, we look for an element which has value greater than or equal to X. Then we start from R and move toward the center of the list until we find an element with value less than or equal to X. These two elements are then exchanged. We then continue moving toward the center from both sides, exchanging elements to the left of X that are greater than or equal to X, with elements to the right of X that are less than or equal to X.

When our paths cross, the list is said to have been partitioned about X. Note that X itself can be moved. When the partition is complete, all values to the left of X will be less than or equal to X, and all values to the right of X will be greater than or equal to X. In addition, X will have migrated to its proper position in the list and need not be considered further. We thus have two sublists to be sorted.

As we can consider only one list at a time, we put the right-hand sublist aside for later consideration. We do this by pushing its boundaries onto the

stack. The left-hand sublist is then partitioned in the same manner as the original list. Eventually the sublist being partitioned will be so short that it is trivially sorted. Then we pull the addresses of another sublist from the stack and continue to partition it until it too is sorted. If we repeat this process until the stack is empty, the result is a sorted list.

Quicksort is, on the average, one of the fastest sorting algorithms known. The number of operations (comparisons and exchanges) required to sort a list of N elements is of the order of N times the base 2 logarithm of N. Compare this to the ubiquitous Bubble-sort, which requires an average of N-squared operations. The advantage of Quicksort thus increases rapidly with the size of the list to be sorted.

The program is shown in listing 1. It may appear to be quite long, but remember that the macros only have to be entered into your system once; you may use them for as many programs as you like without reentering them. Excluding the macros, comments, and

assembler directive, the program is implemented in 74 lines of code. An equivalent, non-recursive, implementation in Pascal took 38 lines. I leave to your imagination the number of lines it would take in 6502 assembly code!

The program was tested on randomly-ordered lists of length 256 bytes (128 addresses) and 4096 bytes (2048 addresses). Using a stopwatch, the shorter list took 2.0 seconds, and the longer list 35.5 seconds.

A few comments are in order. If the sort routine is to be used by a larger program, parameters (L, R, and the location of the user stack) can be passed by way of page zero. You can actually place them into the appropriate Sweet-16 register from the main program. Another point is that the program, as written, will only work for lists residing in memory locations below \$8000. This is because the algorithm used to calculate the middle element of the list is $(L + R)/2$, and the addition will overflow if L + R exceeds \$FFFF. The solution to this problem is to use the fact that $L + (R - L)/2$ will

Table 1: Sweet-16 Instruction Set

Op-Code	Mnemonic	Operand	Effect
--	@SW16		Enter SWEET16
00	RTN		Return to calling 6502 program
01	BR	(addr)	Unconditional branch
02	BNC	(addr)	Branch if No Carry
03	BC	(addr)	Branch if Carry flag set
04	BP	(addr)	Branch if prior result Plus
05	BM	(addr)	Branch if prior result Minus
06	BZ	(addr)	Branch if prior result Zero
07	BNZ	(addr)	Branch if prior result Not Zero
08	BM1	(addr)	Branch if prior result is -1
09	BNM1	(addr)	Branch if prior result is not -1
0A	BK		Execute 6502 BRK instruction
0B	RS		Return from SWEET16 subroutine
0C	BS	(addr)	Branch to SWEET16 subroutine
0D			Unassigned
0E			Unassigned
0F			Unassigned
1n	SETR	(Rn Constant)	Rn := Constant
2n	LD	(Rn)	(Rn) := Rn
3n	ST	(Rn)	Rn := R0
4n	LD@	(Rn)	R0H := 0; R0L := (Rn); Rn := Rn+1
5n	ST@	(Rn)	(Rn) := R0L; Rn := Rn+1
6n	LDD@	(Rn)	R0L := (Rn); Rn := Rn+1; R0H := (Rn); Rn := Rn+1
7n	STD@	(Rn)	(Rn) := R0L; Rn := Rn+1; (Rn) := R0H; Rn := Rn+1
8n	POP@	(Rn)	Rn := Rn-1; R0L := (Rn); R0H := 0
9n	STP@	(Rn)	Rn := Rn-1; (Rn) := R0L
An	ADD	(Rn)	R0 := R0 + Rn
Bn	SUB	(Rn)	R0 := R0 - Rn
Cn	PPD@	(Rn)	Rn := Rn-1; R0H := (Rn); Rn := Rn-1; R0L := (Rn)
Dn	CPR	(Rn)	R13 := R0 - Rn; Set status register
En	INCR	(Rn)	Rn := Rn+1 (16-bit increment)
Fn	DECR	(Rn)	Rn := Rn-1 (16-bit decrement)

be seen, the need for a separate program counter and subroutine return stack. With much of the overhead eliminated, the resulting program will run considerably faster.

You may be wondering, "What's the catch?" The catch, if you want to call it that, is that the object code produced will not be nearly as compact as Sweet-16 op-codes. This may or may not be a problem, depending on the application.

All this is accomplished with a new set of macros which I have taken the liberty of calling "SPEED16". The mnemonics and their effects are the same as described in table 1 for Sweet-16, but the method of implementation is quite different. Because the program counter and return stack have been eliminated, the unconditional branch ("BR") and subroutine call ("BS") are implemented using absolute rather than relative addressing. For the same reason, R12 and R15 can be used as general purpose registers. The "@SW16" instruction serves the same purpose as before, but its implementation is greatly simplified; in SPEED16 it merely has to call the monitor's routine for saving registers. Similarly, the "RTN" instruction merely calls the monitor's routine for restoring registers.

give the same result without overflow and to modify the program accordingly.

Sweet-16 and the Apple II Plus

When I got my Apple II Plus home from the dealer in February 1980, I was surprised to discover that the mini-assembler, the step and trace functions, and Sweet-16 were not included. (The mini-assembler and Sweet-16 resided in leftover space in the Integer BASIC ROM and step and trace were casualties of the Autostart ROM.) I soon discovered, however, that the source code for the mini-assembler and Sweet-16 were in the "Red Book," the January 1978 edition of the Apple II Reference Manual, which was then provided by Apple with its computers. The source code for Sweet-16 was also published by Steve Wozniak, the author, in the November 1977 issue of *Byte*. I therefore lost little time in relocating first the mini-assembler and then Sweet-16 to RAM. I chose to put Sweet-16 at \$7689 because I then had a 32K cassette system. (That location also works for a 48K disk system.) The only tricky part of the relocation was the instruction at \$F69E/\$769E, which had to be changed from LDA #\$F7 to LDA #\$77. If you were going to relocate

Sweet-16 to \$9089, for example, this instruction would be changed to LDA #\$91. This is the high-order byte used by an internal jump table.

Listing 2 is a disassembled version of the relocated Sweet-16 interpreter that I use in my Apple II Plus.

SPEED16

Sweet-16 spends much of its time decoding instructions. Specifically, it maintains its own program counter (in R15), fetches op-codes, uses a jump table to decide which subroutines to call to execute the op-code, and keeps track of status. All of this takes time, and all of it is overhead.

The Sweet-16 macros discussed above translate the mnemonics into Sweet-16 op-codes, which are then decoded by the Sweet-16 interpreter into the appropriate actions. By taking fuller advantage of the power of the macroassembler, we can eliminate the middleman and translate the mnemonics directly into the appropriate actions. This completely eliminates the need for Sweet-16 to fetch and decode op-codes. In fact, it eliminates the need for op-codes! It also eliminates, as will

The SPEED16 macros are shown in listing 3 with the demonstration program. Only two minor changes were required to the source instructions of the Quicksort routine. Both involved relative branch instructions that had to be changed to absolute branches (because the SPEED16 object code is not as compact) and both were flagged by the assembler. After these two changes were made, the program ran correctly. Note that the object code produced is to the left and below each mnemonic, and is considerably longer than that produced by the Sweet-16 macros. Again using a stopwatch, the program ran in 1.0 seconds for the 128 element sort and 14.5 seconds for the 2048 element sort.

Some of the SPEED16 macros implement the desired actions directly, including SETR and all the branching instructions. Note that the conditional branching instructions must ascertain the status of the Sweet-16 machine via R14H and/or the register containing the last result. The remaining instructions are implemented using calls to subroutines within the Sweet-16 interpreter. Before these subroutines are called, two times the register number must be put in the X register and in R14H. For the CPR instruction, the Y

register must also contain two times 13 (to indicate R13 as the result register). The op-code decoding function of the Sweet-16 interpreter is thus completely bypassed.

Conclusions

Which set of macros should you choose? Using the Quicksort program for the 2048 item sort as a benchmark, some comparisons can be made. Using the Sweet-16 macros, the program assembled in 101 bytes and ran in 35.5 seconds. Using the SPEED16 macros, the program assembled in 586 bytes and ran in 14.5 seconds. It is, thus, a tradeoff of speed *versus* compactness. It should be pointed out, however, that a program can be run under either set of macros with little or no change so that you can use whichever set of macros suits your needs at the moment. Because the instruction set is virtually

the same, there is no "learning curve" in switching from one to the other.

Several other comments are in order. First, although the original Sweet-16 has three unused op-codes (\$0D, \$0E, and \$0F), extending the instruction set would be relatively difficult. Because the SPEED16 implementation uses no op-codes, extension of its instruction set using macros is relatively trivial. An example of a desirable extension would be an instruction to move the contents of one register to another without going through the accumulator. Or you might need to add a multiply instruction. Sixteen-bit shift instructions would also be convenient.

One cosmetic change that would simplify the use of either set of macros would be to add "aliases" to several instructions. For example, the STD@ instruction is sometimes used to push a 16-bit quantity onto a stack. An appropriate alias would be the macro

```
!!!PUSHD@ .MD (REG)
          STD@ (REG)
          .ME
```

For 16-bit processing on the 6502, it makes sense to use a virtual machine such as Sweet-16 to simplify the programming effort. Hopefully this article will make the job easier, whether you choose to use the Sweet-16 macros or the SPEED16 macros.

Charles Taylor is a Lieutenant Commander in the U.S. Navy and is currently on the faculty of the Naval Postgraduate School, where he teaches courses in Operations Research, Statistics, and Computer Science. He became involved with computing in 1966, writing ALGOL programs for a Burroughs B5500. He has since worked on and off with computers ranging from the Apple II to the IBM 3033AP and with languages ranging from various assembly languages to Pascal, FORTRAN, C, PILOT, and APL.

Listing 1

```
***** QUICKSORT *****
;*
;* SWEET16 DEMO *
;* PROGRAM *
;*
;* BY *
;*
;* C. F. TAYLOR, JR. *
;*
;* APRIL 1981 *
;*
;*****
;
.BA $E000
.OS
;SWEET 16 MACROS
;BY R. C. VILE, JR.
;MICRO (20:25)
;MODIFIED BY
;C. F. TAYLOR, JR.
;APRIL 1981
!!!SETR .MD (REG ADDR)
        .BY $10+REG
        .SE ADDR
        .ME
!!!LD .MD (REG)
       .BY $20+REG
       .ME
!!!ST .MD (REG)
       .BY $30+REG
       .ME
!!!LD@ .MD (REG)
        .BY $40+REG
        .ME
!!!ST@ .MD (REG)
        .BY $50+REG
        .ME
!!!LDD@ .MD (REG)
         .BY $60+REG
         .ME
!!!STD@ .MD (REG)
         .BY $70+REG
         .ME
!!!POP@ .MD (REG)
```

```
.BY $80+REG
.ME
!!!STP@ .MD (REG)
        .BY $90+REG
        .ME
!!!ADD .MD (REG)
        .BY $A0+REG
        .ME
!!!SUB .MD (REG)
        .BY $B0+REG
        .ME
!!!POP@ .MD (REG)
        .BY $C0+REG
        .ME
!!!CPR .MD (REG)
        .BY $D0+REG
        .ME
!!!INCR .MD (REG)
        .BY $E0+REG
        .ME
!!!DECR .MD (REG)
        .BY $F0+REG
        .ME
!!!RTN .MD
        .BY 00
        .ME
!!!RELBR .MD (LOC)
          .BY LOC--=1
          .ME
!!!BR .MD (WHERE)
        .BY 1
        RELBR (WHERE)
        .ME
!!!BNC .MD (WHERE)
        .BY 2
        RELBR (WHERE)
        .ME
!!!BC .MD (WHERE)
        .BY 3
        RELBR (WHERE)
        .ME
!!!BP .MD (WHERE)
        .BY 4
        RELBR (WHERE)
        .ME
!!!BM .MD (WHERE)
        .BY 5
        RELBR (WHERE)
        .ME
```

```
!!!BZ .MD (WHERE)
       .BY 6
       RELBR (WHERE)
       .ME
!!!BNZ .MD (WHERE)
        .BY 7
        RELBR (WHERE)
        .ME
!!!BMI .MD (WHERE)
        .BY 8
        RELBR (WHERE)
        .ME
!!!BNMI .MD (WHERE)
        .BY 9
        RELBR (WHERE)
        .ME
!!!BK .MD
        .BY $A
        .ME
!!!RS .MD
        .BY $B
        .ME
!!!BS .MD (WHERE)
        .BY $C
        RELBR (WHERE)
        .ME
!!!@SW16 .MD
          JSR $7689
          .ME
;
R0L .DE $00
R0H .DE $01
L1 .DE $7500 ;SORT FROM
L2 .DE $75FE ;TO
I .DE 1
J .DE 2
L .DE 3
R .DE 4
X .DE 5
AI .DE 6
MIDPT .DE 7
AJ .DE 8
R10 .DE 10
SP .DE 11
;
;INITIALIZE
;
.ES
```




SENSIBLE SOFTWARE, INC. IS PLEASED TO INTRODUCE...
OUR 1981 COLLECTION OF SUPERIOR SOFTWARE FOR THE APPLE COMPUTER...

APPLESOFT-PLUS STRUCTURED BASIC [APLUS]

\$25.00

32K +, Disk II, ROM/RAM Applesoft, Apple II/Apple II +

APLUS is a 4K machine language utility that adds the following structured programming commands to Applesoft basic: 1) WHEN..ELSE..FIN, 2) UNTIL, 3) WHILE, 4) UNLESS, 5) CASE, 6) SELECT (variable), and 7) (OTHERWISE). Multi-line IF..THEN statements are also supported. APLUS allows the use of "named" subroutines or "procedures". The programmer can now instruct a program to "DO CURVE-FIT" without worrying about the location of the subroutine. APLUS automatically indents "&LIST"ed programs to clarify the logic flow. The APLUS "&CONVERT" command replaces the above structured programming commands with "GOTO"s and "GOSUB"s to provide a standard Applesoft program as output. New programs can now be written using "GOTO"-less logic.

APPLESOFT PROGRAM OPTIMIZER [AOPT]

\$20.00

32 +, Disk II, ROM/RAM APPLESOFT, Apple II/Apple II +

AOPT is a 2.2K machine language utility that will substantially reduce the size of an Applesoft program without affecting the operation of the program. AOPT automatically: 1) Shortens variable names, 2) Removes remarks, 3) Removes unreferenced lines, 4) Appends short lines together, 5) Removes extra colons, and 6) Renumbers line numbers. AOPT will convert a verbose, well documented, development version of a program into a memory-efficient, more secure, production version of the same program. This is the ORIGINAL and the BEST optimizer on the software market today!

DOS PLUS

\$25.00

32 +, Disk II, DOS 3.3, Apple II/Apple II +

DOS PLUS is the software solution for living with both 13-sector (DOS 3.1, 3.2, and 3.2.1) and 16 sector (DOS 3.3) Apple diskettes. DOS PLUS adds 8 new commands to Apple DOS. Three of these are built-in and five are user definable. The built in commands include: 1) ".F" to ".flip" between DOS 3.2 and 3.3 (The user need not re-boot and any program that resides in memory will not be affected by the flip. The DOS version can even be changed within a program!), 2) ".S" status command informs you what DOS version is currently active, and 3) ".B" BLOAD- analysis is also provided to inform the user of the starting address and length of the last accessed binary file. DOS PLUS also includes a DOS COMMAND CHANGER program to allow easy customization of Apple DOS commands to suit individual tastes.

DISK ORGANIZER II

—NEW—

\$30.00

48K, Disk II, Apple II/Apple II +

DO II is the fastest and friendliest utility available today for organizing files on an Apple II diskette. DO II provides the following functions: 1) TITLING in Normal, Inverse, Flashing, Lower case, and other characters normally not available, 2) CUSTOM REORDERING of the directory, 3) ALPHABETIZING, 4) DYNAMIC DISPLAY of ALL filenames on a diskette (including deleted files), 5) RENAMING files with the same character options as TITLING, 6) UNDELETING, 7) DELETING, 8) PURGING deleted files, 9) LOCKING (all or some), 10) UNLOCKING (all or some), 11) USE of DOS sectors for increased data storage, and 12) a SIMULATED CATALOG to show the modified directory before it is written to the diskette. DO II is completely MENU DRIVEN and attains it's speed by altering a RAM version of the catalog. DO II uses a very powerful SMART KEY to automatically locate the next valid filename for any specified disk operation. Compatible with DOS 3.1, 3.2, 3.2.1, and 3.3 as well as MUSE DOS to allow manipulation of SUPER TEXT files! (Note: Updates available for \$5.00 and original diskette.)

PASCAL LOWER CASE

—NEW—

\$25.00

48K +, Disk II, Apple II/Apple II +, Language System

This is the most recent commercially available LOWER CASE MOD for Pascal for the Apple II. It is the only currently available modification that is compatible with both versions of Pascal (1.0 and 1.1). The Pascal version is automatically checked prior to updating system Apple. If you have any of the hardware lower case adapters you can now input the following characters directly from the keyboard: | ~ ^ _ { } _ and \. This modification does NOT interfere with any of the 'Control' character functions implemented by the Pascal environment and will 'undo' any alterations made by other commercially released modifications.

QUICKLOADER

\$25.00

48K +, Disk II, Apple II/Apple II + . . . (2 Disks)

If you find yourself doing the same things over and over -- QL will help you do it faster! QL is a unique disk that lets you load DOS, a language card (optionally), and an application program of your choice extremely rapidly. QL boots as a 13 or 16 sector diskette and is easy to set up and use. To change the setup, you merely load your Apple RAM with the new data and use the "RECONFIGURE" option of QL. The next time you boot your QL disk, it will quickly load your new setup (Language Card, DOS, Application program) into your Apple! QL can reduce the time to perform these functions by up to 80%! Now that you've read this, you say "But I can already do all of that!" QL doesn't do anything new -- it just does it MORE CONVENIENTLY and FASTER! Try it, you'll like it!

DISK RECOVERY ["THE SCANNER"]

\$30.00

48K +, Disk II, Apple II/Apple II +

This program is long overdue. You need no longer be concerned with the problem of physically damaged disks. Just as "Apple Pascal" provides a "BAD BLOCK SCAN", DISK RECOVERY will do a complete scan of your Apple diskettes' recording surface. Damaged areas will be "marked" as used in the disk directory so that no attempts will be made to "WRITE" to a bad sector. The VTOC will be completely redone to reflect both the bad sectors and actual disk usage. A complete report is generated advising the user of all corrections. A resulting "DISK MAP" is presented for your review. The greatest advantage of this program over the other versions is that it can be used on either NEWLY INITIALIZED DISKS or disks that ALREADY CONTAIN PROGRAMS as well as the SPEED of analysis. THE SCANNER is fully compatible with both 13 and 16 sector diskettes. This is a must for all Disk II owners!

ALSO AVAILABLE:

- SUPER DISK COPY III** \$30.00
- MULTI-DISK CATALOG III** \$25.00
- THE NEW PROTECTOR** \$250.00
- (Call or Write for Information)
- LUNAR LANDER II** \$15.00
- MASTER MAZE** \$15.00

SENSIBLE SOFTWARE, INC.

6619 PERHAM DRIVE / W. BLOOMFIELD, MICHIGAN 48033
313-399-8877

VISA and MASTERCARD WELCOME

Michigan Residents add 4% Sales Tax

Please add \$1.00 postage & handling for each item ordered.

```

;LOOPS FINDS AN ELEMENT
;TO RIGHT OF MIDPT WITH
;VALUE < X
;
        LDD@ (J)      ;A(J)
6032- 62      LOOPS
        DECR (J)      ;COMPENSATE
6033- F2
        DECR (J)      ;FOR AUTO-INCR.
6034- F2
        ST (AJ)
6035- 38
        LD (X)
6036- 25
        CPR (AJ)      ;LOOP UNTIL
6037- D8
        BC (ENDLOOPS)      ;A(J) <= X
6038- 03
6039- 04
        DECR (J)
603A- F2
        DECR (J)
603B- F2
        BR (LOOPS)
603C- 01
603D- F4      ENDLOOPS
;
        LD (J)
603E- 22
        CPR (I)      ;IF I>J
603F- D1      BNC (ENDLOOP3)      ;GOTO ENDLOOP3
6040- 02
6041- 08
        LD (AI)      ;A(I)
6042- 26
        STD@ (J)      ;EXCHANGE A(I)
6043- 72
        DECR (J)      ;AND A(J)
6044- F2
        DECR (J)      ;ADJ POINTER TO
6045- F2
        DECR (J)      ;PREVIOUS ELEMENT
6046- F2
        DECR (J)
6047- F2
        LD (AJ)      ;A(J)
6048- 28
        STD@ (I)      ;FINISH EXCHANGE
6049- 71 ENDLOOP3
        LD (J)      ;LOOP UNTIL
604A- 22
        CPR (I)      ;I > J
604B- D1
        BC (LOOP3)
604C- 03
604D- DD
;
        LD (R)
604E- 24
        CPR (I)      ;IF I>R THEN
604F- D1
        BNC (ENDIF) ;GOTO ENDIF
6050- 02
6051- 04
        LD (I)      ;PUSH FOR LATER
6052- 21
        STD@ (SP)    ;PARTITIONING
6053- 7B
        LD (R)      ; (RIGHT PART OF LIST)
6054- 24
        STD@ (SP)    ;
6055- 7B
;
        LD (J)      ;PREPARE TO PARTITION
        ENDIF
6056- 22
;LEFT PART
        ST (R)      ;R := J
6057- 34
        LD (L)
6058- 23
        CPR (R)      ;IF L<R
6059- D4
        BNC (LOOP2)
605A- 02
605B- B9
        LD (R10)    ;ORIG VAL OF SP

```

```

605C- 2A      CPR (SP)      ;STACK EMPTY?
605D- DB      BC (EXIT)    ;YES
605E- 03
605F- 02
        BR (LOOP1)    ;NO
6060- 01
6061- AF      EXIT      RTN      ;DONE
6062- 00
6063- 60      RTS
        .EN

```

Listing 2

```

7689- 20 4A FF      JSR      $FF4A
768C- 68          PLA
768D- 85 1E          STA      $1E
768F- 68          PLA
7690- 95 1F          STA      $1F
7692- 20 98 76      JSR      $7698
7695- 4C 92 76      JMP      $7692
7698- E6 1E          INC      $1E
769A- D0 02          BNE      $769E
769C- E6 1F          INC      $1F
769E- A9 77          LDA      #$77
76A0- 48          PHA
76A1- A0 00          LDY      #$00
76A3- B1 1E          LDA      ($1E),Y
76A5- 29 0F          AND      #$0F
76A7- 0A          ASL
76A8- AA          TAX
76A9- 4A          LSR
76AA- 51 1E          EUR      $1E,1
76AC- F0 0B          BEQ      $76B9
76AE- 36 1D          STX      $1D
76B0- 4A          LSR
76B1- 4A          LSR
76B2- 4A          LSR
76B3- A8          TAY
76B4- B9 E1 76      LDA      $76E1,Y
76B7- 48          PHA
76B8- 60          RTS
76B9- E6 1E          INC      $1E
76BB- D0 02          BNE      $76BF
76BD- E6 1F          INC      $1F
76BF- BD E4 76      LDA      $76E4,X
76C2- 48          PHA
76C3- A9 1D          LDA      $1D
76C5- 4A          LSR
76C6- 60          RTS
76C7- 68          PLA
76C8- 68          PLA
76C9- 20 3F FF      JSR      $FF3F
76CC- 6C 1E 00      JMP      ($001E)
76CF- B1 1E          LDA      ($1E),Y
76D1- 95 01          STA      $01,X
76D3- 98          DEY
76D4- B1 1E          LDA      ($1E),Y
76DE- 95 00          STA      $00,X
76D8- 98          TYA
76D9- 38          SEC
76DA- 65 1E          ADC      $1E
76DC- 85 1E          STA      $1E
76DE- 90 02          BCC      $76E2
76E0- E6 1F          INC      $1F
76E2- 60          RTS
;Jump Table
76E3- 02 F9 04 9D 0D
76E8- 9E 25 AF 16 B2 47 B9 51
76F0- C0 2F C9 5B D2 85 DD 6E
76F8- 05 33 E8 70 93 1E E7 65
7700- E7 E7 E7
7703- 10 CA          BPL      $76CF
7705- B5 00          LDA      $00,X
7707- 85 00          STA      $00
7709- B5 01          LDA      $01,X
770B- 85 01          STA      $01
770D- 60          RTS
770E- A5 00          LDA      $00

```

```

7710- 95 00 STA $00, X
7712- A5 01 LDA $01
7714- 95 01 STA $01, X
7716- 60 RTS
7717- A5 00 LDA $00
7719- 81 00 STA ($00, X)
771B- A0 00 LDY #$00
771D- 84 1D STY $1D
771F- F6 00 INC $00, X
7721- D0 02 BNE $7725
7723- F6 01 INC $01, X
7725- 60 RTS
7726- A1 00 LDA ($00, X)
7728- 85 00 STA $00
772A- A0 00 LDY #$00
772C- 84 01 STY $01
772E- F0 ED BEQ $771D
7730- A0 00 LDY #$00
7732- F0 06 BEQ $773A
7734- 20 66 77 JSR $7766
7737- A1 00 LDA ($00, X)
7739- A8 TAY
773A- 20 66 77 JSR $7766
773D- A1 00 LDA ($00, X)
773F- 85 00 STA $00
7741- 84 01 STY $01
7743- A0 00 LDY #$00
7745- 84 1D STY $1D
7747- 60 RTS
7748- 20 26 77 JSR $7726
774B- A1 00 LDA ($00, X)
774D- 85 01 STA $01
774F- 4C 1F 77 JMP $771F
7752- 20 17 77 JSR $7717
7755- A5 01 LDA $01
7757- 81 00 STA ($00, X)
7759- 4C 1F 77 JMP $771F
775C- 20 66 77 JSR $7766
775F- A5 00 LDA $00
7761- 81 00 STA ($00, X)
7763- 4C 43 77 JMP $7743
7766- B5 00 LDA $00, X
7768- D0 02 BNE $776C

```

```

776A- D6 01 DEC $01, X
776C- D6 00 DEC $00, X
776E- 60 RTS
776F- A0 00 LDY #$00
7771- 38 SEC
7772- A5 00 LDA $00
7774- F5 00 SBC $00, X
7776- 99 00 00 STA $0000, Y
7779- A5 01 LDA $01
777B- F5 01 SBC $01, X
777D- 99 01 00 STA $0001, Y
7780- 98 TYA
7781- 69 00 ADC #$00
7783- 85 1D STA $1D
7785- 60 RTS
7786- A5 00 LDA $00
7788- 75 00 ADC $00, X
778A- 85 00 STA $00
778C- A5 01 LDA $01
778E- 75 01 ADC $01, X
7790- A0 00 LDY #$00
7792- F0 E9 BEQ $777D
7794- A5 1E LDA $1E
7796- 20 19 77 JSR $7719
7799- A5 1F LDA $1F
779B- 20 19 77 JSR $7719
779E- 18 CLC
779F- B0 0E BCS $77AF
77A1- B1 1E LDA ($1E), Y
77A3- 10 01 BPL $77A6
77A5- 88 DEY
77A6- 65 1E ADC $1E
77A8- 85 1E STA $1E
77AA- 98 TYA
77AB- 65 1F ADC $1F
77AD- 85 1F STA $1F
77AF- 60 RTS
77B0- B0 EC BCS $779E
77B2- 60 RTS
77B3- 0A ASL
77B4- AA TAX
77B5- B5 01 LDA $01, X

```

```

77B7- 10 E8 BPL $77A1
77B9- 60 RTS
77BA- 0A ASL
77BB- AA TAX
77BC- B5 01 LDA $01, X
77BE- 30 E1 BMI $77A1
77C0- 60 RTS
77C1- 0A ASL
77C2- AA TAX
77C3- B5 00 LDA $00, X
77C5- 15 01 ORA $01, X
77C7- F0 D8 BEQ $77A1
77C9- 60 RTS
77CA- 0A ASL
77CB- AA TAX
77CC- B5 00 LDA $00, X
77CE- 15 01 ORA $01, X
77D0- D0 CF BNE $77A1
77D2- 60 RTS
77D3- 0A ASL
77D4- AA TAX
77D5- B5 00 LDA $00, X
77D7- 35 01 AND $01, X
77D9- 49 FF EOR $FF
77DB- F0 C4 BEQ $77A1
77DD- 60 RTS
77DE- 0A ASL
77DF- AA TAX
77E0- B5 00 LDA $00, X
77E2- 35 01 AND $01, X
77E4- 49 FF EOR $FF
77E6- D0 B9 BNE $77A1
77E8- 60 RTS
77E9- A2 18 LDX $18
77EB- 20 66 77 JSR $7766
77EE- A1 00 LDA ($00, X)
77F0- 85 1F STA $1F
77F2- 20 66 77 JSR $7766
77F5- A1 00 LDA ($00, X)
77F7- 85 1E STA $1E
77F9- 60 RTS
77FA- 4C C7 76 JMP $76C7

```

```

Listing 3      ;**** QUICKSORT ****
;*
;* SWEET16 DEMO *
;* PROGRAM *
;*
;* BY *
;*
;* C. F. TAYLOR, JR. *
;*
;* APRIL 1981 *
;*
;*****
;
.BA $E000
.OS

L1 .DE $7500 ;SORT FROM HERE
L2 .DE $73FE ;TU HERE
1 .DE 1
J .DE 2
L .DE 3
R .DE 4
X .DE 5
AI .DE 6
MIDPT .DE 7
AJ .DE 8
R10 .DE 10
SP .DE 11
;

;**** SPEED16 MACROS ****
;*
;* BY *
;*
;* C. F. TAYLOR, JR. *
;*
;* APRIL 1981 *
;*
;*****
;
;SWEET16 SUBROUTINES
LOAD .DE $7705
STORE .DE $770E

```

```

LOADI .DE $7726
STOREI .DE $7717
DLOADI .DE $7748
DSTOREI .DE $7752
POPS .DE $7730
PUSHS .DE $775C
ADDITION .DE $7786
SUBTRACT .DE $776F
POP16 .DE $773A
COMPARE .DE $7771
INCREMENT .DE $771F
DECREMENT .DE $7766
;
;PAGE ZERO LOCATIONS
R0L .DE $00
R0H .DE $01
R14H .DE $1D
;
;MACRO DEFINITIONS
;
!!!SETUP .MD (REG) ;FOR SUBR CALL
LDA #REG
ASL A ;DOUBLE TO INDEX
STA *R14H ;16-BIT REG
TAX
.ME
;
!!!SETR .MD (REG ADDR)
SETUP (REG)
LDA #H, ADDR ;HI BYTE
STA *R0H, X ;IN PROPER REG
LDA #L, ADDR ;LO BYTE
STA *R0L, X
.ME
;
!!!LD .MD (REG)
SETUP (REG)
JSR LOAD
.ME
;
!!!ST .MD (REG)
SETUP (REG)
JSR STORE

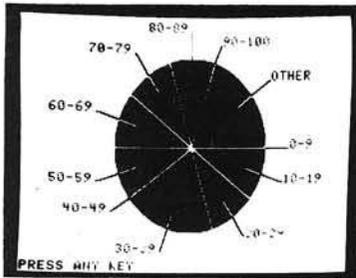
```

GET 120% VALUE FOR YOUR
PROGRAM PURCHASING DOLLAR
WITH

THE DATA REPORTER

MORE THAN JUST A DATABASE

Version 2 of the versatile Modifiable Database



DATA PLOT & ANALYSIS

- Data may be plotted in a variety of formats such as scatter graphs, line graphs, bar charts, and pie charts.
- Ranges, minimums, maximums, means, standard deviations, correlation coefficients, etc. of any number of data files can be calculated

PLOTTER PACKAGE

THE DATABASE

20% 40%

TEXT EDITOR

INFORMATION MANAGEMENT

POWERFUL DATA MANAGER

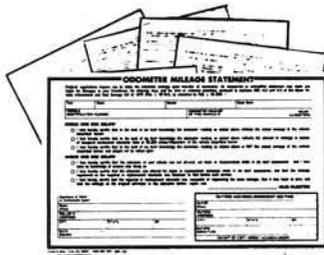
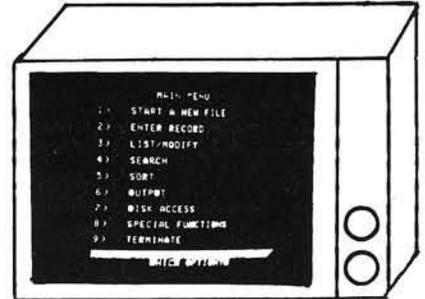
- Versatile, user definable database can store data segmented by up to 35 fields.
- User oriented format is easy for the novice or professional to utilize. The use of menus, extensive prompting, single keystroke commands, and a universal escape capability allow anyone to store or retrieve information in seconds without errors.
- Machine language searches and sorts operate in a fraction of the time required by other programs.
- Searches or sorts, subtotals or totals may be performed on any field at any time, not just on those that are indexed or specified in advance.
- Search results may be displayed, printed, deleted, counted, totalled, edited, and/or saved to a new data file.

REPORT GENERATOR

- The sophisticated report generator allows you to format your data output in an infinite variety of ways.
- You can print form letters, columnar reports, lists, mailing labels, etc.
- Data, ratios or the results of calculations can be embedded anywhere in your letters or reports.
- The report generator gives your output the professional appearance that you require.

OTHER FEATURES

- **HARD DISK DRIVE COMPATIBILITY** with hard drive version, works with Corvus and other hard drives.
- Works with all Floppy drives with slot, drive and volume selection.
- You can append or merge up to a full disk of data files, or segment your data into separate files by a search key.
- Searches can contain up to 10 levels. You can search for a key word in any field, the absence of a keyword, or a number being within a specified range.
- Global editing of data may be performed.
- Arithmetic processing can be performed during record entry, edit, or output.
- Record entry, edit, or deletion (individual records or blocks) can be performed with no tedious delays waiting for disk accesses, index file updates, etc.
- Data may be stored on any number of floppy or hard disk drives.
- Data files can be reformatted at any time without reentering the data.
- With \$5.00 Registration Fee receive one backup disk.
- The package requires an Apple II plus or Apple II with Applesoft firmware, 48K RAM, at least one disk drive, and DOS 3.3.



SYNERGISTIC SOFTWARE

ORDER YOURS TODAY!

Floppy Drive version \$220.00 — Hard Drive version \$220.00

Available from your local dealer or send check or money order to Synergistic Software, 5221 120 Avenue S.E., Bellevue, Washington 98006 or phone 206-226-3216.

Washington residents add 5.4% sales tax.
Apple is a trademark of Apple Computer, Inc.

```

!!!LDA@ .ME
        .MD (REG)
        SETUP (REG)
        JSR LOADI
!!!STA@ .ME
        .MD (REG)
        SETUP (REG)
        JSR STOREI
!!!LDD@ .ME
        .MD (REG)
        SETUP (REG)
        JSR DLOADI
!!!STD@ .ME
        .MD (REG)
        SETUP (REG)
        JSR DSTOREI
!!!POP@ .ME
        .MD (REG)
        SETUP (REG)
        JSR POPB
!!!STP@ .ME
        .MD (REG)
        SETUP (REG)
        JSR PUSHB
!!!ADD .ME
        .MD (REG)
        SETUP (REG)
        JSR ADDITION
!!!SUB .ME
        .MD (REG)
        SETUP (REG)
        JSR SUBTRACT
!!!POPD@ .ME
        .MD (REG)
        SETUP (REG)
        JSR POP16
!!!CPR .ME
        .MD (REG)
        SETUP (REG)
        JSR LCOMPARE
!!!INCR .ME
        .MD (REG)
        SETUP (REG)
        JSR INCREMENT

```

```

!!!DECR .ME
        .MD (REG)
        SETUP (REG)
        JSR DECREMENT
!!!RTN .ME
        .MD (REG)
        JSR $FF3F ;TO 6502 CODE ;RESTORE REGS
!!!GETCARR .ME
        .MD (REG)
        LDA *R14H ;STATUS REG
        LSR A ;EXTRACT CARRY BIT
!!!BR .ME
        .MD (DEST)
        JMP DEST
!!!BNC .ME
        .MD (DEST)
        GETCARR
        BCC DEST
!!!BC .ME
        .MD (DEST)
        GETCARR
        BCS DEST
!!!TEST .ME
        .MD (DEST)
        GETCARR ;GET PREV RESULT
        ASL A ;GET PRIOR REG #
        TAX
!!!BP .ME
        .MD (DEST)
        TEST
        LDA *R0H, X
        BPL DEST
!!!BM .ME
        .MD (DEST)
        TEST
        LDA *R0H, X
        BMI DEST
!!!BZ .ME
        .MD (DEST)
        TEST

```

Decision Systems

Decision Systems
P.O. Box 13006
Denton, TX 76203

SOFTWARE FOR THE APPLE II*

ISAM-DS is an integrated set of Applesoft routines that gives indexed file capabilities to your **BASIC** programs. Retrieve by key, partial key or sequentially. Space from deleted records is automatically reused. Capabilities and performance that match products costing twice as much.
\$50 Disk, Applesoft.

PBASIC-DS is a sophisticated preprocessor for structured **BASIC**. Use advanced logic constructs such as **IF...ELSE...**, **CASE**, **SELECT**, and many more. Develop programs for Integer or Applesoft. Enjoy the power of structured logic at a fraction of the cost of **PASCAL**.
\$35 Disk, Applesoft (48K, ROM or Language Card).

DSA-DS is a disassembler for 6502 code. Now you can easily dis-assemble any machine language program for the Apple and use the dis-assembled code directly as input to your assembler. Dis-assembles instructions and data. Produces code compatible with the S-C Assembler (version 4.0), Apple's Toolkit assembler and others.
\$25 Disk, Applesoft (32K, ROM or Language Card).

FORM-DS is a complete system for the definition of input and output forms. **FORM-DS** supplies the automatic checking of numeric input for acceptable range of values, automatic formatting of numeric output, and many more features.
\$25 Disk, Applesoft (32K, ROM or Language Card).

UTIL-DS is a set of routines for use with Applesoft to format numeric output, selectively clear variables (Applesoft's **CLEAR** gets everything), improve error handling, and interface machine language with Applesoft programs. Includes a special load routine for placing machine language routines underneath Applesoft programs.
\$25 Disk, Applesoft.

SPEED-DS is a routine to modify the statement linkage in an Applesoft program to speed its execution. Improvements of 5-20% are common. As a bonus, **SPEED-DS** includes machine language routines to speed string handling and reduce the need for garbage clean-up. Author: Lee Meador.
\$15 Disk, Applesoft (32K, ROM or Language Card).

(Add \$4.00 for Foreign Mail)

*Apple II is a registered trademark of the Apple Computer Co.

```

        LDA *R0L, X ;TEST FOR 0
        ORA *R0H, X ;(BOTH BYTES)
        BEQ DEST
        .ME
!!!BNZ .ME
        .MD (DEST)
        TEST
        LDA *R0L, X ;TEST BOTH
        ORA *R0H, X ;BYTES
        BNE DEST
        .ME
!!!BMI .ME
        .MD (DEST)
        TEST
        LDA *R0L, X ;TEST FOR $FF=-1
        AND *R0H, X ;(BOTH BYTES)
        EOR #$FF
        BEQ DEST
        .ME
!!!BNMI .ME
        .MD (DEST)
        TEST
        LDA *R0L, X
        AND *R0H, X
        EOR #$FF
        BNE DEST
        .ME
!!!BK .ME
        .MD (DEST)
        BRK ;6502 INSTR
        .ME
!!!RS .ME
        .MD (DEST)
        RTS ;6502 INSTR
        .ME
!!!BS .ME
        .MD (DEST)
        JSR DEST ;DIRECT ADDR MODE
        .ME
!!!@SW16 .ME
        .MD (DEST)
        JSR $FF4A ;SAVE REGISTERS
        .ME
;
; .LS
; INITIALIZE
;
        .ES
        @SW16 ;CALL SWEET16

```

```

6000- 20 4A FF  SETR (SP #7900)      ;STACK POINTER
6003- A9 0B
6005- 0A
6006- 85 1D
6008- AA
6009- A9 79
600B- 95 01
600D- A9 00
600F- 95 00      SETR (R10 #7900)      ;SAVE FOR LATER

6011- A9 0A
6013- 0A
6014- 85 1D
6016- AA
6017- A9 79
6019- 95 01
601B- A9 00
601D- 95 00      SETR (0 L1)      ;FIRST ADDR TO SORT

601F- A9 00
6021- 0A
6022- 85 1D
6024- AA
6025- A9 75
6027- 95 01
6029- A9 00
602B- 95 00      STD@ (SP)      ;PUSH

602D- A9 0B
602F- 0A
6030- 85 1D
6032- AA
6033- 20 52 77 SETR (0 L2)      ;LAST ADDR TO SORT

6036- A9 00
6038- 0A
6039- 85 1D
603B- AA
603C- A9 75
603E- 95 01
6040- A9 FE

```

```

6042- 95 00      STD@ (SP)      ;PUSH
6044- A9 0B
6046- 0A
6047- 85 1D
6049- AA
604A- 20 52 77
;
;LOOP1 IS THE
;CONTROL LOOP AND
;DECIDES WHICH SUBLIST
;TO PARTITION NEXT
;
LOOP1 POPD@ (SP)      ;GET BOUNDARIES
604D- A9 0B
604F- 0A
6050- 85 1D
6052- AA
6053- 20 34 77
;
ST (R)      ;OF NEXT SUBLIST

6056- A9 04
6058- 0A
6059- 85 1D
605B- AA
605C- 20 0E 77
;
POPD@ (SP)      ;TO PARTITION

605F- A9 0B
6061- 0A
6062- 85 1D
6064- AA
6065- 20 34 77
;
ST (L)

6068- A9 03
606A- 0A
606B- 85 1D
606D- AA
606E- 20 0E 77 ;
;
;LOOP2 DOES THE
;ACTUAL PARTITIONING
LD (L)      ;I := L

LOOP2
6071- A9 03
6073- 0A

```

The powerful package:

Super-Text II™

Allows you to learn the basics of text editing quickly. Advanced features will meet your expanding word processing requirements far into the future. \$150.00

plus Form Letter™

Stores names, addresses, and telephone numbers and prints mailing labels. Has user-definable category system. \$49.95

plus Address Book™

Provides automatic repetitive printing of letters. Allows insertion anywhere in a letter, also direct entry, optional prompting, special commands. \$100.00

**From the leader in word processing
for the Apple II or II Plus**

MUSE SOFTWARE™

330 N. CHARLES STREET
BALTIMORE, MD 21201
(301) 659-7212

Call or write for information and
the name of your nearest MUSE dealer

Apple II is a trademark of Apple
Computer Corp.

```

6074- 85 1D
6076- AA
6077- 20 05 77          ST (I)

607A- A9 01
607C- 0A
607D- 85 1D
607F- AA
6080- 20 0E 77          LD (R)      ;J := R

6083- A9 04
6085- 0A
6086- 85 1D
6088- AA
6089- 20 05 77          ST (J)

608C- A9 02
608E- 0A
608F- 85 1D
6091- AA
6092- 20 0E 77          ADD (L)     ;R0 := L+R

6095- A9 03
6097- 0A
6098- 85 1D
609A- AA
609B- 20 8E 77          RTN        ;BACK TO 6502

609E- 20 3F FF          LSR *R0H   ;DIVIDE BY 2
60A1- 46 01             ROR *R0L
60A3- 66 00             LDA #0FE   ;MASK ODD BIT
60A5- A9 FE             AND *R0L
60A7- 25 00             STA *R0L   ;TO GET EVEN WORD BOUNDARY
60A9- 85 00             ASW16     ;BACK TO SWEET16

60AB- 20 4A FF          ST (MIDPT) ;SAVE RESULT

60AE- A9 07
60B0- 0A
60B1- 85 1D
60B3- AA
60B4- 20 0E 77          LDD0 (MIDPT) ;FETCH THAT ITEM

60B7- A9 07
60B9- 0A
60BA- 85 1D
60BC- AA
60BD- 20 48 77          ST (X)     ;MIDDLE ELEMENT OF LIST

60C0- A9 05
60C2- 0A
60C3- 85 1D
60C5- AA
60C6- 20 0E 77          ;
;LOOP3 INTERCHANGES ELEMENTS
;TO ACCOMPLISH PARTITION
;ABOUT MIDPT (VALUE X)
;
LOOP3
;
;LOOP4 FINDS AN ELEMENT
;TO LEFT OF MIDPT WITH
;VALUE X
;
LOOP4
LDD0 (I)      ;A(I)

60C9- A9 01
60CB- 0A
60CC- 85 1D
60CE- AA
60CF- 20 48 77          ST (AI)    ;SAVE

60D2- A9 06
60D4- 0A
60D5- 85 1D
60D7- AA
60D8- 20 0E 77          CPR (X)    ;LOOP

60DB- A9 05
60DD- 0A
60DE- 85 1D
60E0- AA
60E1- 20 71 77          BNC (LOOP4) ;UNTIL A(I))=X

60E4- A5 1D
60E6- 4A
60E7- 90 E0             DECR (I)   ;ADJUST POINTER

```

ELCOMP BOOKS and SOFTWARE

For ATARI - PET/CBM - OSI - 6502

8K Microsoft BASIC Reference Manual
 Authoritative reference for the original Microsoft 4K + 8K BASIC developed for Altair and later computers including OSI, PET and TRS-80.
Order-No. 141 \$9.95
Expansion Handbook for 6502 and 6802
 S-44 Card Manual describes all of the 4.5 x 6.5 44-pin S-44 cards incl. schematics. A MUST for every KIM-, SYM- and AIM-owner.
Order-No. 152 \$9.95
Microcomputer Application Notes
 Reprint of Intel's most important application notes including 2708, 9085, 8255, 6251 chips. Very necessary for the hardware buff.
Order-No. 153 \$9.95
Complex Sound Generation
 New revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator. Circuit Board available (\$8.95).
Order-No. 154 \$6.95
Small Business Programs
 Complete listings for the business user. Inventory, Invoice Writing, Mailing List and much more. Introduction to Business Applications.
Order-No. 156 \$14.90
The First Book of Ohio Scientific
 Introduction to OSI computers. Diagrams, Hardware and software information not previously available in one compact source. 192 pages.
Order-No. 157 \$7.95
The Second Book of Ohio Scientific
 Very valuable information about OSI microcomputer systems. Introduction to OS-65 D and OS-65J Networking. Hardware and Software hints and tips. Systems specifications. Business applications.
Order-No. 158 \$7.95
The Fourth Book of Ohio Scientific
 Very Important Programs Many interesting programs for OSI computers. Sorting (Binary Tree), Differential Equations, Statistics, Astrology, Gas Consumption, Games a.s.o
Order-No. 160 \$9.95
VIP Package - Above book plus a cassette with the programs.
Order-No. 160 A \$19.95
Invoice Writing Program for OSI-C1PMF, C4P, Disk and Cassette, 8K RAM.
Order-No. 8234 \$29.80
Mailing List for C1PMF or C4PMF 24K RAM
 250 addresses incl. phone number and parameters on one 5 1/4 Disk
Order-No. 8240 \$29.80

Important Software for CBM 16K/32K
 Most powerful Editor/Assembler for Commodore CBM 16/32K on cassette. Assembler can be started directly from editor or from the TIM-Monitor. Translates in three passes. If an error is encountered, automatic return to the editor. Cassette with DEMO.
Order-No. 3276 \$39.00
MONJANA/1 Makes Machine Language Programming Easy!
 In every Commodore CBM there is a spare ROM socket waiting for it's MONJANA/1. The new MONJANA/1 Machine Language Monitor in ROM offers more user guidance and debugging aids than any other monitor available today. Comprehensive manual included.
Order-No. 2001 SPECIAL PRICE \$49.00
JANA-Monitor on Cassette for the PET. Similar to MONJANA/1. Very powerful.
Order-No. 2002 \$19.95
Programming in Machine Language with the Commodore PET
 This book includes EDITOR/ASSEMBLER, MONJANA, JANA, EDITOR, ASSEMBLER, LINKER and DISASSEMBLER, HEXDUMP and complete descriptions of the programs.
Order-No. 165 \$19.95
BLANK CASSETTES
 Highest Quality C-10 cassettes. Blank Cassettes (Quantity 10)
Order-No. 8095G \$4.99
ATARI OWNERS TAKE NOTE:
EPROM-BURNER für ATARI 400/800. Bare boards only with description, schematic + software (2716, 2732).
Order-No. 7041 \$99.00
Invoice Writing for very small business with ATARI 400/800 16K RAM.
Order-No. 7022, cass. \$8.95
Order-No. 7200, disc. \$39.99
ATARI-BASIC - Learning by Using
 A new book with programs and learning exercises. Many of the programs are appropriate for beginners as well as experienced computer users. (Screen Drawings, Special Sounds, Keys, Paddles + Joysticks, Specialized Screen Routines, Graphics and Sound, Peeks and Pokes and special stuff).
Order-No. 164 \$9.95
ATMONA-1 Machine Language Monitor for the ATARI 400/800
 This powerful monitor provides you with the firmware support that you need to get the most out of your powerful system. ATMONA-1 comes on a bootable cassette. No cartridges required. Disassemble, Memory Dump HEX + ASCII, (Change Memory Locations, Blocktransfer, Fill memory block, Save and Load Machine Language Programs, Start Mach. Lang. Progr. (Printer Options)).
Order-No. 7022 \$ 19.95
ATMONA-2 Superstepper
 A very powerful Tracer to explore the ATARI ROM/RAM area. Stop at previously selected address, Opcode or operand. (cassette)
Order-No. 7049 (includes ATMONA-1) \$49.95
EDITOR/ASSEMBLER for ATARI 800, 32K RAM
 Extremely fast and powerful Editor/Assembler. (8K Sourcecode in about 5 seconds) includes ATMONA-1. (cass.)
Order-No. 7098 \$49.95
MACRO-Assembler for ATARI-800, 48K RAM (cass.)
Order-No. 7099 \$89.00



Programs for the Challenger C1/C2 8K
Order-No. 2004 "Bare Bones" Wordprocessor \$9.95
Order-No. 2005, "Bare Bones" Mailing List \$9.95

Care and Feeding of the Commodore PET
 Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.
Order-No. 150 \$9.95

ELCOMP Publishing, Inc.
 53 Redrock Lane, Pomona, CA 91766
 Phone: (714) 623-8314

Payment: Check, Money Order, VISA, Mastercharge, Eurocheck. POSTPAID or PREPAID in USA. \$ 5.00 handling fee for C.O.D. All orders outside USA: ADD 15 % shipping. CA add 6 % sales tax. ATARI is a registered trademark of ATARI INC. PET/CBM is a registered trademark of Commodore Business Machines.

Lazer isn't afraid to compare!

(because we have the best lower case system available.)

Despite the fact that we were one of the first manufacturers to produce lower case equipment for the Apple II, Lazer MicroSystems products are still the state-of-the-art. Beside the obvious price/performance advantage we have over the competition, our products are expandable. Lazer is constantly introducing new products including our Lower Case + Plus II, Character Set + Plus (that adds 2 additional character sets to the Lower Case + Plus), and our new "Double Vision + Plus" for owners of Computer STOP's Double Vision 80-column board.

Lazer's products are compatible with more word processors than anybody else's. Our Lower Case + Plus is compatible with Easywriter and unmodified Apple writers. None of our competitors below can make that claim. In fact, BASIS' board isn't even compatible with Programma's PIE! The following chart lists Lazer's superiority over the competing units.

(LC+ = Lower Case + Plus, LC+II = Lower Case + Plus II, KB+ = Keyboard + Plus)

Feature	Paymar		VIDEX	BASIS	VISTA	LC+	LC+II	KB+/LC+II	KB+/LC+	KB+
	LCA-1	LCA-2								
True ASCII upper/lower case display	Y	Y	Y	Y	N	Y	Y	Y	Y	N
Inverse Lower Case	N	N	rev 7 only	N	—	Y	N	N	Y	—
Font Size	5 x 7	5 x 7	5 x 8	5 x 8	—	5x7, 7x8	5 x 7	5 x 7	5x7, 7x8	—
# of on-board character sets	1	1	1	1	—	up to 4 (2 std)	1	1	up to 4	—
Pseudo-descenders	Y	Y	N	N	—	Y	Y	Y	Y	—
True descenders	N	N	Y	Y	—	optional	N	N	optional	—
Optional fonts avail. (ROM, disk)	N	N	N	Y	—	Y	N	N	Y	—
2716-compatible character generator compatible with fonts created by HIRES character generators	N	N	N	N	—	Y	N	N	Y	—
On-board graphics character set	N	N	N	N	—	Y	N	N	Y	—
Software provided on diskette	\$5 extra		N	N	—	Y	N	N	Y	Y
Single board works with all Apples	N	N	N	N	Y	Y	N	N	Y	Y
Expandable System	N	N	N	N	N	Y	Y	Y	Y	Y
Extensive user Documentation	N	N	Y	N	N	Y	Y	Y	Y	Y
High quality PC board	N	—	Y	Y	Y	Y	—	Y	Y	Y
Reset key disable	N	N	Y	Y	N	N	N	Y	Y	Y
Shift key mod	N	N	Y	Y	N	N	N	Y	Y	Y
All 128 characters available from keyboard	—	—	N	N	—	—	—	Y	Y	Y
Type ahead buffer	N	N	N	N	Y	N	N	Y	Y	Y
# of characters in buffer	—	—	—	—	40	—	—	64	64	64
Ability to clear or turn off buffer	—	—	—	—	N	—	—	Y	Y	Y
PRICE	59.95	49.95	129.95	125.00	49.95	64.95	29.95	129.90	164.90	99.95

Don't settle for anything less than the Lower Case + Plus, Lower Case + Plus II, or Keyboard + Plus. If your dealer doesn't stock our products give us a call, we'll try to connect you with a dealer in your area.

Before you buy a lower case system for the Apple II, call or write for our free booklet "Keyboard Enhances/Buffers and Lower Case Adapters: From The Inside Out." This booklet explains the advantages and disadvantages of using a lower case adapter in your Apple II.

Lazer products are carried by reputable dealers all across the world. If your dealer cannot provide you with a demonstration of our equipment and tries to sell you an inferior lower case adapter, give us a call, we'll give you the location of a dealer that can show you our equipment. Remember, an intelligent purchase cannot be made if you do not compare before buying.

State of the art performance, software compatibility, and exceptional value make Lazer's products the best there are!

Lower Case + Plus \$64.95
 Keyboard + Plus \$99.95
 Lower Case + Plus II \$29.95
 Character Set + Plus \$24.95
 Double Vision + Plus \$39.95

Anix 1.0 \$49.95
 Lazer Pascal \$39.95

Visicalc Users! Now you can have lower case on your Visicalc Screen, only from Lazer.

Lazer
 MICRO-SYSTEMS INC.
 1791-G Capital
 Corona, CA 91720
 (714) 735-1041

```

60E9- A9 01
60EB- 0A
60EC- 85 1D
60EE- AA
60EF- 20 66 77          DECR (I)

60F2- A9 01
60F4- 0A
60F5- 85 1D
60F7- AA
60F8- 20 66 77

;

;LOOPS FINDS AN ELEMENT
;TO RIGHT OF MIDPT WITH
;VALUE < X
;
;
        LDDA (J)      ;A(J)

60FB- A9 02          LDDA (J)
60FD- 0A
60FE- 85 1D
6100- AA
6101- 20 48 77          DECR (J)      ;COMPENSATE

6104- A9 02
6106- 0A
6107- 85 1D
6109- AA
610A- 20 66 77          DECR (J)      ;FOR AUTO-INCR.

610D- A9 02
610F- 0A
6110- 85 1D
6112- AA
6113- 20 66 77          ST (AJ)

6116- A9 08
6118- 0A
6119- 85 1D
611B- AA
611C- 20 0E 77          LD (X)

611F- A9 05
6121- 0A
6122- 85 1D
6124- AA
6125- 20 05 77          CPR (AJ)      ;LOOP UNTIL

6128- A9 08
612A- 0A
612B- 85 1D
612D- AA
612E- 20 71 77          BC (ENDLOOPS)      ;A(J) <= X

6131- A5 1D
6133- 4A
6134- B0 15          DECR (J)

6136- A9 02
6138- 0A
6139- 85 1D
613B- AA
613C- 20 66 77          DECR (J)

613F- A9 02
6141- 0A
6142- 85 1D
6144- AA
6145- 20 66 77          BR (LOOPS)

6148- 4C FB 60          ENDLOOPS

;
        LD (J)

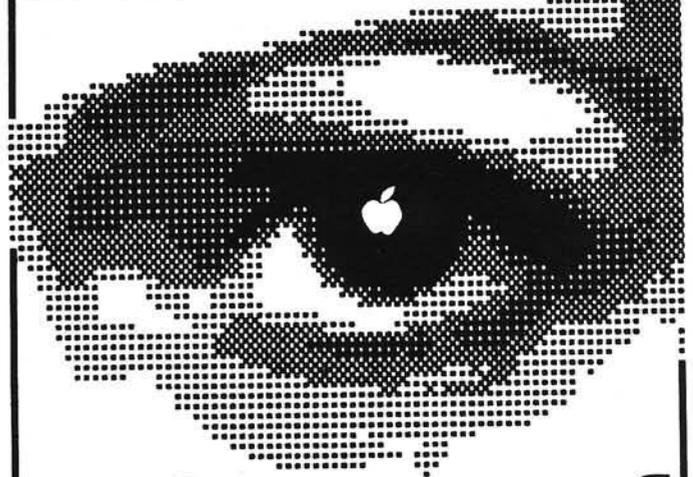
614B- A9 02
614D- 0A
614E- 85 1D
6150- AA
6151- 20 05 77          CPR (I)      ;IF I>J

6154- A9 01
6156- 0A
6157- 85 1D
6159- AA
615A- 20 71 77          BNC (END3)      ;GOTO END3

615D- A5 1D

```

Dithertizer IITM



...the eye of your apple.[®]

Though it is very simple to use, the Dithertizer II represents the ultimate in video digitizing using the Apple II computer. The Dithertizer is an interface card which converts video input into digitized images. Because the Dithertizer II is a frame grabber, DMA type digitizer, it offers extreme high speed in the conversion process (it grabs an entire frame in 1/60th of a second). The camera supplied with the package is the Sanyo model VC1610X. Cabling is supplied for this camera so as to have the Dithertizer II system up and running in minutes. The video camera used for input must have external sync to allow for the frame grabber technology employed for digitizing. If a camera other than the model recommended is used, wiring adaptations by the user may be required. Software is supplied with the board to allow you to display up to 64 pseudo grey levels on your Apple's screen. The number of grey levels may be changed with one keystroke. The intensity and contrast of the image are controllable via game paddles. Also supplied is software for image contouring for those interested in movement detection or graphic design applications.

The Dithertizer II package is available ready to run with camera, interface card and the software described above for only:

\$650.00

Dithertizer II interface card and software (without camera):

\$300.00

Computer Station
 11610 Page Service Dr.
 St. Louis, MO 63141
 (314) 432-7019

Apple II is a registered trademark of Apple Computer, Inc.
 Dithertizer II is a trademark of Computer Station, Inc.

```

615F- 4A
6160- 90 48
LD (AI) ;A(I)

6162- A9 06
6164- 0A
6165- 85 1D
6167- AA
6168- 20 05 77
STD@ (J) ;EXCHANGE A(I)

6168- A9 02
616D- 0A
616E- 85 1D
6170- AA
6171- 20 52 77
DECR (J) ;AND A(J)

6174- A9 02
6176- 0A
6177- 85 1D
6179- AA
617A- 20 66 77
DECR (J) ;ADJ POINTER TO

617D- A9 02
617F- 0A
6180- 85 1D
6182- AA
6183- 20 66 77
DECR (J) ;PREVIOUS ELEMENT

6186- A9 02
6188- 0A
6189- 85 1D
618B- AA
618C- 20 66 77
DECR (J)

618F- A9 02
6191- 0A
6192- 85 1D
6194- AA
6195- 20 66 77
LD (AJ) ;A(J)

6198- A9 08
619A- 0A
619B- 85 1D
619D- AA
619E- 20 05 77
STD@ (I) ;FINISH EXCHANGE

61A1- A9 01
61A3- 0A
61A4- 85 1D
61A6- AA
61A7- 20 52 77
ENDS LD (J) ;LOOP UNTIL

61AA- A9 02
61AC- 0A
61AD- 85 1D
61AF- AA
61B0- 20 05 77
CPR (I) ;I ) J

61B3- A9 01
61B5- 0A
61B6- 85 1D
61B8- AA
61B9- 20 71 77
BNC (ENDLOOP3)

61BC- A5 1D
61BE- 4A
61BF- 90 03
BR (LOOP3)

61C1- 4C C9 60
ENDLOOP3
LD (R)

61C4- A9 04
61C6- 0A
61C7- 85 1D
61C9- AA
61CA- 20 05 77
CPR (I) ;IF I)=R THEN

61CD- A9 01
61CF- 0A
61D0- 85 1D
61D2- AA
61D3- 20 71 77
BNC (ENDIF) ;GOTO ENDIF

61D6- A5 1D
61D8- 4A

```

```

61D9- 90 24
61DB- A9 01 LD (I) ;PUSH FOR LATER

61DD- 0A
61DE- 85 1D
61E0- AA
61E1- 20 05 77
STD@ (SP) ;PARTITIONING

61E4- A9 08
61E6- 0A
61E7- 85 1D
61E9- AA
61EA- 20 52 77
LD (R) ;(RIGHT PART OF
; LIST)

61ED- A9 04
61EF- 0A
61F0- 85 1D
61F2- AA
61F3- 20 05 77
STD@ (SP)

61F6- A9 08
61F8- 0A
61F9- 85 1D
61FB- AA
61FC- 20 52 77
ENDIF LD (J) ;PREPARE TO
; PARTITION

61FF- A9 02
6201- 0A
6202- 85 1D
6204- AA
6205- 20 05 77
ST (R) ;LEFT PART
;R := J

6208- A9 04
620A- 0A
620B- 85 1D
620D- AA
620E- 20 0E 77
LD (L)

6211- A9 03
6213- 0A
6214- 85 1D
6216- AA
6217- 20 05 77
CPR (R) ;L<R

621A- A9 04
621C- 0A
621D- 85 1D
621F- AA
6220- 20 71 77
BC (ENDLOOP2)

6223- A5 1D
6225- 4A
6226- B0 03
BR (LOOP2)

6228- 4C 71 60
ENDLOOP2
LD (R10) ;ORIG VAL OF SP

622B- A9 0A
622D- 0A
622E- 85 1D
6230- AA
6231- 20 05 77
CPR (SP) ;STACK EMPTY?

6234- A9 08
6236- 0A
6237- 85 1D
6239- AA
623A- 20 71 77
BC (EXIT) ;YES

623D- A5 1D
623F- 4A
6240- B0 03
BR (LOOP1) ;NO

6242- 4C 4D 60
EXIT RTN ;DONE

6245- 20 3F FF
6248- 60
RTS
.EN

```



MONEY BUSINESS

Beat the I.R.S.

You'd always pay the minimum Federal income tax if you had the knowledge and time to examine 120 tax return options. Well, now you can do it, with Datamost's TAX BEATER.

Written by an I.R.S. Enrolled Agent, with 24 years of financial and tax planning experience, the TAX BEATER automatically evaluates up to 120 return options from your input. It searches and finds the best tax path for you . . . displaying up to 15, and ready to print out the optimum method so you pay the minimum!

The TAX BEATER can handle it all. From income averaging to loss carryovers to dividends, alimony, pension to special exclusions. It's perfect for the average taxpayer . . . indispensable for the financial professional. It's so complete, so logical that, especially in this interim year of unusual tax revisions, it can easily pay for itself many times over. Be ready for the I.R.S. . . . with TAX BEATER, the program that's updated for the 1981 tax laws!

\$129.95 on disk for Apple II*. Complete with thorough, easy to follow documentation.

Beat the Real Estate game

Real Estate has always been the major wealth-builder. In fact, more millionaire dynasties owe their creation to investments in real estate than anything else. And, it doesn't matter . . . boom times or bust . . . inflation or deflation . . . the knowing investor can make money, even create an empire!

But, the key to real estate success is accurate analysis of opportunities, knowledge of cash flows, return on investment, current and future profitability, tax consequences and other interrelated information — all needed, all necessary to making the right decision.

And that's what REAP (Real Estate Analysis Program) is all about. It takes your input, probes for the right information, scrutinizes the data, the opportunities . . . and automatically delivers the facts . . . showing you the possibilities and why one situation may be superior to another. In short, REAP can help you reap bigger profits. That's why REAP is **the** program for any investor . . . a must program for the sophisticated investor. Don't option, commit, invest or buy without it . . . whether you just want to make good money or create a successful real estate empire!

\$129.95 on disk for Apple II*. Complete with thorough easy to follow documentation.

VISA/MASTERCARD accepted.
\$1.00 shipping/handling charge.
(California residents add 6% tax)

* Apple II is a trademark of Apple Computer, Inc.

Available at
computer stores, or from:

DATAMOST
19273 Kenya St.
Northridge, Ca. 91326
(213) 366-7160

VersaWriter & APPLE II: The Keys to Unlimited Graphics

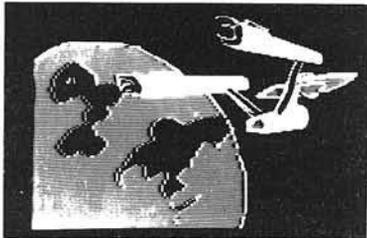
DRAWING TABLET

Although VersaWriter operates on a simple principle, it produces graphics which match or exceed those of other digitizers. Rugged construction, translucent base, easy to use — plugs directly into APPLE II.



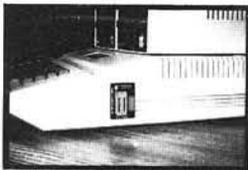
GRAPHICS SOFTWARE

Easily the most capable and complete graphics software for the home computer available. Fast fill drawings in 100 colors. All text in five sizes, compile and display shapes, edit, move and much more!



UNIQUE OFFER

See VersaWriter at your local dealer and pick up a copy of our demonstration disk. The complete VersaWriter hardware and software package is a real bargain at \$249. For more information call or write:



EZ Port Will Solve Your Game I/O Problem!

How many times have you gone through the hassle of changing from game paddles to joystick, VersaWriter, or any other device using the game I/O? First, you have to remove whatever is sitting on top of the Apple—a video terminal, disk drives, printer, etc.

Next you remove the computer cover and try to see what you're doing as you switch plugs to the I/O. Then you replace the computer cover and whatever was on top of the Apple.

After all this, you find that you can't run the program because the I/O device is plugged in backwards or is 'off by a pin'.

Sound familiar?

EZ PORT GAME I/O EXTENDER FOR APPLE II

WHAT IS EZ PORT?

EZ Port is a specially designed extension unit for the Apple game I/O port. It's a board with a socket and a two foot long cable which plugs into the internal I/O port. You attach EZ Port wherever you prefer on the outside—on the side, the back, or on top.

EZ Port has a ZIP DIP II socket (ZIP=zero insertion force). These sockets are meant to be plugged into many times and will not wear out like ordinary sockets. All you do is plug in the appropriate device (joystick, paddles, etc.) and flip the switch to the ON position. No pressure is exerted on the 16-pin plug until you switch, so all the connectors will last longer, too!



EZ PORT MAKES GAME I/O CHANGES CONVENIENT, QUICK & SAFE.

Suggested price \$24.95

Ask your local computer retailer for EZ Port, or contact:

VersaComputing, Inc.
3541 Old Conejo Rd. Suite 104
Newbury Park, CA 91320
(805) 498-1956

Dealers inquiries welcome.

Apple and Apple II are registered trademarks of Apple Computer, Inc.

ZIP DIP is a trademark of Textool Products, Inc.

Versa Computing, Inc.

3541 Old Conejo Road, Suite 104
Newbury Park, CA. 91320 (805)498-1956

Epson MX80 Interface for SYM-1

This article describes the hardware and software needed for a parallel interface of an Epson MX-80 printer to a SYM-1. The software illustrates the use of the SYM EXECUTE and USER commands. The interface also serves as an example application of the 6522 VIA.

Richard H. Turpin
8226 Warbler Way
Indianapolis, Indiana 46256

When I bought my Epson MX-80, I decided not to order an interface cable, but to make my own since commercially available cables are quite expensive. The MX-80 standard interface is a parallel interface, with a serial interface offered as an option.

The parallel interface requires an Amphenol connector, type number 57-10360 or equivalent, which I purchased at a local electronics store. After studying the printer manual, I decided to interface the printer to the SYM auxiliary applications (AA) connector, and use the 6522 VIA #2 to provide the required I/O.

Figure 1 gives the interconnections. Port A is the character output port, with control line CA2 configured in the pulse mode to strobe data into the printer buffer after it has been written to the port. CA1 senses the printer ready line. Port B provides further I/O such as sensing printer status and selecting/deselecting the printer.

The code I wrote to drive the MX-80 was designed to provide convenient control of the printer operation from

the computer terminal. USER commands are implemented to turn on and off the compressed character, double strike, and emphasized printer modes. It is also possible to specify the line spacing. All the control codes use USR 0. To turn on the compressed character format, for example, you would type U0 1 \downarrow (\downarrow denotes carriage return) at the terminal. To set up double spacing type U0 9-18 \downarrow .

A listing of the interface code is given in figure 2. New and potential MX-80 owners and SYM-1 owners should be interested in the example applications of the SYM EXECUTE and USR commands. The EXECUTE command is used to initialize the 6522 VIA and to attach the printer driver code to the SYM-1 monitor. To use the code given here, simply type E 7000.

Figure 1: SYM-1/MX-80 Interface

Ribbon Cable	MX-80 Connector	Signal	SYM AA Connector (VIA 2)
1	1	<u>STROBE</u>	AA-4, CA2 (pulse mode)
2	2	D1	AA-D
3	3	D2	AA-3
4	4	D3	AA-C
5	5	D4	AA-12
6	6	D5	AA-N
7	7	D6	AA-11
8	8	D7	AA-M
9	9	D8	AA-10
10	10	<u>ACKNLG</u>	AA-E, CA1
11	11	BUSY	AA-6, PB7
12	12	PE	AA-H, PB6
13	13	<u>SLCT</u>	AA-7, PB5
14	14	<u>AUTO FEED XT</u>	AA-9, PB1
15	16	Logic Gnd	AA-1, Gnd
16	31	<u>INIT</u>	AA-L, PB0
17	36	<u>SLCT IN</u>	AA-K, PB2
18	32	<u>ERROR</u>	AA-J, PB4
19	16	Logic Gnd	AA-1, Gnd
20	16	Logic Gnd	AA-1, Gnd

(Pins 19 through 30 connected to pin 16 on MX-80 connector.)

Figure 2

```

;
; Program to interface MX80 printer to SYM
; by Richard H. Turpin, April 11, 1981
;
;       .ba $7000
;
; Initialize the VIA
;       .by 'G701F' $D
;
; Attach the code to SYM monitor.
;       .by 'sd7037,A664' $D
;
; Attach USR0 code to monitor
;       .by 'SD7055,A66D' $D 0
;
;
; Define external references
crt      .de $8aa0    SYM RS-232 service routine
lstcom   .de $A657
via      .de $a800
portb    .de via
porta    .de via+1
ddrb     .de via+2
ddra     .de via+3
pcr      .de via+$c
ifr      .de via+$d
;
; Initialize VIA
INIT     lda #$ff      data output (port A)
         sta ddra
         lda #1
         sta ddrb      INIT control bit 0
         sta portb
         lda #$a
         sta pcr        CA2 pulse mode, CA1 neg. edge sense
         lda #0
         sta porta     dummy write to arm flag (IFR)
         rts
;
; Printing code to attach to OUTCHR
; Test for printer on line..if not, simply display on CRT
print    pha           save character
         lda #$20
         bit portb     check printer on line
         beq skipit   (0 if off line)
         pla           retrieve character
         jsr toMX80   print it
         pha
         pla
skipit   jmp crt now to the CRT service routine
;
; Subroutine to output character to MX80
toMX80   pha           save character
         lda #2
         bit ifr       wait MX80 ready
         beq ==-4
         pla           retrieve character
         sta porta     write it
         rts
;
; USR0 code to control MX80 format.
;
; code no.      function
; 1             compressed character ON
; 2             compressed character OFF
; 3             double strike ON
; 4             double strike OFF
; 5             emphasized ON
; 6             emphasized OFF
; 7             select printer
; 8             deselect printer
; 9             set line spacing (parameter 2 = spacing,
;                   $C for normal, $18 for double spacing)
;
; USR parameter 3 storage
p31      .de $A64A
;
prcon    cmp lstcom   test valid entry
         beq p.of

```

7000- 47 37 30
7003- 31 46 0D

7006- 73 64 37
7009- 30 33 37
700C- 2C 41 36
700F- 36 34 0D

7012- 53 44 37
7015- 30 35 35
7018- 2C 41 36
701B- 36 44 0D
701E- 00

701F- A9 FF
7021- 8D 03 AB
7024- A9 01
7026- 8D 02 AB
7029- 8D 00 AB
702C- A9 0A
702E- 8D 0C AB
7031- A9 00
7033- 8D 01 AB
7036- 60

7037- 48
7038- A9 20
703A- 2C 00 AB
703D- F0 05
703F- 68
7040- 20 48 70
7043- 48
7044- 68
7045- 4C A0 BA

7048- 48
7049- A9 02
704B- 2C 0D AB
704E- F0 FB
7050- 68
7051- 8D 01 AB
7054- 60

7055- CD 57 A6
7058- F0 02

```

705A- 38      p.bad      sec          flag illegal activity
705B- 60      rts
705C- C9 14      p.of        cmp #14      is it USRO?
705E- D0 FA      bne p.bad    no..
7060- E0 03      cpx #3       3 params not allowed
7062- F0 F6      beq p.bad    2 params for line spacing
7064- E0 02      cpx #2
7066- F0 30      beq p.line
7068- AD 4A A6    lda p31 (1 parameter) get parameter
706B- 29 0F      and #f
706D- C9 09      cmp #9 can't be greater than 8
706F- 10 E9      bpl p.bad
7071- AA        tax          move to index
7072- BD B6 70    lda table,x lookup control character
7075- 10 09      bpl p.skip
7077- 29 7F      and #7f     mask off msb (ESC char. flag)
7079- 48        pha          save character
707A- A9 1B      lda #1b send ESC character
707C- 20 48 70    jsr toMX80
707F- 68        pla
7080- C9 11      p.skip      cmp #11 is it printer select?
7082- F0 0D      beq p.sel
7084- C9 13      cmp #13 is it printer deselect?
7086- F0 05      beq p.des
7088- 20 48 70    jsr toMX80 write control character
708B- 18        clc
708C- 60        rts
708D- A9 00      p.des      lda #0 deselect printer via port B, bit 0
708F- F0 02      beq p.sel+2
7091- A9 01      p.sel      lda #1 select printer
7093- 8D 00 AB    sta portb
7096- 18        clc
7097- 60        rts

;
; Routine to set line spacing.
; Second parameter specifies new spacing.
; Hex C is standard, hex 18 gives double spacing.
p.line      lda #1b      output ESC character
            jsr toMX80
            lda #'A      followed by an A
            jsr toMX80
            lda p31 get new line spacing
            ora #80      add 128
            jsr toMX80
            lda #1b      send another ESC
            jsr toMX80
            lda #'2      followed by a 2
            jsr toMX80
            clc
            rts

; Table of MX80 command characters
table      .by 0 %0F %12 %c7 %c8 %c5 %c6 %11 %13

709B- A9 1B
709A- 20 48 70
709D- A9 41
709F- 20 48 70
70A2- AD 4A A6
70A5- 09 80
70A7- 20 48 70
70AA- A9 1B
70AC- 20 48 70
70AF- A9 32
70B1- 20 48 70
70B4- 18
70B5- 60

70B6- 00 0F 12
70B9- C7 C8 C5
70BC- C6 11 13

```

Letterbox (Continued from page 6)

MICRO

What About Atari?

Dear Editor:

I would like to praise the inclusion of the new "From Here to Atari" column by James Capparell. I feel the Atari is a fine machine and deserves more recognition. Hopefully, the new column signals a growing interest on your part to cover the Atari computer more fully.

The Atari seems to have gained a reputation as a game computer, and while the games are of course good, the reason I bought an 800 instead of a VCS was that I wanted it to do more. I hope we can look forward to some practical applications appearing in MICRO soon.

Perhaps the continuation of game-only articles becomes a self-fulfilling

prophecy, and perpetuates an undeserved reputation.

In the future I, and I'm sure other Atari owners, would appreciate your increased attention to serious Atari applications.

Michael B. Moore
San Francisco, CA

Editor's Note: We encourage our readers who use Ataris to send in articles and applications they've developed. We are aware of the growing popularity of the Atari and want to expand our coverage of it, but need your help.

A Call for Chemistry Programs

Dear Editor:

My science education class acquired

an Apple II Plus this Fall. Now my chemistry students practice writing formulas and equations, they study the periodic table and account for energy changes between atoms, they review for tests and check their knowledge with immediate confirmation, and they learn the ways of atoms and electrons through animation and simulations — on the computer!

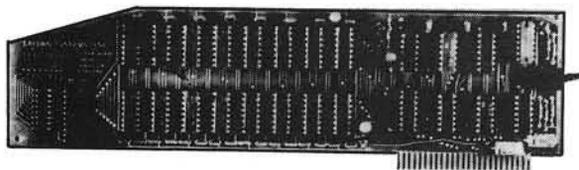
I'd like to find out about programs for drills, graphics, and simulations — anything useful for chemistry class. Perhaps other teachers could help.

Judy Toop
Auburn Adventist Academy
Auburn, Washington 98002
(206) 939-5000, Ext. 236

MICRO

SATURN SYSTEMS 32K RAM BOARD FOR APPLE

32K of buffered read/write memory on a plug-in card



Compatible with: Apple II®, Apple II+®, Microsoft's Z80 Softcard®, DOS 3.2, DOS 3.3, INTEGER Basic®, Applesoft®, PASCAL, FORTRAN, LISA®, Personal Software's VISICALC®

- Software included:**
1. Relocation of DOS into SATURN 32K board (recovers approximately 10K of main board RAM).
 2. Utility package for saving and loading Applesoft® and INTEGER® programs and data on the 32K RAM board; overlaying, chaining.
 3. PSEUDO-DISK: Modifies DOS 3.3 to allow use of SATURN 32K RAM board(s) like another disk drive.

COMPREHENSIVE DOCUMENTATION • 1 YEAR WARRANTY

ALL FOR ONLY \$239.00

NEW!

MEMORY EXPANSION SYSTEM FOR VISICALC®

Now you can expand the memory available to Personal Software's 16 sector VISICALC® using the SATURN 32K RAM BOARD!

With VC-EXPAND™ and one or more SATURN 32K RAM BOARDS the memory available to VISICALC® is increased from 18K to:

50K with 1 SATURN 32K BOARD

82K with 2 SATURN 32K BOARDS

VC-EXPAND supplied on 16 sector disk

ONLY \$100.00



SATURN SYSTEMS, INC.

P.O. BOX 8050 • ANN ARBOR, MI 48107 • (313)665-6416

"THIEF"

"The damn things nearly killed me."



It seemed like a cinch assignment. At least for the galaxy's master thief.

Just sneak inside the Star-Complex Base, dodge a few guardian robots and grab the formula. A piece of cake.

Oh yeah! They didn't say the robots went berserk at the sight of a human. They didn't say I'd have to laser my way through 7 levels. Or, that rampaging robots would keep coming and coming.

And most of all, they didn't bother to say there's some weird blob, an unearthly **something** that tracks you right thru the damn walls.

I made it to the 7th level. I found the formula. But, more robots are massing out there. And I'm wounded. My energy charge is low.

You. Yes, **you**. How good a Thief are you? Prove yourself. Come get me. Come save me.

\$29.95 for Apple II*. At computer stores, or from DATAMOST.

VISA/MASTERCHARGE accepted. \$1.00 shipping/handling charge. (CA residents add 6% tax)

*Apple II is a trademark of Apple Computer, Inc.

DATAMOST

19273 Kenya St., Northridge, CA 91326, (213) 366-7160

Tiny Pascal, with some enhancements, is intended primarily for learning the language. There are actually two versions. One, called just Tiny Pascal, runs in 16K. The other, called Tiny Pascal Plus+, requires 32K, but includes enhancements for graphics support (limited to the quarter-boxes for 80 x 50 resolution plotting).

The editor is a traditional line-oriented editor, where lines may be inserted, deleted, moved, searched, listed, etc. The familiar screen-editing capabilities of the PET itself are not supported. When a source file is saved, all but the last line is saved. (This problem may not be present in all versions, but I have called it to the attention of Abacus and they intend to correct it.)

The compiler is written in BASIC, which means it is very slow. However, it also means that it is easy to make changes to suit your particular needs. The P-code interpreter has an optional TRACE mode, which can be helpful both in debugging programs and in learning how things work. The manual covers the operation of the three programs, the differences from standard Pascal, and a few examples. It does not cover standard Pascal or provide any tutorial material.

Tiny Pascal is available for 3.0 and 4.0 PETs and the 8032 on 2040/4040 diskette for \$35.00, and on cassette for \$40.00. Tiny Pascal Plus+ is \$50.00 on diskette and \$55.00 on cassette. Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510.

KMMM Pascal — AB Computers

KMMM Pascal was written by Willi Kusche of Wilserv Industries and is marketed by AB Computers. This implementation is probably closest to Tiny Pascal, but Boolean, real, and text variables are supported. The editor combines the screen-editing features of the PET with the features of a traditional line editor. The lack of line numbers makes it a little difficult to use the line commands. The compiler is in machine code and generates P-code, which is converted to executable machine code by a program called the "Translator." After this machine code is in place, a BASIC SYS command will run the compiled program.

The manual, supplied to me in preliminary form, includes a description of the operation of the editor, the differences from standard Pascal with a

few examples, and a full set of syntax diagrams. Standard Pascal is not documented, nor is there any tutorial material.

KMMM Pascal is available for 3.0 or 4.0 PETs (including 8032) on 4040 or 8050 diskette for \$85.00. An older version, which runs in 16K but doesn't support floating point numbers, is available for \$75.00. AB Computers, 252 Bethlehem Pike, Colmar, PA 18915.

Commodore TCL Pascal

This version, written by Keith Frewin of Transam Components Limited, and marketed in the U.S. by Commodore as its "Pascal Development System," is a standard Pascal. The full power of the language is realized. Producing a source file is very much like writing a BASIC program, and auto line numbering, renumbering, searching, and changing capabilities have been added.

The compiler can be used in two ways. In the resident mode, the source, object, and compiler program are held in memory together. In the disk mode, the compiler, source, and object are all in files stored on disk.

The manual includes complete documentation of the editor and compiler. There's a lot of tutorial material, illustrating standard Pascal usage. However, I would not recommend that anyone learn Pascal from this manual.

TCL Pascal is available for 8032 and 8050 with protection ROM and manual for \$295.00. An older version may still be available for 3.0 ROM PETs and 2040 for \$250.00.

Final Thoughts

There are three very different versions of Pascal available for the PET. They differ in price, "completeness," and in the machine configurations they require. Certainly the best is the TCL version, but it is definitely not over three times better than KMMM Pascal, as the price might indicate. Tiny Pascal is not as good as the other two, but it is the cheapest, it is modifiable, it may be the only version that works on your system, and it will fill the need for a teaching system.

According to sources, Commodore plans to offer a UCSD version of Pascal for the 8096 (not the SuperPET) sometime this year. Further details were not available.

By Loren Wright

What is Pascal?

Pascal was conceived by Niklaus Wirth in 1970-71 as a "complete" language, capable of the most complex structures, yet still easy to learn and program. Although the language was fairly well-specified by Wirth, there was room for improvement. Several different versions have been written, all consistent with the basic structure of the language, but different in several minor respects.

Probably the most popular implementation is called UCSD Pascal, which was developed at the University of California at San Diego. UCSD Pascal adds some important enhancements, particularly a convenient method of handling character strings, which make it very attractive for microcomputer implementations.

Another version, called "Tiny" Pascal, was described by Yuen and Chung in the September-November 1978 issues of *BYTE*. As its name implies, there is quite a bit missing, including some of the more powerful features of the original. Nevertheless, it does make the language available where memory is severely restricted (such as in a 16K PET).

To learn more about Pascal, read Victor Fricke's series, which began in our November issue and concludes in this issue. He cites a number of other books.

Pascal is generally a compiled language. However, microcomputer implementations ordinarily use a compiler which produces P-code. A P-code interpreter is then required for execution. The typical microcomputer Pascal package includes three programs: an editor, a compiler, and a P-code interpreter. As we shall see, a couple of the PET packages are not typical.



TRICK

IF YOU LIKED OUR
POOL 1.5, YOU'LL
LOVE TRICK SHOT!*

* Watch for the "GREAT TRICK
SHOT TOURNAMENT"

SHOT

FOR YOUR
APPLE II

IDSI
P.O. BOX 1658
LAS CRUCES, NM
88004 505-522-7373

Wizard-80™

INSTANT 80 COLUMN APPLE*

The miracle of the 80's... everything you want in an 80-column card.

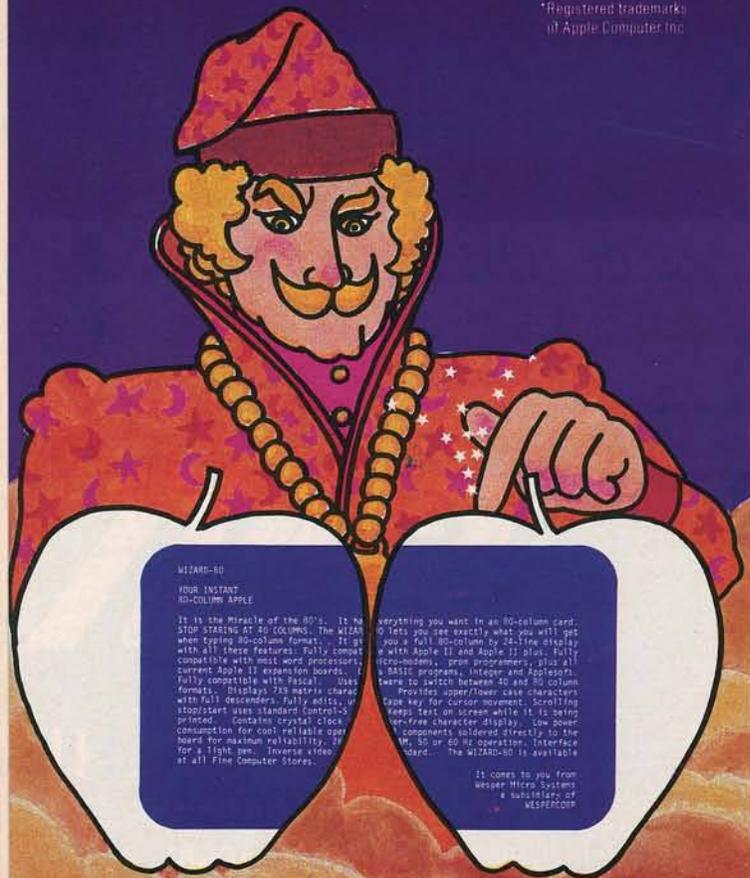
STOP STARING AT 40 COLUMNS

WIZARD-80 lets you see exactly what you will get when typing 80-column format. It gives you a full 80-column by 24-line display with all these features:

- Fully compatible with Apple II and Apple II Plus *
- Fully compatible with most word processors, micro-modems and prom programmers, plus all current Apple II expansion boards
- Lists BASIC programs, integer and Applesoft
- Fully compatible with Pascal
- Uses software to switch between 40 and 80 column formats
- Displays 7 x 9 matrix characters
- Provides upper/lower case characters with full descenders
- Fully edits... uses ESCape key for cursor movement
- Scrolling stop/start uses standard Control-S entry
- Retains text on screen while it is being printed
- Contains crystal clock for flicker-free character display
- Has low power consumption for cool reliable operation
- Leads soldered directly to board for maximum reliability
- 2K on-board RAM, 50 or 60 Hz operation
- Inverse video selection standard



*Registered trademarks of Apple Computer Inc.



\$345.00 AVAILABLE AT ALL FINE COMPUTER STORES

Submitting an article to MICRO?

The following tips will help both you and our staff:

Text

- Send typewritten, double-spaced copy.
- Put your name and address on the first page of the article, and name on each page.
- Provide a summary of the article, and a brief biographical note.
- Use tables and figures — they're not only effective, but add visual interest to your article.

Listings

Make sure *printed* listings are:

- machine generated
- black ink on white paper
- commented
- thoroughly tested

We'd appreciate listings on *magnetic media*.

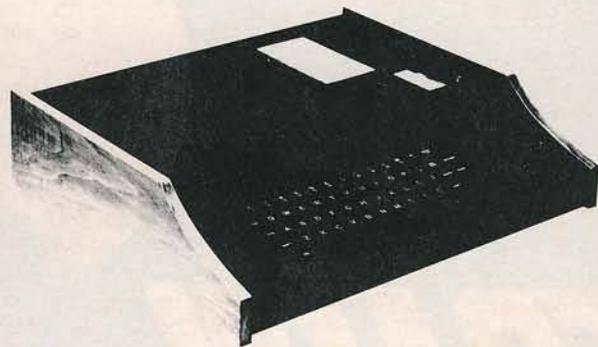
Please provide:

- BASIC and binary files
- assembler source files
- specifications and loading instructions

Write for a copy of our Writer's Guideline.

NEW!

SYM-1/KTM-2 Enclosure



ENCLOSURE FEATURES:

- Low Profile Design: 18.5 in. Wide x 16 in. Deep x 4.5 in. High
- .060 Aluminum • Durable Charcoal Texture Finish • Walnut Finished Side Panels • Hinged Top • Rear Panel, Power & I/O • Simple Assembly & Instructions



MOUNTING PROVISIONS FOR:

- SYM-1/KTM-2 • Add-on Memory Board • Cooling Fan • (2) DB25 Connectors (RS 232) • Video Jack

ENCLOSURE INCLUDES:

- Keypad Access Cover • Rubber Feet • Fuse and Fuse Holder • Power On Switch • Terminal Strip • AC Outlet

\$95.00 Job Minneapolis

KEN-WAY PRODUCTS 831 Patton Rd., New Brighton, Minnesota 55112

OSI COMPATIBLE PRODUCTS

56K 2-MHz Ultra Low Power CMOS Static Memory Board MEM-56K\$850

Partially Populated Boards (Specify address locations required) MEM-48K \$750
 MEM Board uses the new 2K-Byte Wide Static RAM chips which are 2716 EPROM compatible. Any 2K byte memory segment can be populated with RAM or EPROM (or left empty for use of Address Space by another board). Fully expandable to any memory size you will ever need. No special addressing requirements, just solder in extra sockets and add memory. Also has space for a 1.75K Monitor ROM at \$F800 (FC).

MEM-32K \$550
 MEM-24K \$450
 MEM-16K \$350
 MEM- 8K \$250
 MEM- 4K \$200

Extra 2K RAM Memory Chip \$24
 Optional Parallel Printer Port -P \$120

Optional Calendar/Clock (Software available in EPROM) -T \$ 25

Both options (Disk software mods provided for use of 6522 VIA on printer) -PT \$125

EXAMPLE USES: C4P & C8P:

Expansion to 40K RAM of Basic workspace.
 Parallel Printer Port — Reserve Serial Port for MODEM
 Calendar/Clock Displaying on unused portion of screen.
 Space for 5.75K of Enhanced System Monitor EPROMS.

All of this on 1 Board, using only one of your precious slots. Software for Enhanced System Monitor capabilities is continuously being developed and improved. As new EPROM Monitors are available, you may upgrade to them for any price differential plus a nominal \$10 exchange fee. Another possibility is to fill any portion of the memory with Basic Programs in EPROM for Power-on Instant Action. This custom EPROM programming service is available at \$25 per 2716 (includes EPROM). Extra copies at \$15 for each EPROM.

C4P-MF & C8P-DF: Memory expansion to 48K.

Add 4K Memory at \$E000 for special software requirements.
 Parallel Printer Interface and/or Displaying Calendar/Clock.
 Add 1.75K Enhanced System Monitor ROM.

C3:
 Up to 56K of Memory Expansion — can be addressed for Multiuser.
 (Optionally, each user can have his own Dedicated Printer Port).
 Add Enhanced Monitor ROM with Calendar/Clock software, warm start and Hard Disk Boot.

IEEE-488 INTERFACES AND SOFTWARE:

The General Purpose Instrumentation Bus (GPIB) Controller interface is available for all OSI Computers. Machine code GPIB Drivers are linked to Basic to provide easy control of IEEE-488 instruments which is equal to the best of Hewlett-Packard Controllers and far superior to most others. Basic Commands for Serial Poll, Parallel Poll, IFC Clear, full Local/Remote Control, Respond to SRQ Interrupts, Send Trigger, do Formatted Input/Output, Direct Memory Input/Output and MORE. Interface includes IEEE-488 Ribbon Cable/Connector.

GPIB Controller Interface for C2, C3, C4 and C8 Systems GPIB 4-488 \$395
 GPIB Software for OS-65D (Add -8 for 8" or -5 for 5") GPIB 488-D \$ 70
 GPIB Software for OS-65U GPIB 488-U \$100
 GPIB Software on two 2716 EPROMS for ROM based systems GPIB 488-R \$100

Add Optional Parallel Printer Interface to GPIB 4-488 -P \$120
 Add Optional Calendar/Clock to GPIB 4-488 -T \$ 25
 Add 2K RAM to GPIB 4-488 (Specify location, \$4000-\$BFFF & \$D000-\$EFFF available) -M \$ 25

Software for EPROM Programming, Reading, Verifying, and Erased Check; fully integrated with Assembler, Editor and Extended Monitor. Can be used with many types of EPROM up to 8K. Requires Optimal Technology Model Ep-2A-79 EPROM Programmer and the GPIB 4-488 Board. Specify 8" or 5" Disk EPROM MI-EP \$180

GPIB Controller for C1P, Includes Software, Clock & space for 6K EPROM GPIB 6-488R \$395
 Add Optional Parallel Printer Interface to GPIB 6-488R -P \$120

EPROMS: (Check with your Dealer for newest EPROM Products).

C1P ROM with 48 Col Display, Smart Terminal, Edit & More for Series II ROM-TERM II \$59.95

C1P ROM with 24 Col Display, Other ROM-TERM II Features & Disk Boot ROM-TERM \$59.95

Just flip switch for Serial or Video System with Corrected Keyboard SYNKEY \$39.95

ENHANCED MONITOR ROMS FOR USE ON GPIB 4-488 & MEM BOARDS:

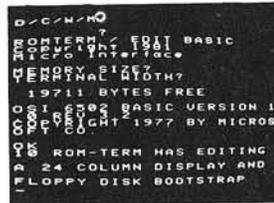
Expanded Support for C4P & C8P Featuring Calendar/Clock, Line Edit, Smart Terminal, Memory Files, Parallel Printer Control & More MI48P1 \$59.95

Disk Support with Calendar/Clock, Warm Start and Corrected Keyboard MI48D1 \$59.95

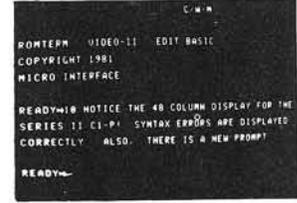
Expanded C3 Monitor with Calendar/Clock Software, Hard Disk Boot, Line Edit and Warm Start MIC3-1 \$59.95

C1-P Series II Computer with ROM-TERM II Smart Terminal Monitor (Order Direct) ... \$549.00

WHICH EDITING "SMART-TERMINAL" MONITOR ROM IS BEST FOR YOUR C1P?*



ROM-TERM



ROM-TERM II

FEATURES AVAILABLE ON BOTH ROMS AT THE TOUCH OF A KEY:

- Enter "Smart Terminal" mode for communications with a time share Dial-up computer network.
- Select half-duplex/full-duplex operation.
- Select auto or manual line feed at carriage return.
- Transmit a pre-prepared memory file from C1P to remote computer. This memory file can be a message, letter or program and is sent at full speed — saving time and telephone expense. Programs can be listed to memory file while in basic.
- Receive a message or program (or all transactions) into a memory file for later review on video, recording on tape and printing. The file can be downloaded to basic after you exit the "smart terminal" mode.
- Uploading/downloading of programs can be done in this memory file manner or directly into basic by using a new serial output distributor and a new "Control-L" load command.
- Return to basic program operation at the same point of execution from which you entered the "smart-terminal" mode.
- "Smart-Terminal" mode can be utilized with the modem/telephone disconnected in order to prepare memory files, type directly to serial printer, send memory files to printer or tape, and to view tapes without interference from basic "Syntax Error."
- The serial output distributor can be turned on and off with a "control S" keystroke or with a poke which allows easy control of a serial printer from basic.
- Basic program lines can be recalled, edited and re-entered. The editing includes backspacing, forward spacing, deleting, typing over, inserting new text, and changing line # (duplicating a line). During editing, the cursor position and display are wrapped around, allowing operation on and displaying of an entire line up to 72 characters long. The preparation of line numbered messages can utilize these features — extremely handy for poor spelling, typists like me!
- Keyboard has been completely corrected to provide standard typing format. By the use of the control and repeat keys as modifiers, any character in the full ASCII 128 character set can be entered from the keyboard. This will give you all the characters you need for running Pascal and other high level languages in a remote computer.
- Video output may be halted at any time for easy viewing.
- Screen clear at keystroke.

ALL FEATURES ARE ROM RESIDENT AND ALWAYS AVAILABLE AT POWER ON.

ADDITIONAL FEATURES PROVIDED IN THE ROM-TERM:

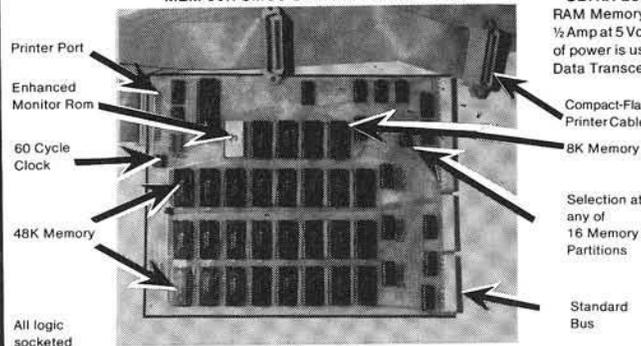
- Disk bootstrap — In disk operation you can alternate between ROM Basic and Disk Basic with a keystroke. Can Warm Start Disk Basic.
- Easy transfer of programs between disk and ROM Basic. (Use the ROM Basic for editing disk basic programs.)
- Memory files can be stored or recalled in Disk Basic, ROM Basic or the "Smart Terminal" interchangeably.

ADDITIONAL FEATURES PROVIDED BY ROM-TERM II:

- A 48 column video display on series II C1P (Revision "D" Superboard). Selection of 48 or 24 column video with a "Control-V" keystroke. Corrected "Syntax Error" messages.

*RECOMMEND THE ROM-TERM II FOR NON-DISK OPERATION OF SERIES II C1P (OR REVISION "D" SUPERBOARD) AND THE ROM-TERM FOR ALL OTHER SYSTEMS.

MEM-56K CMOS STATIC MEMORY BOARD



ULTRA-LOW POWER — By using CMOS Static RAM Memory, the total power consumption is about 1/2 Amp at 5 Volts when populated for 48K. In fact, most of power is used by the Address Line Buffers and the Data Transceivers.

MULTI-USER — Can be addressed for any of the 16 multi-user memory partitions. The low power and single memory board/partition simplify installation and provide a typical \$1400 saving for a 3-user system.

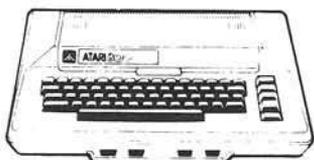
MICRO-INTERFACE

3111 SO. VALLEY VIEW BLVD., SUITE I-101
 LAS VEGAS, NEVADA 89102
 Telephone: (702) 871-3263

Check with your local Dealer or Order Direct.
 Phone orders accepted.
 TERMS: Check/Money Order/Master Charge/VISA
 Sent POSTPAID ON PREPAID ORDERS.
 Foreign Orders: Prepaid only.
 Add 5% for handling/shipping.



**Computers
for people.™**



800™ \$699

410 Recorder	\$59.00
810 Disc Drive	\$444.00
822 Printer	\$359.00
825 Printer	\$629.00
830 Modem	\$159.00
820 Printer	\$269.00
850 Interface	\$159.00
New DOS 2 System	\$21.00
CX70 Light Pen	\$64.00
CX30 Paddle	\$18.00
CX40 Joy Stick	\$18.00
CX853 16K RAM	\$89.00
Microtek 16K RAM	\$75.00
Microtek 32K RAM	\$169.00
One year extended warranty	\$50.00



ATARI 400
16K.... \$329
32K.... \$478
48K.... \$555

Intec 48K Board..... \$249

ATARI SOFTWARE

CX404 Word Processor	\$119.00
CX404 PILOT	\$68.00
CX413 Microsoft Basic	\$68.00
CX4101 Invitation To Programming I	\$17.00
CX4102 Kingdom	\$13.00
CX4103 Statistics	\$17.00
CX4104 Mailing List	\$17.00
CX4105 Blackjack	\$13.00
CX4106 Invitation to Programing 2	\$20.00
CX4107 Biorythm	\$13.00
CX4108 Hangman	\$13.00
CX4109 Graph II	\$17.00
CX4110 Touch Typing	\$20.00
CX4111 SPACE INVADERS	\$17.00
CX4112 States & Capitals	\$13.00
CX4114 European Countries & Capitals	\$13.00
CX4115 Mortgage & Loan Analysis	\$13.00
CX4116 Personal Fitness Program	\$59.00
CX4117 Invitation To Programing 3	\$20.00
CX4118 20 Conversational Languages (ea.)	\$45.00
CX4121 Energy Czar	\$13.00
CXL4001 Educational Master	\$21.00
CX6001-17 Talk & Teach Series (ea.)	\$23.00
CX8106 Bond Analysis	\$20.00
CX8107 Stock Analysis	\$20.00
CX8101 Stock Charting	\$20.00
CXL4002 Basic Computing Language	\$46.00
CXL4003 Assembler Editor	\$46.00
CXL4004 Basketball	\$24.00
CXL4005 Video Easel	\$24.00
CXL4006 Super Breakout	\$30.00
CXL4007 Music Composer	\$45.00
CXL4009 Chess	\$30.00
CXL4010 3-D Tic-Tac-Toe	\$24.00
CLS4011 STAR RAIDERS	\$39.00
CXL4012 MISSILE COMMAND	\$32.00
CXL4013 ASTEROIDS	\$32.00
CXL4015 TeleLink	\$20.00
Visicalc	\$149.00
Letter Perfect (Word Processor)	\$109.00
Source	\$89.00

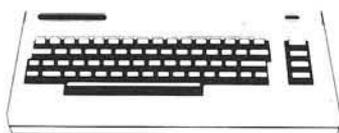


CBM 8032 \$1149

4016	\$799.00
4032	\$999.99
8096	\$1795.00
CBM4022 Printer	\$629.00
Tally 8024	\$1699.00
CBM C2N Cassette Drive	\$69.00
CBM4040 Dual Disk Drive	\$1039.00
CBM8050 Dual Disk Drive	\$1349.00
CBM 2031 Single Disc Drive	\$525.00
CBM 8300 Letter Quality Printer	\$1799.00
CBM 8023P 132 Column Printer	\$799.00

SOFTWARE

WordPro3 Plus	\$229.00
WordPro4 Plus	\$329.00
Commodore Tax Package	\$399.00
Visicalc	\$149.00
BPI General Ledger	\$329.00
OZZ Information System	\$329.00
Dow Jones Portfolio	\$129.00
Pascal	\$239.00
Legal Time Accounting	\$449.00
Word Craft 80	\$289.00
Create-A-Base	\$249.00
Power	\$89.00
Socket 2-Me	\$20.00
Jinsam	\$ Call
MAGIC	\$ Call

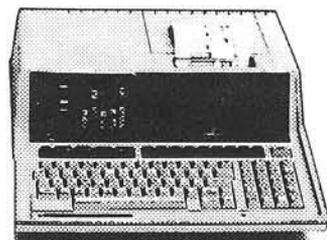


VIC 20 \$259

Vic-TV Modul	\$19.00
Vic Cassette	\$69.00
Vic 6 Pack Program	\$44.00
VIC1530 Commodore Datasette	\$69.00
VIC1540 Disk Drive	\$499.00
VIC1515 VIC Graphic Printer	\$399.00
VIC1210 3K Memory Expander	\$32.00
VIC1110 8K Memory Expander	\$53.00
VIC1011 RS232C Terminal Interface	\$43.00
VIC1112 VIC IEEE 488 Interface	\$86.00
VIC1211 VIC 20 Super Expander	\$53.00
VIC1212 Programmers Aid Cartridge	\$45.00
VIC1213 VICMON Machine Language Monitor	\$45.00
VIC1901 VIC AVENGERS	\$23.00
VIC1904 SUPERSLOT	\$23.00
VIC1906 SUPER ALIEN	\$19.00
VIC1907 SUPER LANDER	\$23.00
VIC1908 DRAW POKER	\$23.00
VIC1909 MIDNIGHT DRIVE	\$23.00
VT106A Recreation Pack A	\$44.00
VT107A Home Calculation Pack A	\$44.00
VT164 Programmable Character/Graphics	\$12.00
VT232 VICTerm I Terminal Emulator	\$9.00



**HEWLETT
PACKARD**



HP•85 \$2595

NEW! HP•125	\$3295.00
HP•83	\$1795.00
HP•85 16K Memory Module	\$249.00
5 1/4" Dual Master Disc Drive	\$2129.00
Graphics Plotter (7225B)	\$2079.00

Call for HP Software Prices & Information.
Call for Calculator prices.



Texas Instruments



TI-99/4A \$379

PHC 004 TI-99/4 Home Computer	\$399.00
PHP 1600 Telephone Coupler	\$169.00
PHP 1700 RS-232 Accessories Interface	\$169.00
PHP 1800 Disk Drive Controller	\$239.00
PHP 1850 Disk Memory Drive	\$389.00
PHP 2200 Memory Expansion (32K RAM)	\$239.00
PHA 2100 R.F. Modulator	\$43.00
PHP 1100 Wired Remote Controllers(Pair)	\$31.00
PHM 3006 Home Financial Decisions	\$26.00
PHM 3013 Personal Record Keeping	\$43.00
PHD 5001 Mailing List	\$60.00
PHD 5021 Checkbook Manager	\$18.00
PHM 3008 Video Chess	\$60.00
PHM 3010 Physical Fitness	\$26.00
PHM 3009 Football	\$26.00
PHM 3018 Video Games I	\$26.00
PHM 3024 Indoor Soccer	\$26.00
PHM 3025 Mind Challengers	\$22.00
PHM 3031 The Attack	\$35.00
PHM 3032 Blast	\$22.00
PHM 3033 Blackjack and Poker	\$22.00
PHM 3034 Hustle	\$22.00
PHM,3036 Zero Zap	\$18.00
PHM 3037 Hangman	\$18.00
PHM 3038 Connect Four	\$18.00
PHM 3039 Yahtzee	\$22.00
PHM 3017 Terminal Emulator I	\$39.00
PHM 3026 Extended Basic	\$88.00
PHM 3035 Terminal Emulator II	\$45.00

Call for the best prices on
PRINTERS
by Epson, Diablo, TEC and Tally.

DISKS
by Atari and Maxell.

NO RISK • NO DEPOSIT ON PHONE, C.O.D. OR CREDIT CARD ORDERS.

east computer mail order west

800-233-8950

501 East Third Street
Williamsport, PA 17701
(717) 327-9575

OVER 40 YEARS EXPERIENCE IN SOPHISTICATED ELECTRONICS



HOW TO ORDER:

Phone orders invited or send check or money order and receive free shipping in the continental United States. PA residents add 6% sales tax. Add 3% for VISA or MC. Equipment subject to price change and availability without notice.



800-648-3351

P.O. Box 6689
State Line, Nevada 89449

Jim Capparell
297 Missouri
San Francisco, California 94107

This month I'm going to talk about the vertical blank (Vblank) interrupt. I will give you a working definition of what an interrupt is, then discuss how Vblank fits into the overall interrupt structure, what is accomplished in this time period, and how programmers may access this interrupt for their own use. I will also provide a simple program to illustrate the use of Vblank vectors and how to insert code at VVBLKD.

Recall last month, in my discussion of raster scan graphics, that the term vertical blank is given to that time period when the electron beam is turned off and returned to the upper left corner of the video screen, ready to start tracing a new frame. The number of machine cycles available at Vblank is some fraction of 29868 machine cycles that are needed to trace one entire television frame. In the normal graphics 0 (text screen), approximately 7980 machine cycles are left over at Vblank to be shared by the Operating System Vblank interrupt service routine (ISR) and any programmer supplied code. The term interrupt applies to any signal, originating from hardware or software, which serves to suspend normal mainline program flow.

When an interrupting event occurs, the program counter (PC) and processor status registers are automatically saved on the system stack. The processor then executes special code referred to as an interrupt service routine (ISR). The address of the ISR is found in a memory location reserved for this purpose, called an interrupt vector. When the ISR is finished, the values of the PC and status registers are retrieved from the stack and processing of the suspended program is resumed as if nothing had intervened. This all happens at machine speed — in hundreds of microseconds.

The vertical blank interrupt is an essential part of the Atari operating system and appears as a non-maskable interrupt (NMI) to the system. The NMI is only one of three possible interrupts that the Atari can process. These three, chip reset, NMI, and IRQ, are analyzed further by interrupt service software. Whenever an NMI or an IRQ signal occurs, the appropriate service routine is executed. These service routines interrogate a status register to isolate the interrupting source. See table 1 for a breakdown of vectors and contents for each type of interrupt.

It's apparent from table 1 that all NMI interrupts are vectored through location \$FFFA to the NMI interrupt service routine (ISR) starting at address \$E7B4. Since there are three possible causes of an NMI, the ISR must determine the source of the interrupt by interrogating an NMI status register at address \$D40F. This location, called NMIST in the documentation, has bit 7 set when a DLI occurs, bit 6 set when a Vblank occurs, and bit 5 set when the system reset button has been pressed. If neither a DLI nor a system reset caused the NMI, then a Vblank interrupt is assumed by the ISR and the processor jumps to the address contained in the vector at \$0222.

There are actually two vectors used by Vblank through which a programmer may introduce additional or replacement code. One vector, referred to as vertical blank immediate vector VVBLKI, is at address \$0222. This vector normally contains the address \$E7D1, the start of the system Stage 1 Vblank ISR. Should it be necessary to either replace system functions or simply perform operations prior to the system code, then you would use this vector. The other vector location, called vertical blank deferred VVBLKD, is at address \$0224. This vector normally contains the address \$E93E, which is the start of code for the system return from interrupt. The contents of \$0224 would be changed to point to new code when your operation was needed after system housekeeping was accomplished.

The Vblank process is actually divided into two stages. Whenever a Vblank NMI occurs, the following events always happen:

1. Processor registers A, X, and Y are pushed on stack.
2. Interrupt request is cleared by writing zero to \$D40F.

Table 1

INTERRUPT	VECTOR	ISR LOCATION
-----------	--------	--------------

CHIP RESET	FFFC	E477
NMI	FFFA	E7B4
	Display list	Jump through 0200
	Vertical Blank	0222 and 0224
	S/Reset key	E474
IRQ	FFFE	E6F3
	Serial bus output ready jump through	020C
	serial bus output complete	020A
	Serial bus input ready	020E
	*Serial bus proceed line	0202
	*Serial bus interrupt line	0204
	*Pokey timer 1	0210
	*Pokey timer 2	0212
	*Pokey timer 4 (Bug in O.S. timer 4)	0214
	Keyboard key scan	0208
	Break key	????
	*6502 break instruction	0206

* These vectors are unused by the O.S. and are initialized to point to an RTI instruction.

```

10 ; ** PROGRAM EXAMPLE 1 **
20 ;PROGRAM SETS UP A VVBLKD ISR
30 ;
40 ; SET UP NEW VECTOR WITH A BASIC USR CALL A=USR(1536)
50 ; NEED TO DO THIS WHENEVER SYSTEM IS RESET.

```

```

0000      60      *=      $600      PUT IN PAGE 6 DECIMAL 1536
0600 68      70      PLA      NULL VALUE FROM BASIC
0601 A907    80      LDA      #7      INDICATOR FOR VVBLKD
0603 A206    90      LDX      #06     HIGH BYTE FOR VECTOR ADDR
0605 A040    0100     LDY      #40     LOW BYTE FOR VECTOR ADDR
0607 205CE4  0110     JSR      $E45C    SET UP DEFERRED VECTOR
060A 60      0120     RTS      RETURN TO BASIC
0130 ; ** ** ** **
0140 ; ROUTINE AT DECIMAL 1600 IS DESIGNED TO WASTE TIME.
0150 ; PUT A NUMBER FROM 1 - 5 IN DECIMAL 1568.
0160 ; USE POKE 1568,N
0170 ; THIS IS THE ISR WHICH SIMPLY WASTES TIME.
060B      0180     *=      $640
0640 A600    0190     LDX      0      INIT COUNTERS
0642 A400    0200     LDY      0
0644 E8      0210     LOOP1    INX      INCR COUNT
0645 EC2006  0220     CFX      $620    DELAY VALUE
0648 F003    0230     BEQ     LOOP2
064A 18      0240     CLC      FORCE BRANCH
064B 90F7    0250     BCC     LOOP1
064D C8      0260     LOOP2    INY
064E CC2006  0270     CPY      $620    DELAY VALUE
0651 F003    0280     BEQ     EXIT     DONE ?
0653 18      0290     CLC      NO-FORCE BRANCH
0654 90EE    0300     BCC     LOOP1
0656 4C3EE9  0310     EXIT     JMP      $E93E    TAKE NORMAL VBLANK EXIT

```

processor status register or the critical flag at address \$42 are set, then the interrupted code is assumed to be time-critical. When this occurs, the registers are restored and an RTI instruction is executed.

The critical flag can be set by a Serial I/O in progress. If no time constraints are present, then Stage 2 processing is begun. It is in this section of code that IRQ interrupts are enabled, keyboard auto repeat logic is processed, keyboard debounce is performed, and system timers 2, 3, 4, and 5 are processed. In addition, the color data for playfield and player/missiles are updated. This color data and other RAM locations, called shadow registers, are copied into their associated hardware locations. Stage 2 also reads the game controller data from Jacks 1, 2, 3, and 4 into RAM memory.

To insert code either at VVBLKI or VVBLKD, the address where the new code resides must be placed into the appropriate vector. A system routine is provided at \$E45C. This routine insures that both bytes of the vector will be updated while Vblank is enabled. A vertical blank can be processed during a call to this routine. The routine is called SETVBV in the documentation and the calling sequence is:

```

reg A (update indicator)
    = 1-5 then update timers 1-5
    = 6 for immediate Vblank vector VVBLKI
    = 7 for deferred Vblank vector VVBLKD
reg X = Most Significant Byte of vector address
reg Y = Least Significant Byte of vector address

```

JSR SETVBV Jump to subroutine

The A, X, and Y registers may be altered.

The display list interrupt will always be enabled on return.

A knowledge of processing interrupts and inserting code at interrupt vectors is essential to get the most from the Atari. With this example you should have enough information to experiment with the Vblank vectors. Interrupt-driven sound control, page flipping, animation techniques, greater color control, and many other procedures are possible.

COLOR VIDEO MONITORS

- **COMPOSITE VIDEO INPUT, NTSC:**
TC-700 13" color monitor/TV receiver, switchable, \$399.00. TC-900 19" monitor/TV receiver, \$495.00.
- **Sony TV** to video monitor conversion kit, MCK-100; optoisolator input, \$135.00.
- **RGB VIDEO MONITORS:** Analog or TTL drive, 380 x 350 resolution.
13" CRM-13 \$485.00
19" CRM-19 \$575.00
15" Trinitron, 3 modes, RGB, composite video, TV. \$1095.00, CM 15 RGB.
- **RGB converter board** for Apple 11, provides RGB video and sync; mod. VCB-A2. \$179.00.
- **Sony TV** to RGB and composite video monitor conversion kit, RGB-100: \$295.00 (available January 1982).

For additional information, contact:

Video Marketing, Inc.
P.O. Box 339
Warrington, PA 18976
(215) 343-3000

DEALER INQUIRIES INVITED

3. Jump through VVBLKI normally pointing to Stage 1 Vblank.

When Stage 1 processing is executed, it increments the three-byte counter called RTCLOK at addresses \$12, \$13, and \$14. Location \$12 is the most significant byte. This counter wraps to zero after approximately 77 hours and then continues counting. The attract mode is also processed at Stage 1; that is the process which causes the colors on your screen to start shifting if no key has been pressed on the keyboard in the previous nine minutes.

Additionally, system timer 1 at locations \$218 and \$219 is decremented if it is non-zero. When the counter goes to zero, an indirect JSR is performed via a vector at addresses \$226 and \$227. Note that an indirect JSR is performed by copying the address from the vector to the stack and executing an RTS instruction.

At this point a test is made to determine if a time-critical section of code was interrupted. If either the I bit in the

List Scroller

This program lets you scroll forwards or backwards through a listing to view any part of a BASIC program without requiring a series of keyed LIST commands.

Colin Macauley
39 Shoalhaven Street
Werribee
Victoria 3030
Australia

The problem with editing a BASIC program is that a LIST only displays a small "window" of your program. Often you wish to view outside this window, which requires a further LIST. This can be very frustrating because the screen depth never appears to be long enough to display all the program lines desired, especially on my OSI Superboard. Each subsequent LIST scrolls a lot, if not all, of your previous listing off the screen.

Word processors have the ability to scroll through a document, either forwards or backwards, to allow for operator insertions, deletions, etc. My program is similar in operation and allows continuous controlled forward or backward scrolling through a BASIC program *after* a LIST.

The keys used are "CTRL-A" for backward scrolling and "CTRL-Z" for forward scrolling. Holding down the keys will allow continuous scrolling until the keys are released. The program is located in RAM unused by the OSI BASIC interpreter, and is not lost by warm and cold starts to the system.

To use the program, the BASIC input vector (\$218,\$219) must be re-set by typing in the following:

```
POKE 536,34 :POKE 537,2<CR>
```

to divert keyboard input through my program. Thus, when you want to review your own BASIC program, a LIST (e.g. LIST 10) should be entered and the program listing on the screen manipulated, using the CTRL-A and CTRL-Z keys.

Operation of the program is difficult to follow unless you are fully conversant with the storage and tokenizing of BASIC program lines, and the routines involved in actually running a BASIC program. Essentially, the program directly manipulates the input buffer to cause a serial supply of single line LIST instructions to be entered and run while the previously described keys are

depressed. Further information regarding BASIC operation, with references to specific subroutines in the 8K BASIC ROMs, may be found in *The First Book of OSI* by Jim Williams and George Dorner (Aardvark Technical Services), and *OSI BASIC in ROM* by Edward H. Carlson.

The sample run shows how the program works by scrolling forward through a BASIC program until line 150 (CTRL-Z) and backwards from line 150 until line 90 (CTRL-A).

Colin Macauley is a qualified physicist and a member of the firm of Callinan and Associates, Patent Attorneys. He uses a modified OSI Superboard II and is mainly interested in utility-type programming. His current interest is development of software for his brother's minimum chip 6502-based computer which has software-controlled video.

Figure 1: Sample Run

```
100 FOR R=2 TO 0 STEP -1
110 FOR M=P1 TO P2:POKE M,Q:NEXT M
120 FOR M=P1+R TO P2 STEP 3:POKE M,T:NEXT M
130 V=R+1
140 FOR M=P1 TO P2
150 V=V-1
140 FOR M=P1 TO P2
130 V=R+1
120 FOR M=P1+R TO P2 STEP 3:POKE M,T:NEXT M
110 FOR M=P1 TO P2:POKE M,Q:NEXT M
100 FOR R=2 TO 0 STEP -1
90 FOR H=1 TO 2
```

Listing 1

```

0222      *=$0222
0222      ;ENABLE MSG PRINTER
0222 A94C  LDA #$4C
0224 8503  STA $03
0226      ;GET CHAR. FROM KEYBD.
0226 20BAFF JSR $FFBA
0229      ;CHECK KEY
0229 C901  CMP #$01
022B F02D  BEQ UP
022D C91A  CMP #$1A
022F F001  BEQ DOWN
0231 60    RTS
0232      ;
0232      ;SCROLL THRU ASCENDING LINE NOS.
0232 8A    DOWN TXA
0233 4B    PHA
0234 9B    TYA
0235 4B    PHA
0236      ;CHECK NEXT PROGRAM LINE
0236 A000  LDY #$00
0238 B1AA  LDA ($AA),Y
023A      ;END OF PROGRAM LINES?
023A C900  CMP #$00
023C D00E  BNE DOWN1
023E      ;NO,BRA TO SET UP SCROLL
023E C8    INY
023F B1AA  LDA ($AA),Y
0241 C900  CMP #$00
0243 D007  BNE DOWN1
0245      ;YES,RET. TO BASIC
0245 68    DOWN4 PLA
0246 AB    TAY
0247 68    PLA
0248 AA    TAX
0249 A900  LDA #$00
024B 60    RTS
024C      ;GET NEXT LINE NO.
024C A000  DOWN1 LDY #$00

```

```

024E C8    INY
024F C8    INY
0250 C8    INY
0251 B1AA  LDA ($AA),Y
0253 4B    PHA
0254 8B    DEY
0255 B1AA  LDA ($AA),Y
0257      ;LOAD INPUT BUFFER
0257 4CA602 JNF SCRO
025A      ;
025A      ;SCROLL THRU DESCENDING LINE NOS.
025A 8A    UP TXA
025B 4B    PHA
025C 9B    TYA
025D 4B    PHA
025E      ;PUT PRESENT LINE NO. POINTER ADDR. IN $AA,AB
025E 2032A4 JSR $A432
0261      ;SAVE $AA,AB IN $DC,DD
0261 A5AA  LDA $AA
0263 85DC  STA $DC
0265 A5AB  LDA $AB
0267 85DD  STA $DD
0269 A000  UP3 LDY #$00
026B B1DC  LDA ($DC),Y
026D      ;END OF BASIC PROGRAM LINE?
026D C900  CMP #$00
026F      ;NO,CHECK IF OUT OF RANGE
026F D019  BNE UP1
0271 C8    INY
0272 B1DC  LDA ($DC),Y
0274      ;START OF PREVIOUS LINE?
0274 C5AA  CMP $AA
0276      ;NO,CHECK IF OUT OF RANGE
0276 D012  BNE UP1
0278 C8    INY
0279 B1DC  LDA ($DC),Y
027B C5AB  CMP $AB
027D D00B  BNE UP1
027F      ;SET UP LINE NO.

```

(Continued)

- Z-FORTH IN ROM** by Tom Zimmer
5 to 10 times faster than Basic. Once you use it, you'll never go back to BASIC!
source listing add \$ 75.00
- OSI FIG-FORTH** True fig FORTH model for OS65D with fig editor named files, string package & much more \$ 20.00
- OSI FIG-FORTH** True fig FORTH model for OS65D with fig editor named files, string package & much more \$ 45.00
- TINY PASCAL Operates** in fig-FORTH, an exceptional value when purchased with forth.
TINY PASCAL & documentation \$ 45.00
FORTH & TINY PASCAL \$ 65.00
- SPACE INVADERS** 100% machine code for all systems with 64 chr. video. Full color & sound on C2, 4P & 8P systems. The fastest arcade program available. \$ 14.95
- PROGRAMMABLE CHARACTER GENERATOR** \$ 99.95
Use OSI's graphics or make a complete set of your own! Easy to use, comes as a kit. 2 Mhz. boards \$ 84.95
\$109.95
- PROGRAMMABLE SOUND BOARD** \$ 74.95
Complete sound system featuring the AY-3-8910 sound chip. Bare boards available. \$29.95
- 32/64 CHARACTER VIDEO MODIFICATION** \$ 39.95
Oldest and most popular video mod. True 32 chr. C1P, or 32/64 chr. C4P video display. Also adds many other options.
- ROMS!!!**
Augment Video Mod with our Roms. Full screen editing, print at selectable scroll, disk support and many more features. Basic 4 & Monitor \$ 44.95
Basic 3 \$ 18.95
All 3 for \$ 59.95
- 65D DISASSEMBLY MANUAL.** by Software Consultants. First Class throughout. \$ 25.95
A must for any 65D user.
- NUMEROUS BASIC PROGRAMS, UTILITY PROGRAMS AND GAMES ALONG WITH HARDWARE PROJECTS. ALL PRICES ARE U S FUNDS. Send for our \$1.50 catalogue with free program (hardcopy) Memory Map and Auto Load Routine.**



3336 Avondale Court
Windsor, Ontario, Canada N9E 1X6
(519) 969-2500
3486 Countryside Circle
Pontiac Township, Michigan 48057
(313) 373-0468



progressive computing

Listing 1 (Continued)

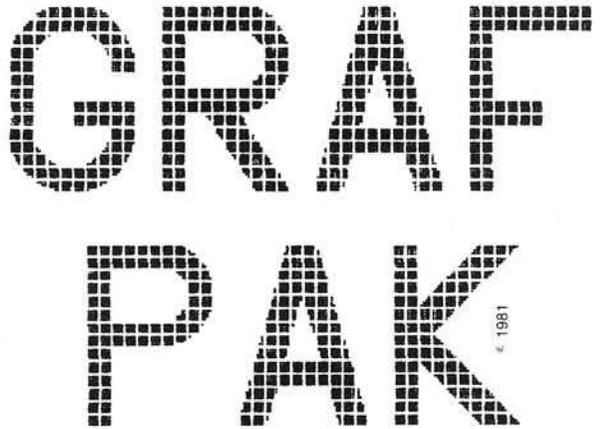
```

027F C8      INY
0280 C8      INY
0281 B1DC    LDA ($DC),Y
0283 48      PHA
0284 88      DEY
0285 B1DC    LDA ($DC),Y
0287         ;LOAD INPUT BUFFER
0287 4CA602  JMP SCRO
028A         ;TEST FOR OUT OF RANGE IE BELOW $02FF
028A A5DD    UP1 LDA $DD
028C C902    CMP #902
028E D009    BNE UP2
0290 A5DC    LDA $DC
0292 C9FF    CMP #9FF
0294 D003    BNE UP2
0296         ;YES,RET. TO BASIC
0296 4C4502  JMP DOWN4
0299         ;BUMP SEARCH ADDR.
0299 C6DC    UP2 DEC $DC
029B A5DC    LDA $DC
029D C9FF    CMP #9FF
029F D0C8    BNE UP3
02A1 C6DD    DEC $DD
02A3         ;LOOP TO FIND END OF LINE
02A3 18      CLC
02A4 90C3    BCC UP3
02A6         ;
02A6         ;LOAD INPUT BUFFER
02A6         ;LINE NO. LO IN Y, HI IN A
02A6 A8      SCRO TAY
02A7 68      PLA
02A8         ;CONVERT TO FLOATING POINT
02A8 20C1AF  JSR #AFC1
02A8         ;CONVERT TO ASCII STRING
02A8 206EB9  JSR #B96E
02AE         ;SET UP POINTERS TO $BC ROUTINE
02AE A912    LDA #12
02B0 85C3    STA $C3
02B2 A900    LDA #900
02B4 85C4    STA $C4
02B6         ;LIST TOKEN
02B6 A999    LDA #999
02B8 8513    STA $13
02BA A200    LDX #200
02BC         ;ASCII STRING TO BUFFER
02BC B0101   DOWN3 LDA $0101,X
02BF C900    CMP #900
02C1 F006    BEQ DOWN2
02C3 9514    STA $14,X
02C5 E8      INX
02C6 18      CLC
02C7 90F3    BCC DOWN3
02C9         ;INSERT NULL
02C9 9514    DOWN2 STA $14,X
02CB         ;DISABLE MSG. PRINTER
02CB A960    LDA #960
02CD 8503    STA $03
02CF 68      PLA
02D0 A8      TAY
02D1 68      PLA
02D2 AA      TAX
02D3 86DC    STX $DC
02D5         ;RESTORE SP TO AVOID STACK OVERFLOW
02D5 A2FC    LDX #2FC
02D7 9A      TXS
02D8 A5DC    LDA $DC
02DA AA      TAX
02DB         ;BASIC EXECUTION ROUTINE
02DB 4CF6A5  JNP #A5F6

```

MICRO

PANORAMAS!



Reproduce either Page 1 or Page 2, horizontally or vertically on the paper; or, reproduce both as a **two page panorama** with both pages butted in perfect registration.

Compose your picture by framing, cropping, positioning, window-erasing, and adding text annotation (upper/lower case, punctuation, numerals and *expanded* symbology) in *all four* directions.

GRAF-PAK imposes no scale factor limitations: if it will fit on the paper, GRAF-PAK will reproduce it. GRAF-PAK displays the available scale factors, which depend only on your printer dot density, paper width and chosen cropping boundaries.

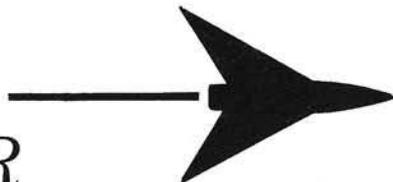
Eleven pages of Instructions, Examples and Pictures!

PRINTERS SUPPORTED	POST-PAID PRICE
EPSON MX70/80/100	\$34.95
IDS 440G/445G	34.95
460G/560G	39.95
ANADIX DP9000 thru DP9501	39.95
NEC PC 8023	34.95
3510/3520/3530	39.95
5510/5520/5530	
7710/7720/7730	

SmartWare

2281 Cobble Stone Court
Dayton, Ohio 45431

SPEED POWER EFFICIENCY



for **OSI**
65D3 SYSTEMS

FBASIC: BASIC Compiler \$155/\$10

- **FAST** efficient machine code written with the ease of BASIC.
- **SPEED**-optimized, native-code compiler.
- **INTEGER** subset of OSI-supplied BASIC.
- **DISK** based: No problem with size of source or object files.
- **EXTENSIONS** to BASIC:
 - Simple interface to system hardware and software.
 - Direct access to 6502 registers.
 - Array initialization.
 - Optional absolute array locations.
 - **WHILE** and other structures.
 - Simple technique for combining compiler and interpreter advantages.
- **FULL** system: utilities (plus source), manual, and many useful examples.

R-EDIT: Edit any program or text with ease! \$40

- **FULL CURSOR** control. Edit anywhere on the screen.
- **INSERT**, replace, add, delete.
- **ONE KEY** stroke and you're editing.
- **BASIC**, assembler, etc. can all be edited without reloading editor.
- **RAM**-resident: Always ready!
- **SYSGEN** relocates R-EDIT and customizes.

SPUL-65: Printer Spooler \$95/\$10 Virtual Indirect File

- **STOP WAITING** for your printer!
- **PROCESS** words, write programs...all while printing!
- **QUEUE** lets you pile on print jobs.
- **MULTIPLE COPIES** printed with top and bottom page margins.
- **SYSGEN** relocates SPUL65 and gives extensive customization.
- **INDIRECT FILE** commands produce disk files giving you:
 - A virtually unlimited temporary file.
 - A link between incompatible files; for example, use WP-2 for extensive BASIC editing.
 - Ability to merge multiple program segments.

XREF: BASIC Cross Referencer \$25

- **TABULATES:**
 - Referenced line numbers.
 - Variable names (numeric, string, array).
 - Defined functions.
- **FAST** machine language program.
- **DISK** based: Handles large BASIC source files on any drive.

CP/M to OSI Disk Translation

Frustrated by all those good CP/M disks that won't run on your OSI CP/M system? It's that special OSI disk format! And we can fix that. Just send us your disk, \$15, and you'll soon have an OSI compatible disk.

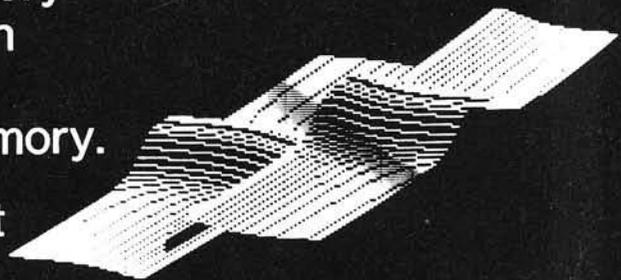
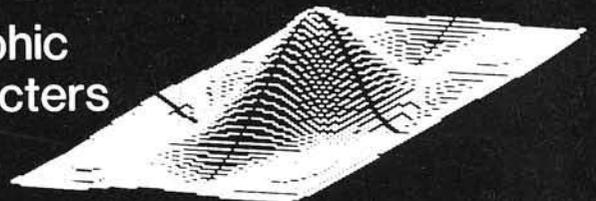
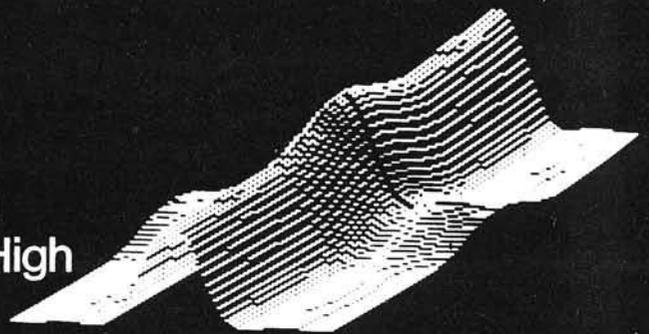


Data Resource Corporation
Suite 204
1040 Lunaai Street
Kailua, HI 96734 (808) 261-2012

Manual orders applied to software purchases. Programs supplied on 8-in, single-density, single-sided disks. Hawaii residents add 4% tax.

GRAPHICS FOR OSI COMPUTERS

- ☆ You Can Produce The Images Shown Or Yours And Program Motion With Our 256 By 256 High Resolution Graphics Kit. Thats 65,536 Individually Controlled Points On Your TV Screen.
- ☆ Increase Column/Line Display. You Can Set Up Your Own Graphic Pixels Including Keyboard Characters And Unlimited Figures.
- ☆ This Kit Includes All Parts, Software And Assembly Instructions Required To Get Up And Running. The Included 8k Of 2114 Memory Is Automatically Available When Not Using The Graphics. Boot Up And See 8k More Memory.
- ☆ Adding The Kit Does Not Affect Your Existing OSI Graphics. Use Both At The Same Time Or Separately.
- ☆ Buy The Entire Kit, Including Memory, For \$185.00 Or A Partial Kit For Less If You Have Parts. Board And Instructions \$40.00. Instructions Include Software.



For This Kit Or A Catalog
Of Other Kits, Software
And Manuals Call Or Write:

MITTENDORF ENGINEERING
905 Villa Neuva Dr.
Litchfield Park, Az. 85340
(602)-935-9734



BOX 120
ALLAMUCHY, N.J. 07820
201-362-6574

HUDSON DIGITAL ELECTRONICS INC.

THE TASK* MASTERS

HDE supports the *TIM, AIM, SYM and KIM (TASK) with a growing line of computer programs and peripheral components. All HDE component boards are state-of-the-art 4½" x 6½", with on board regulation of all required voltages, fully compatible with the KIM-4 bus.

OMNIDISK 65/8 and 65/5

Single and dual drive 8" and 5¼" disk systems. Complete, ready to plug in, bootstrap and run. Include HDE's proprietary operating system, FODS (File Oriented Disk System).

DM816-M8A

An 8K static RAM board tested for a minimum of 100 hours and warranted for a full 6 months.

DM816-UB1

A prototyping card with on-board 5V regulator and address selection. You add the application.

DM816-P8

A 4/8K EPROM card for 2708 or 2716 circuits. On board regulation of all required voltages. Supplied without EPROMS.

DM816-CC15

A 15 position motherboard mounted in a 19" RETMA standard card cage, with power supply. KIM, AIM and SYM versions.

DISK PROGRAM LIBRARY

Offers exchange of user contributed routines and programs for HDE Disk Systems. Contact Progressive Computer Software, Inc. for details.

HDE DISK BASIC

A full range disk BASIC for KIM based systems. Includes PRINT USING, IF . . . THEN . . . ELSE. Sequential and random file access and much more. \$175.00

HDE ADVANCED INTERACTIVE DISASSEMBLER (AID)

Two pass disassembler assigns labels and constructs source files for any object program. Saves multiple files to disk. TIM, AIM, SYM, KIM versions. \$95.00

HDE ASSEMBLER

Advanced, two pass assembler with standard mnemonics. KIM, TIM, SYM and KIM cassette versions. \$75.00 (\$80.00 cassette)

HDE TEXT OUTPUT PROCESSING SYSTEM (TOPS)

A comprehensive text processor with over 30 commands to format and output letters, documents, manuscripts. KIM, TIM and KIM cassette versions. \$135.00 (\$142.50 cassette)

HDE DYNAMIC DEBUGGING TOOL (DDT)

Built in assembler/disassembler with program controlled single step and dynamic breakpoint entry/deletion. TIM, AIM, SYM, KIM AND KIM cassette versions. \$65.00 (\$68.50 cassette)

HDE COMPREHENSIVE MEMORY TEST (CMT)

Eight separate diagnostic routines for both static and dynamic memory. TIM, AIM, SYM, KIM and KIM cassette versions. \$65.00 (\$68.50 cassette)

AVAILABLE DIRECT OR FROM THESE FINE DEALERS:

Progressive Computer Software
405 Corbin Road
York, PA 17403
(717) 845-4954

Johnson computers
Box 523
Medina, Ohio 44256
(216) 725-4560

Falk-Baker Associates
382 Franklin Avenue
Nutley, NJ 07110
(201) 661-2430

Perry Peripherals
P.O. Box 924
Miller Place, NY 11764
(516) 744-6462

Lux Associates
20 Sunland Drive
Chico, CA 95926
(916) 343-5033

Laboratory Microcomputer Consultants
P.O. Box 84
East Amherst, NY 14051
(716) 689-7344

MICRO

The Single Life

Editor's note: This column is a new, on-going addition to MICRO. The purpose is to provide information about, product evaluations of, and uses for the single board computers and their makers. Readers are encouraged to submit entries for publication to:

*Brad Rinehart
1508 Stanton St.
York, Pennsylvania 17404*

So, you've put away your old single board computer and have purchased one of the new personal computers. As you unpack it from the carton you marvel at the simplicity and ease with which you can plug it in, turn it on, and find something displayed on the screen. Not only that, but it comes complete with pre-packaged software! Certainly more appealing than the pile of breadboards and wire lying in the corner. Then suddenly you begin to reminisce about the "good old days" when adding a new peripheral to your single board machine left a feeling of pride and accomplishment. Well, you're not alone.

Those days are behind us now. In today's world, plastic packaging, pre-packaged software, and intriguing games have taken the spotlight. What most of us have failed to realize though, is that most of the single board promoters are still with us and are producing some pretty sophisticated hardware and software. Some of these manufacturers even custom tailor their hardware and software for OEM and industrial applications.

Many of these single board-based machines have found their way into schools, laboratories, institutions, industry, and of course in the homes of computer hobbyists. OEMs may well want to consider the single board computer for its versatility, adaptability, durability, and modular design. Many manufacturers produce:

Backplanes
Memory boards
Disk controllers
EPROM cards

RS-232, IEEE-488, and parallel interfaces
A/D and D/A converters
Cabinets and enclosures

and a host of other items all designed to expand and support one or more of the current single board computers. This type of modularity allows OEMs and industrial manufacturers to include necessary design functions in their products without incurring the expense of unwanted or unnecessary hardware.

For example, Hudson Digital Electronics Inc. (HDE Inc.) supports their line of TIM-, AIM-, SYM-, and KIM-compatible (hence the name TASK Masters) hardware with complete development systems.

In comparison with the personal computer manufacturers, the single board people rely heavily upon OEMs and industrial users to purchase their products. Therefore, their products are usually built to be durable, reliable, sophisticated, and easy to maintain. This explains the higher initial cost, as compared to the personal computer, which is normally built entirely on a single board and packaged to please the consumer. However, when one considers the advantages to the industrial user of modular design, this higher initial cost factor can easily be justified. For example, some of the single board systems can be expanded from a single five-inch disk drive to several double-sided eight-inch drives simply by changing the disk controller card and drives. The software remains compatible. In addition, because most do *not* use memory-mapped video, almost any CRT or hardcopy terminal can be interfaced directly to them. This does create a problem of providing software which will interface to different brands of terminals, but this problem can be overcome, as we shall see later.

The problem of maintenance is greatly simplified in a modular system. To isolate a problem, one must only remove and replace the individual boards until the problem is corrected. Then, the board that caused the problem is either sent for repair or repaired by the user. In many cases a modular system will still be operable even if no spares are available to replace the broken board. For example, if the problem were in a memory board, the system might still operate, using the memory available on other memory boards which had not failed. Hence, very little down time!

If the user does stock spare boards, the cost is usually very minimal. Then, after the problem has been isolated, the broken board may be returned to the manufacturer for repair. In addition, Perry Peripherals on Long Island does repair work on AIM, SYM, and KIM boards. (Steve Perry told me that the turn-around time is approximately one week.)

Because the single board promoters depend on those who use their products in custom applications, they are most eager to provide excellent customer support. HDE, for example, provides in-house engineering and custom software development on a contract basis. Other manufacturers such as The Computerist, Micro Technology Unlimited, Systems Innovations Inc., etc., provide detailed explanations describing how to interface and use their products. Also helpful are Perry Peripherals' application notes concerning the AIM, KIM, and SYM single board machines.

The single board people seem to have taken a silent oath to standardize the bus structure of their products as much as possible. Therefore, it may be possible to use one manufacturer's processor board with another's card cage and memory cards. In yet another step, some vendors supply interfaces which will adapt one manufacturer's product to another's. For example, Perry Peripherals can provide a KIMSI to HDE's disk system interface. This idea of modular design and interfacing one manufacturer's product to another erases the problem of obsolescence. So, when a new board is introduced, just plug it in. There is no need to replace the entire system in order to upgrade it.

In addition to the equipment manufacturers themselves, other vendors are providing hardware. Optimal Technology offers an EPROM programmer, complete with software listings, that interfaces through a PIA to many of the single board systems. Keystone Data Consultants Inc. will be releasing a time-of-day clock for the KIM 4 bus (2nd quarter 1982). In addition, Keystone Data can provide equipment and software to interface 110V and 220V devices to numerous single board machines. Progressive Computer Software Inc. offers a disk head cleaning kit for HDE disk systems. The list goes on and on.

Why have the personal computers attained so much popularity while the single boards have been "left in the dust?" Good question! There appear to be several reasons. As mentioned

before, initial purchase price has an effect upon the "business user." In today's runaway inflation, the business man is out to get the most for his hard-earned dollar. Another reason may be packaging. The personal computers are packaged in an appealing plastic and sometimes metal cabinet. Many single board systems are packaged in a heavy, industrial cabinet, enough to give any secretary heart failure. I have also been told that because very few "how-to-fix-bugs-in-your-system" articles have been written about the single boards, they have not received the publicity of some other systems. Perhaps some of the single board manufacturers should intentionally build boards that need fixing! The most obvious reason for this lack of interest though, is the apparent lack of software for these single board-based systems.

I find this hard to believe. After all, weren't the single boards here first? Don't those of us who suffered through the "hex keypad syndrome" pride ourselves in having to really "know the system" in order to have written software? Although I will admit it would have been very difficult to write "General Ledger" on a KIM with a hex keypad, times have changed! One of

the oldest and probably best-known supporters of the TIM, AIM, SYM, and KIM single boards, HDE Inc., offers a great deal of development software to complement their tried and proven disk operating system — FODS.

For assembly language programmers, there is a text editor, assembler, dynamic debugging tool, and a disassembler that generates source code, complete with labels. The text editor may be used, not only to generate assembly language source code, but also for composition.

The assembler is a multifile assembler, meaning that source code is not limited to the amount of available memory. Several files may be assembled by calling them in from the disk. In addition, the assembler includes a formatter which prints the listings in the proper format, therefore alleviating this chore when the source code is entered by the programmer. This, of course, saves several bytes of memory per line of source code (no need to insert spaces to align the columns).

The dynamic debugging tool (DDT) is a comprehensive debugger that allows the assembly language program-

mer to insert break points in a program, single-step the program, proceed to a breakpoint, step multiple instructions at a time, and read and change memory locations. In addition, DDT will display memory as a single byte, an address word, ASCII characters, or disassembled instructions. Memory may be changed using the current display mode. For example, if an ASCII 'A' is displayed, to change it to a 'B' it is only necessary to type in a 'B'.

While in the instruction disassemble mode, the instruction may be changed by typing in the mnemonic and data for the new instruction. The user should be aware that if an instruction's byte count is longer than that of the instruction being replaced, no attempt is made to move the existing code. Remember, this is a debugger, not an assembler. In the single-step mode (this is a software function, not hardware) DDT displays the contents of all registers, the instruction address and mnemonic, as well as the condition code flags, after each instruction is executed.

The disassembler (AID for Advanced Interactive Disassembler) is truly a work of art. Most disassemblers merely generate hard copy listings that contain the instruction mnemonic and referenced address. If you've ever taken one of these listings and tried to decipher it, you'll really appreciate AID. Not only does it assign labels to all the referenced addresses and output hard copy, it also builds a source file in memory that is compatible with the HDE text editor (TED). In addition to all this, if the disassembled source file grows larger than the available memory, AID asks you if you want to save the file to disk. If so, it automatically saves it, resets the textfile pointers, and continues disassembling.

All HDE-supplied development software interfaces to FODS, the File Oriented Disk System. FODS is a complete disk operating system, because simple commands are provided for all disk operations. User commands may be added by building an object module (executable 6502 code) and saving the module to disk identified by a three-character name. Then, whenever the three characters are entered from the keyboard, FODS will access the system drive, load the module, and execute it. In addition, whenever FODS reads or writes the disk, it does a read after read, or read after write verify. In other words, it compares what was read from, or written to, disk with the data in memory, thus insuring positive data transfer.

CBM/PET? SEE SKYLES ... CBM/PET?

"They laughed when I sat down at my PET and immediately programmed in machine language... just as easily as writing BASIC."

With the new Mikro, brought to you from England by Skyles

Electric works, always searching the world for new products for PET/CBM owners. A 4K machine language assembler ROM that plugs into your main board. At just \$80.00 for the Mikro chip, it does all the machine language work for you; all you have to do is start laying down the code.

The Mikro retains all the great screen editing features of the PET...even all the Toolkit commands. (If you own a Toolkit, of course.) Sit down and write your own machine language subroutine. The program you write is the source code you can save. And the machine language monitor saves the object code. The perfect machine language answer for most PET owners and for most applications. (Not as professional as the Skyles MacroTeA...not as expensive, either.)

A great learning experience for those new to machine language programming but who want to master it easily. Twelve-page manual included but we also recommend the book, "6502 Assembler Language Programming," by Lance A. Leventhal at \$17.00 direct from Skyles.

Skyles guarantees your satisfaction: if you are not absolutely happy with your new Mikro, return it to us within ten days for an immediate, full refund.

Skyles Mikro Machine language assembler.....\$80.00

"6502 Assembler Language Programming" by Leventhal..... 17.00

Shipping and Handling.....(USA/Canada) \$2.50 (Europe/Asia) \$10.00

California residents must add 6%/6½% sales tax, as required.



Skyles Electric Works
231E South Whisman Road
Mountain View, California 94041
(415) 965-1735

Visa/Mastercard orders: call tollfree
(800) 227-9998 (except California).
California orders: please call (415)
965-1735.

PET? SEE SKYLES ... CBM/PET? SEE SKYLES

SEE SKYLES ... CBM/PET? SEE SKYLES

... CBM/PET? SEE SKYLES

Disk accesses made through FODS are very fast. This is partly due to the format used to save files to disk. FODS does not use the sector-mapping technique when writing to the disk. Instead, disk files are written one sector after another, in a straight line, so to speak. This can cause some grief to the user who is accustomed to sector-mapping techniques that write data to any available sectors. So, as new files are created and old ones deleted, "holes" appear in the index. When the disk becomes full it is necessary to "PAK" it, thus filling in the gaps. From a development standpoint, this can be somewhat annoying. In actual applications programs, however, this is of little consequence as methods have been devised to re-use the disk space without "PAK"ing the disk.

One good point is that by allowing these holes, deleted files can be recovered — provided the disk has not been packed. Have you ever deleted the wrong file and wasted hours of development time? Well, under FODS, you can recover these.

In addition to assembly language development tools, there are numerous high-level languages available for HDE's disk-based systems. Eric Rehnke's 6502 FORTH has been offered in cassette version for some time now. I understand that it either is or will soon be available for HDE disk-based systems.

HDE is offering CPM on their systems. Yes, a 6502 version of the popular CPM operating system. In addition, a UCSD Pascal interface is available from HDE or their distributors. This package will interface Softech Microsystem's popular languages, Pascal, FORTRAN, and BASIC, to HDE's disk system. An advantage to using the Pascal system is that your programs become portable. This means that a package written on another machine operating under the UCSD system will normally run under the HDE disk system, and *vice versa*. This really opens up some doors for software compatibility!

Probably the most significant addition to HDE's growing line of development software is HDE Disk BASIC. Built around the popular Microsoft BASIC, this package is really an eye opener. I have been evaluating HDE Disk BASIC for approximately a year now, and believe me, an enormous amount of work and forethought has gone into this package.

In order to allow for the multitude of terminal configurations that are on the market today, a personality module has been implemented which allows the user to custom tailor the software to the terminal. Also, a 250-character input buffer allows numerous statements per line. HDE BASIC allows the user to save data three ways. There is the simple "snapshot" data file, as well as sequential data files, and random access files. All of the old KIM BASIC commands have been carried along in this new version, making it an easy task to upgrade your old software. In addition, a multitude of new commands have been added, making this one of the most powerful BASIC interpreters I have had the pleasure of evaluating.

OK, you say, this is all well and good, but I don't want to develop all my own software. Besides, I'm an industrial user and I need a multitasking process control system. Well, look no further! Keystone Data Consultants Inc. has such a system available. The software, called PECO, for Process Environment Operating System, provides the industrial user with a real time multitasking operating system. Keystone Data will configure the software to run stand-alone or in conjunction with an HDE disk-based system.

PECO allows job scheduling, queue processing, event timing, single or multiple access points, interrupt-driven operations, time-of-day scheduling and a host of other features. PECO is not a "pre-packaged" piece of software; Keystone Data provides the software based upon user specifications. The system can be provided in EPROM, or on disk. In addition, the software may be licensed in either object or source code.

There are numerous vendors willing to provide custom software for the industrial and OEM user. In many instances, equipment manufacturers themselves provide this service. Outside sources, like Keystone Data Consultants offer this service either to the manufacturer or their customers. Most single board manufacturers can provide the user with names of reliable software vendors.

What about applications software? Even though HDE Disk BASIC has only been released a short time, there are already several vendors supplying applications software and numerous user's groups providing games and numerous utility programs. The HDE

Disk Program Library is presently undergoing some structural changes, but should be in operation by the time this is printed.

For the more serious user, I know of at least two vendors offering business applications programs for HDE disk-based systems. Western New York Micro offers Mail Manager, Mini Money Manager, Payroll Office, Memo Writer, and Tax Advisor. Keystone Data Consultants offers Data Foreman, Checking Account Management, Inventory Management, and will be releasing Accounts Payable/Receivable, and General Ledger. Contact both of these vendors for additional information.

The allure of plastic and chrome is very tempting. But, now that you know, give the single boards 'Another Look.' You may be surprised at what you find.

Manufacturers are encouraged to keep Mr. Rinehart aware of new products for the single board computers.

Names and Addresses of Vendors

Eric Rehnke
1067 Jadestone Lane
Corona CA 91720

Hudson Digital Electronics Inc.
P.O. Box O
Allamuchy, NJ 07820

Keystone Data Consultants Inc.
P.O. Box 606
York, PA 17405

Micro Technology Unlimited
2806 Hillsborough St.
P.O. Box 12106
Raleigh, NC 27605

Optimal Technology
Blue Wood 127
Earleysville, VA 22936

Perry Peripherals
P.O. Box 924
Miller Place, NY 11764

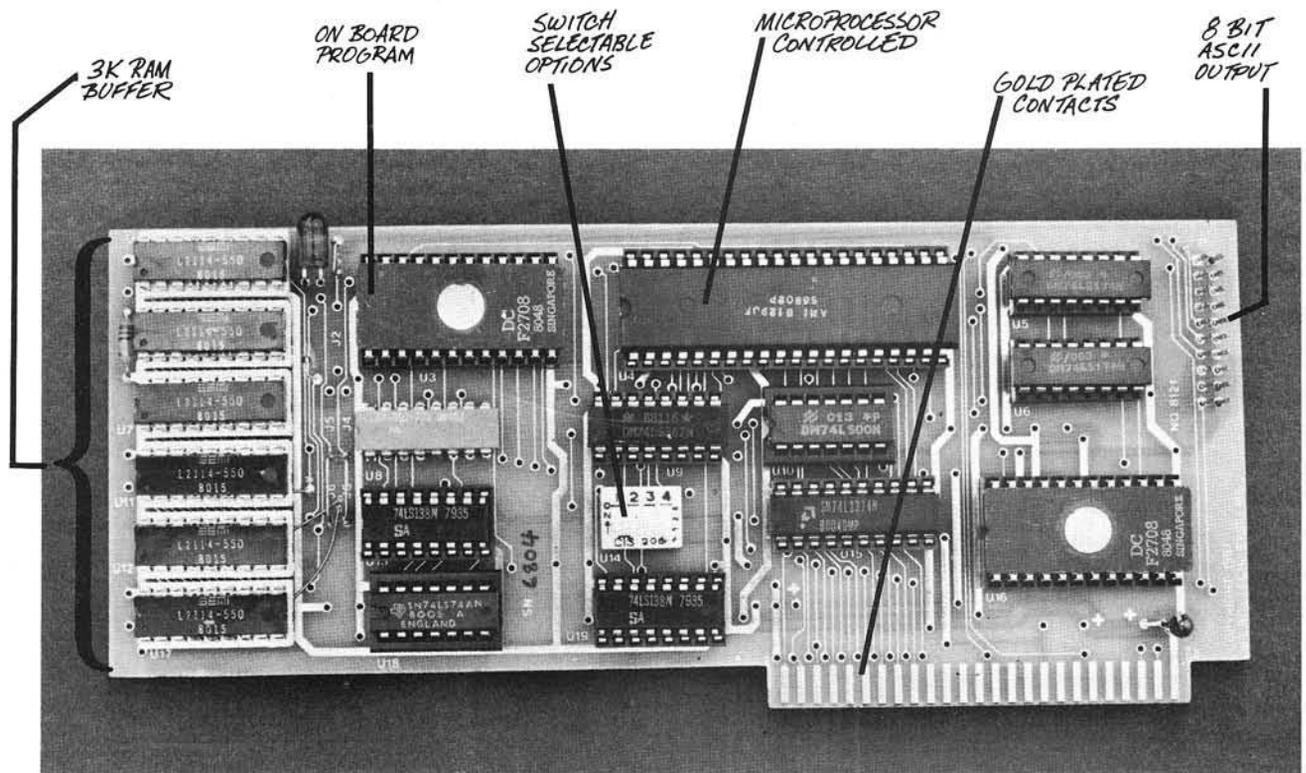
Systems Innovations Inc.
P.O. Box 2066
Lowell, MA 01851

The Computerist
34 Chelmsford St.
P.O. Box 6502
Chelmsford, MA 01824

Western New York Micro
P.O. Box 84
East Amherst, NY 14051

MICRO

SMART II MEANS FAST.



SMART II MICROPROCESSOR CONTROLLED PARALLEL PRINTER INTERFACE

Be Smart! With the new **SMART II** parallel printer interface for your Apple II* Computer you can have print spooling, left and right margin control, and adjustable tab stops. The **SMART II** can buffer over three thousand characters before it signals the Apple to stop sending. This eliminates the start - stop problem created with conventional printer cards and will keep your printer printing (instead of waiting).

The **SMART II** is compatible with all known hardware and software including the Pascal Language System, Microsoft Z-80 Softcard*, and Hayes Micromodem II*.

FEATURES:

- Compatible with all Centronics-type Parallel printers including the Epson MX-70/80/100, Centronics 737/739/779, IDS 440/445/460/560, C. Itoh Starwriter, Anadex 8000/9000/9500, and similar printers.
- 3K Print Spooler which acts much larger when spooling text because of a unique compaction routine.
- On board software supports typewriter-like TAB Commands and has 16 software selectable TAB positions. Left and right margin commands are also software selectable to ease in the justification of reports and listings.
- Use with the Hayes Micromodem II* to prevent loss of characters while on line with a host computer.

AVAILABLE AT YOUR LOCAL APPLE DEALER

INTRODUCTORY RETAIL PRICE **\$225.** (cable and connector included)

HARDWARE: 6800 type microprocessor
 Two ROMs
 Six static RAMs
 Eight support ICs
 4 ft printer cable and connector
 High quality board with gold plated edge connector

OLENSKY BROS., INC.

COMPUTER SALES DIVISION

3763 AIRPORT BLVD.

MOBILE, AL 36608

TOLL FREE: 800-633-1636

DEALER INQUIRIES INVITED.

* Apple is a registered trademark of Apple Computer, Inc.
 * Z-80 Softcard is a registered trademark of Microsoft.
 * Micromodem II is a registered trademark of Hayes, Inc.

Now You Have "The Choice"

Reliability, Quality and Performance at a reasonable Price. Systems International, Inc. is pleased to offer an alternate to Ohio Scientific microcomputers. Our systems are 100% compatible to OSI OS-65D and OS-65U software to preserve your software development investment. Just load your present floppies and run; no conversion of software needed or required. Compare the Following Facts and Make "The Choice."

Ohio Scientific, Incorporated Standard Features C2-OEM

48K Memory, 1 MHz
One Serial Port
Dual 8" Single Sided Floppies
Plug in Boards with Many Connections
120 Volt 60, Hz Operation Only
90-Day Warranty
Weight 80 Pounds
Size W17" × H9½" × D23½"

Extra Cost Items

Second Serial Port
Parallel Port
2 MHz

Systems International, Incorporated Standard Features The Choice II

48K Memory, 2 MHz
2 Serial Ports, 1 Parallel Port
Dual 8" Double Sided Floppies
Single Board Construction for Reliability
120/240 Volt 50/60 Hz Operation
180-Day Warranty
Weight 40 Pounds
Size W12½" × H13½" × D16"
Shippable by UPS in Factory Carton

Extra Cost Items

None

Now Compare the Bottom Line and Make "The Choice"

Total Retail \$4,925.00 *

Total Retail \$4,525.00
240 Volt 50 Hz Operation add \$50.00

Future plans include the "Choice III" which is 100% compatible to the OSI C2-D 8" Winchester System. Also Multi-user Winchester Hard Disk System that is 100% compatible with Ohio Scientific OS-65U Level 3 Software.

REMEMBER — THERE IS "THE CHOICE" TO CHOOSE A BETTER SYSTEM!

Domestic and International Dealer and Distributor Inquiries are Invited. Discounts to 40%

* Ohio Scientific Price List June/July 1981

Systems International Incorporated

15920 Luanne Drive
Gaithersburg, Maryland 20760
U.S.A.
Tel. (301) 977-0100 Twx# 710-828-9703

Sii

500 Chesham House
150 Regent Street
London W1R 5.F.A England
Tel. 01-439-6288 Tlx 261426

80 x 25

PET/CBM™

2000/3000/4000 Series

not using a CRT, or display controller chip

\$275.00*

Select either
80 x 25 or **40 x 25**

On The
Built-in
Display

From the keyboard or program

Displays the full, original character set

Available from your local dealer or:

EXECOM CORP.

1901 Polaris Ave.
Racine, WI 53404
Ph. 414-632-1004

*Plus installation charge of \$75.00

Available only for Basic 3.0 & Basic 4.0

PET & CBM™_a

trademark of Commodore Business Machines

KIM * SYM * AIM USERS

SALES SUPPORT

HDE DISK SYSTEMS

NEW! ADC-818-16 ANALOG-TO-DIGITAL CONVERTER WITH 16 CHANNEL ANALOG INPUTS!

- *KIM-4 BUS COMPATIBLE
- *8-BIT CONVERSION
- *80 USEC CONVERSION
- *BUILT ON 4-1/2 x 6 CARD
- *MUX-OUT AVAILABLE FOR ANALOG SIG CONDITIONING
- *BUY BUILT AND TESTED OR SAVE \$5 AND BUY KIT
- *COMPLETE W/MANUAL AND CIRCUITS

ADC-818-16 (BUILT & TESTED) \$295.00
ADC-818-16KW (KIT W/WIRE WRAP

SOCKETS) \$159.00
ADC-818-16KS (KIT W/SOLDER
SOCKETS) \$159.00

SOFTWARE FOR ALL FDS BASED SYSTEMS:

MAIL MANAGER	PRICE \$49.95
SOFTWARE FOR HDE BASIC:	
MINI-MONEY MANAGER	PRICE \$99.95
MEMO-WRITER	PRICE \$49.95
PAYROLL OFFICE	PRICE \$99.95
TAX ADVISOR	PRICE \$79.95
CLASS RECORD	PRICE \$49.95
STATISTICAL PACKAGE	PRICE \$24.95

PLEASE WRITE FOR COMPLETE DESCRIPTION

MORE SPECIALS:

- *CENTRONICS 739-1 PRINTER REG \$995/
NOW \$699
- *CENTRONICS 704 PRINTER REG \$2495/
NOW \$1795
- *2716's—10.95@/3 FOR 9.95@/10 FOR 8.80@

DEALER INQUIRIES INVITED

ADD \$3.00 FOR SHIPPING ON ORDERS UNDER \$100. FREE SHIPPING ON ORDERS OVER \$100. NEW YORK RESIDENTS ADD 7% SALES TAX

WESTERN NEW YORK MICROCOMPUTER, INC.

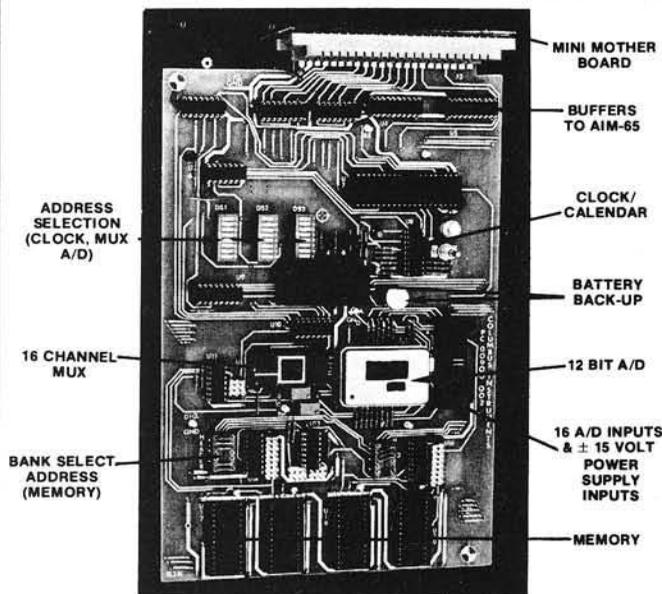


P.O. BOX 84
EAST AMHERST, NY 14051
716/689-7344



AIM-65/SYM-PET-KIM-6800

Universal Interface Board Converts AIM-65/SYM
Into Professional Data Logger



(Also connects to PET or KIM with adapter cable.
Adaptable to other 6502 and 6800 systems)

CONTAINS:

- ★ 12 bits, 16 channels, fast A/D converter
- ★ space for additional 16K RAM memory or 32K EPROM (or combination)
- ★ real time clock/calendar with real time interrupt capability and 10-year lithium battery backup
- ★ plugs directly into AIM-65 expansion connector with the help of a mini-mother board which supports up to three interface boards
- ★ supplied with supportive demonstration and control programs

AVAILABLE MODELS:

- ★ IB-902 Additional Memory Space (only) \$ 390.00
- ★ IB-902-A Calendar/Clock plus memory space \$ 690.00
- ★ IB-902-B A/D (12 bits, 16 channels plus memory space) \$ 960.00
- ★ IB-902-AB A/D, plus memory space and calendar/clock \$1,270.00
- Mini mother board to support up to three (3) interface boards \$65.00

Quantity Discounts Available



COLUMBUS INSTRUMENTS INTERNATIONAL CORPORATION
Supplier of individual instruments and total measuring systems

950 N. HAGUE AVE., COLUMBUS, OHIO 43204 U.S.A.
PHONE: (614) 488-6176 TELEX: 246514

Some Help for KIM

Part 3

The author presents hardware and software for an improved single-step function. Also included is a TRACE routine.

Wayne D. Smith
 Box 8352
 Austin Peay State University
 Clarksville, Tennessee 37040

Last month we examined the operation of the KIM single-step hardware. We saw that a simple modification to this hardware would allow the substitution of user-supplied software for the KIM software.

There is a number of variations on this basic scheme. Several K areas may be ANDed together to allow moving the single-step program to different areas as the need arises. Switches may be added to allow the selection of various K areas, as desired. If you extend this concept to the most general case, the circuit in figure 1 can be used. With these eight switches installed, the single-step software may be moved to anywhere in the lower 6K of memory.

By turning on the appropriate K switch, any K area can be prevented from generating the single-step NMI. Be sure that the K7 switch is also on, however, or the KIM software will single-step. If only the K7 switch is on and the NMI vector is set to \$1C00, the system will perform as an unmodified KIM. If a K switch is on, it means that programs in this area will run at normal speed, even if the single-step switch is on. Since the K6 and K7 areas contain KIM ROM, these switches would both normally be on. They may be turned off, however, if you want to single-step any of the KIM software.

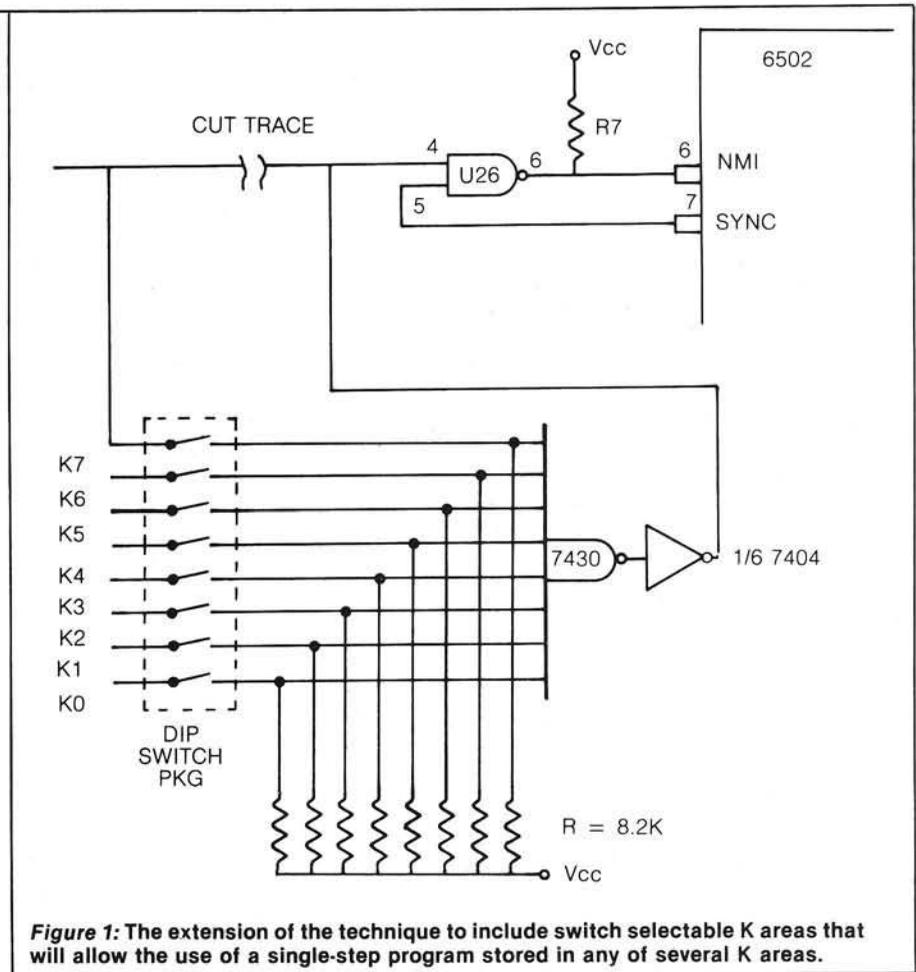


Figure 1: The extension of the technique to include switch selectable K areas that will allow the use of a single-step program stored in any of several K areas.

The 8.2 K Ω pull-up resistors shown in figure 1 are required to prevent noise, which might inadvertently generate a NMI if the 7430 inputs were left floating. These pull-ups supplement rather than replace the 560 Ω pull-ups already on the K signal outputs from the 74145. The additional pull-ups must be used, even though they do reduce the fanout of the K signals slightly. With this modification, try to limit the load on the K signal to about five normal TTL loads.

A secondary problem with the KIM software is eliminated with the hardware modification described above. This problem has to do with the KIM Peripheral Interface Adapters (PIAs). Included within the KIM single-step software are provisions for resetting the directional registers associated with the KIM PIA. It is, therefore, impossible to single-step a program which depends upon the setting of this directional register. As the single-step interrupt is generated, the KIM software

resets the registers to the KIM configuration. This, of course, negates any setting of the directional registers that may have been accomplished by the user. This can result in a program which runs correctly in the normal mode, but which will not run in the single-step mode.

Installing the switch-selected single-step area is probably best accomplished on a small perf board. I installed mine on the board that contains my data bus buffers. If you are willing to settle for the single additional area, the hardware modification can be made directly on the KIM board. A single trace must be cut as shown in figure 2. The AND gate (7408) may be mounted on the KIM board in any convenient location using a little contact cement. Mount the IC with the legs up. By being careful, you can make all the solder connections directly to the socket contacts on the KIM board. Just be sure that the solder doesn't interfere with the insertion of the KIM into the sockets. For convenience, the 7408 connections are listed in table 1.

The improved single-step program is shown in listing 1. The program is completely relocatable, and may be moved anywhere in memory without address changes. Other than the normal KIM page zero locations, SSTEP uses one additional page zero location, \$EE.

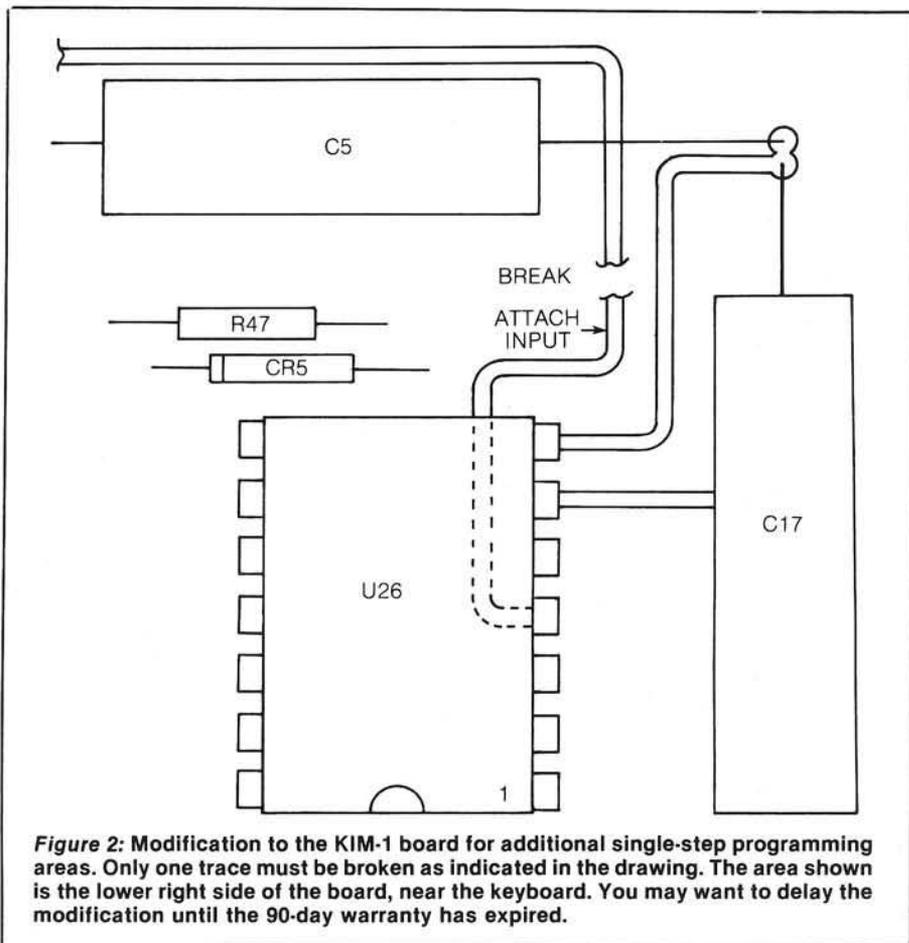


Figure 2: Modification to the KIM-1 board for additional single-step programming areas. Only one trace must be broken as indicated in the drawing. The area shown is the lower right side of the board, near the keyboard. You may want to delay the modification until the 90-day warranty has expired.

PERRY PERIPHERALS REPAIRS KIMs!! (SYM and AIMs Too)

- We will Diagnose, Repair, and Completely Test your Single Board Computer
- We Socket all replaced Integrated Circuits
- You receive a 30-day Parts and Labor Warranty
- Labor is \$38.00 if 40-pin ICs are socketed (\$40.00 otherwise) — Parts Extra
- Your repaired S.B.C. returned via U.P.S. — C.O.D., Cash

Don't delay! Send us your S.B.C. for repair today
Ship To: (Preferably via U.P.S.)

PERRY PERIPHERALS
6 Brookhaven Drive
Rocky Point, NY 11778

Perry Peripherals carries a full line of the acclaimed HDE expansion components for your KIM, SYM, and AIM, including RAM boards, Disk Systems and Software like HDE Disk BASIC V1.1. Yes, we also have diskettes. For more information, write to: P.O. Box 924, Miller Place, NY 11764 or Phone (516) 744-6462.

Table 1: The 7408 pin connections for a single additional single-step program storage area. K5 is used as the additional area, but may be changed if desired. Pins not listed are not connected.

Pin Number	Connection	Attach To
1	K5	KIM App J
2	K7	KIM App H
3	U26 pin 4	at cut trace
7	Ground	KIM Exp 21
17	Vcc	KIM Exp 22

If you use the program in the K5 RAM, resist the temptation to make any changes that lengthen the program. SSTEP ends at \$17E6, and the KIM tape routines use variables at \$17E7 and up. (Believe me, this wasn't easy, and accounts for some of the strange coding.) If you lengthen the program, the tape-write routine (including Super-tape) will destroy some bytes above \$17E7, and render loading the program from tape impossible.

To use the program, first make the hardware modification as shown in figures 1 and 2. Then load the program normally. Be sure to set the NMI vector (\$17FA, \$17FB) to the starting location of the new single-step program (\$1780). Now whenever the single-step switch is on, the complete status of the machine is printed as each instruction is executed. The status printed is the status *after* the instruction on that line has been executed. The registers are listed in the order X, Y, A, S (stack-pointer) and P (status).

The program shares one idiosyncrasy with the KIM single-step program. If a subroutine jump is executed to a routine within the non-interrupt area (say K7), the program will perform this routine at normal speed, without any output. The program will, however, also execute the first step following the return at normal speed. Recall that the interrupt is generated as the instruction is fetched, but not honored until the instruction has been completed. That means that the first instruction after the return generates an interrupt, but will not be listed. The status of the registers listed after the first step in the subroutine will actually be the status after the first step following the return is executed. The operand field should be ignored in this case. If this presents a problem, simply use a NOP immediately after any subroutine call to a non-interrupt area.

A Trace Program

While the single-step routine is a great help in debugging programs, there are times when it is inconvenient to sit at the terminal, pressing the G key after every step. It is often desirable to let the program run from beginning to end without intervention, but still have the steps traced, and the register information printed as the program executes. The resulting printout can then be analyzed at a more convenient time or place.

Listing 1: Single-Step Program

```

0010 ;
0020 ; PROGRAM TO PROVIDE IMPROVED SINGLE STEP
0030 ; OPERATION OF THE KIM-1 MICROCOMPUTER.
0040 ; THE PROGRAM PROVIDES ALL THE NORMAL
0050 ; KIM-1 SINGLE STEP OPERATIONS PLUS
0060 ; PRINTING THE OPERAND FOR EACH INSTRUCTION
0070 ; AND PRINTING THE REGISTER CONTENTS
0080 ; OF ALL REGISTERS AFTER THE INSTRUCTION
0090 ; IS EXECUTED. A HARDWARE MODIFICATION OF
0100 ; THE KIM BOARD IS REQUIRED IN ORDER TO USE
0110 ; THIS PROGRAM.
0120 ;
0130 ACC =#$F3 STORAGE FOR ACCUMULATOR
0140 PREG =#$F1 STORAGE FOR STATUS REGISTER
0150 PCL =#$EF STORAGE FOR PGM CNTR (LOB)
0160 PCH =#$F0 STORAGE FOR PGM CNTR (HOB)
0170 YREG =#$F4 STORAGE FOR Y REGISTER
0180 XREG =#$F5 STORAGE FOR X REGISTER
0190 SPUSER =#$F2 STORAGE FOR STACK POINTER
0200 POINTH =#$FB ADDR OF CURRENT INST (HOB)
0210 POINTL =#$FA ADDR OF CURRENT INST (LOB)
0220 TEMP =#$EE BYTES TO PRINT (NON KIM)
0230 OUTSP =#$E9E KIM ROUTINE TO PRINT SPACE
0240 PRYBYT =#$E3D KIM ROUTINE TO PRINT A BYTE
0250 SHOW =#$D9C REENTRY POINT FOR KIM LOOP
0255 ;
0260 1780 ; *#$1780 START OF ROUTINE (RELOCATABLE)
0270 1780 D9 SSTEP CLD CLEAR DECIMAL MODE
0280 1781 85 F3 STA ACC SAVE ACCUMULATOR
0290 1783 68 PLA RECOVER STATUS AND
0300 1784 85 F1 STA PREG SAVE IT.
0310 1786 68 PLA RECOVER PROGRAM COUNTER,
0320 1787 85 EF STA PCL AND SAVE IT.
0330 1789 68 PLA SAVE BOTH LOB AND
0340 178A 85 F0 STA PCH HOB.
0350 178C 84 F4 STY YREG SAVE Y REGISTER
0360 178E 86 F5 SIX XREG SAVE X REGISTER
0370 1790 BA TSX TRANSFER STACK POINTER
0380 1791 86 F2 STX SPUSER TO X AND SAVE IT.
0390 1793 20 9E 1E JSR OUTSP PRINT A BLANK SPACE
0400 1796 A2 04 LDX #04 SET FOR 4 SPACES TO PRINT
0410 1798 38 SEC FIND DIFFERENCE BETWEEN
0420 1799 A5 F0 LDA PCH OLD AND NEW PROGRAM
0430 179B E5 FB SBC POINTH COUNTER TO DETERMINE
0440 179D A5 EF LDA PCL NUMBER OF BYTES
0450 179F E5 FA SBC POINTL TO PRINT.
0460 17A1 85 EE STA TEMP SAVE THIS DIFFERENCE
0470 17A3 A1 F6 LDA (POINTL-4,X) LOAD OP CODE
0480 17A5 48 PHA AND SAVE IT.
0490 17A6 29 0F AND #0F TEST FOR BRANCH AND OTHER
0500 17A8 D0 0D BNE SETY UNUSUAL DIFFERENCE INSTS.
0510 17AA 68 PLA RECOVER OP CODE
0520 17AB C9 20 CMP #20 IF OP = 20 THEN
0530 17AD F0 08 BEQ SETY THREE BYTE INST.
0540 17AF 29 90 AND #90 MASK ALL BUT B7, B4
0550 17B1 F0 15 BEQ SPACES IF BOTH OFF, 1 BYTE INST
0560 17B3 A3 02 LDA #02 ELSE SET FOR 2 BYTE INST
0570 17B5 85 EE SIA TEMP BY SETTING TEMP=2
0580 17B7 A0 01 LDY #01 SET OFFSET TO OPERAND BYTE
0590 17B9 CA EE CPY TEMP COMPARE BYTES PRINTED TO
0600 17BB F0 0B BEQ SPACES BYTES TO PRINT. IF NOT
0610 17BD B1 FA LDA (POINTL),Y DONE, LOAD OPERAND
0620 17BF 20 3H 1E JSR PRYBYT THEN PRINT IT.
0630 17C2 A0 02 LDY #C2 SET Y FOR SECOND BYTE
0640 17C4 CA DEX DECREMENT SPACES TO
0650 17C6 CA DEX PRINT BY 2.
0660 17C8 D0 F1 BNE AGN IF NOT 0, THEN REPEAT
0670 17C8 E8 SPACES INX ONE MORE SPACE TO PRINT
0680 17C9 20 9E 1E MORESP JSR OUTSP PRINT SPACES TO FILL

```

```

0690 17CC CA          DEX          OPERAND FIELD.
0700 17CD DO FA          BNE MORESP
0710 17CF A2 05          LDX #05          SET X TO PRINT 5 REGISTERS
0720 17D1 B5 F0          LDA PREG-1,X     LOAD AND PRINT REGISTER
0730 17D3 20 3B 1E      AGAIN JSR PRBYT      STORAGE IN THE ORDER:
0740 17D6 20 9E 1E      JSR OUTSP        X, Y, A, STACK POINTER,
0750 17D9 CA          DEX          AND STATUS WITH SPACES.
0760 17DA DO F5          BNE AGAIN
0770 17DC A5 EF          LDA PCL          UPDATE POINTN AND POINTL
0780 17DE 85 FA          STA POINTL       FOR NEXT INSTRUCTION.
0790 17E0 A5 FO          LDA PCH
0800 17E2 85 FB          STA POINTH
0810 17E4 4C AC 1D      JMP SHOW        AND RETURN TO KIM
0820 17E7                .END

```

The program shown in listing 1 can be easily modified to perform this TRACE function, provided that it is stored in some location other than K5. As mentioned above, attempting to lengthen the program in K5 will result in erroneous operation of the tape routines, the single-step program, or both.

Since the initial portion of the TRACE program is identical to the SSTEP, only the step at \$17E4 must be changed, and eight new steps added (listing 2). If desired, a flag can be set, and a test and branch sequence inserted at the location of the JMP SHOW instruction. In this manner, one program can accomplish both functions. I elected not to do this, since I keep SSTEP in K5 at all times, and only load TRACE when it is needed.

To insure that the program being traced terminates properly, simply include a JMP KIM (4C 64 1C) as the last step in the program. Needless to say, the trace program is of limited usefulness unless a hard copy terminal is being used. If you are using a CRT, you will just have to punch G and watch Star Trek at the same time (multi-processing?).

Listing 2: Trace Addition to Single-Step Program

```

0010                ;
0020                ; A NEW END TO CONVERT THE IMPROVED KIM-1
0030                ; SINGLE STEP PROGRAM TO A TRACE PROGRAM.
0040                ; THE PROGRAM OPERATES SIMILAR TO THE
0050                ; SINGLE STEP PROGRAM EXCEPT THAT THE
0060                ; PROGRAM BEING EXECUTED RUNS WITHOUT
0070                ; OPERATOR INTERVENTION. A JUMP TO THE
0080                ; KIM MONITOR WILL TERMINATE THE TRACE.
0090                ; NOTE THAT THE ADDRESSES ARE RELATIVE TO
0100                ; THE SINGLE STEP PROGRAM. THE PROGRAM
0110                ; CAN NOT BE LOADED AT THE LOCATION SHOWN.
0120                ; SEE TEXT FOR DETAILS.
0130                ;
0140                ; POINTL =#$FA ADDRESS OF NEXT PROGRAM STEP
0150                ; GOEXEC =#$1DCB KIM EXECUTE ROUTINE ADDRESS
0160                ; PRTPNT =#$1E1E KIM PRINT ROUTINE
0170                ; CRLF =#$1E2F KIM CARRAGE RETURN ROUTINE
0180                ; OUTSP =#$1E9E KIM ROUTINE TO PRINT A SPACE
0190                ;
0200 17E4                *=$17E4
0210 17E4 20 2F 1E      START JSR CRLF      START A NEW LINE.
0220 17E7 20 1E 1E      JSR PRTPNT      PRINT ADDR OF NEXT INST.
0230 17EA 20 9E 1E      JSR OUTSP       PRINT BLANK SPACE.
0240 17ED A0 00          LDY #00         SET INDEX FOR OP CODE
0250 17EF B1 FA          LDA (POINTL),Y LOAD OP CODE AND
0260 17F1 20 3B 1E      JSR PRBYT      PRINT IT.
0270 17F4 20 9E 1E      JSR OUTSP       PRINT TWO BLANKS.
0280 17F7 20 9E 1E      JSR OUTSP
0290 17FA 4C C8 1D      JMP GOEXEC      EXECUTE NEXT INSTRUCTION.
0300 17FD                .END

```

MICRO

POWER TO YOUR AIM

Treat your AIM to a quality power supply:

1. Designed to Rockwell's specifications for the AIM-65 (5 volts at 2 amps, regulated; 24 volts, .5 amps avg., 2.5 amps peak, unregulated).
2. *Overvoltage protection* to protect the expensive circuits in your AIM (5 volt output).
3. Handsome all metal case (two tone blue).
4. Fuse (externally accessible), switch, pilot light, line cord, cable from power supply to AIM — all included.
5. Conservative thermal design for long life.

\$64.95 plus shipping (5 lbs.)

CA residents add 6 % sales tax.
VISA/MC, cashier's or registered check.
Personal check (allow 2 weeks to clear).

CompuTech
Box 20054
Riverside, CA 92516

Engineering Micro-Software Center Design Software for Micro-Computers Apple II & III

Vibration Analysis
Structural Loads and Stress
General Mechanical Design

104 E. Queenwood, Suite 2
Morton, Illinois 61550
309-263/2602

Software for Engineers by Engineers

- | | |
|--|-------|
| I. Truss & Linkage Analysis 2D & 3D | \$75 |
| II. Beam Analysis w/Multi-Loads (diagrams) | \$75 |
| III. Rubber Element Design Shear & Compression | \$75 |
| IV. Torsional System Vibration
Holzer Analysis (Branching & Gearing) | \$100 |
| V. Linear Vibration Systems-6 Degree of Freedom Mass
Excellent for Mounting System Response | \$75 |
| VI. Bolted Joint Analysis | \$50 |
| VII. Fourier Analysis w/Data Display | \$35 |
| VIII. Column Design/Minimum Moment of Inertia Calc | \$60 |
| IX. Four-Bar Linkage — Generates Coupler Point Path
Motion Synthesis for Mechanisms | \$60 |
| X. Weibull Failure Analysis — Considers both
Failures and Suspensions w/Printer Plot | \$60 |
| XI. CPM-Critical Path Method of Project Management
Very General — 500 Activities Max | \$60 |

*All Software is Well Prompted
Many Others Under Development Now
by our Professional Staff*

GET FREE SOFTWARE FOR YOUR APPLE!

HOW? JUST ORDER ANY OF THE ITEMS BELOW, AND SELECT YOUR FREE SOFTWARE FROM THE BONUS SOFTWARE SECTION, USING THE FOLLOWING RULE: FOR THE FIRST \$100.00 WORTH OF MERCHANDISE ORDERED TAKE 1 ITEM; FOR THE NEXT \$200.00 WORTH OF MERCHANDISE ORDERED TAKE ANOTHER ITEM; FOR THE NEXT \$300.00 TAKE A THIRD ITEM, ETC. ALL AT NO COST.

HARDWARE BY APPLE

APPLE II PLUS, 48k	1199
DISK DRIVE+CONTROLLER (3.3)	535
DISK DRIVE only	455
Language System w. Pascal	397
Silentype Printer & Interface	360
Integer or Applesoft Firmware Card	159
Graphics Tablet	645
Parallel Printer Interface Card	149
Hi-Speed Serial Card	155
Centronics Parallel Intfoc.	175

HARDWARE BY OTHERS

HAYES MICROMODEM II	300
HAYES SMART MODEM	239
HAYES S100 MODEM	339
VIDEO VIDEOTERM 80 W. GRAPHICS	275
MICROSOFT Z80 SOFTCARD	299
MICROSOFT 16K RAMCARD	159
CORVUS 10MB HARD DISK	4750
SSM A10 SERIAL/PARALLEL A&T	189
MICRO-SCI Disk & Controller	495
TYMCAO DOUBLE DOS 3.2/3.3	35

VIDEO MONITORS

Leedex-Video-100 12" B&W w/Cable	139
Leedex 12" Green w/Cable	165
Leedex 13" COLOR MONITOR & Cable	399
SUP-R-TERM RF MODULATOR	29

HARDWARE BY MOUNTAIN COMPUTER

Clock/Calendar Card	239
A/D & D/A Interface	319
Expansion Chassis	555
ROMplus Card	135
Mark Sense Card Reader	895
CPS Multifunction Bd.	239

SOFTWARE FOR APPLE

APPLE FORTRAN	159
APPLE PILOT	125
DOS 3.3	50
DOS TOOL KIT	65
APPLE PLOT	59
D. J. REPORTER	45
D. J. NEWS	45
PORTFOLIO	45
SHELL GAMES	25
ELEMENTARY DEAR APPLE	25

SOFTWARE BY OTHERS

APPLE FORTRAN by MICROSOFT	159
APPLE BASIC COMPILER by MICROSOFT	315
APPLE COBOL by MICROSOFT	599
VISICALC 3.3	189
VISILOT	155
VISILOT/VISITREND	199
VISIDEX	189
CCA DATA MGT.	79
DB MASTER by STONEWARE	189
DATA CAPTURE 4.0	55
Z - TERM	65
ON-LINE APPLESOFT COMPILER	89

SOFTWARE BY PEACHTREE

GEN. LEDGER	219
A/R	219
A/P	219
PAYROLL	219
INVENTORY	219
MAIL LIST	219

WORD PROCESSING SOFTWARE FOR APPLE

PEN-ULTIMATE	235
WORD STAR	245
EZ WRITER Prof. Sys.	195
EZ WRITER	89
MUSE SUPER TEXT II	139
APPLE-WRITER	69
PROGRAMMA APPLE PIE 2.0	110
MAGIC WAND	345
WORDPOWER	50

EPSON PRINTERS

MX - 70 w/Graftrax	415
MX - 80	515
MX - 80 FT	615
MX - 80 w. GRAFTRAX	575
MX - 80 FT w. GRAFTRAX	675
MX - 100 FT w. GRAFTRAX	775
APPLE PAR. INTFCE (for all Epson)	75
MX - 70/80 FRICTION FEED Adeptor	75

OTHER PRINTERS

IDS 445 w. GRAPHICS + 2K Buff.	750
IDS 460 w. GRAPHICS	899
IDS 460	825
IDS 560	1099
IDS 580 w. GRAPHICS	1150
CENTRONICS 737	899
CENTRONICS 739	799
CCS Centronics Par. Intfoc & Cable	135
NEC SPINWRITER 5510 RO	2795
C. ITOH 25 CPS DAISYWHEEL	1750
C. ITOH 45 CPS DAISYWHEEL	2025
WATANABE MI-PLOT PLOTTER	1150
DIABLO 630 DAISY w. P. Wheel & Rib.	2350

BONUS SOFTWARE SECTION!

Let us acquaint you with MESSAGE-MAKING SOFTWARE. Just place the disk in the APPLE, enter the text, and colorful, dynamic messages appear on the screens of TV sets connected to the computer. Use the software to broadcast messages on TV screens in schools, hospitals, factories, store window, exhibit booths, etc. The following program is our latest release:

SUPER MESSAGE: Creates messages in full-page "chunks". Each message allows various statements of mixed typesetstyles, typesizes and colors, in mixed upper and lower case. Styles range from regular APPLE characters, up to double-size, double-width characters with a heavy, bold font. Six colors may be used for each different typesetstyle. Vertical and horizontal centering are available, and word-wrap is automatic. Users can chain pages together to make multi-page messages. Pages can be advanced manually or automatically. Multi-page messages can be stored to disc or recalled instantly. REQUIRES 48K & ROM APPLESOFT..... \$50.

APPLE PLOTS YOUR DATA & KEEPS YOUR RECORDS TOO! APPLE DATA GRAPH 2.1: Plots up to 3 superimposed curves on the Hi-res Screen both X & Y axes dimensioned. Each curve consists of up to 120 pieces of data. Graphs can be stored to disc and recalled immediately for updating. Up to 100 graphs can be stored on the same disc. Great for Stock-market Charting, Business Management, and Classroom Instruction! REQUIRES 48K & ROM APPLESOFT..... \$36

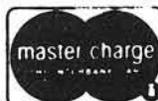
APPLE RECORD MANAGER: Allows complete files to be brought into memory so that record searches and manipulations are instantaneous. Records within any file can contain up to 20 fields, with user-defined headings. Information can be string or numeric. User's can browse thru files using page-forward, page-backward or random-search commands. Records can easily be searched, altered or sorted at will. Files can be stored on the same drive as the master program, or on another, if a second drive is available. Records of files can be printed, if desired. Additional modules coming are a STATISTICS INTERFACE, CHECKBOOK, MAILING LIST & DATA-ENTRY. REQUIRES 48K & ROM APPLESOFT..... \$40

APPLE LITERATURE DATABASE: allows rapid retrieval (via keywords) of references from total APPLE literature thru 1980, on 5.25" disk. Each entry in the data base consists of the article, author-name, periodical-name, date of issue, & page nos. The database is intended to support large magazine files which would require lengthy manual searching to recover information. Annual updates will be available. REQUIRES 48K, ROM APPLESOFT..... \$60

WORDPOWER: is a simple, powerful, low cost, line-oriented word-processor program. It offers a fast machine language FIND & REPLACE. Text can be listed to screen or printer, with or without line-numbers. Lower-case adaptors are supported. You can merge files, move groups of lines, and easily add, change, or delete lines. WORDPOWER can be used to create and maintain EXEC files. It can also be used as a rapid, unstructured, information-storage and retrieval system via its rapid search capabilities. REQUIRES: 48K, ROM APPLESOFT..... \$50

LABELMAKER: allows users to quickly create address labels. A given label may be generated in any quantity from 1 to 32767. Space is allowed on labels for a personal and company name, but the space is automatically closed up if only a personal name is entered. Space is also allowed for foreign countries. The program can also generate labels for price-tags, part numbers and mail-messages such as "RUSH", "FRAGILE", etc. A self-incrementing feature allows theatre-tickets to be produced, with a date, and numbers running from 0000 to 9999. An editor is provided for editing labels prior to printing. All labels may be saved to disk for instant recall. REQUIRES 48K & ROM APPLESOFT..... \$35

TO ORDER: Use phone or mail. We accept VISA, MASTERCARD, COD's, personal checks & money orders. Add 4% for credit card. Customer pays handling on COD orders. Foreign orders must be in American Dollars & include 10% for handling. Connecticut residents add 7.5% sales tax.



CONNECTICUT INFORMATION SYSTEMS CO.
218 Huntington Road, Bridgeport, CT 06608 (203) 579-0472

WHY DO UNNECESSARY SURGERY ON YOUR APPLE?

Sooner or later, you're going to need a 16K memory-expansion for your Apple. When you do, we suggest you buy it on the card that doesn't require poking about on the motherboard — nor removing a RAM chip, installing a strap, etc.

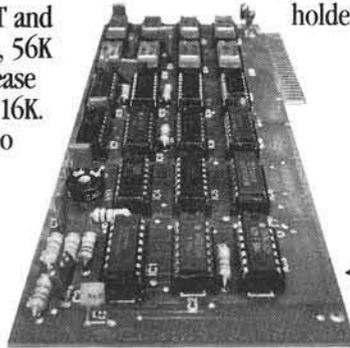
The Ramex 16 RAM Board just plugs in. It's simple, reliable, and does its own memory refresh, with no additional connections.

Run Pascal, Fortran, FP, INT and other alternate languages, 56K CPM with a Z80 Softcard, increase usable memory for Visicalc by 16K. The possibilities are endless. Do it with the finest, closed-track engraved, epoxy sealed, 16K

board available — the Ramex 16. And do it without unnecessary surgery on your Apple.

In spite of its quality, the Ramex 16 costs less than most other expansion boards — just \$139.95. And it comes with a *one year* limited warranty, instead of the usual 90 days.

Get the Ramex 16 from your local dealer, or order direct. Visa and Mastercard holders call toll-free, 1-800-835-2246.



OMEGA MICROWARE, INC.
222 SO. RIVERSIDE PLAZA
CHICAGO, IL 60606
312-648-1944

*Look, ma,
no straps!*

Apple and Applesoft are registered trademarks of Apple Computer, Inc. Pascal is a registered trademark of the Regents of the U. of C. San Diego. Visicalc is a registered trademark of Personal Software. CPM is a registered trademark of Digital Research, Inc. Z80 is a registered trademark of Zilios, Inc. Softcard is a registered trademark of Microsoft.

the retailer

a fully integrated retail management system

- cash register program
 - inventory manager
 - report generator
- available now

Dealer Inquiries Invited



RETCOM Systems, Inc., 61-B Mountain Blvd., Warren, New Jersey 07060 (201) 561-3112

MICRO

Short Subjects

KEYSORT for BASIC 4.0

by Gordon Campbell

A Disk Menu Program

by David C. Oshel

Auto-Run-Wedge for the PET

by Werner Kolbe

KEYSORT for BASIC 4.0

Gordon Campbell, Willowdale,
Ontario, Canada

One of the most powerful utility programs published for the PET appeared in MICRO (23:11) — Rev. James Strasma's KEYSORT. Unfortunately, converting the program to work with BASIC 4.0 requires a lot of work. But, this difficulty can be overcome with the approach presented here.

The problem is that strings are stored differently under BASIC 4.0 than under earlier BASICs. At the end of a string there is a backward pointer which is used to speed up garbage collect. KEYSORT doesn't move strings around, it just changes the array pointers. Consequently, the backward pointers are incorrect. If the PET tries to do a garbage collect, it might crash. You could change the KEYSORT program to fix up the pointers, but you'll find that modifying the BASIC program is easier.

Listing 1 is a simple demonstration of using KEYSORT on a new PET. The steps in this example are:

1. Read in the file to be sorted.
2. Compress strings to the top of memory.
3. Seal off the strings.
4. Invoke the sort.
5. Write out the sorted file.
6. Reset memory pointers.

My version of KEYSORT includes element zero in the sort. My PET has normal memory where most PETs have ROM sockets, so I have relocated the sort to this area. The sort includes null elements.

The key to making the sort operate on BASIC 4.0 is in steps 2 and 3 above.

The statement, X equals FRE(0), forces all strings to be compressed to the top of memory. They are sealed off by resetting the top of memory at the same place as the bottom of the strings. Therefore, none of these strings are eligible to participate in garbage collection. Then, when the sort is completed, it doesn't matter that the backward pointers are incorrect. Before the program ends, the top of memory is reset to its original value. (Otherwise, you would permanently lose the memory which we sealed off.) Then, to make no errors occur, the variables are cleared.

```
100 REM KEYSORT WITH BASIC 4.0
110 REM
120 REM BY GORDON CAMPBELL
130 REM
140 REM
150 REM STEP 1: READ IN THE FILE TO SORT
160 REM
170 DIM S$(1000): REM ARRAY TO SORT
180 OPEN B,B,B,"FILE": REM FILE TO READ
190 INPUT#B,S$(N)
200 EF = ST: REM END OF FILE?
210 N = N + 1
220 IF EF=0 THEN 190: MORE FIELDS
230 CLOSE B
240 REM
250 REM
260 REM STEP 2: COMPRESS STRINGS
270 REM
280 X = FRE(0)
290 REM
300 REM
310 REM STEP 3: SEAL OFF THE STRINGS
320 REM
330 X = PEEK(52): REM SAVE
340 Y = PEEK(53): REM POINTERS
350 POKE 52, PEEK(48): REM SEAL OFF
360 POKE 53, PEEK(49): REM STRINGS
370 REM
380 REM
390 REM STEP 4: INVOKE THE SORT
400 REM
410 SYS10*4096
420 REM
430 REM
440 REM STEP 5: WRITE OUT SORTED FILE
450 REM
460 OPEN B,B,B, "O:SORTED FILE,S,W"
470 FOR J=0 TO 1000
480 IF S$(J) = "" THEN 500: SKIP NULLS
490 PRINT#B, S$(J)
500 NEXT
510 CLOSE B
520 REM
530 REM
540 REM STEP 6: RESET MEMORY POINTERS
550 REM
560 POKE 52,X: REM RESET TOP
570 POKE 53,Y: REM OF MEMORY
580 CLR: REM KILL BAD STRINGS
590 END
```

A Disk Menu Program

David C. Oshel, 1219 Harding Ave.,
Ames, IA 50010

Most of the disk directory management programs I've seen involve flashy READ/WRITE track sector subroutines which deal with disk files directly. The costs are high, both in terms of purchasing, and in comprehension and utility.

The twenty lines of Applesoft which follow provide an elegant and powerful alternative.

The program creates a dynamically-numbered Disk Menu which is susceptible to immediate insertion, deletion or rearrangement of any of the displayed menu items. You may arrange your programs at will, in alphabetical or logical groupings. Further, you may display a program *description* rather than the terse and sometimes cryptic catalog title under which the program actually runs. Moreover, if your catalog contains a suite of programs which call each other, you only need to display the primary program of the system, cutting your menu length by three-fourths in some cases. While your *catalog* may show confusion, your *menu* is logical, orderly and concise!

Menu entries take the form of paired items in DATA statements at the end of the program. There is no limit on the number of items which may be included, subject to disk space. An "empty" menu is valid, while long menus are displayed over subsequent screen pages, each dynamically-numbered.

The first item in each DATA pair is the program's menu description. The second item in the DATA pair is the program's catalog name, the name under which it runs. There must be two entries for each program in the menu, even if one of them is null (that is, ""). Also, some care must be taken when entering DATA statements to

enclose each item in quotes; a missing quote will truncate a lengthy menu, or produce other peculiar effects. Including an initial period in the catalog-name DATA field will suppress DOS, and allows the corresponding *menu* description to be a non-executing documentation line!

RUN, BRUN and EXEC are valid, with two items of interest. First, a machine language utility program which initializes and returns (normally) to BASIC, will initialize and return to the menu via the "File Check" statement. You must then exit the program to get at your utility program. Secondly, EXEC will "pend," as it was designed to do, until the program again calls the keyboard for input, at which time the EXEC will commence. The delay is disconcerting the first time you see it, and the "File Check" message in this case is also normal.

One warning: You may dislike the POKE 1012,0 statement in line 20. This causes the disk to reboot whenever RESET is hit, returning you to your HELLO program. In my case, all my disks include this menu program as the HELLO program. I like the "turnkey" feel of a disk containing many otherwise autonomous programs. The POKE may be deleted with no ill effects.

The POKE 216,0 in line 130 re-enables normal error messages before exiting the program.

Auto-Run-Wedge for the PET

Werner Kolbe, Hardstr. 77, CH 5432 Neuenhof, Switzerland

Recently I bought a CBM 3040 floppy disk. I do not have BASIC 4.0 because the ROMs do not fit into my old PET's hardware. Therefore, my first keystrokes after switching on are always the same:

```
LOAD"**,8
```

to load the DOS, support the "wedge" from disk and

```
RUN
```

I wanted to save some of the work — at least the RUN. I discovered the following trick from a program I had analyzed.

The machine code of the wedge consists of two parts: the first one is a jump instruction which is put into the CHR GET routine of PET's BASIC located at \$70. The second part loads into the high RAM memory (for example from \$7E52 to \$8000 for a 32K PET).

What you have to do is create a program file that starts loading at \$70 then makes a gap and continues to load into the upper part of the memory. The first part is easy. You open a program file and the first two bytes you write on it are the start address. In your case, this will be CHR\$(112) and CHR\$(0), which is \$0070. The following bytes that you print onto the file are the "program." You have to enter the jump instruction and continue with PET's standard zero page setup until you come to \$FB,FC, which is the "load pointer." By changing this pointer you get the necessary gap.

For example, if you put \$7D into \$FC, the following bytes will be loaded at the location \$7DFD and beyond it. Note that it is not possible to change the low part of the load pointer also. In a first attempt, I tried to put \$7E52 into it. PET crashed because after loading \$52 into \$FB the load was continued at \$0052, and \$FC remained unchanged.

Here is how it is done:

1. Step: Reset the PET, switch it off and on again.
2. Step: Load your wedge into PET and run it.

5 REM

A DISK MENU PROGRAM

BY DAVE OSHEL

```
10 D$ = CHR$(4)
20 PRINT D$"MONONICO": POKE 1012,0: DIM P$(15,2)
30 PG% = 1: SW% = 0: ONERR GOTO 80
40 TEXT : HOME : PRINT "DISK MENU    J001[    APRIL 27, 1981": PRINT
50 PRINT "PAGE "PG%: INVERSE : VTAB 23: HTAB 10: PRINT "RETURN FOR NEXT PAGE": NORMAL : VTAB 5
60 FOR I = 1 TO 14: IF I < 10 THEN PRINT " ";
70 READ P$(I,0): READ P$(I,1): PRINT I" - "P$(I,0): NEXT I: GOTO 90
80 SW% = 1
90 PRINT I" - EXIT THIS MENU": PG% = PG% + 1: PRINT
100 PRINT "WHICH, PLEASE? (1-"I": INPUT ") "; AN$: AN% = INT ( VAL ( AN$)): IF (AN% < 1 OR AN% > I) AND AN% < > "" THEN VTAB
    ( PEEK (37)): CALL - 868: GOTO 100
110 IF AN% = "" AND SW% = 1 THEN RESTORE : GOTO 30
120 IF AN% = "" THEN 40
130 IF AN% = I THEN VTAB 23: CALL - 958: POKE 216,0: END
140 ONERR GOTO 160
150 PRINT D$"RUN"P$(AN%,1)
160 ONERR GOTO 180
170 PRINT D$"BRUN"P$(AN%,1)
180 ONERR GOTO 200
190 PRINT D$"EXEC"P$(AN%,1)
200 PRINT : CALL - 958: PRINT "FILE CHECK => "P$(AN%,1): FOR I = 1 TO 2500: NEXT : RESTORE : GOTO 30
1000 REM ILLUSTRATIVE DUMMY          MENU
1010 DATA "EXAMPLE 1: PROGRAM NOT ON DISK", "CANTERBURY TALES"
1020 DATA "EXAMPLE 2: THIS PROGRAM", "DISK MENU PROGRAM"
1030 DATA "* EX 3: HOUSEKEEPING MEMOS FORMAT", ".PERIOD SUPPRESSED DOS"
```

3. Step: Type in the Shifter program, listing 1, run it and save it. (You may need it again if you make a mistake in one of the following steps).

4. Step: Jump into the resident monitor and enter the bytes listed in listing 2. Save them with the monitor for the same reason as above. (S'1:BYTES',08,056E,0642).

5. Step: Type in the Wedge-Saver program, listing 3, save it, put an empty formatted disk into drive 1 and run it.

Now your "wedge" is ready. Test it! Reset the PET, put the disk into drive 0 and enter LOAD "''",8. Then enter > \$, and see that it works. If it doesn't, repeat the steps above and check every byte carefully.

You might think this is a lot of work just to save a RUN, but if you have prepared your wedge file once, you may copy it on all your disks like any other program file.

In the Shifter and in the Saver there are several PEEKs and POKEs, which are necessary because of the various PETs' memory sizes and wedge versions. Now the whole process should work independently of that, and the wedge will load into the upper end automatically.

Listing 1: Shifter

```
10 A=PEEK(52)+256*PEEK(53)+1
15 B=PEEK(52)+6*256+1:C=(PEEK(53)+2)*256-A
20 FOR I=0 TO C:POKE(I+B),PEEK(I+A):NEXT
```

Listing 2: Enter with MLM

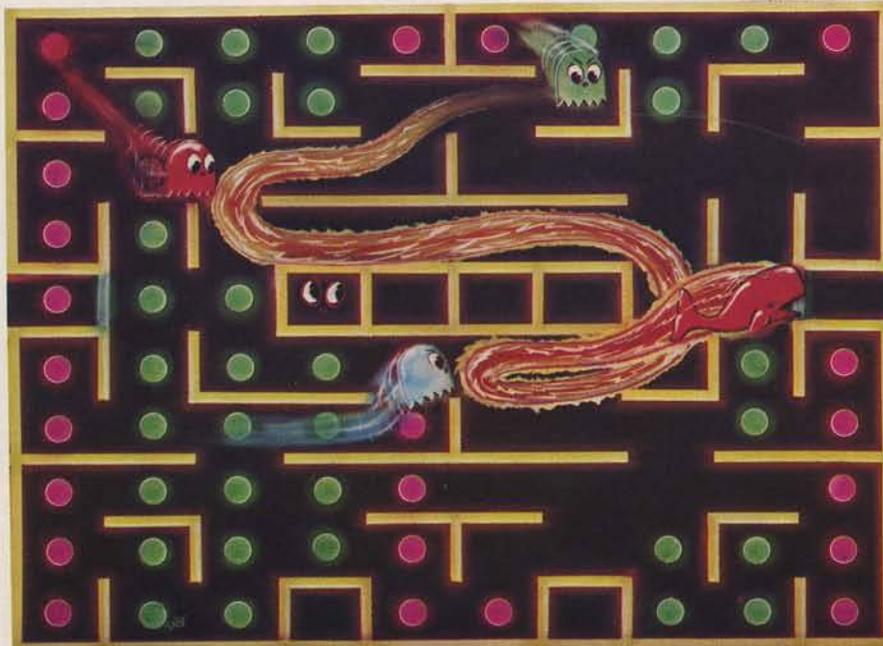
```
C* PC SR AC XR YR SP NV*BDIZC
.; C6FB 33 00 00 00 FE 00110011
.
.      0 1 2 3 4 5 6 7
.: 056E 70 00 4C FD 7D 02 E6 78
.: 0576 AD 09 02 C9 3A B0 0A C9
.: 057E 20 F0 EF 38 E9 30 38 E9
.: 0586 D0 60 80 4F C7 52 00 00
.: 058E 20 C1 2E E6 19 90 E0 96
.: 0596 00 1B 00 2A 01 FF 00 00
.: 059E 00 00 00 11 00 18 10 3F
.: 05A6 1B 01 03 20 00 00 27 00
.: 05AE 00 00 03 00 00 5E 00 00
.: 05B6 00 00 00 00 03 00 00 00
.: 05BE 00 00 00 00 00 00 C0 83
.: 05C6 11 00 84 AD AF 00 00 00
.: 05CE 00 00 00 01 0E 60 08 27
.: 05D6 00 00 18 43 01 02 00 00
.: 05DE 00 00 80 80 80 80 80 80
.: 05E6 80 81 81 81 81 81 81 82
.: 05EE 82 82 82 82 82 82 83 83
.: 05F6 83 83 83 00 00 FB 7D A2
.: 05FE 52 86 71 CA 86 34 E6 72
.: 0606 A5 72 85 35 A9 01 85 28
.: 060E A9 04 85 29 A9 00 A8 91
.: 0616 28 C8 91 28 A5 28 18 69
.: 061E 02 85 2A A5 29 69 00 85
.
.: 0626 2B A5 34 A4 35 85 30 84
.: 062E 31 A5 2A A4 2B 85 2C 84
.: 0636 2D 85 2E 84 2F 20 30 C7
.: 063E 6C 71 00 00 AA AA AA AA
```

Listing 3: Wedge-Saver

```
10 POKE43,8:POKE42,0:CLR:OPEN2,8,3,"1:WEDGE.P,W"
15 POKE1394,PEEK(53)-1:POKE1532,PEEK(53)-1
20 POKE1534,PEEK(52)+1
30 FOR I=1390 TO 2049:PRINT#2,CHR$(PEEK(I)):NEXT:CLOSE2
```

MICRO

SNACK ATTACK



Try one game and you're caught in its irresistible web of fun. More habit forming than peanuts. More fun than gorging on hot fudge sundaes. More exciting than anything like it.

SNACK ATTACK won't just a-maze you, it'll 3-maze you! Win the first level, and up pops a new, faster version, with a more intricate maze. And for more challenge there are doors you can enter and **they** can't. Doors they can dash thru and **you** can't.

SNACK ATTACK... by Dan Illowsky, the game that defies anyone to stop after just one game!

\$29.95, for Apple II*
At computer stores, or from:

DATAMOST
19273 Kenya St.
Northridge, CA 91326
(213) 366-7160

*Apple II is a trademark of Apple Computer, Inc.

VISA/MASTERCHARGE accepted. \$1.00 shipping/handling charge. (Calif. residents add 6% tax)

MICRO

Dealers

Dealer Update January, 1982

Presented here in zip-code order are those MICRO dealers who responded to our newsletter request for information concerning their dealership. Many have been MICRO dealers for quite some time while others are new. This service is provided to acquaint readers with these dealers and to encourage readers to visit dealers in their area. This listing is provided twice a year to update previous listings (see MICRO 35:51). This is not intended as a complete listing of MICRO dealers.

United States

New Jersey

The Computer Forum
80 Broad St.
Red Bank, New Jersey 07701
Contact: Steve Morse
201/530-9103
Services: Courses/Seminars
Hardware: Apple, Atari, CBM, PET
Software: Business, Personal,
Educational, Games

New York

The Computer Corner
200 Hamilton Ave.
White Plains, New York 10601
914/WHY-DATA
Services: Seminars, Service Dept.
Hardware: Apple
Software: Business, Personal,
Educational, Games, Other

Computer Microsystems
1196 Northern Blvd.
Manhasset, New York 11030
Contact: Andrei Rozwadowski
516/627-3640
Hardware: Apple, CBM, PET, Northstar, Micromation
Software: Business, Personal,
Educational, Games

Computer Shop
207 Boices Lane
Kingston, New York 12401
Contact: Clemens Haneke
914/336-8411
Hardware: Apple, Atari, Compustar,
Intertec
Software: Business, Personal,
Educational, Games

Computerland/Ithaca
225 Elmira Rd.
Ithaca, New York 14850
Contact: Ben Herrmann
607/277-4888
Services: User's Software Library
Hardware: Apple, IBM 8088, Xerox 280
Software: Business, Personal,
Educational, Games

Pennsylvania

Computer Store of Pittsburgh
612 Smithfield St.
Pittsburgh, Pennsylvania 15222
Contact: Art Vaughan
412/391-8050
Hardware: Apple, Atari, Northstar,
Zenith, Dynabyte, HP
Software: Business, Personal,
Educational, Games

The Computer Spot
On the Diamond
Ligonier, Pennsylvania 15658
Contact: Harold Newell
412/238-2381
Hardware: Apple
Software: Business, Personal,
Educational, Games

Computers Unlimited
2813 East Prospect Road
York, Pennsylvania 17402
Contact: Keith C. Kirn
717/755-1045
Hardware: Apple, CBM, PET
Software: Business, Personal,
Educational, Games

Maryland

The Computer Forum
569 Baltimore-Annapolis Blvd.
Severna Park, Maryland 21146
Contact: Virginia Stibolt
301/544-0909
Services: Education, Rental
Hardware: Atari, CBM, PET, Osborne
Software: Business, Personal,
Educational, Games (software support for Apple, TRS-80, Osborne)

Computers Unlimited
907 York Road
Towson, Maryland 21204
Contact: Phillip Lester
301/321-1553
Hardware: Apple, CBM, PET
Software: Business, Personal,
Educational, Games

Virginia

Community Computers
2704 N. Pershing Drive
Arlington, Virginia 22201
Contact: J. Michael Versace
703/527-4600
Hardware: OSI
Software: Business, Personal,
Educational, Games

North Carolina

Byte Shop
218 N. Elm St.
Greensboro, North Carolina 27401
Contact: Bob Terrell
919/275-2983
Services: Service Center for Apple,
Epson, Commodore
Hardware: Apple, Atari, PET,
Microtek, Epson, Mountain
Computer
Software: Business, Personal,
Educational, Games

Georgia

Atlanta Computer Mart
5091 Buford Highway
Atlanta, Georgia 30340
404/455-0647
Hardware: Apple, Atari, Northstar,
California Computer Systems, Ithaca
Intersystems
Software: Business, Personal,
Educational, Games

Florida

SEB Computers
1705 University Blvd. N.
Jacksonville, Florida 32211
Contact: Sam Bateh
904/743-7050
Services: Consulting
Hardware: Apple, Atari, CBM, PET
Software: Business, Personal,
Educational, Games, Custom
Programming

AI Personal Computers
178 Oxford Rd.
Fern Park, Florida 32730
Contact: Pete Bender
305/339-8914
Services: Atari Service Center
Hardware: Apple, Atari, CBM, VIC,
TRS-80, Eagle, Xerox
Software: Business, Personal,
Educational, Games

Computer Store
 2620 East Robinson Street
 Orlando, Florida 32803
 Contact: Jim Lewis
 305/894-8357
 Services: Custom Programming,
 Vocational Programming Classes
 Hardware: Apple, Atari, CBM,
 TRS-80, IBM, Vector Graphic
 Software: Business, Personal,
 Educational, Games, Scientific

Associated Information Systems
 825 Osceola Dr.
 Rockledge, Florida 32955
 Contact: David R. Hendricks
 305/632-1090
 Services: Computer Service Bureau
 Hardware: OSI, Epson, Amdex,
 Hazeltine, ATV, D.P. Supplies
 Software: Business, Personal,
 Educational, Games, Custom
 Programming

Michigan

Computer Center
 28251 Ford Rd.
 Garden City, Michigan 48135
 313/425-2470
 Hardware: Apple, Atari
 Software: Business, Personal,
 Educational, Games

New Dimensions In Computing Inc.
 541 E. Grand River Ave.
 E. Lansing, Michigan 48823
 Contact: Robert Gibbs
 Claus Buchholz
 517/337-2880
 Services: Repair
 Hardware: Atari, Vector Graphic Z80,
 Exidy Sorcerer Z80, Paper Tiger and
 Epson Printers
 Software: Business, Personal,
 Educational, Games, Books

Iowa

Cyberia Inc.
 2330 Lincoln Way
 Ames, Iowa 50010
 Contact: Dolores Keith-Taylor
 515/292-7634
 Services: Software Development,
 Service Department, Consultation
 Hardware: Apple, CBM, PET
 Software: Business, Personal,
 Educational, Games, Agricultural

Computerland
 3271 Armar Dr.
 Marion, Iowa 52302
 Contact: Frank Malone
 319/373-1241
 Services: Seminars, Training
 (in-store)

Hardware: Apple, Atari, CBM, Xerox,
 SAM, 8088, IBM Personal Computer,
 Vector Graphics
 Software: Business, Personal,
 Educational, Games

Wisconsin

Colotron Computer Division
 2111 Lathrop Ave.
 Racine, Wisconsin 53405
 Contact: Lance Evans
 414/637-2003
 Services: Custom Programming and
 Consulting
 Hardware: Apple, CBM, PET
 Software: Business, Personal,
 Educational, Games

Century Computer/Phone Concepts
 117 South 4th St.
 La Crosse, Wisconsin 54601
 Contact: Dan Saugstad
 608/785-2010
 Services: Custom Programming,
 Bulletin Board Service (1982)
 Hardware: Apple, Atari
 Software: Business, Personal,
 Educational, Games

(Continued on page 81)

COUNTY FAIR
 is COUNTY TERRIFIC

The only thing missing is cotton candy

You're on the midway, and here's a chance to show your skill. You pick up your rifle and bang away. Seems easy . . . but!

But, watch those ducks! They're sneaky as all get out. They'll gobble up your bullets and leave you with an empty gun and a low score. And don't miss the rabbits . . . they multiply like crazy.

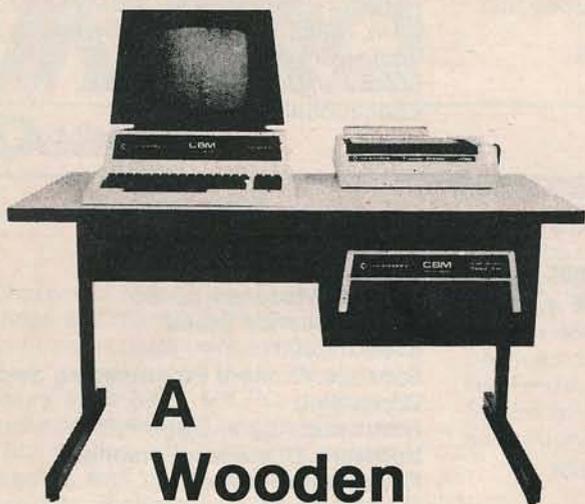
Come on, join the crowd . . . with enjoyable, fascinating graphics the whole family will love.

County Fair by Dan Illowsky For Apple II*.
 Just \$29.95 at computer stores, or:

DATAMOST
 19273 Kenya St.
 Northridge, Ca 91326
 (213) 366-7160

VISA/MASTERCHARGE accepted.
 \$1.00 shipping/handling charge.
 (California residents add 6% tax)

* Apple II is a trademark of Apple Computer, Inc.



A Wooden Computer?

Not from Commodore!

So why should the desk look like wood? A pleasant cream and charcoal trimmed desk looks so much better with Commodore systems. One look and you'll see. Interlink desks are right. By design.

The specifications only confirm the obvious:

- Cream and charcoal color beautifully matches the Commodore hardware and blends with your decor.
- An ideal 710 mm (28") keyboard height yet no bumping knees because a clever cutout recesses the computer into the desk-top.
- High pressure laminate on both sides of a solid core for lasting beauty and strength.
- Electrostatically applied baked enamel finish on welded steel legs—no cheap lacquer job here.
- T-molding and rounded corners make a handsome finish on a durable edge that won't chip.
- Knocked down for safe, inexpensive shipment.
- Patented slip joints for quick easy assembly.
- Leveling glides for uneven floors.
- Room enough for a Commodore printer on the desk, yet fits into nearly any den or office niche—H: 660 mm (26") W: 1170 mm (46") D: 660 mm (26").
- Matching printer stand available with slot for bottom feeding.

PRICE: \$299

In short, as Commodore dealers, we won't settle for anything that looks good only in the catalog! Our customers won't let us. They don't buy pictures. And neither should you. This is why **we will let you use one of our desks for a week** and then decide. If for any reason you don't like it, just return it in good condition for a cheerful refund.

If your Commodore dealer doesn't carry our desks yet, send a check for \$299 and we will ship your desk freight paid!

Name _____

Address _____

City _____ St _____ Zip _____

Interlink, Inc., Box 134, Berrien Springs, MI 49103
Master Charge and Visa welcome. Call our order line:
616-473-3103

Wizard-16K™

16K RAM APPLE MEMORY CARD

Unleashes your Apple II* and Apple II Plus* computer.

ON TO MAXIMUM MEMORY

Wizard-16K gives your 48K Apple II or Apple II Plus the last bit of directly accessible add-on memory it can accept. And, it interfaces with all Z80** cards to give you CP/M***

- Fully compatible with Apple II and Apple II Plus
- Adds 16K bytes of Random Access Memory (RAM)
- Fully compatible with Z80 microprocessor cards for CP/M
- Used with Z80 card, it turns your Apple II into a two-microprocessor system with 56K of usable memory
- With a Z80 card, it lets you run BASIC-80****

- COBOL-80****
- FORTRAN-80****; BASIC Compiler****; and Assembly Language Development System****, plus Applesoft BASIC*, Integer BASIC*, Apple Pascal System*, Apple FORTRAN* and Apple Pilot*
- Utilizes Apple DOS 3.3* 16-sector system to permit loading both Applesoft* and Integer BASIC*
- Compatible with VisiCalc*****
- Offers all features of Apple Language Card* (except Autostart RAM)
- LED indicators show which banks and functions are selected (deselected)

 **WESPER MICRO
Systems**

SUBSIDIARY OF WESPERCORP

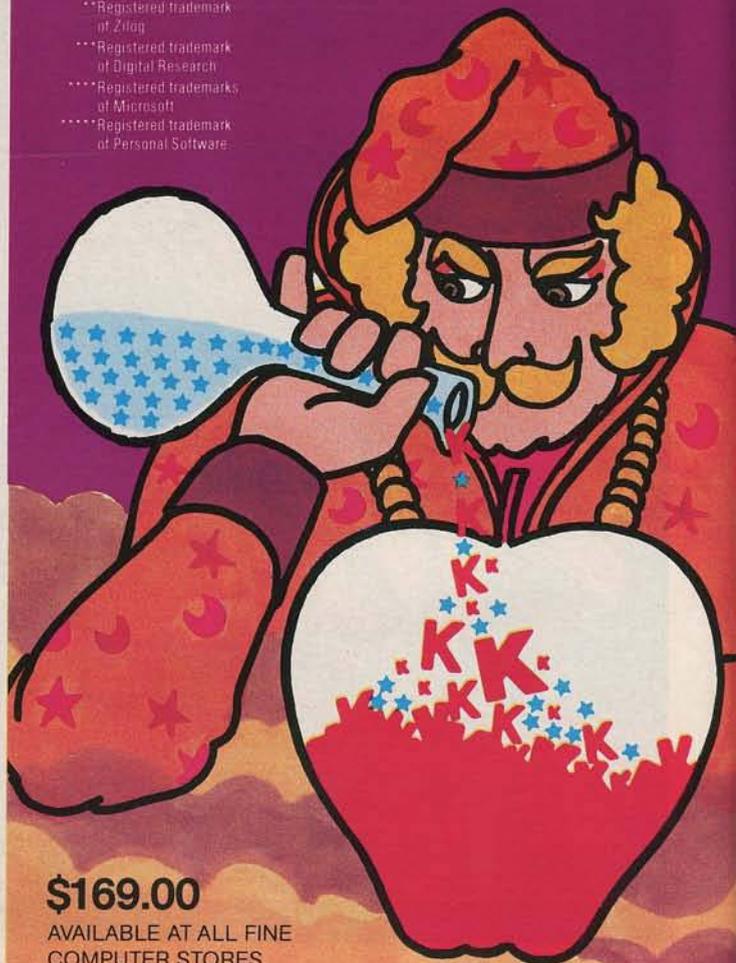
*Registered trademarks of Apple Computer Inc.

**Registered trademark of Zilog

***Registered trademark of Digital Research

****Registered trademarks of Microsoft

*****Registered trademark of Personal Software



\$169.00

AVAILABLE AT ALL FINE
COMPUTER STORES

Minnesota

Digital Designs
829 3rd Ave. S.E. #265
Rochester, Minnesota 55901
Contact: Steve Surprenant
507/282-3222
Hardware: OSI, Altos (Z80)
Software: Business, Personal, Word
Processing, FARM Accounting

Illinois

DigitalWorld
711 Army Trail Road
Addison, Illinois 60101
312/628-9222
Services: Training, Service
Hardware: Atari, CBM, PET, Xerox,
Zenith, NEC
Software: Business, Personal,
Educational, Games

Oak Brook Computer Centre
17 W. 426 22nd Street
Oakbrook Terrace, Illinois 60181
Contact: Bill Colsher
312/941-9005
Hardware: Apple, Atari
Software: BPI, Personal Software,
PFS, etc., (largely business oriented)

Data Domain of Schaumburg
1612 E. Algonquin Rd.
Schaumburg, Illinois 60195
312/397-8700
Services: Business Seminars,
Service Dept.
Hardware: Apple, Archives, Alpha
Micro, Hewlett-Packard Calculators
Software: Business, Personal,
Educational, Games, Large Selec-
tion of Books and Magazines

Farnsworth Computer Center
1891 N. Farnsworth Ave.
Aurora, Illinois 60505
Contact: Eleanor Snyder
312/851-3888
Hardware: Apple, Hewlett-Packard
Software: Business, Personal,
Educational, Games

The Computer Store of Rockford
3515 Auburn Street
Rockford, Illinois 61103
815/962-7580
Hardware: Apple, Cromemco, Data
General, Northstar
Software: Business, Personal,
Educational, Games

Missouri

Computer Mart
1904 E. Meadowmere
Springfield, Missouri 65804
Contact: Rob Lurvey
417/862-6500
Services: Consulting
Hardware: Apple, IMS International
Software: Business, Personal,
Educational, Games

Kansas

Personal Computer Center
3819 W. 95th Street
Overland Park, Kansas 66206
Contact: Charles Meyers
913/649-5941
Services: Repair Department,
Seminars and Training
Hardware: Apple, CBM
Software: Business, Personal,
Educational, Games

Mr. Computer
1424 Industrial-Emporia W. Plaza
Emporia, Kansas 66801
Contact: Bill or Sue
316/342-4893
Services: Apple and Atari Service
Center, Classes and Seminars
Hardware: Apple, Atari
Software: Business, Personal,
Educational, Games

Amateur Radio Equipment Co.
1203 E. Douglas
Wichita, Kansas 67211
Contact: Alden Lansdowne
316/264-9166
Services: Amateur, Experimenter
Software: Business, Personal,
Educational, Games

Nebraska

MicroAge® Computer Store
4217 South 84th St.
Omaha, Nebraska 68127
Contact: Dennis Hendrickson
402/339-7441
Services: Consulting
Hardware: Apple, Atari, CBM, Altos,
Northstar, Archives
Software: Business, Personal,
Educational, Games

Arkansas

Computers Etc.
7624 Baseline Rd.
Little Rock, Arkansas 72209
Contact Jerry or Sherry Baldwin
501/562-3200
Hardware: Apple, Z-80 NEC
Software: Business, Personal,
Educational, Games, Utility

Texas

Computer Concepts
4699 Calder
Beaumont, Texas 77707
Contact Ed or May Culotta
713/892-3992
Hardware: Apple, Epson Printer
Software: Business, Personal,
Educational, Games

Computer 'n Things
2825 Hancock Dr.
Austin, Texas 78731
Contact: Gary Bellamy
512/453-5970
Hardware: Apple, NEC, Cromemco
Software: Business, Personal,
Educational, Games

Arizona

Personal Computer Place
1840 W. Southern
Mesa, Arizona 85202
Contact: Roger L. Smith
602/833-8949
Services: Disk Drive Repairs, Pro-
gram EPROMs
Hardware: Apple, CBM, PET,
Southwest Technical Products
Software: Business, Personal,
Educational, Games

Nevada

JBA Computers
3111 S. Valley View Ste I-101
Las Vegas, Nevada 89102
Contact: W. Street
702/871-2999
Services: Repair and Maintenance,
Contracts, Custom Programming,
Circuit Design, Consulting
Hardware: Atari, OSI
Software: Business, Personal,
Educational, Games

California

Main-Line Computers
1844 14th Street
Santa Monica, California 90404
Contact: W. Niles
213/450-9924
Hardware: Apple, Atari, OSI
Software: Business, Personal,
Educational, Games

Computer Forum
14052 E. Firestone Blvd.
Santa Fe Springs, California 90670
Contact: Dave Hayhurst
213/921-2111
Services: Classes, Service Depart-
ment, Custom Programming
Hardware: Apple, SYM
Software: Business, Personal,
Educational, Games

(Continued)

A NEW
STAR ON THE
HORIZON

SpeedStar

The Applesoft Compiler
from Southwestern Data Systems

SpeedStar dramatically increases the operating speed of your Applesoft programs. It works simply, quickly and automatically — and it offers these important features:

- Compiles at approximately 1200 lines per minute — many times faster than most other Apple compilers since the disk is not accessed during compilation
- Full support for DOS commands, Error Messages, and Graphics
- Special "Compile to Disk" mode allows compilation of programs too large to be done in memory
- Unique selective chaining option allows you to pass just the variables you want to subsequent programs. Because SpeedStar converts Applesoft programs to binary files, you can also have any number of programs in memory at once. Compiled programs can also be used via CALLs as subroutines in ordinary Applesoft programs.
- Unlimited user back-up copies

GET MORE THAN YOU PAY FOR

When you buy SpeedStar from SDS, you get more than just a great Apple compiler — you get a team of utility software specialists ready to help you solve your software problems. The SDS name is your assurance of quality and service — before and after the sale.

Each SpeedStar package includes a program diskette with complete documentation enclosed in an attractive padded notebook. Each manual is fully indexed with tab dividers for quick and easy reference. Easy-to-follow examples will make you a SpeedStar pro in no time.

REQUIREMENTS

A 48K Apple II with Applesoft in ROM or equivalent. Please specify DOS 3.2 or 3.3.

\$134.95

SpeedStar is at your local dealer NOW. If he's out of stock, have him give us a call and we'll ship your copy the same day.

SpeedStar . . . ask for it by name.

SDS
southwestern
data systems

*Apple II and Applesoft Basic are trademarks of Apple Computer, Inc.

P.O. Box 582-M, Santee, CA 92071 • 714-562-3670

SOUTHEASTERN MICRO SYSTEMS

1080 IRIS DRIVE
 CONYERS, GEORGIA 30207
 404-922-1620

ST-02 VIDEO BOARD

SCREEN FORMAT

- * ST-02 HAS FOUR SCREEN FORMATS SWITCH SELECTABLE:
 - 16 x 32
 - 16 x 64
 - 20 x 80
 - 24 x 80

CHARACTER FORMAT

- * ST-02 HAS TWO CHARACTER GENERATORS:
 - MC6674 5x7 Matrix
 - 2716 User Programmable 5x7 Matrix
- * CHARACTER GENERATORS ARE SWITCH SELECTABLE ON RESET OR MAY BE CHANGED UNDER SOFTWARE CONTROL.

IO INPUT/OUTPUT

- * KEYBOARD INPUT IS 7 OR 8 BIT ASCII ENCODED WITH ACTIVE LOW STROBE.
- * TERMINAL IS STANDARD RS-232.
- * SELECTABLE BAUD RATES OF 300, 600, 1200, 2400, 4800, 9600.
- * PRINTER OUTPUT IS PARALLEL 7 OR 8 BIT WITH ACK. THIS PORT MAY BE USED AS SERIAL TO PARALLEL CONVERTER OR MAY BE USED IN SCREEN PRINT FUNCTION.

US SHIPPING \$3.50, FOREIGN ADD 10%
 (US FUNDS ONLY)

* THE ST-02 IS A STAND ALONE VIDEO CONTROLLER UTILIZING THE 6802 CPU AND 6845 VIDEO CONTROLLER.

- * THE SIZE OF THE BOARD IS 7 1/4" x 8 1/4".
- * POWER SUPPLY REQUIREMENTS:
 - 3 amps @ +5 vdc
 - 100 ma. @ +12 vdc
 - 100 ma. @ -12 vdc
- * VIDEO OUTPUT IS COMPOSITE VIDEO

CONTROL CHARACTERS

- | | |
|--------------------------|------------------------------|
| CTL J - LINE FEED | CTL L - FORWARD SPACE CURSOR |
| CTL Z - CLEAR SCREEN | CTL M - CARRIAGE RETURN |
| CTL K - UPLINE | CTL N - KEYBOARD UNLOCK |
| CTL G - BELL | CTL O - KEYBOARD LOCK |
| CTL H - BACKSPACE CURSOR | CTL A - HOME CURSOR |

ESCAPE COMMANDS

- | | |
|-------------------------|---------------------------------|
| SEND CURSOR LOCATION | DEACTIVATE PRINTER |
| CURSOR POSITION REQUEST | PRINT SCREEN |
| INVERSE VIDEO | ACTIVATE CRT & PRINTER |
| ACTIVATE PRINTER | SWITCH CHARACTER GENERATOR ROMS |

THESE ARE ONLY A FEW!!!

CURSOR FORMAT

- | | |
|------------------|--------------------|
| BLOCK CURSOR | UNDERLINE CURSOR |
| NON-BLINK CURSOR | BLINKING CURSOR |
| BLINKING BLOCK | BLINKING UNDERLINE |

Assembled
 \$325.00

Kit
 \$275.00

Char. Gen. 2716 Eprom
 \$15.00

Bare Board
 With Monitor EPROM
 \$100.00

Bare Board
 \$75.00

Master Charge, Visa, American Express Accepted

NIKROM TECHNICAL PRODUCTS PRESENTS A DIAGNOSTIC PACKAGE FOR THE APPLE II AND APPLE II + COMPUTER. "THE BRAIN SURGEON"

Apple Computer Co. has provided you with the best equipment available to date. The Diagnostic's Package was designed to check every major area of your computer, detect errors, and report any malfunctions. **The Brain Surgeon** will put your system through exhaustive, thorough procedures, testing and reporting all findings.

The Tests Include:

- | | |
|--|---|
| <ul style="list-style-type: none"> • MOTHERBOARD ROM TEST • APPLESOFT ROM CARD TEST • INTEGER ROM CARD TEST • MOTHERBOARD RAM TESTS • DISK DRIVE SPEED CALIBRATION • DISK DRIVE MAINTENANCE • DC HAYES MICROMODEM II TEST (HARDWARE & EPROM) • MONITOR & MODULATOR ROUTINES • MONITOR SKEWING TESTS • MONITOR TEST PATTERN • MONITOR TEXT PAGE TEST | <ul style="list-style-type: none"> • MONITOR & TV YOKE ALIGNMENT • LO-RES COLOR TESTS • HI-RES COLOR TESTS • RANDOM HI-RES GENERATOR • SPEAKER FUNCTION TESTS • SQUARE WAVE MODULATION • PADDLE & SPEAKER TEST • PADDLE & BUTTON TEST • PADDLE STABILITY • INTERNAL MAINTENANCE • GENERAL MAINTENANCE • ON BOARD "HELP" |
|--|---|

NEW!

The Brain Surgeon allows you to be confident of your system. This is as critical as the operating system itself. You must depend on your computer 100% of it's running time. **The Brain Surgeon** will monitor and help maintain absolute peak performance.

Supplied on diskette with complete documentation and maintenance guide.

PRICE: \$49.95
 REQUIRES: 48K, FP in ROM
 1 Disk Drive, DOS 3.2 or 3.3

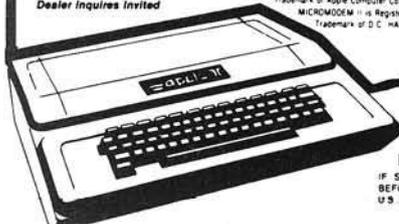
Nikrom Technical Products
 25 PROSPECT STREET • LEOMINSTER, MA 01453

Call Toll-Free Now!

Master Charge & VISA users call: 1-800-835-2246
 Kansas Residents call: 1-800-362-2421

Dealer Inquiries Invited

APPLE is Registered
 Trademark of Apple Computer Co.
 MICROMODEM II is Registered
 Trademark of D.C. HAYES



DISKETTE UPDATE

IF SERIAL NUMBER IS BELOW 20000 OR DATED BEFORE 2/15/81, THEN RETURN DISKETTE PLUS \$7.00
 U.S. \$9.00 FOREIGN

L I S P

for the Apple II

Special Introductory Price to end January 31, 1982

Pegasys Systems, Inc. has been marketing its version of P-LISP since May, 1981 at the introductory price of **\$99.95**. On February 1, 1982, we must increase this price to **\$199.95**. You have this final opportunity to order the latest floating point HI-RES graphics version of P-LISP at the old price (Please specify DOS version).

Our version of P-LISP has been acknowledged as the finest and most complete available for Apple micro-computers, and, with the addition of floating point math and HI-RES graphics, it becomes an indispensable tool for educators, scientists, business executives, mathematicians, or applications requiring artificial intelligence. Included is a ninety page user's manual which will aid you in creating your P-LISP programs. This manual is also available separately for **\$20.00**, which is fully refundable on purchase of the program.

P-LISP will run on a 32K or larger APPLE II/II+, and will take advantage of ALL available memory. Supplied with the interpreter are several sample programs including a complete ELIZA.

For those of you who do not fully understand P-LISP, we have available The P-LISP Tutorial for **\$25.00**. This expertly written text is bound in a handsome binder and is packaged to include a disk, containing all the sample programs referenced in the text at no extra charge.



Applesoft in ROM or a language card is needed for floating point math

gnosis

formerly Pegasys Systems, Inc.

4005 Chestnut Street—Philadelphia, PA 19104
 Orders Only: 800-523-0725—Penna. Residents: 215-387-1500
 Pennsylvania residents add 6% sales tax. Apple is a trademark of Apple Computer, Inc.

Pascal Tutorial

Part 3

Victor R. Fricke
325 Ramapo Valley Road
Mahwah, New Jersey 07430

In the previous articles in this series we concentrated on the use of the Apple Pascal operating system software, more than on Pascal itself. This article concentrates on the Pascal language and gives examples of why I think it is easier to program in Pascal than in BASIC. We will discuss disk I/O operations, and compare BASIC control structures, such as IF and GOSUB, to their Pascal equivalents.

One of the Pascal structured data types is the file, a sequence of records. The usual analogy is a file cabinet, which is a sequential collection of folders, each one containing a record. In each folder there may be several different pieces of paper, but they are all related to each other in some way. Each piece of paper is an element of the record, and it can contain several data fields.

For example, a medium-sized business could have its "PERSONNEL" file in one cabinet. Each employee is represented by a folder containing his record. For each record folder, there might be a personal data card, a W-4 form, and a work log.

Each of these "elements" of the record can contain several data fields. The personal data card, for example, would have name, address, home phone, department, date hired, current pay rate, etc.

Just as the accountant does not have enough space on his desk for all this information at once, so also the computer does not have enough central memory for its files. In both cases, the answer is to keep the file in external storage, and to process one record at a time. Disk I/O is the process of selecting one record at a time and bringing it into central memory from the external storage medium for processing.

Pascal files are sequential. Each record is stored in sequence, and retrieved in the same sequence. In this way, Pascal files are like tape files: a new record can only be added at the end of the file.

There is another resemblance to tape files. A Pascal file can only be in one mode at a time; either it is in a read mode, or a write mode — never both at the same time. This, of course, is also the restriction on BASIC disk files.

Creating a File

Following our analogy a little further, suppose our hypothetical accountant were establishing the personnel file for the first time at a new business. Part of his job is to define the internal structure of the file; i.e., what data will be in each person's file. Each record can be as simple or complex as necessary. However, each record will have the same format. In Pascal, the TYPE declaration is used for this purpose.

Figure 1

```
TYPE
  DATE=
    RECORD
      DAY      : 1..31;
      MONTH    : PACKED ARRAY [1..3] OF CHAR;
      YEAR     : 0..99
    END; (* DATE *)

  PERSONALDATA=
    RECORD
      LASTNAME  : PACKED ARRAY [1..15] OF CHAR;
      FIRSTNAME : PACKED ARRAY [1..12] OF CHAR;
      EMPLOYEENO : INTEGER;
      DEPARTMENT : INTEGER;
      HOMEPHONE : PACKED ARRAY [1..10] OF CHAR;
      STREETAD  : PACKED ARRAY [1..12] OF CHAR;
      ZIP       : INTEGER;
      DATEHIRED : DATE;
      PAYRATE   : REAL
    END; (* PERSONALDATA *)

  W4=
    RECORD
      MARRIED      : BOOLEAN;
      DEPENDENTS  : INTEGER;
      EXTRAWH     : REAL
    END; (* W4 *)

  PERSON=
    RECORD
      DATA      : PERSONALDATA;
      WITHHOLD   : W4
      REGHOURS   : ARRAY [1..52] OF REAL;
      OTHOURS    : ARRAY [1..52] OF REAL
    END (* PERSON *)

VAR
  WORKER : FILE OF PERSON
```

Using our personnel file example, the hypothetical accountant might make the Pascal declarations in figure 1.

This results in a file called WORKER, composed of a fairly complex structure of nested records. The beauty of Pascal is that you don't need to worry about memory allocation or how the data is packed into disk files. Pascal takes care of all that automatically.

There can be many more records in a file than can fit into available memory. Fortunately, Pascal deals with a file one record at a time. The way the system deals with an external file is to set up something called a "file buffer variable." This variable serves as a window to peer into the file and examine one record at a time. For this reason, the file buffer variable is frequently referred to as a "window variable."

For a file called WORKER, the file buffer variable is referred to as WORKER^. Each of its components can be individually referred to; for example WORKER^.DATA.LAST-NAME, or WORKER^.WITHHOLD.MARRIED.

After the file is defined, it is opened for writing by the REWRITE statement. We can select the same file name or a different one for the disk directory. For clarity, we will call it DISKFILE. To create the file, we use

```
REWRITE(WORKER,'DISKFILE')
```

I like to think of the REWRITE statement as analogous to erasing and rewinding a tape. It does the following:

1. Allocates variable storage space in memory for the defined data structure of the WORKER file.
2. Sets up the file buffer variable WORKER ^
3. Places the file name DISKFILE temporarily on the disk directory.
4. Sets the file position pointer to 0 (first record in file).
5. Sets EOF to true (the beginning of the file is also the end of the file if no records exist yet).

EOF is a predefined procedure which returns a Boolean value of TRUE when the file position pointer is at or beyond the end of the file, and FALSE when it is at a record before the end of the file.

The directory entry for the file is only temporary; it will be removed from the directory if the program terminates without executing a

```
CLOSE(WORKER,LOCK)
```

statement. This statement instructs the system to make the temporary diskfile permanent.

Putting Data Into a File

Once your program has established values for the various elements in WORKER ^, you can write the resulting record to the file by using

```
PUT(WORKER)
```

This statement puts the record into the file buffer area of memory and then advances the file position pointer to the start of the next record. Depending on size, it may also cause the system to write the buffer block onto the disk. It doesn't always happen with each PUT, because the block size is always 512 bytes, but the record can be any size.

Reading From a File

To extract data from a file, you have to open it for reading. The RESET statement does this. For our example, it would be

```
RESET(WORKER,'DISKFILE')
```

If you think of the tape analogy, this statement is like rewinding the tape and reading the first record into the window variable. If you RESET a file that is already open, you will make the window variable have the values associated with the first record in the file. In a way, this is like

```
10 RESTORE  
20 READ
```

in BASIC.

EOF is left with the value of FALSE by a RESET. Once the file is RESET, to read subsequent records use the GET statement. GET(WORKER) reads the record at the current file pointer location and then advances the file position pointer.

Updating a File

In any file that requires sequential access as described in this article, it would be awkward to update any record if the sequential access were strictly observed. You would have to read and write back all the records before the

one you wanted to update. It would be far more convenient to go directly to the record you want, and write its new value.

The SEEK statement allows you to do this. Each record has a sequence number associated with it (the first record is number 0). By doing a SEEK and then a PUT, you can update a record.

The SEEK statement looks like this:

```
SEEK(WORKER,57)
```

This statement advances the file position pointer so that it is at the beginning of the 58th record (record 57). The next GET or PUT will then operate on the desired record.

Closing a File

After you finish reading or writing records in the file, one or more records may remain in the file buffer. The directory entry of the file name is temporary.

To preserve the data in the file buffer and to deallocate the file buffer, it is necessary to close the file before the program terminates. This is done by using the

```
CLOSE(WORKER,LOCK)
```

statement.

Of course, you may not want to save the data that you have placed in the disk file. In this case,

```
CLOSE(WORKER,PURGE)
```

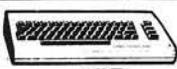
will delete the temporary directory entry created by the REWRITE(WORKER,'DISKFILE') statement. Since the directory no longer contains the file name 'DISKFILE', it considers the space formerly occupied by the temporary file as < UNUSED >.

IORESULT

In many applications, it would be a good idea to test for errors when a disk I/O operation is attempted. The disk could be bad, the wrong volume might be on line, or the file you want to update may not yet exist.

BASIC provides the ON ERR GOTO statement so that you can recover from an error without an abnormal termination of the program operation. Pascal provides a similar capability with the predefined IORESULT function.

VIGIL



VIC



PET

Exciting, new games interactive language.

- Easy to learn with 60+ powerful commands
- Double density graphics, large number display
- LOADING and SAVING of VIGIL programs to cassette or diskette
- Nine complete programs included - Breakout, SpaceWar, Ant/Aircraft, U.F.O., SpaceBattle, Concentration, Maze, Kaleidoscope & FortuneTeller.
- Comprehensive 50+ page manual
- For OLD, NEW or 4.0 ROMS with 8K of memory

	U.S. & CANADA	FOREIGN
VIGIL for PET/CBM on cassette or diskette w/9 programs.....	\$35	\$40
VIGIL for VIC on cassette (requires 3K memory expander).....	\$35	\$40
VIGIL User's Manual (refundable with software order).....	\$10	\$12
VIGIL Interpreter Listing (6502 Assembler Language).....	\$25	\$30

PET & APPLE II USERS TINY PASCAL

Structured language alternative to BASIC for PET or APPLE II includes:

- LINE EDITOR - creates, modifies and maintains source language.
- COMPILER - converts your source to an executable P-code format.
- INTERPRETER - executes compiled P-code. Features built-in TRACE.
- CASE-OF, WHILE-DO, IF-THEN-ELSE, REPEAT-UNTIL, FOR-TO/DOWNTO, PROC, FUNC
- Graphics version has more: GRAPHICS, PLOT, POINT, TEXT, LINEY, ABS, SQR, APPLE II has lores & hires-COLOR, HGRAPHICS, HCOLOR, HPILOT, PDL and TONE



	U.S. & CANADA	FOREIGN
TINY Pascal PLUS+ GRAPHICS PET 32K NEW/4.0 ROMS diskette.....	\$50	\$60
TINY Pascal PLUS+ GRAPHICS PET 32K NEW/4.0 ROMS cassette.....	\$55	\$65
TINY Pascal PLUS+ GRAPHICS APPLE II 48K and DOS 3.2/3.3.....	\$50	\$60
TINY Pascal NON-GRAPHICS PET 16K/32K NEW/4.0 ROMS diskette.....	\$35	\$45
TINY Pascal NON-GRAPHICS PET 16K/32K NEW/4.0 ROMS cassette.....	\$40	\$50
TINY Pascal NON-GRAPHICS APPLE II 32K/48K and DOS 3.2/3.3.....	\$35	\$45
TINY Pascal User's Manual (refundable with software order).....	\$10	\$12
TINY Pascal 6502 Interpreter Listing-GRAPHICS version.....	\$25	\$30
TINY Pascal 6502 Interpreter Listing-NON-GRAPHICS version.....	\$15	\$20

Plus+ GRAPHICS



TINY BASIC COMPILER - PET

A true compiler that turns your BASIC program into fast machine code

- Subset of PET BASIC compiles to 6502 machine code.
- Has full floating point capabilities and functions.
- Compiler listing optional with 16K version (included).
- Can load compiled machine code anywhere in memory.

	U.S. & CANADA	FOREIGN
TINY Basic Compiler-OLD/NEW/4.0 ROMS min. 8K-cassette/diskette.....	\$25	\$30
TINY Basic User's Manual (refundable with software order).....	\$10	\$12

PET MACHINE LANGUAGE GUIDE

Now in its ninth printing. Learn the hidden talents of your OLD, NEW or 4.0 ROM PET/CBM with the easy to follow manual. Details 30 of the PET's built-in routines.

	U.S. & CANADA	FOREIGN
PET MACHINE LANGUAGE GUIDE for OLD, NEW or 4.0 ROMS.....	\$9	\$11



ABACUS SOFTWARE

P. O. Box 7211

Grand Rapids, Michigan 49510

816 / 241-5510



Prices include postage.

Orders must be prepaid via check, money order or bank card. Foreign orders may be paid for via international money order or bank card: (Access, Eurocard, Barclaycard)



A STATISTICAL ANALYSIS AND FILE MAINTENANCE SYSTEM FOR THE APPLE II™ MICROCOMPUTER

As a Subset Language of P-STAT™ 78...
A-STAT™ 79 computes:

- FREQUENCIES
- BI-VARIATE TABLES - CHI SQUARES
- CORRELATION MATRICES
- MULTIPLE REGRESSION
- RESIDUALS
- APPLE PLOT INTERFACE
- APPLE FILE CABINET INTERFACE
- FILE SORT
- AGGREGATION
- REPORT WRITING
- COMPLETE TRANSFORMATION LANGUAGE
- READS VISICALC FILES

A-STAT™ 79

Uses Standard DOS Text File and EXEC's 48K Version — All programs in Applesoft™

A-STAT™ 79 is available from:

ROSEN GRANDON ASSOCIATES
7807 Whittier Street
Tampa, Florida 33617
(813) 985-4911

A-STAT™ 79 on disk with 80-page manual... \$145.00

Apple II™ is a trademark of the Apple Computer Inc.
P-STAT™ 78 is a trademark of P-STAT Inc., Princeton, N.J.
A-STAT™ 79 is copyrighted by Gary M. Grandon, Ph.D.

EXCEL-9

The Ultimate 6809 Board for Apple



- EXCEL-9 FLEX, a famous DOS, Assembler and Editor included.
- Also able to use Apple DOS.
- 8KB versatile monitor contains 35 commands including 6809.
- Can handle all Apple slot I/O routine from EXCEL-9.
- On-board programmable timer for both 6809 and 6502 systems allows printer spooling, multitask, etc.
- 50 page well documented manual.
- 64K RAM area expandable for multi-MPU operation.
- Able to switch MPU from 6809 to 6502 and vice versa in both machine code routine and BASIC.
- TSC 6809 BASIC, EXTENDED BASIC, PRECOMPILER, SOFT/MERG, etc., are coming soon.

Ask your nearest dealer or

ESD LABS CO., LTD.

c/o AbCom

P.O. Box 5203

Mission Hills, CA 91345

Dealer Inquiries are Invited.

Introductory Price: **\$399.95** for Board & FLEX diskette
(Sales tax not included)

- FLEX is a trade mark of Technical Systems Consultants, Inc.

To use IORESULT, you have to turn off the I/O error checking by using the compiler directive (*\$I-*) first; otherwise, the program will terminate before you can check the value returned by IORESULT.

IORESULT returns an integer value from 0 to 14, as listed in table 2 of Appendix B in the Apple Pascal Language Manual. If the value is 0, there is no I/O error. For the other codes, you may want to define some error recovery procedures, and perhaps use a CASE statement to invoke them.

Putting It All Together

Now that we have covered the highlights of Pascal disk I/O, it will be instructive to look at an example. Listing 1 creates and updates a simplified personnel file. The file structure has been simplified from our previous examples to keep the program short.

There are similarities and differences between Pascal and BASIC. The similarities should make it easy for anyone who knows BASIC to learn Pascal quickly. The differences are what allows you to write better programs more quickly in Pascal.

Variables

In many versions of BASIC, a variable name can only be one letter, or a letter and a digit. Applesoft is slightly better because you can use a variable name of almost any length. Unfortunately, however, only the first two characters count. That is, SUNDOWN, SUDS, and SU are all the same variable in Applesoft.

In Pascal, variable names can also be quite lengthy, but Pascal variables are distinguished by the first eight characters. So the examples given in the previous paragraph would be distinct in Pascal. This allows you to use identifiers that have a better mnemonic relationship to the quantity represented by the variable.

As an example, it is much easier to remember the meanings of INTRATE, INTEREST, and INVOICE than of I, I2, and I4.

In BASIC there are a limited number of variable types; integer (A%), real (A), and string (A\$). These variable types are implicitly defined by the suffix character on the variable name.

Listing 1

```

PROGRAM PERSONNEL(WORKER);

TYPE
  PERSON=
    RECORD
      LASTNAME      :STRING[15];
      EMPLOYEEENO   :INTEGER;
      MARRIED       :BCOLEAN;
      DEPENDENTS    :INTEGER;
      PAYRATE       :REAL
    END; (* PERSON RECORD *)

VAR
  WORKER           :FILE OF PERSON;
  FILENAME        :STRING;
  NUMBER,
  RUGRATS,
  RECNO           :INTEGER;
  NAME            :STRING[15];
  STATUS          :BOOLEAN;
  RATE            :REAL;

PROCEDURE SHOWENDRECNO;          (* INDICATE LOCATION OF EOF *)
BEGIN
  RECNO := 0;
  RESET(WORKER);
  WHILE NOT EOF(WORKER) DO
    BEGIN
      GET(WORKER);
      RECNO := RECNO + 1;
    END; (* WHILE *)
  WRITELN('EOF IS ',RECNO);
END;

PROCEDURE EMPTY;                (* CLEAR RESIDUAL JUNK *)
BEGIN
  WITH WORKER^ DC
  BEGIN
    LASTNAME := '                ';(* 15 BLANKS *)
    EMPLOYEEENO := 0;
    MARRIED := FALSE;
    DEPENDENTS := 0;
    PAYRATE := 0.0;
  END;
END;

PROCEDURE NAMEIT;
BEGIN
  WRITE('LAST NAME      :');
  READLN(NAME);
  WORKER^.LASTNAME := NAME;
END;

PROCEDURE NUMBERIT;
BEGIN
  WRITE('EMPLOYEE NO.   :');
  READLN(NUMBER);
  WORKER^.EMPLOYEEENO := NUMBER;
END;

PROCEDURE MARRYIT;
VAR
  ANSWER : CHAR;
BEGIN
  WRITE('MARRIED? (Y/N) :');
  READ(ANSWER);
  WRITELN;
  IF ANSWER = 'Y' THEN STATUS := TRUE
    ELSE STATUS := FALSE;
  WORKER^.MARRIED := STATUS;
END;

```

```

PROCEDURE DEPENDIT;
BEGIN
  WRITE('NUMBER OF RUGRATS   :');
  READLN(RUGRATS);
  WORKER^.DEPENDENTS := RUGRATS;
END;

PROCEDURE PAYIT;
BEGIN
  WRITE('PAY RATE           :$');
  READLN(RATE);
  WORKER^.PAYRATE := RATE;
END;

PROCEDURE FILLOUT;          (* GET VALUES FOR RECORD ELEMENTS *)
BEGIN
  WRITELN('RECORD NO: ',RECNO);
  NAMEIT;
  NUMBERIT;
  MARRYIT;
  DEPENDIT;
  PAYIT;
END;

PROCEDURE APPEND;          (* STICK A RECORD ON THE END OF FILE *)
BEGIN
  EMPTY;
  FILLOUT;
  PUT(WORKER);
END;

PROCEDURE DISPLAY;        (* SHOW THE CURRENT RECORD *)
BEGIN
  PAGE(OUTPUT);
  WITH WORKER^ DO
  BEGIN
    WRITELN('1:LAST NAME       : ',LASTNAME);
    WRITELN('2:EMPLOYEE NO.    : ',EMPLOYEEENO);
    WRITE( '3:MARITAL STATUS   : ');
    CASE MARRIED OF
      FALSE: WRITELN('SINGLE');
      TRUE  : WRITELN('MARRIED');
    END; (* CASES *)
    WRITELN('4:# OF DEPENDENTS  : ',DEPENDENTS);
    WRITELN('5:PAY RATE         :$',PAYRATE);
  END (* WITH *);
END; (* DISPLAY *)

PROCEDURE UPDATE;         (* MODIFY A RECORD *)
VAR
  CHOICE : INTEGER;
  ANSWER : CHAR;
BEGIN
  DISPLAY;
  WRITELN('SELECT NUMBER OF ITEM TO BE CHANGED. ');
  WRITELN('SELECT 0 TO QUIT. ');
  RESET(WORKER);
  CHOICE := 1;
  WHILE CHOICE >0 DO
  BEGIN
    READLN(CHOICE);
    IF (CHOICE>0) AND (CHOICE<6) THEN
      CASE CHOICE OF
        1: NAMEIT;
        2: NUMBERIT;
        3: MARRYIT;
        4: DEPENDIT;
        5: PAYIT;
      END; (* CASES *)
    END; (* WHILE *)
  END;
  DISPLAY;
  WRITELN('IS EVERYTHING OK? ');
  READ(ANSWER);
  WRITELN;
  IF ANSWER <> 'Y' THEN UPDATE
  ELSE
  BEGIN
    (Continued)

```

In Pascal, a wide variety of variable types are available. Besides INTEGER, REAL, and STRING, you have other predefined types like CHAR, BOOLEAN, and LONG INTEGER. You can also define your own data types. As a matter of fact, you must declare all variables to be of a specific type before you use them in a Pascal program.

The big advantage of Pascal is that you are not confined to using just these predefined types of data; you can define your own data types, and use variables which have values of those types.

There are lots of advantages to defining your own data types. For instance, you could represent the months of the year by their ordinal integers; e.g., 1 for January, 2 for February, etc. In BASIC this is the only way to do it. But in Pascal you can define a new data type MONTH as follows:

```

TYPE
  MONTH = (JAN,FEB,MAR,
           APR,MAY,JUN,JUL,AUG,SEP,
           OCT,NOV,DEC);

```

```

VAR
  BIRTHMONTH : MONTH;

```

This method allows you to use an assignment statement in your program which is straightforward and easy to understand:

```
BIRTHMONTH := MAY;
```

Assignments

In BASIC, the symbol "=" has an ambiguous meaning. It can represent the assignment of a value to a variable, as in

```
50 A = 27
```

Or it can represent the Boolean equality operator; i.e.,

```
50 IF A = B THEN 100
```

In the above example, A = B is an expression that is either true or false. I have called this ambiguous because the fragment A = B can be either a logical (Boolean) expression, or an assignment instruction, depending on context. Also, the Boolean value of "false" is the same as the real value of 0 in BASIC, lending further ambiguity.

In Pascal this ambiguity is not present. An assignment statement uses the "assignment operator," ":", as in the example

```
A := B;
```

```

        SEEK(WORKER, RECNO);
        PUT(WORKER);
        END; (* ELSE *)
END;

PROCEDURE DOIT;          (* THIS IS THE PROCEDURE *)
BEGIN                  (* THAT CONTROLS THE OTHERS *)
    PAGE(OUTPUT);
    SHOWENDRECNO;
    WRITELN('RECORD NO? (-1 TO QUIT)');
    READLN(RECNO);
    WHILE RECNO >= 0 DO
        BEGIN
            RESET(WORKER);
            SEEK(WORKER, RECNO);
            GET(WORKER);
            IF EOF(WORKER) THEN APPEND
                ELSE UPDATE;
            WRITE('RECORD NO? (-1 TO QUIT)');
            READLN(RECNO);
        END; (* WHILE *)
    END; (* DOIT *)

PROCEDURE ERRHANDLE;   (* OPENS FILE IF NEW *)
VAR
    ANSWER : CHAR;
BEGIN
    WRITELN('NO SUCH FILE ON DISK. ');
    WRITE('DO YOU WANT TO ADD IT? ');
    READ(ANSWER);

    IF ANSWER = 'Y' THEN
        BEGIN
            REWRITE(WORKER, FILENAME);
            DOIT;
        END; (* IF *)
    END; (* ERRHANDLE *)

BEGIN (* MAIN PROGRAM *)
    WRITE('FILE? ');
    READLN(FILENAME);

    (*$I-*)
    RESET(WORKER, FILENAME);
    (*$I+*)

    IF IORESULT = 0 THEN DOIT
        ELSE ERRHANDLE;

    CLOSE(WORKER, LOCK)
END.

```

while a Boolean expression uses the "equality operator," "=" . The BASIC statement

100 IF A=B THEN C=D

results in only C changing its value. This becomes more obvious in the equivalent Pascal statement

IF A = B THEN C := D;

IF Statements

In BASIC the IF statement has the format

10 IF expression THEN statement1

20 statement2

If expression is true, then statement 1 is executed; otherwise statement 2 is executed. In Pascal, the structure of the IF statement is exactly the same. It can also be written in this form:

IF expression THEN statement1
ELSE statement2;

Multiple Branches

The situation where your program must choose between multiple alternatives provides an interesting comparison between BASIC and Pascal. In BASIC, such a branch statement might be used to select a subroutine based on student grades, for example. You would need to use a "computed GOSUB" statement:

10 ON GRADE GOSUB 1000,
1750, 2235, 8870, 9025

This type of statement requires GRADE to have an integer value of 1

Send for **FREE**
Control Page
Also Available soon on Atari

EDIT 6502 T.M. LJK

Two Pass Assembler, Disassembler, and Editor Single Load Program
DOS 3.3., 40/80 Columns, for Apple II or Apple II Plus*

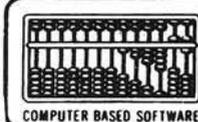
A MUST FOR THE MACHINE LANGUAGE PROGRAMMER. Edit 6502* is a two pass Assembler, Disassembler and text editor for the Apple computer. It is a single load program that only occupies 7K of memory. You can move freely between assembling and disassembling. Editing is both character and line orientated, the two pass disassemblies create editable source files. The program is so written so as to encompass combined disassemblies of 6502 Code, ASCII text, hex data and Sweet 16 code. Edit 6502 makes the user feel he has never left the environment of basic. It encompasses a large number of pseudo opcodes, allows linked assemblies, software stacking (single and multiple page) and complete control of printer (paganation and tab setting). User is free to move source, object and symbol table anywhere in memory. Requirements: 48K of RAM, and ONE DISK DRIVE. Optional use of 80 column M&R board, or lower case available with Paymar Lower Case Generator.

TAKE A LOOK AT JUST SOME OF THE EDITING COMMAND FEATURES. Insert at line #n Delete a character Insert a character Delete a line #n List line #n1, n2 to line #n3 Change line #n1 to n2 "string" Search line #n1 to n2 "string".

LJK Enterprises Inc. P.O. Box 10827 St. Louis, MO 63129 (314)846-6124
*Edit 6502 T.M. of LJK Ent. Inc. — *Apple T.M. of Apple Computer Inc.

LOOK AT THESE KEY BOARD FUNCTIONS: Copy to the end of line and exit: Go to the beginning of the line: abort operation: delete a character at cursor location: go to end of line: find character after cursor location: non destructive backspace: insert a character at cursor location: shift lock: shift release: forward copy: delete line number: prefix special print characters. Complete cursor control: home and clear, right, left down up. Scroll a line at a time. **Never type a line number again.**

All this and much much more — Send for FREE Information.
Atari Cartridge **\$199.95**
Apple Disk (Version 2) **\$99.95**



COMPUTER BASED SOFTWARE



ENTERPRISES

through 5, which might correspond to a grade of F through A. The difficulty here is that you have to do a lot of page-flipping to see what each of those sub-routines does.

In the Pascal version of this selection statement, there are two significant differences. You can make GRADE have values of A, B, C, D, or F by defining your own data type:

```
TYPE
  SCORE = (A,B,C,D,F);
VAR
  GRADE : SCORE;
```

You can also use meaningful procedure names for each of the target procedures, instead of the statement numbers which have no meaning. Thus, the example of multiple branching in Pascal would be:

```
CASE GRADE OF
  A: EXEMPTFROMFINAL;
  B: OPTIONALFINAL;
  C: FINALEXAM;
  D: COUNSEL;
  F: FAIL
END;
```

Looping

Anyone familiar with BASIC knows about FOR...NEXT loops. This structured command is used to repeat a series of instructions a predefined number of times. The FOR statement sets up an index to count the number of iterations, gives the index its initial value, does the block of instructions, increments the index, and finally checks to see if the upper limit of the index has been reached. If it has, the loop is satisfied, and the instruction following the loop is executed. If the index has not yet reached its limit, the block is executed repeatedly until the loop is satisfied.

Pascal also has a FOR statement, which looks like this:

```
FOR I := LOW TO HIGH DO
  BEGIN
    FIRSTSTEP;
    SECONDSTEP;
    THIRDSTEP;
  END;
```

There are several differences between BASIC and Pascal. The STEP clause of BASIC is not available; the index can only be incremented by 1. You cannot count by twos, by fives, or by anything else. You can count down, by using the reserved word DOWNT0 in place of TO in the FOR statement, as in

```
FOR I := HIGH DOWNT0
  LOW DO
```

In BASIC, the parameters in the FOR statement may have real or integer values. In the Pascal version, they must be ordinal, such as INTEGER, integer subrange, CHAR, or a user defined type, such as the type MONTH referred to earlier in this article.

If you want to perform other types of loops in BASIC, you have to get very clever with IF statements, indexes, etc. For example, suppose you want to loop for as long as it takes for a process to return a desired result, and you have no way of knowing in advance how many iterations it takes. An example of this type of loop would be the use of the Newton-Raphson method of finding the roots of an equation.

To do this, you need to start with an approximate answer, calculate a new approximate answer, and compare the two results to see how close they are to being the same. This process is repeated until the difference between the two successive answers is acceptably small.

Doing this in BASIC is awkward. In Pascal, it is quite easy. It is done using the REPEAT loop:

```
REPEAT
  STEP1;
  STEP2;
  STEP3;
  STEP4
UNTIL DIFFERENCE < =
  DELTA;
```

Of course, you must be sure that somewhere in the body of this loop DIFFERENCE, it is affected in such a way that it will eventually satisfy the condition in the UNTIL statement. Otherwise, you will have an infinite loop, just as easily as you can in BASIC.

An additional Pascal looping structure not available in BASIC is the WHILE loop:

```
WHILE DIFFERENCE > =
  DELTA DO
  BEGIN
    STEP1;
    STEP2;
    STEP3;
    STEP4
  END;
```

The difference between the REPEAT...UNTIL structure and the WHILE...DO structure is that in the former, the condition for satisfying the

loop is evaluated after the loop is executed, while in the latter case the condition is evaluated before executing the loop.

Functions and Procedures

In Pascal terminology a set of instructions that is self-contained and constitutes a subprogram is called a procedure. In BASIC it is called a subroutine. The BASIC subroutine is called into operation by "GOSUB line number." The Pascal procedure is activated by using its name in the main program. As discussed before, this tends to make Pascal programs easier to understand.

Another difference between these languages is parameter passing. In Pascal the values of the variables modified by the procedure are carefully controlled by the use of local variables and formal parameters. In a BASIC program all variables are global; that is, all parts of the program have equal access to each variable. This can result in some hard-to-find bugs when a variable is changed in a remote part of the program while you are expecting it to have a different value.

By keeping all variables as local as possible in Pascal, and passing the values through formal parameters, this problem is eliminated. For a thorough discussion of this area, see reference 1 in the bibliography at the end of this article.

Functions are similar in both languages. In BASIC a function is defined in a DEF FN statement. It, too, has a formal parameter (referred to as its argument in BASIC) like it does in Pascal. In Pascal a function is defined in a FUNCTION subprogram.

Summary

In this series of articles I have given a general overview of the Apple Pascal system, with emphasis on the operating system. The more I got into the Pascal language, the more I was convinced that Pascal has many advantages over BASIC for most applications except for very short programs.

One of my motives for writing this series was the lack of good references for learning Pascal on your own. I wanted to share some of my hard-won

knowledge with others and save them the trouble I had digging up all this information.

In the time since this series was started, several more references have become available. The following bibliography should prove useful to anyone seriously interested in learning Pascal.

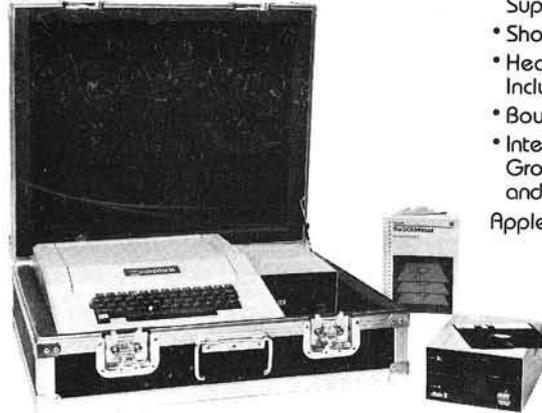
Bibliography

1. "Pascal Primer," by David Fox and Mitchell Waite, Howard W. Sams Co., Inc.
2. "Apple Pascal, A Hands-on Approach," by Arthur Luehrmann and Herbert Peckham, McGraw-Hill Book Company.
3. "Beginner's Guide for the UCSD Pascal System," by Kenneth L. Bowles, BYTE Books.
4. "Programming in Pascal," by Heathkit Educational Systems.
5. "Pascal Programming Structures," by George W. Cherry, Reston Publishing Company.
6. "Pascal With Style — Programming Proverbs," by Henry F. Ledgard, John F. Hueras and Paul A. Nagin, Hayden Book Company, Inc.
7. "Apple Pascal Operating System Reference Manual," and "Apple Pascal Language Reference Manual," Apple Computer Inc.
8. "Pascal User Manual and Report," by Kathleen Jensen and Niklaus Wirth, Springer-Verlag.
9. "Programming in Pascal," by Peter Grogono, Addison-Wesley.
10. "Introduction to Pascal, Including UCSD Pascal," by Rodney Zaks, Sybex.
11. "Microcomputer Problem Solving Using Pascal," by Kenneth L. Bowles, Springer-Verlag.

MICRO

LIGHT FORM

BY CASES, INC.
DESIGNED TO PROTECT YOUR COMPUTER



- Features —**
- Rigid Shell Made of Plywood Supported High Impact ABS.
 - Shock Resistant Foam Lining.
 - Heavy Duty Hardware Includes Key Locking Latches
 - Bound Metal Edges.
 - Interlocking Tongue and Groove Extrusion, Mating Lid and Bottom.
- Apple II Plus & Drives \$175.00

OTHER
MODELS
AVAILABLE

CLUB AND DEALER DISCOUNTS AVAILABLE
CASES, INC. P.O. Box 33820 Seattle, WA 98133 (206) 365-5210

CBM/PET? SEE SKYLES ... CBM/PET?

"Should we call it Command-O or Command-O-Pro?"

That's a problem because this popular ROM is called the Command-O-Pro in Europe. (Maybe Command-O smacks too much of the military.)

But whatever you call it, this 4K byte ROM will provide your CBM BASIC 4.0 (4016, 4032) and 8032 computers with 20 additional commands including 10 Toolkit program editing and debugging commands and 10 additional commands for screening, formatting and disc file manipulating. (And our manual writer dug up 39 additional commands in the course of doing a 78-page manual!)

The Command-O extends Commodore's 8032 advanced screen editing features to the ultimate. You can now SCROLL up and down, insert or delete entire lines, delete the characters to the left or right of the cursor, select TEXT or GRAPHICS modes or ring the 8032 bell. You can even redefine the window to adjust it by size and position on your screen. And you can define any key to equal a sequence of up to 90 key strokes.

The Command-O chip resides in hexadecimal address \$9000, the rightmost empty socket in 4016 and 4032 or the rearmost in 8032. If there is a space conflict, we do have Socket-2-ME available at a very special price.

Skyles guarantees your satisfaction: if you are not absolutely happy with your new Command-O, return it to us within ten days for an immediate, full refund.

Command-O from Skyles Electric Works.....\$75.00

Complete with Socket-2-Me..... **95.00**

Shipping and Handling..... (USA/Canada) **\$2.50** (Europe/Asia) **\$10.00**

California residents must add 6%/1/2% sales tax, as required.



Skyles Electric Works
231E South Whisman Road
Mountain View, California 94041
(415) 965-1735

Visa/Mastercard orders: call tollfree
(800) 227-9998 (except California).
California orders: please call (415)
965-1735.

PET? SEE SKYLES ... CBM/PET? SEE SKYLES

OSI COMPATIBLE HARDWARE

- IO-CA10X SERIAL PORT** \$125
ACIA based RS-232 serial printer port. DIP SWITCH selectable baud rates of 300-9600. Handshaking (CTS) input line is provided to signal the computer when the printer buffer is full. Compatible with OS-65U V1.2 and OS-85D.
- IO-CA9 PARALLEL PORT** \$175
Centronics Standard Parallel printer interface for OSI computers. The card comes complete with 10 ft. of flat ribbon cable. Compatible with OS-65D and OS-65U software.
- IO-CA8D DIABLO PARALLEL PORT** \$175
DIABLO 12 BIT WORD Parallel port for use with word processor type printers. Complete with 10 ft. cable. Compatible with OS-65U software.
- IO-LEVEL 3 MULTI-USER EXPANSION** \$450
Provides 3 printer interfaces currently supported by OSI-Serial, Centronics Parallel, Diablo Parallel. 4K of memory at D000 for Multi-user executive. 4 Port serial cluster. The LEVEL 3 card allows expansion of an OSI C3 machine up to 4 users with appropriate additional memory partitions.
- 24MEM-CM9...\$380** **16MEM-CM9...\$300** **8 MEM-CM9...\$210**
24K memory card is available at 3 different populated levels. All cards are fully socketed for 24K of memory. The card uses 2114-300ns chips. DIP SWITCH addressing is provided in the form of one 16K block and one 8K block. Also supports DIP SWITCH memory partition addressing for use in multi-user systems.
- FL470 FLOPPY DISK CONTROLLER** \$180
OSI-Type floppy disk controller and real time clock. Will Support 5 1/4" or 8", Single or double-sided drives. Requires drives with separated data and clock outputs.
- BIO-1600 BARE IO CARD** \$50
Super I/O Card. Supports 8K of 2114 memory in two DIP SWITCH addressable 4K blocks. 2 16 Bit Parallel Ports may be used as printer interfaces, 5 RS-232 Serial Ports with CTS & RTS handshaking. With manual and Molex connectors.
- BMEM-CM9 BARE MEMORY CARD** \$50
Bare 24K memory card, also supports OSI-type real time clock and floppy disk controller. With manual and Molex connectors.
- #98 PROTOTYPE CARD** \$35
Prototype board holds 96 14 or 16 pin IC's. Will also accommodate 18, 24, or 40 pin IC's. Row and column zone markings, easy layout. 1/8" epoxy glass P.C. board.
- C1P-EXP EXPANSION INTERFACE** \$95
Expansion for C1P-600 or 610 boards to the OSI 48 Pin Buss. Uses expansion socket and interface circuitry to expand to 48 Pin Backplane. Requires one slot in backplane.
- BP-580 BACKPLANE** \$47
Assembled 8-slot backplane with male Molex connectors and termination resistors.
- DSK-SW DISK SWITCH** \$29
A circuit when added to OSI Minifloppy systems extends the life of drives and media. Accomplish this by shutting off Minifloppy Spindle motor when system is not accessing the drive. Complete KIT and manual.
- PW-5-6 POWERSUPPLY** \$29
Power One brand supply 5V - 6 amps with overvoltage protection. Reg. \$49.95.

D&N MICRO PRODUCTS, INC.

3684 N. Wells Street Ft. Wayne, Indiana 46808
219/485-6414

TERMS: Check or money order Add \$2 Shipping, Outside U.S. add 10%.

ED-SCI STATISTICS

FOR THE PROFESSIONAL A COMPLETE STATISTICS AND DATA MANAGEMENT PACKAGE

Data Entry and Filing

- By Variable Name and Case Number
- One-Time Data Entry
- Easy and Rapid Editing
- Data Entry Worksheets

Data File Manipulation

- Add New Variables
- Add or Delete Case Values
- Create SUBFILES By User Defined SEARCH & SELECT Criteria
- Merge Files

Statistical Calculations

- Mean, Std. Dev., Std. Error
- Coefficient of Variation
- Frequency Distribution
- Unpaired t-Test
- Paired t-Test
- Mann-Whitney U Test
- Wilcoxon Paired Sample Test
- Chi-Square Test
- Linear Regression
- Correlation
- One-Way ANOVA with the Newman-Keuls Test
- Hard Copy of Data & Results

Statistical Calculations can be made on **VISICALC*** (DIF) and **DATADEX* FILES**. Graphic Plotting of all **ED-SCI STATISTICS** Data Files can be done with **APPLE PLOT.***

Only \$95.00 brings you the **ED-SCI STATISTICS** instruction manual, the Master Program Disk, and a Back-Up Disk.

See **ED-SCI STATISTICS** at your local Apple Computer store. Dealer inquiries invited. For information please phone or write:

Ed-Sci Development

460 Beacon St. San Francisco, CA 94131 (415) 282-7020

ED-SCI STATISTICS requires an Apple II with the Applesoft or Language Card, or an Apple II+, 48K memory, and at least one disk drive with DOS 3.3 (16 sector).

*Apple is a registered trademark of Apple Computer Inc.
VisCalc is a registered trademark of Personal Software Inc.
DATADEX is a registered trademark of Sonoma Softworks.



There's no
Dr. Jekyll
in Apple II*
programming...

Programming 6502 Assembly Language is no longer frightening or a monster problem. Because Randy Hyde has written *the* book that's *easy* to understand, *easy* to follow. It turns assembly language into the 'friendly language'. For anyone. For the average Apple II owner and the newest beginner.

Let Mr. Hyde get you started immediately, with string and math operations. See how to convert BASIC programs so they run up to 100 times faster! Discover Sweet-16, the 'hidden' 16-bit pseudo computer inside your Apple. Enjoy using your Apple to the maximum by following the step-by-step, practical examples. . . which turn you into a programmer in the blink of a chapter.

thanks to Mr. Hyde

\$19.95 per easy-reading copy at computer stores everywhere, or from:

DATAMOST
19273 Kenya St.
Northridge, CA 91326
(213) 366-7160

VISA/MASTERCARD accepted.
\$1.00 shipping/handling charge.
(California residents add 6% tax)



*Apple II is a trademark of Apple Computer, Inc.

BUG

**Bill Budge, creator of
"Raster Blaster," needs it:**

"...I'll never write another
program without BugByter!"

BYTER

FEATURES INCLUDE:

- All registers displayed
- Compatible with all Apple languages
- Completely relocatable
- Full hex and ASCII I/O
- Multiple options while in trace mode
- Literal and transparent breakpoints
- Resident assembler
- Resident disassembler
- User-definable screen
- Ram screen dump in hex and ASCII
- Comprehensive documentation
- Single keystroke operation
- Instruction cycle counter
- Hexadecimal/decimal conversions
- Can run in add-on ram card

Who else needs BugByter?

- ... Apple* users who want to learn machine language.
- ... Apple programmers in need of a complete 6502 debugging tool.
- ... Educators who need to demonstrate the operation of the Apple's central processor.
- ... Software professionals who need to display and control all 6502 registers.

BugByter

is
NOW AVAILABLE AT \$39.95
on diskette for Apple II or Apple II+

from
COMPUTER-ADVANCED IDEAS, INC.

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

*Apple is a registered trademark of Apple Computer, Inc.

RELOC

RELOC allows the Apple Pascal text editor to be used with DOS 3.3 to more easily edit BASIC text files.

Robert Walker
6100F Wood Chase Lane
Marietta, Georgia 30067

With the recent purchase of Apple Pascal, one shortcoming of Applesoft and Integer BASIC has become evident. Unlike Pascal, BASIC is not supported by a powerful text editor. This article describes how to use the Pascal editor to develop BASIC programs.

With the following program (hereafter known as RELOC) BASIC programs, written with the Pascal editor, are relocated from a Language System text file to a DOS 3.3 exec file. This file is then executed, thus loading the BASIC program into memory for running.

Using the editor for developing BASIC programs offers many advantages. (See listing 1.) Variable names throughout an entire program, for instance, may be changed in seconds. Like Pascal, indentation may be used to illustrate FOR-loop nesting. The feature I find most convenient is the ability to effectively document a program. All text enclosed in brackets is ignored by RELOC and not sent to the exec file, thus eliminating the need for REM statements in the final program. This means the final program requires less memory and executes faster.

Another important feature of RELOC is that all programs are initially relocated into an exec file. This is a handy means of storing often-used subroutines. We may have, for example, a subroutine (saved as an exec file) called "PLOT," which plots data from an array. After completing the main program (with it still in memory) simply "EXEC PLOT" to insert the subroutine into the main

program. Provided there is correct interaction of variables, and no overlapping of line numbers, everything should work fine.

Program Implementation

The ability to read Language System disks while operating in DOS 3.3 is made possible by the fact that both systems utilize identical methods to physically format disks. Like DOS 3.3, Language System disks have 35 tracks, numbered 0 through 34. Each track is divided into 16 sectors, numbered 0 through 15. Furthermore, each sector contains 256 bytes. By using the RWTS (read or write a track or sector; see pp. 94-98, *The DOS Manual*) subroutine, data on a disk can be accessed by simply specifying its location in track-sector pairs.

Finding the location of our Language System text file is easy. The Filer command "E|XTENDED LIST" supplies the starting block address and the number of blocks occupied by the text file. Equally

convenient is the fact that Language System files are stored in consecutive blocks. If a file starts at block 235 and occupies three blocks, then the file resides in blocks 235, 236, and 237. Simple! Now for the real problem.

How are these blocks associated with track-sector pairs? First, a block is actually two sectors (512 bytes). Each block number represents two track-sector pairs. Second, with some experimenting, I've found that each track contains exactly 8 blocks (i.e., no blocks are split between tracks; see table 1). Blocks 0 through 7 occupy track 0. Blocks 8 through 15 occupy track 1, and so on. Finally, blocks 272 and 279 occupy track 34. In short, the track associated with any block can be computed by the following formula:

$$\text{TRACK NUMBER} = \text{INT}(\text{BLOCK NUMBER} / 8)$$

Next, we must determine the two sectors associated with each block. Because these sectors follow no logical

Listing 1

```
[ PASCAL-BASIC TEXT FILE TRANSFER ]
[   WRITTEN BY R. WALKER           ]
[   WICHITA, KS                   ]

[ INITIALIZE VARIABLES ]

10 HIMEM:4095 [ PROTECT DISK I/O BUFFER ]
20 DIM LZ(7),HZ(7)
30 D$=CHR$(4) [ CTRL-D ]
32 NL$=0 [ NULL ASCII ]
34 DL$=16 [ DLE ASCII ]
36 LB$=91 [ LEFT BRACKET ASCII ]
38 RB$=93 [ RIGHT BRACKET ASCII ]
40 K=7.99999 [ NUMBER BLOCK PER TRACK
              SLIGHTLY LESS THAN 8 TO PREVENT ROUND OFF ERRORS ]

[ POKE RWTS CONTROL STATEMENTS
  CONTROLLING SUBROUTINE: 768-776
  I/O CONTROL BLOCK: 777-793
  DEVICE CHARACTERISTIC TABLE: 794-797 ]

50 FOR I = 768 TO 797: READ C$: POKE I,C$: NEXT

[ LOAD SECTOR-BLOCK ASSOCIATION TABLE ]

60 FOR I = 0 TO 7: READ LZ(I),HZ(I): NEXT

[ INTRODUCTION ]

70 HOME: VTAB(3)
80 PRINT " PASCAL-BASIC TEXT FILE TRANSFER"
90 PRINT:PRINT
110 INPUT "SOURCE DRIVE # (PASCAL)-- ":SDZ
120 INPUT "OBJECT DRIVE # (BASIC)--- ":ODZ
```

(Continued)

Table 1: Block-Track-Sector Association Table

Block	Track	First Sector	Second Sector
0	0	0	14
1	0	13	12
2	0	11	10
3	0	9	8
4	0	7	6
5	0	5	4
6	0	3	2
7	0	1	15
8	1	0	14
9	1	13	12
10	1	11	10
11	1	9	8
12	1	7	6
13	1	5	4
14	1	3	2
15	1	1	15
-	-	-	-
-	-	-	-
272	34	0	14
273	34	13	12
274	34	11	10
275	34	9	8
276	34	7	6
277	34	5	4
278	34	3	2
279	34	1	15

order, this proves to be more difficult. Table 1 shows that within each track, these sector locations repeat themselves. For example, the first block of any track consists of sector 0, followed by sector 14. This sequence is stored in DATA statements and later read into arrays L% and H%. Locating sector numbers would proceed as follows.

Let's assume that some arbitrary block X is the Nth block (numbered 0 through 7, where $N = \text{TRACK NUMBER MOD } 8$) of some arbitrary track. The value $L\%(N)$ would be equal to the low (first) sector of block X. Likewise, $H\%(N)$ would be equal to the high (second) sector of block X. We now have an algorithm for determining the two track-sector pairs associated with each block number.

As mentioned earlier, the RWTS subroutine is used to read the Language System text file. During program initialization, the RWTS controlling subroutine is stored in locations 768-776. Then, the RWTS IOB (I/O control block) is stored in locations 777-793. And finally, the RWTS device characteristic table is stored in locations 794-797.

During execution of RELOC, five important locations in the IOB are set. First, location 779 contains the drive

Listing 1 (Continued)

```

130 PRINT:PRINT
140 INPUT "STARTING BLOCK-- ";SB%
150 INPUT "NUMBER BLOCKS--- ";NB%
160 PRINT:PRINT
170 INPUT "EXEC FILE NAME-- ";F$
180 PRINT:PRINT

[ LOAD DATA BUFFER WITH PASCAL TEXT FILE ]

190 PRINT "INSERT PASCAL DISK IN DRIVE #";SD%
200 INPUT "THEN HIT RETURN...";A$
210 HOME: PRINT "READING PASCAL TEXT FILE..."
220 PG%=15 [ PAGE COUNTER: PG%#256 = BEGIN LOC. OF DATA I/O BUFFER ]
222 POKE 779,SD% [ DISK DRIVE NUMBER ]
224 POKE 789,1 [ COMMAND CODE: READ ]

230 FOR BL [BLOCK NUMBER] = SB%+2 [ SKIP 1ST 2 BLOCKS ] TO SB%+NB%-1
240 TR% = INT(BL/K) [ COMPUTE TRACK ]
250 BI% = INT((BL/K-INT(BL/K))*8) [ RELATIVE BLOCK NUMBER: BI% = BL MOD 8 ]

255 PG%=PG%+1

[ READ FIRST SECTOR OF BLOCK ]

260 POKE 781,TR% [ STORE TRACK NUMBER IN IOB ]
270 POKE 782,L%(BI%) [ STORE SECTOR NUMBER IN IOB ]
280 POKE 786,PG%
290 CALL 768 [ CALL RWTS SUBROUTINE ]

[ READ SECOND SECTOR OF BLOCK ]

330 PG%=PG%+1
340 POKE 782,H%(BI%)
350 POKE 786,PG%
360 CALL 768

370 NEXT

[ CREATE DOS EXEC FILE ]

380 PRINT: PRINT "INSERT BASIC DISK IN DRIVE #";OD%
390 INPUT "THEN HIT RETURN...";A$
400 HOME: PRINT "CREATING DOS EXEC FILE..."
410 PRINT D$;"OPEN";F$;"",D";OD%
420 PRINT D$;"WRITE";F$
430 FL%=0 [ REMARKS FLAG ]
440 FOR X = 4098 [ FIRST TEXT CHAR ] TO 4095+(NB%-2)*512 [ LAST CHAR ]
442 IF PEEK(X)=DL% GOTO 520 [ SKIP DLE ]
444 IF PEEK(X-1)=DL% GOTO 520 [ SKIP INDENTATION CODE ]
450 IF PEEK(X)=LB% [ L. BRACKET ] THEN FL%=1: GOTO 520 [ IGNORE TEXT ]
460 IF PEEK(X)=RB% [ R. BRACKET ] THEN FL%=0: GOTO 520 [ SAVE TEXT ]
470 IF FL%=1 GOTO 520 [ IGNORE TEXT ]
480 IF PEEK(X)=NL% GOTO 520 [ SKIP NULL ]
510 PRINT CHR$(PEEK(X)); [ SEND CHAR TO EXEC FILE ]
520 NEXT
525 PRINT [ MAKE SURE ALL CHARS SENT ]
530 PRINT D$;"CLOSE";F$
540 PRINT "FILE TRANSFERED"
550 INPUT "ANOTHER (Y/N)";A$
560 IF LEFT$(A$,1)="Y" GOTO 70
999 END

[ RWTS CONTROLLING SUBROUTINE CODE ]

1000 DATA 169,3,160,9,32,217,3,96,0

[ RWTS I/O CONTROL BLOCK ]

1100 DATA 1,96,1,0,0 [TRK],0 [SEC],26,3,0,16,0,0,1 [READ],0,254,96,1

[ RWTS DEVICE CHARACTERISTIC TABLE ]

1200 DATA 0,1,239,216

[ SECTOR-BLOCK ASSOCIATION TABLE ]

[ SECTORS RELATIVE ]
[ LOW,HIGH BLOCK NUMBER ]
1300 DATA 0,14 [ 0 ]
1310 DATA 13,12 [ 1 ]
1320 DATA 11,10 [ 2 ]
1330 DATA 9,8 [ 3 ]
1340 DATA 7,6 [ 4 ]
1350 DATA 5,4 [ 5 ]
1360 DATA 3,2 [ 6 ]
1370 DATA 1,15 [ 7 ]

```

number from which the Language System text file is read. Secondly, locations 781 and 782 contain the track and sector number, respectively. Location 786 contains the high-order byte of the data buffer starting address. The low-order byte is set to zero. Note that RELOC uses memory locations 4096 (page 16 of memory) and higher for the data buffer. The most important location in the IOB is 789. This contains the command code, which tells the RWTS subroutine whether to read or

write. It is important to make sure that this code is 1; otherwise, the Language System text file may be destroyed!

The format of Language System text files is straightforward (see pp. 185, *Apple Pascal Reference Manual*). Each text file begins with a two-block header page containing information used by the text editor. As a result, these first two blocks are not read by RELOC. Our text actually begins in the third block. Each line of text is preceded by a DLE (Data Link Escape), followed by a one-

byte indentation code. These two bytes are ignored by RELOC. Each line is then terminated with a carriage return. The end of the text is padded out with null characters.

With the text file in memory, the only thing left is to create the DOS 3.3 exec file. First, RELOC opens the exec file with the name assigned by the user. Next, each character, with the excep-

tion of control characters and bracketed comments, is sent to the exec file. Finally, the exec file is closed.

Program Operation

Writing a BASIC program using the text editor requires two special considerations. First, no BASIC line statement, including the carriage return, may exceed 80 characters. This limitation is due to the 80-column format of the editor. I haven't found this to be a significant handicap. Second, by enclosing in brackets, comments can be placed anywhere in the program text. This means that no print statements, for instance, may contain brackets. Naturally, it would still be possible to print brackets by using the CHR\$ statement.

Once the text is written and saved, enter the Filer and execute the "E)XTENDED LIST" command. Note the beginning block and the number of blocks occupied by the text file. These will be needed later by RELOC, but the Language System is no longer needed. Boot DOS 3.3, and run RELOC.

The first item requested by RELOC is the source drive number. This is the drive from which the Language System text file will be read. Likewise, the object drive number will be requested. This is the drive to which the exec file will be written. When requested, enter the starting block number given by the "E)XTENDED LIST" command. RELOC automatically skips the first two blocks. Therefore, it is unnecessary for the user to add two to the starting block number. The last request made by RELOC is the exec file's name. Any legal DOS 3.3 file name will do.

RELOC will then prompt the user to insert the Pascal disk. Once this is read, RELOC will prompt the user to insert the BASIC disk. The exec file will then be written.

In order to run the BASIC program now in exec file, it is first necessary to clear any program in the memory with "NEW." Incidentally, "NEW" (and any other command) may be included in the basic text file, thus making this first step unnecessary. Now load the program with the "EXEC" command. The BASIC program is now loaded and ready to be run.

The utility of RELOC extends beyond editing BASIC programs. With slight modification for example, it would be possible to transfer data generated in a FORTRAN or Pascal program to a BASIC program. This would be very handy to anyone desiring Applesoft, Integer BASIC, Pascal, and FORTRAN to have access to some large data base.

Listing 2

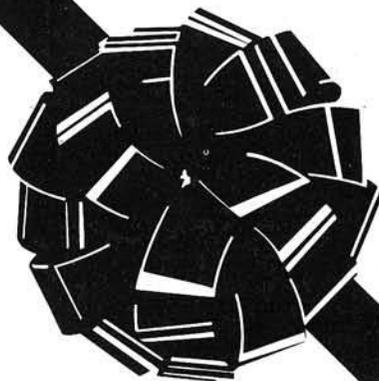
```

10 HIMEM: 4095
20 DIM L%(7),H%(7)
30 D$ = CHR$(4)
32 NL% = 0
34 DL% = 16
36 LB% = 91
38 RB% = 93
40 K = 7.99999
50 FOR I = 768 TO 797: READ C%: POKE I,C%: NEXT
60 FOR I = 0 TO 7: READ L%(I),H%(I): NEXT
70 HOME : VTAB (3)
80 PRINT " PASCAL-BASIC TEXT FILE TRANSFER"
90 PRINT : PRINT
110 INPUT "SOURCE DRIVE # (PASCAL)-- ";SD%
120 INPUT "OBJECT DRIVE # (BASIC)--- ";OD%
130 PRINT : PRINT
140 INPUT "STARTING BLOCK-- ";SB%
150 INPUT "NUMBER BLOCKS--- ";NB%
160 PRINT : PRINT
170 INPUT "EXEC FILE NAME-- ";F$
180 PRINT : PRINT
190 PRINT "INSERT PASCAL DISK IN DRIVE #";SD%
200 INPUT "THEN HIT RETURN...";A$
210 HOME : PRINT "READING PASCAL TEXT FILE..."
220 PG% = 15
222 POKE 779,SD%
224 POKE 789,1
230 FOR BL = SB% + 2 TO SB% + NB% - 1
240 TR% = INT (BL / K)
250 BI% = INT ((BL / K - INT (BL / K)) * 8)
255 PG% = PG% + 1
260 POKE 781,TR%
270 POKE 782,L%(BI%)
280 POKE 786,PG%
290 CALL 768
330 PG% = PG% + 1
340 POKE 782,H%(BI%)
350 POKE 786,PG%
360 CALL 768
370 NEXT
380 PRINT : PRINT "INSERT BASIC DISK IN DRIVE #";OD%
390 INPUT "THEN HIT RETURN...";A$
400 HOME : PRINT "CREATING DOS EXEC FILE..."
410 PRINT D$;"OPEN";F$;" ,D";OD%
420 PRINT D$;"WRITE";F$
430 FL% = 0
440 FOR X = 4098 TO 4095 + (NB% - 2) * 512
442 IF PEEK (X) = DL% GOTO 520
444 IF PEEK (X - 1) = DL% GOTO 520
450 IF PEEK (X) = LB% THEN FL% = 1: GOTO 520
460 IF PEEK (X) = RB% THEN FL% = 0: GOTO 520
470 IF FL% = 1 GOTO 520
480 IF PEEK (X) = NL% GOTO 520
510 PRINT CHR$( PEEK (X));
520 NEXT
525 PRINT
530 PRINT D$;"CLOSE";F$
540 PRINT "FILE TRANSFERED"
550 INPUT "ANOTHER (Y/N)";A$
560 IF LEFT$(A$,1) = "Y" GOTO 70
999 END
1000 DATA 169,3,160,9,32,217,3,96,0
1100 DATA 1,96,1,0,0,0,26,3,0,16,0,0,1,0,254,96,1
1200 DATA 0,1,239,216
1300 DATA 0,14
1310 DATA 13,12
1320 DATA 11,10
1330 DATA 9,8
1340 DATA 7,6
1350 DATA 5,4
1360 DATA 3,2
1370 DATA 1,15

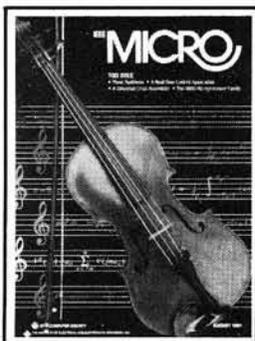
```



Subscribe to *IEEE Micro*
and *COMPUTER* ...



The Unbeatable Package



IEEE Micro — an authoritative forum for the practicing hardware and software engineer. Covers design and applications problems from original statement through alternative approaches, design concepts, engineering theory, algorithms, choice of hardware, circuit design, and software.



COMPUTER — the readable professional journal that covers the spectrum of computer system design and application. Comes automatically with membership in the Computer Society.

Combined subscriptions to both magazines are available now for \$36. Act now.

In coming issues of *IEEE Micro*:

- application features — aerospace, biomedicine, communications, consumer electronics, controls, education, measurement and instrumentation, programmable machine tools, robotics, signal processing
- microcomputer hardware — chips, boards, buses, systems
- microcomputer software — signal processing algorithms, languages, application software
- tutorials — computer science, engineering theory, algorithms, interfacing techniques, system organization, high-level languages
- and many other exciting topics

In coming issues of *COMPUTER*:

- dataflow supercomputers
- computer graphics impacts the home & industry
- highly parallel arrays
- applications oriented specifications
- interconnection networks
- human/computer interaction
- local computer networks

Special offer to new members. Join the Computer Society now and receive a FREE copy of either of the following:

Microprocessors and Microcomputers (Second Edition) — selected papers from *COMPUTER*, organized and introduced by the technical editor. Sections on architecture, software, and applications include the standard specification for S-100 bus interface devices and special articles on modular programming in PL/M, microprocessor networks, and microprocessors in automation and communications. (298 pp.)

Regular nonmember price: \$12

Selected Reprints in Software — selected papers from *COMPUTER*, organized and introduced by Marvin V. Zelkowitz. Sections cover programming languages, software creation, data bases, and applications. Includes more than 25 of the best articles from *COMPUTER* on the subject. (282 pp.)

Regular nonmember price: \$12

Note: To receive your free book you must mail your completed application with correct remittance to the IEEE Computer Society, 10662 Los Vaqueros Circle, Los Alamitos, CA 90720.

 **IEEE COMPUTER SOCIETY**

 THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.



IEEE Computer Society Membership Application

Check here for your free copy of

- Microprocessors and Microcomputers*
or
 Selected Reprints in Software

MAILING ADDRESS

First name _____ Middle initial(s) _____ Last name _____
 Street address _____
 City _____ State/Country _____ Zip _____
 Full signature _____ Date _____

OCCUPATION

Title or position _____
 Firm name _____
 Firm address _____
 City _____ State/Country _____ Zip _____
 IEEE membership no. or affiliate society membership no. (if applicable) _____ Grade _____

EDUCATION (highest level completed)

Name of educational institution _____
 Course _____ Degree received _____ Date _____

ENDORSEMENT (Name one individual, preferably an IEEE member, who knows you professionally.)

Name (print in full) _____
 Street address _____
 City _____ State/Country _____ Zip _____

FOR OFFICE USE ONLY

Member Number										St/Cntry		Zip Code/City				Reg	Coun	Sec	
3										10	11	14				20	27	24	
Subsec		C/S	Country	A/C	BPA Code			Grade	Birthdate		Sex								
26		28	29	32	33			39	40	42		48							
Elec Date		Brochure		Year	Disc	Event													
72			75	1	4	4	C	8	1			M	C	R	1	1	-	8	1

Use the numbers to identify your plant activity and your own work. If more than one activity is involved, use the code number for the most prevalent. Note: if you select "other" for work and plant code or "other personnel" for job function code, be sure to explain on the lines provided.

WORK AND PLANT (Enter codes)

- Plant _____ Your own work _____
1. Large computers
 2. Minicomputers
 3. Microcomputers
 4. Computer peripheral equipment
 5. Data processing systems (system integration)
 6. Office and business machines
 7. Test, measurement, and instrumentation equipment
 8. Communications systems and equip.
 9. Navigation and guidance systems and equipment
 10. Consumer entertainment electronic equipment
 11. Consumer electronic appliances
 12. Other consumer electronics
 13. Industrial controls, systems, and equip.
 14. Components and subassemblies

15. Materials and hardware
16. Aircraft, missiles, space and ground support equipment
17. Oceanography and support equipment
18. Medical electronics
19. Industrial companies within OEM incorporating electronics equip. in their end product, not elsewhere classified
20. Independent research, test, and design laboratory and consultant (only if you are not connected with a mfg. co.)
21. Government agency and military
22. Industrial companies using and/or incorporating any electronic products in their manufacturing, research, or development activities
23. Communication (radio, TV, police)
24. Transportation services (airline, railroads, etc.)
25. Computer and data processing services: service bureaus, software services, timesharing, consulting

26. All other commercial users
27. Power generation equip. manufacturer
28. Power production (atomic, elec., etc.)
29. Power generation
30. Power transmission
31. Power distribution
32. Utilities, except power (telephone, telegraph, pipelines, etc.)
33. Distributor
34. School, university, or library
35. Others (explain)

JOB FUNCTIONS (Enter code)

1. General and corporate management
2. Design and development engineering (circuits, components, equip. systems)
3. Engineering services evaluation (quality control, reliability standards, tests)
4. Member of Technical Staff (MTS)
5. Basic research
6. Manufacturing and production

7. Engineering support (draftsman, lab assistant, technician)
8. Purchasing and procurement
9. Marketing, including sales
10. Computer systems/operation
11. Engineering systems planning and design (utilities)
12. Operations including construction and maintenance (utilities)
13. Consulting
14. Other "EE's"
15. Other engineers (explain _____)
16. Dean, professor, instructor, etc.
17. Student
18. Other personnel (explain _____)

JOB CATEGORY (Enter code)

1. Management other than engineering
2. Engineering management
3. Engineering

schedule of fees

Important: Pay the HALF-YEAR rate if your application is post-marked between March 1, 1982 and August 31, 1982. Pay the FULL-YEAR rate if your application is postmarked between September 1, 1982 and February 28, 1983. Membership and publications expire December 31.

- If you are not yet a Computer Society member:**
- | | | |
|---|----------------------------------|----------------------------------|
| | Half-Year | Full-Year |
| • I am an IEEE member who wishes to join the Computer Society. Enclosed is my | <input type="checkbox"/> \$4.00 | <input type="checkbox"/> \$8.00 |
| • I am a non-IEEE member who wishes to join both IEEE and the Computer Society.* Enclosed is my | <input type="checkbox"/> \$44.00 | <input type="checkbox"/> \$78.00 |
| • I am a non-IEEE member who wishes to join the Computer Society only. Enclosed is my | <input type="checkbox"/> \$14.00 | <input type="checkbox"/> \$28.00 |
| • In addition to my automatic subscription to COMPUTER, I also want to subscribe to IEEE Micro (3071). Enclosed is my | <input type="checkbox"/> \$4.00 | <input type="checkbox"/> \$8.00 |
- If you are already a Computer Society member:**
- I am already a Computer Society member and wish to subscribe to IEEE Micro (3071). Enclosed is my

Total amount remitted with this application: _____
 (Make checks or money orders payable to IEEE. Mail to the IEEE Computer Society, 10662 Los Vaqueros Circle, Los Alamitos, CA 90720.)

*IEEE members in Region 7 (Canada) and 8 (Western Europe and the Mid-East) may deduct \$6 from full-year rates, \$3 from half-year rates. IEEE members in Regions 9 and 10 may deduct \$13 from full-year rates, \$6.50 from half-year rates. ACM members who join both the IEEE and the Computer Society may deduct \$5 from full-year rates, \$2.50 from half-year rates. ACM discount applies only to those who join both IEEE and the Computer Society.

Hardcopy bulk air option for members in Regions 8-10: Western Europe, Latin America (including Mexico), and the Far East.

Add the following amount(s) for two-week delivery for COMPUTER and IEEE Micro:	Western Europe		All Other Areas	
	Half-Year	Full-Year	Half-Year	Full-Year
COMPUTER	<input type="checkbox"/> \$3.50	<input type="checkbox"/> \$7.00	<input type="checkbox"/> \$20.00	<input type="checkbox"/> \$40.00
IEEE Micro	<input type="checkbox"/> \$1.75	<input type="checkbox"/> \$3.50	<input type="checkbox"/> \$9.75	<input type="checkbox"/> \$19.50

"Western Europe" includes Albania, Austria, Belgium, Bulgaria, Cyprus, Czechoslovakia, Denmark, Finland, France, East Germany, West Germany, Gibraltar, Greece, Greenland, Holland, Hungary, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Malta, Monaco, Norway, Poland, Portugal (and Azores), Rumania, Spain (and Canary Islands), Sweden, Switzerland, Turkey, United Kingdom, USSR, and Yugoslavia. "All other areas" includes all other countries outside the U.S., Canada, and Mexico.

Apple PASCAL

TEXTfile LISTER

Outputting Language System textfiles to your printer using the transfer command is handy, yet it produces an awkward and untidy listing with no page breaks. This program solves that problem, producing neatly paged output with titles and numbers on each page.

Robert Walker
6100F Wood Chase Lane
Marietta, Georgia 30067

Apple Pascal users are familiar with using the Filer option "Transfer" for printing Language System textfiles. For those desiring program listings with a professional appearance, this method is inadequate. First, each page has no top and bottom margins. In fact, it's common for a line of text to be printed on the perforation between two pages. Second, each page lacks a title and page number, making identification and ordering difficult or impossible if pages become separated. With this in mind, I proceeded to write a short Apple Pascal utility program which included the above mentioned features.

The program employs the following simple algorithm:

*Repeat until end of text.
Start at top of page.
Print page heading (page number and optional title).
Scroll past top margin.
Print text until reaching bottom margin.*

Although the program is simple and relatively easy to decipher, some explanation is needed.

In the program listing, the constant declaration section contains the most significant items. The constants Topmargin, Bottommargin, and Pagelength represent the number of lines each of these listing parameters occupies. For example, with the values assigned in the listing, 59 lines per page will be available for the textfile ($\text{Pagelength} - \text{Topmargin} - \text{Bottommargin} = 66 - 3 - 4 = 59$).

The page heading is within the space occupied by the top margin. Specifically, the first line of Topmargin (i.e., the page) will always be blank, followed by the second line which has the page title and number. As a result, the minimum value for Topmargin is two (lines).

For this program to work, your printer must have at least 80 columns, and must be able to vertically tab to the top of a new page when sent a formfeed control character.

To use the program simply eXecute LISTER (or whatever name you prefer). When the textfile name is requested, respond with any valid file name. If you respond with an asterisk, it will be interpreted as "SYSTEM.WRK.TEXT". A return as a response will end the program. Next, the page title will be requested. Once this is entered, the textfile will be listed, producing documentation with a professional appearance.

```
(* APPLE PASCAL TEXTFILE LISTER *)
(* Written by Robert Walker *)
(* Wichita, KS *)

PROGRAM LISTER;

CONST Topmargin = 4; (* minimum of 2 *)
      Bottommargin = 3;
      Pagelength = 66;

VAR Textfile: Text;
     Textline, Filename, Pagetitle: String;
     Linenum, Pagenum, Ioerror: Integer;
     Printer: Interactive;

(* Determine if linenum is the last line before the bottom margin. *)
FUNCTION ENDOFPAGE: Boolean;
Begin
  If Linenum=(Pagelength-Bottommargin)
  then Endofpage:=True
  else Endofpage:=False
End; (* Endofpage *)

(* Start a new page-- Formfeed, Print heading, and Space up to first line. *)
PROCEDURE STARTNEWPAGE;
```

```

PROCEDURE SPACEUP(Lines: Integer); (* send linefeeds to printer *)
VAR I: Integer;
Begin
  For I:= 1 to Lines do Writeln(Printer)
End; (* SPACEUP *)
Begin (* STARTNEWPAGE *)
  If Pagenum<>1 then Page(Printer); (* assume listing begins on new page *)
  Spaceup(1);
  Writeln(Printer,':(80-Length(Pagetitle)-13) Div 2, Pagetitle,
    ' Page no. ', Pagenum); (* print page heading *)
  Spaceup(Topmargin-2);
  Linenum:= Topmargin+1;
  Pagenum:= Pagenum+1
End; (* STARTNEWPAGE *)
Begin (* MAIN PROGRAM *)
  Reset(Printer, 'Printer:');
  Writeln(Chr(12), 'APPLE PASCAL TEXTFILE LISTER');
  Repeat
    Writeln;
    Write('Textfile Name (*"-SYSTEM.WRK.TEXT)- ');
    Readln(filename);
    If Filename='' then Exit(LISTER);
    If Filename='*' then Filename:='SYSTEM.WRK.TEXT';
    (**I-*)
    Reset(Textfile,Filename);
    Ioerror:=Ioresult;
    If Ioerror = 0
      then (* FILE FOUND *)
        Begin
          Write('Page title- ');
          Readln(Pagetitle);
          Pagenum:= 1;
          Startnewpage;
          (* READ AND WRITE TEXT *)
          While Not Eof(Textfile) do
            Begin
              Readln(Textfile,Textline);
              Writeln(Printer,Textline);
              Linenum:= Linenum+1; (* Count lines *)
              If Endofpage then Startnewpage
            End;
          Page(printer); (* formfeed *)
        End
      else (* I/O ERROR *)
        Begin
          Writeln('I/O ERROR');
          Case Ioerror of (* MOST COMMON I/O ERRORS *)
            3: Writeln('ILLEGAL OPERATION');
            7: Writeln('BAD TITLE');
            9: Writeln('VOLUME IS NOT ON LINE');
            10: Writeln('NO SUCH FILE');
            64: Writeln('BAD ADDRESS OR DATA ON DISK')
          End
        end
      Until Filename=''
    End. (* MAIN PROGRAM *)

```

Spanish Hangman

2,000 SPANISH words and sentences taught in a fun way on the Apple. Send for your school's free 30-day evaluation diskette, from:

George Earl
1302 South General McMullen
San Antonio, TX 78237

Business Software by ADS

For the Apple II and Atari/800. Why pay more for a bunch of unrelated programs? Business Plus will handle invoices, statements, credit memos and more, much more! Just \$299 complete or \$25 for demo disk (credited towards purchase). VISA, Mastercharge accepted.

Advanced Data Systems
7468 Maple Avenue
St. Louis, MO 63143
314/781-9388

Extended SYM-BASIC

Adds 30 commands, requires 16K, \$85 US/\$95 Can., object on cassette, manual, and source listing. SYM-FORTH 1.0: fig-FORTH for 16K SYM-1. Editor, assembler, cassette interface \$135 US/\$155 Can., object on cassette, manual and source listing.

Saturn Software Limited
8246 116A St.
Delta, B.C., V4C 5Y9
Canada

PET Arcade Software

Astroidz and *Munchman* games for your 8K old-new ROMS. *Astroidz* are invading the galaxy. Four levels of play. *Munchman* is based on arcade game Pac-Man. ZIP and ZAP are out to get you. Fantastic graphics. \$9.95 each cassette.

ComputerMat
Box 1664M
Lake Havasu, AZ 86403

PET/CBM Owners

Real world software at low cost. 2114 RAM adapter and 4K Memory Expansion for "old" 8K PETs. Write for free catalog!

Optimized Data Systems
Dept. M, Box 595
Placentia, CA 92670

(Continued on page 107)

The A2-GE1 Graphics Editor for the Apple II

The A2-GE1 Graphics Editor is a collection of programs designed to put the power of A2-3D1 and A2-3D2 graphics in your hands.

The A2-GE1 includes **Object Editor**, **Motion Programmer**, **Motion Playback**, **Slideshow Playback**, and a special A2-3D2 interface for BASIC programmers.

With **Object Editor** you can create whatever objects you want in the colors of your choice. You can also type in whatever 3D text you want, and in different sizes. And saving an object is as easy as naming it.

Then give the object names to **Motion Programmer** and see how the beautifully laid out keyboard controls will let you switch objects on or off, animate them, or add upper or lower case 2D text mixed right in.

You can also record your entire presentation, animation and all, for later use with **Motion Playback**, or just take "computer snapshots" of scenes with **Slide Show Playback**.

We've reached our goal of giving you the most sophisticated graphics utilities in the marketplace . . .

See them now at your dealer!

subLOGIC

Communications Corp.
713 Edgebrook Drive
Champaign, IL 61820
(217) 359-8482
Telex: 206995

Convenient graphics power...



A2-GE1 Graphics Editor
\$34.95 on disk (48K and
A2-3D2 required)

A2-3D1 with 3D2 Enhancement*
\$84.90 on disk (48K required)

*3D1 owners may update to 3D2 for \$24.95. Contact SubLOGIC for details.

For direct order, include \$3 for UPS or \$5 for first class mail delivery. Illinois residents add 5% sales tax. Visa and MasterCard accepted.

Elementary Pascal Internals

Introduction to the internal structure of the P-machine and to some of the concepts which underly the workings of P-code Pascal implementations. While the examples are specific to Abacus Software's Tiny Pascal, others such as UCSD Pascal, Pascal/M, Dynasoft Cassette Pascal, Supersoft Tiny Pascal, and Programma Tiny Pascal are based on similar architectures.

Arnie Lee
Abacus Software
P.O. Box 7211
Grand Rapids, Michigan 49510

Introduction

My interest in the Pascal language stems from two observations and experiences: Pascal is a simple, yet powerful language with which to program, and Pascal is a simple language to implement. These are, in fact, the goals which Wirth set out to meet, as he defined the Pascal language in the late 60's. "The first ... to make available a language suitable to teach programming as a systematic discipline based on certain fundamental concepts clearly and naturally reflected by the language. The second ... to develop implementations of this language which are both reliable and efficient on presently available computers"¹.

Apparently I'm not alone in feeling so positive about Pascal, since micro users have been flocking to use it. If the number of text book titles are any indication of popularity, then we may conclude that Pascal has indeed arrived.

What makes Pascal so attractive? First, the number of language elements in Pascal is not so overwhelming as in other languages such as PL/I. Also, the elements are not cryptic as with the

APL language. Yet even with a relatively modest vocabulary, Pascal affords a concise and clear language with which to program solutions to problems. Thus, the demand for Pascal is due, in part, to its simplicity and usefulness for a variety of applications.

This great demand for Pascal is also easily satisfied, as the language is relatively simple to implement. Pascal has been implemented on most popular micros, and some versions will run in as little as 16K of memory. I have implemented a subset of the full Pascal language for the PET/CBM and Apple II. This undertaking required only modest effort. In the remainder of this article, I will share some of what I learned about Pascal internals.

Pascal Compilers and Interpreters

The statements of a high-level language such as Pascal are called a source program. The Pascal compiler translates the source program into a semantically equivalent program that can later execute on the micro.

Some Pascal compilers translate the source program into machine code, which is directly executable by the computer. Most micro-based Pascal compilers translate the source program into P-code. P-code, however, cannot be directly executed by the computer. Instead, it needs to be interpreted.

Interpreters spend a large amount of execution time determining the desired operations to be carried out on behalf of the program. (Most implementations of BASIC are interpreters.) A compiler, on the other hand, determines the operations to be performed and creates code that reflects these operations. Then the code is executed at a later time. Since the operations are "predetermined" beforehand, a compiled program generally executes faster than an interpreted program. Pascal systems such as UCSD Pascal, Pascal/M and Tiny Pascal, combine both concepts of compilation and

interpretation. So, the source is compiled, which predetermines the operations to be performed, but the resultant P-code is interpreted by the P-machine.

The P-Machine

Most micro implementations of Pascal are based on a 16-bit pseudo-machine model. The pseudo-machine, often called the P-machine, "executes" P-code as its machine language. The P-machine performs its computations through stack operation.

A stack is a data structure that is used to store data. The stack consists of multiple "slots" into which data may be stored, and from which the same data may be retrieved. The *stack pointer* always points to the next slot available for data storage.

There are two operations that may be performed on the stack. PUSHing a value onto the stack means that a given data value is stored into the slot indicated by the stack pointer. After the value is PUSHed, the stack pointer is altered to point to the next available slot. Conversely, POPing a given data value means that the stack pointer is altered to point to the last used slot, and the value occupied by that slot is returned to the program.

The P-machine is actually an *interpreter* that is written in the assembly language of the micro. This interpreter simulates the operations of the hypothetical stack-oriented computer. The interpreter handles all of its operations as if it were a 16-bit computer by emulating all of its elementary operations (arithmetic, comparisons, input, etc.) using 16-bit data and stack operations. Each slot of the stack can accommodate a 16-bit data item. When executing P-code "instructions," the P-machine expects the operands to be on the stack. The P-machine then carries out the computations and places the results back onto the stack.

Figure 1 is an example of a typical stack operation. We want to add two variables (B and C) and assign the sum to a third variable (A). The instruction is shown on the left, while the contents of the stack after the operation is shown on the right.

Instruction 1 shows the stack before any operations take place. *Instruction 2* PUSHes the value of variable B onto the stack, thereby incrementing the stack pointer. *Instruction 3* PUSHes the value of variable C onto the stack, also incrementing the stack pointer. *Instruction 4* POPs the value of C off the stack, POPs the value of B off the stack, performs the addition, and finally PUSHes the sum onto the stack. The stack pointer is altered to point to the next available slot (previously occupied by C). Finally, *instruction 5* POPs the sum off the stack and stores the result in variable A. The stack pointer is left pointing to the same slot as before the series of operations was executed.

P-Code Instructions

Instructions direct the P-machine to perform certain stack operations. These instructions are referred to as "P-code instructions" or just "P-code." It is the job of the *compiler* to convert the Pascal source statements to "P-code." After analyzing the Pascal source statements, the compiler generates the appropriate P-code to perform the desired program operations. This P-code is later executed by the P-machine. Execution in this case really means that the P-code is interpreted by the P-machine.

To continue the above example, let's look at the P-code produced by the Pascal language source statement in figure 2.

This is the example shown previously, using the mnemonics of a typical P-machine. Table 2 describes the mnemonics that are used in some typical Pascal implementations. Below is another example for a more complex arithmetic statement:

A := B + C DIV (D - 6);

In figure 3, the compiler has to work a little harder to analyze the statement and generate the appropriate P-code. The operator precedence directs the compiler to first generate the P-code for the DIVide operation. (Division is performed before addition because division has a higher operator precedence. See table 1.) Because of the parenthetical expression (D - 6), the P-code for that operation must be generated before the

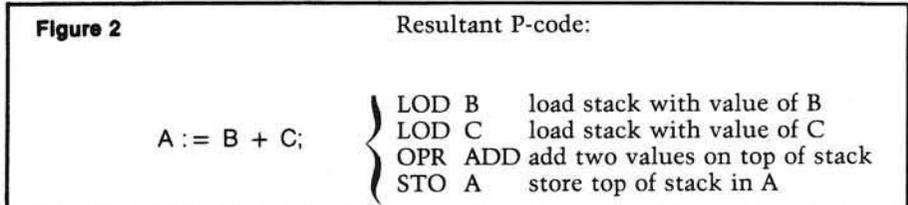
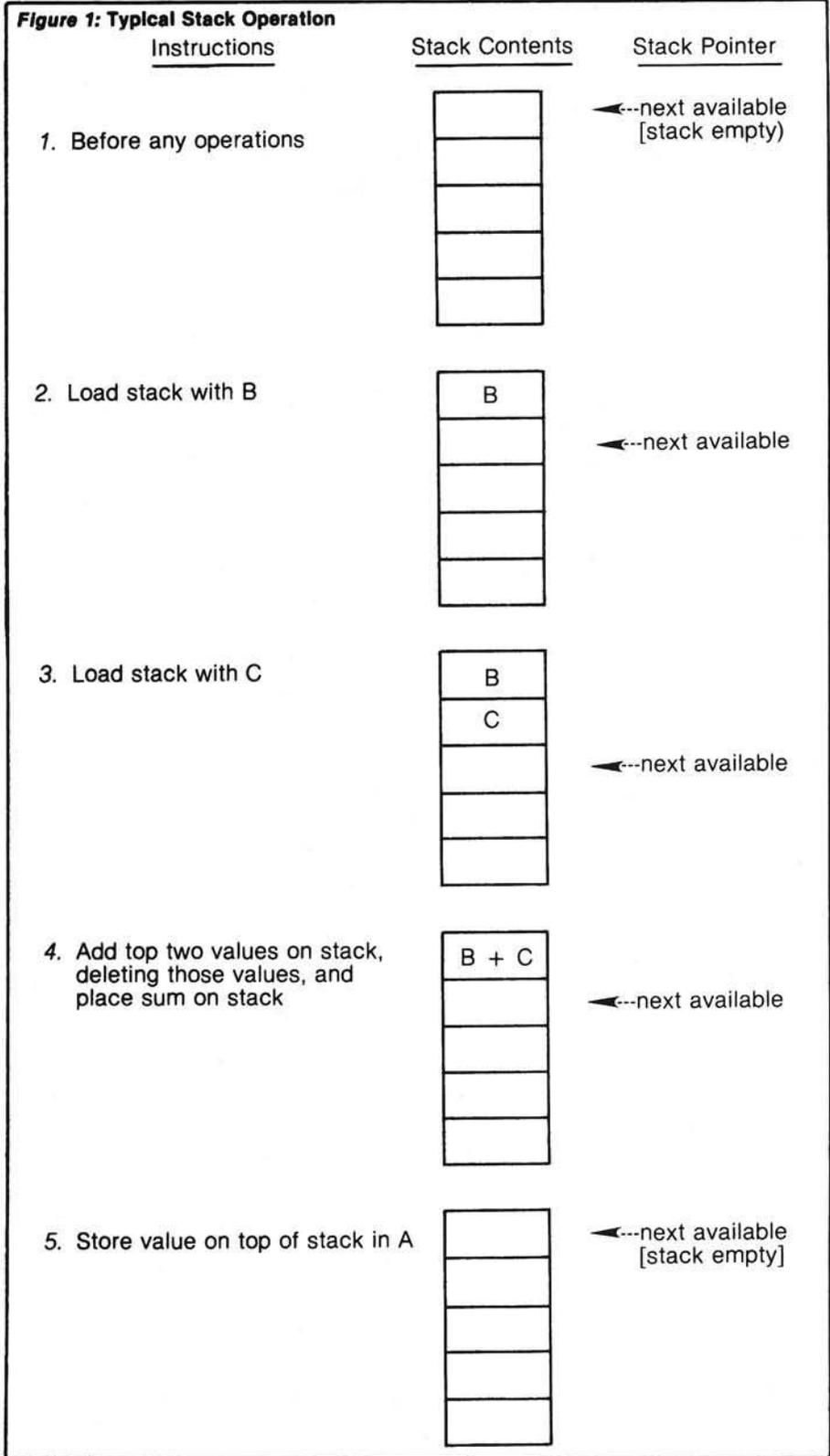


Figure 3

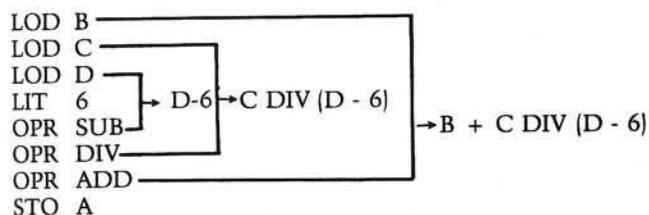


Table 1: Operator Precedence

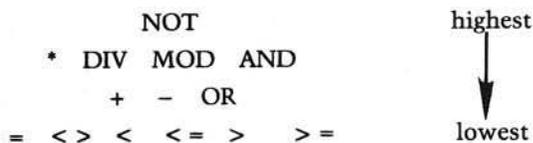


Table 2: P-Code Instructions

The following table is a list of the P-code instructions that are used by this version of TINY Pascal PLUS+. The P-codes represent the instruction set of a hypothetical 16-bit stack machine similar to the one described by Wirth in his ALGORITHMS + DATA STRUCTURES = PROGRAMS.

Opcode (Hex)	Mnemonic	Operand (Dec)	Description
00	LIT	n	Load literal constant to (SP)
10	OPR	0	Return from procedure
10	OPR	1	Negate (SP)
10	OPR	2	Add (SP) to (SP - 1)
10	OPR	3	Subtract (SP) from (SP - 1)
10	OPR	4	Multiply (SP - 1) by (SP)
10	OPR	5	Divide (SP - 1) by (SP)
10	OPR	6	Test for odd
10	OPR	7	(SP - 1) modulo (SP)
10	OPR	8	Test for (SP - 1) = (SP)
10	OPR	9	Test for (SP - 1) > (SP)
10	OPR	10	Test for (SP - 1) < (SP)
10	OPR	11	Test for (SP - 1) > = (SP)
10	OPR	12	Test for (SP - 1) < (SP)
10	OPR	13	Test for (SP - 1) < = (SP)
10	OPR	14	(SP - 1) OR (SP)
10	OPR	15	(SP - 1) AND (SP)
10	OPR	16	NOT (SP)
10	OPR	17	Shift left (SP)
10	OPR	18	Shift right (SP)
10	OPR	19	(SP) + 1
10	OPR	20	(SP) - 1
10	OPR	21	Copy (SP) to (SP + 1)
20 + v	LOD	d	Load (SP)
20 + X'F'	LOD	0	Load from absolute addr (SP)
30 + v	STO	d	Store (SP)
30 + X'F'	STO	0	Store at absolute addr (SP)
40 + v	CAL	a	Procedure call
40 + X'F'	CAL	0	Call proc at absolute addr (SP)
50	INT	n	Increment stack pointer by n
60	JPC	a	Jump to location a if low order bit of (SP) = 0
61	JPC	a	Jump to location a if low order bit of (SP) = 1
6F	JPC	a	Jump unconditionally to location a
70	CSP	0	Input a single character
70	CSP	1	Output a single character
70	CSP	2	Input an integer
70	CSP	3	Output an integer
70	CSP	4	Input a hexadecimal number
70	CSP	5	Output a hexadecimal number

(Continued)

P-code for the DIVide operation is completed. Finally, because of operator precedence rules, the P-code for the ADDition operation is generated.

More Examples

Listing 1 is a sample Pascal source program that performs some elementary arithmetic operation. The program does not perform any useful work and is only meant to illustrate the following examples.

Listing 2 shows the P-code that is generated by the compiler for the Pascal program of listing 1. The listing shows the Pascal source statements and the respective P-code instructions generated for that statement. The listing also shows the memory location at which the P-code is temporarily stored and the internal format of the P-code.

Listing 3 is a Pascal program called DISASSEM which can disassemble the P-code. This program disassembles only the P-code generated by the TINY Pascal PLUS+ compiler, but the same technique may be used to disassemble any P-code, provided that the user is aware of the internal format of his Pascal system's P-codes. Table 2 shows the P-code formats for this implementation.

Listing 4 is a sample disassembly of the Pascal program from listing 1. Listing 4 was produced by the DISASSEM program.

Arnie Lee is a data base analyst for a large manufacturing firm in the Grand Rapids, Michigan area. He is interested in all types of computer languages for micros, and hopes to develop data base systems for these smaller machines. He is co-author of *Tiny Pascal* and the author of the *PET Machine Language Guide*.

Olympic Sales Company

SERVING YOU SINCE 1947

Main Showroom & Offices:
216 South Oxford Avenue
Los Angeles, CA 90004

WE HONOR
VISA and MASTERCARD



TELEX: 67 34 77

ORDER DESKS open 7 Days a Week!
7:00 AM to 7:00 PM Mon thru Sat
Sunday Noon to 5:00 PM
Order Desks: (213) 739-1130

TOLL-FREE (outside Calif.)
TOLL-FREE (within Calif.)
800-421-8045 800-252-2153

NO ONE UNDERSOLLS OLYMPIC SALES

Write & request our new 112 pg catalog-please include \$1.00 to defray postage & handling-includes many more items-from TV's to Watches!

All goods subject to availability; this ad supersedes all previous ads; we are not responsible for typographical errors; we will meet or beat any advertised prices if the competition has the goods on hand.
Minimum shipping and handling \$4.95.
All orders subject to verification and acceptance.



We are an authorized servicing Apple dealer for Apple II & III Immediate delivery on all models—we carry an enormous inventory of Apple products at all times!

Immediate delivery
16K-32K-48K-64K-Plus or Integer in stock!
NEW, IMPROVED APPLE III 128K VERSION
Large Inventory of:
Disk with controller DOS 3.3
Second Disk Drives
Pascal-Fortran-symbol languages
Dow Jones & Quate reporter
Graphics Tablets
Visicalc for Apple II & III
Smarterm 80 column card
Micromodem II by DC Hayes
and more.

ATTENTION: Immediate delivery
WE ALSO CARRY SOFTWARE!
Personal Software
Peach Tree Software
Microsoft
Micropro
Innovative
American
System Plus
and more.

NOW IN STOCK!

HP HEWLETT PACKARD

2 NEW DELUXE CALCS FROM HPI
Slim, shirt-pocket styling

NEW! HP-11C Your Cost: \$114.95
Advanced Programmable Scientific LCD Retail: \$130.00

NEW! HP-12C Your Cost: \$129.95
Advanced Programmable Financial LCD Retail: \$150.00

HP-125 New Microcomputer 3750.00 3195.00
64K CPU/Terminal/Keyboard

HP-85 Microcomputer—built-in printer/monitor 3250.00 2499.00

HP-83 Microcomputer—built-in monitor 2250.00 1789.00

HP-2631B Printer, dot mtrx (ask for optns) 3950.00 3195.00

HP8290SA 80 col printer, dot matrix 945.00 845.00

HP-2601A Letter quality prter, daisy wheel 3495.00

HP-82901M Dual master (256K8 disk drive) 2500.00 1999.00

Call us for the lowest prices on 7 disk drives Call us Call us

HP-41CV New! 2.2K bytes of memory 325.00 256.00

Card Reader for 41CV 215.00 171.00

Printer for 41CV 385.00 294.00

Quad Ram 95.00 84.95

Optical Wand for 41CV 125.00 99.95

HP-41C Calculator 250.00 188.95

Memory mod. for 41C 26.95

HP 97 Programmable printer 750.00 579.95

HP 34C Programmable scientific 150.00 117.95

HP-38C Programmable B/E 150.00 119.95

We have the complete line of accessories, etc.

XEROX

Model 820-1 (5 1/4") 8" \$3750.00

64K COMPUTER & WORD PROCESSOR

AS LOW AS \$2995.00

Special discount available! Schools & Institutions—Inquire! Required software add'l!

NEW—FAMOUS CORVUS DISK DRIVES—5, 10, 20 MEGABYTES with fantastic new OMNINET Network

Call us for the best prices in the USA! System

Texas Instruments Home Computer

New—1982 Model with full typewriter-style keyboard.

TI-99/4A U/L case & more! \$350.00 \$369.95

NEW KEYBOARD \$369.95

10" color monitor for 99/4 650.00 319.95

32K Exp. mem. module 399.95 314.95

Extended Basic, a MUST for 32K module 100.00 75.00

Speech synthesizer 150.00 129.95

We carry a large inventory of software, & accessories

TI-30-2 LCS Stu Slide NEW 18.95

TI-355P LCD SCIENTIFIC 22.50

TI-40 LCD Sci/NEW 28.95

TI-57 Prog. Scientific 39.95

TI-58C 480 Step. Prog. 89.95

TI-59 860 Step. Prog. 179.95

PC-100C Print/Plot 149.95

LCD-Programmer/NEW 59.95

Large inventory of periph's, access. etc.

ATARI Computer

400 SPECIAL PRICE! 16K 595.00 339.95

No language inc., opt'l basic, 54.95

800 16K Computer 1080.00 759.95

SPECIAL! ATARI 800 48K Computer 1250.00 869.95

OHIO SCIENTIFIC

C8PDF-48K Retail: \$3495.00 Y/C: \$3195.00

• Dual 8" Drives • 64 col x 32 line/color

• 7 MIPS -FAST! • Many more std features

Fortran & Pascal available

Many other OSI products—at discounted prices

NEW! From TI—Series 10 Personal Information Terminal Retail 995.00 Your Cost 795.00

PRINTERS

• DIABLO (Letter Quality) Retail Your Cost

630 R102 bi-directional/tractors 2965.00 2699.00

1640K109 keyboard, tractors 3072.00 2899.95

630 RD Receive only 2710.00 2499.95

1650K136 keyboard/tractors 3220.00 2999.95

• CENTRONICS dot matrix

700-9 Parallel, heavy duty 1460.00 1199.95

704-9 Serial, heavy duty 1795.00 1599.95

737-1 Parallel 995.00 799.95

737-3 Serial 1045.00 899.95

704-11 Parallel 1870.00 1695.00

P-1 Electrostatic 495.00 189.95

• PAPER TIGER

460 995.00 895.00

460G graphics 1094.00 969.95

560 1295.00 1099.00

560G graphics 1394.00 1195.00

445 795.00 695.00

445G 894.00 789.00

• EPSON PRINTERS

MX80 Retail: Your Cost

Optional Graftrax Chip 80 645.00 95.00

MX80 FT 745.00 659.95

MX80 FT + GRAFTRAX 80 695.00 579.95

MX80 FT + GRAFTRAX 80 795.00 689.95

MX100 995.00 789.95

WE ALSO HAVE

• NOVIATION Modems Retail Your Cost

CAT 199.95 159.95

D-CAT 199.95 159.95

APPLE-CAT Direct connect 349.95 314.95

SANYO MONITORS High resolution

13" Color (new) high quality 550.00 419.95

12" Green phosphorous 360.00 259.95

12" Black & white 340.00 239.95

15" Black & white 370.00 259.95

9" Black & white (the best seller) 235.00 169.95

AMDEK(Leedex)High Quality Monitors

100 12" B/W, 12 MHz 179.00 139.95

100-G 12" Green, 12 MHz 199.00 174.95

300-G 12" Green, 18 MHz 249.00 199.95

Color I 13" Color, NTSC comp. input, 449.00 339.95

Color II 13" Color, RGB input, hi res graphics, speaker 999.00 699.95

• HAZELTINE Video Display Terminals

• SHUGART Disk Drives

• DEC VT100 & VT103

Call us for your DISCOUNTED price TODAY!



Merlin

THE NEW MACRO-ASSEMBLER FROM SDS PERFORMS ASSEMBLY LANGUAGE MAGIC FOR YOU!

Makes Assembly Language programming easy for the novice as well as the experienced programmer.

USER ORIENTED — manual includes many examples plus supplemental information.

MERLIN is not only FAST, but also has an extremely POWERFUL EDITOR. Nearly a dozen edit commands include block copy or move, line/character insert/change/remove, and a find & replace function that makes it easy to modify existing files.

- Full Macro capabilities.
- 28 Pseudo-ops, conditional assembly, arithmetic support.
- Supports 80 column and RAM cards when present.
- Compatible with TED II+ files; can optionally be used to read, create and edit standard sequential text files.
- SPECIAL BONUS: Also included is SOURCEROR which creates labeled source files from raw binary object code.

WHEN IT'S A PROGRAMMING TOOL YOU NEED, CONTACT THE APPLE UTILITY EXPERTS — SDS!

\$64.95

P.O. Box 582-M, Santee, CA 92071 • 714-562-3670



Table 2 (Continued)

70	CSP	6	Read keyboard without return key
70	CSP	8	Output a string
70	CSP	9	GRAPHICS set graphics mode for or Lo-Res graphics mode for Apple II
70	CSP	10	COLOR sets color for Apple II or PET
70	CSP	11	PLOT point at (SP-1,SP) for PET and Apple II Lo-Res graphics
70	CSP	12	POINT function at (SP-1,SP). For PET returns 0 if point is off and returns 1 if point is on. For Apple II returns the number of the Lo-Res color.
70	CSP	13	TEXT sets text (non-graphics) mode
70	CSP	14	HGRAPHICS sets Apple II Hi-Res graphics mode
70	CSP	15	HCOLOR sets color for Apple II Hi-Res graphics
70	CSP	16	HPOINT Hi-Res plot at (SP-1,SP) for Apple II
70	CSP	17	HPOINT Hi-Res plot from (SP-3, SP-2) to (SP-1,SP) for Apple II
70	CSP	18	ABS(SP) absolute value function
70	CSP	19	SQR(SP) square of value
70	CSP	20	PDL(SP) read paddle
70	CSP	21	TONE play tone on speaker
A0+v	LODX	d	Load with index (SP)
B0+v	STOX	d	Store with index (SP)

The stack pointer is SP. It points to the top element on the stack. (SP) represents the contents of the top element. The address a is a P-code address. The displacement d is the displacement from a base address. The static level difference v is used by procedure calls to isolate variables. The number n is a numeric constant.

Listing 1

```

1: (* SAMPLE PASCAL PROGRAM TO DEMONSTRATE SOME
2:   OF THE ARITHMETIC STATEMENTS IN OF THIS
3:   IMPLEMENTATION OF PASCAL. *)
4:
5: CONST CR=13;
6:
7: VAR A,B,C: INTEGER;
8:
9: BEGIN
10:  A := 0; (* CONSTANT ASSIGNMENT *)
11:  A := B; (* VARIABLE ASSIGNMENT *)
12:  A := B + C; (* ADDITION *)
13:  A := B - C; (* SUBTRACTION *)
14:  A := B * C; (* MULTIPLICATION *)
15:  A := B DIV C; (* DIVISION *)
16:  A := B MOD C; (* MODULO DIVISION *)
17:  A := SQR(B); (* SQUARE FUNCTION *)
18: END.
```

*** 18 LINES IN FILE ***

Listing 2

TINY PASCAL PLUS+				FROM ABACUS SOFTWARE	
ADDR	REL.	CODE	OPND.	ADDR	SOURCE CODE
				0	(* SAMPLE PASCAL PROGRAM TO DEMONSTRATE SOME
				0	OF THE ARITHMETIC STATEMENTS IN OF THIS
				0	IMPLEMENTATION OF PASCAL. *)
				0	
8600	0	JPC	15	0	CONST CR=13;

(Continued)

The Index

Over 12,000 magazine and newsletter articles, editorials, and columns from magazines such as MICRO, BYTE, COMPUTE!, Interface Age. Over 40 magazines and newsletters indexed by machine types like Apple, Atari, TRS-80, and more. Order from your local computer store. Price \$14.95 plus 50¢ shipping.

Missouri Indexing
P.O. Box 301
St. Ann, MO 63074
(213) 997-6470

OSI Software

Universe (by the author of Galaxian) is a super smooth arcade game played by a keyboard or joystick — \$14.95. Edit All includes a full screen editor, scroll window output, full cursor control and more — \$19.95. For C1P, C2-4 systems.

DMP Systems
319 Hampton Boulevard
Rochester, NY 14612

Ohio Scientific C4P

Games: Galactic Trader, Drag Racer II, Missile Defense, Shuffle Bowling, Lunar Lander and more! Many with graphics, real time action, color and sound. Other programs: Transformer Design, Home Budget. Send SASE for catalog to:

Ron Lashley Software
2934 W. Missionwood Circle
Miramar, FL 33025

OSI Non-Symbolic Disassembler

Now look at machine code programs in disassembled format. Standard 6502 mnemonics. Screen control features, step through memory to look at ROM and RAM routines. Runs in under 2K memory. Autoload cassette only \$9.95. A real programmer's tool.

Computer Science Engineering
10 Liberty Avenue
Burlington, MA 01803

Medical Computer Journal

The journal for computer use in daily practice. Programs, system description, laboratory, original articles. Bound Vol. I — \$17.00, subscriptions — \$15.00/year.

Medical Computer Journal
A. Ghaussey
42 E. High Street
East Hampton, CT 06424

(Continued on page 109)

JAY ROSENBERG'S

SUPER SKETCH

THE ULTIMATE
GRAPHICS PROGRAM

- * KEYBOARD OR PADDLE CONTROL
- * DRAW ALPHA-NUMERICS OF ANY SIZE, COLOR OR ANGLE
- * MERGE ANY HI-RES PICTURES TOGETHER
- * CREATE AND SAVE SLIDE SHOWS
- * MOVE ENTIRE HI-RES PICTURES ANYWHERE ON THE SCREEN
- * APPLE II+ 48K DISK

TO ORDER: SEND \$24.95 TO
 JAY ROSENBERG'S SUPER SKETCH
 5 PRASER AVE.
 MONTICELLO, N.Y. 12701
 N.Y.S. RESIDENTS ADD 7% SALES TAX

New MICRO Department

- If you have an idea which is not suited for a lengthy article, but is nonetheless interesting and useful, submit it to MICRO's Short Subjects department.
- Write-ups for this section should be brief and concise. Cover your topic in just a few paragraphs. We'll also accept short listings.
- Contributors to this section will not be paid, but will receive full credit and acknowledgement with a byline.



Disk Library[®]

The Software Management System

Disk Library is an elegant, user-oriented system for creating and maintaining a thorough, cross-referenced Index of all your disk-based programs and data files. It provides for **Automatic** entry into your Library file of the full catalog of any Apple* diskette. Disks formatted under other operating systems (such as Pascal and CP/M*) are easily entered from the keyboard. Written entirely in machine code, **Disk Library's** operation is both smooth and swift.

EASY TO OPERATE:

- Menu-driven • User-definable prompt defaults
- Single keystroke operation • Full featured **Editing**
- Super fast **Sorts** (1200 items in 4 sec.!)
 - Works with all disks created under DOS 3.1, 3.2 and 3.3
- User definable **Program Types** (e.g., Business, Game, Utility) of up to 15 characters each can be assigned to each program entry with single keystroke or via block actions.
- On-screen and printed **Summaries**, by File Type (Inter, Applesoft, Binary, Text) and by Program Type.
- **Block Actions** (global editing/deleting)
- Instant **Searches**. . . find any item in 1/3 sec.
- **Append** new files to existing ones, in memory or on disk
- **Unique Feature:** User can redefine the Disk Volume Number displayed by the DOS Catalog Command
- Assign a unique Identifier and Title to each disk in your library
- Printed **Reports** are formatted for easy readability

EASY TO LEARN:

- The 75 page, professionally prepared User's Guide is oriented to the needs of beginners and experts
- Incls.: Tutorials, Reference and Applications Sections, and Index

EASY TO ORDER:

Use your Visa or MasterCard
 ANYDAY, ANYTIME



TOLL FREE: 1-800-331-1750 (For orders only)
 Ask for operator 948, Dept. 400
 (In Okla.): 1-800-722-3600 Operator 948

Or send check or money order to: **MODULAR MEDIA**
 Florida residents add 4% sales tax.

PRICE: \$39.95 (Special Introductory offer until Feb. 28, 1982) **\$49.95** (Regular Price)

WHAT YOU NEED:

- A 48K Apple II or II+ with DOS 3.3
- A desire to get organized!



11060 Paradela St., Miami, FL 33156 (305) 661-7310
 Developers/Publishers of Innovative Software

* Apple, Apple II and Apple II+ are registered trademarks of Apple Computer, Inc. CP/M is a registered trademark of Digital Research, Inc.

Listing 2 (Continued)

```

1
1 VAR A,B,C: INTEGER;
1
1 BEGIN
1 A := 0; (* CONSTANT ASSIGNMENT *)
      ****ADDR AT 0 CHANGED TO 1
8603 1 INT 0 6
8606 2 LIT 0 0
8609 3 STO 0 3
4 A := B; (* VARIABLE ASSIGNMENT *)
860C 4 LOD 0 4
860F 5 STO 0 3
6 A := B + C; (* ADDITION *)
8612 6 LOD 0 4
8615 7 LOD 0 5
8618 8 OPR 0 2
861B 9 STO 0 3
10 A := B - C; (* SUBTRACTION *)
861E 10 LOD 0 4
8621 11 LOD 0 5
8624 12 OPR 0 3
8627 13 STO 0 3
14 A := B * C; (* MULTIPLICATION *)
862A 14 LOD 0 4
862D 15 LOD 0 5
8630 16 OPR 0 4
8633 17 STO 0 3
18 A := B DIV C; (* DIVISION *)
8636 18 LOD 0 4
8639 19 LOD 0 5
863C 20 OPR 0 5
863F 21 STO 0 3
22 A := B MOD C; (* MODULO DIVISION *)
8642 22 LOD 0 4
8645 23 LOD 0 5
8648 24 OPR 0 7
864B 25 STO 0 3
26 A := SQR(B); (* SQUARE FUNCTION *)
864E 26 LOD 0 4
8651 27 CSP 0 19
8654 28 STO 0 3
29 END.
8657 29 OPR 0 0

*** LENGTH OF P-CODE IS 92 ***

```

Listing 3

```

1: (* DISASSEM - A P-CODE DISASSEMBLER
2:
3: BY ARNIE LEE
4: ABACUS SOFTWARE
5: P.O. BOX 7211
6: GRAND RAPIDS, MI 49510
7:
8: THIS PROGRAM WILL WORK ON EITHER THE PET OR APPLE II.
9: IT ASSUMES THAT THE P-CODE FILE TO BE DISASSEMBLED
10: HAS ALREADY BEEN LOADED BY AN ALTERNATIVE METHOD.
11:
12: *)
13: CONST CR=13;
14: FALSE=1;
15: TRUE=0;
16:
17: VAR STARTLOC,NUMINSTR,
18: LASTPCODE,PCTR,INSTR,
19: MODIFIER,OPERAND:INTEGER;
20:
21: BEGIN
22: NUMINSTR:=0;
23: LASTPCODE:=FALSE;
24: WRITE('ENTER P-CODE STARTING LOCATION-> ');
25: READ(PCTR%);
26: WHILE LASTPCODE=FALSE DO
27: BEGIN
28: INSTR:=MEM(PCTR) SHR 4;
29: MODIFIER:=(MEM(PCTR)) SHL 12) SHR 12;
30: OPERAND:=MEM(PCTR+1) + MEM(PCTR+2) SHL 8;
31: NUMINSTR:=NUMINSTR + 1;
32: WRITE(PCTR%, ' ',MEM(PCTR)%, ' ',MEM(PCTR+1)%, ' ',MEM(PCTR+2)%, ' ');

```

MICRObits (continued)

OSI BASIC LOAD & SAVE w/Filename

Tired of LOAD SAVE times, tape documentation? Cry no more. Now SAVE with filenames on your cassette programs. LOAD by filename. Gives directory of tape as you go. Employs a token I/O system to decrease tape I/O by 50% — \$10.95.

Computer Science Engineering
57 Beals Street, Rm. 57-12
Brookline, MA 02146

Graphics Utility for the Apple II

Ampergraph adds 21 Applesoft commands which allow effortless generation of graphs of scientific or financial data. The imbedded commands include &SCALE, &LIMIT, &AXES, &GRID,&FRAME, &LOGX, &LOGY, &LABELAXES, &LABEL, &DRAW, &PENUP, &ERRORBARS, etc. System: DOS 3.3, 48K — \$25.00 (\$1.00 shipping).

Madwest Software
Department M
P.O. Box 9822
Madison, WI 53715

Commodore VIC 20

3K Memory Expansion — \$59.95 ppd. Plugs in in seconds. VIC Graphic Manual — \$11.95. Most complete documentation on Hi-Res with tape. Joystick Software: *Spider's Parlor, Packman, U.F.O., Asteroids, SJ Slither* — \$5.95 each. SASE brings information.

Peripheral Products
3030 So. Vermont Avenue
Royal Oak, MI 48067

Wanted: OSI 300 board and...

early 400 series boards, documentation and catalogs from 1977 and earlier.

Edward H. Carlson
3872 Raleigh Drive
Okemos, MI 48864
(517) 349-1219

Adventure #1 — Murder Mansion

You and six other people are exploring a three-story mansion for a hidden treasure. But *watch out!* Someone has decided to get *greedy* and is killing the others. You could be next! 8K OSI C1P-C4P — \$12.95. 32K TRS-80 Model I and III (graphics) — \$15.95.

Comp-U-Game Software
P.O. Box 802
Nevada, MO 64772



Listing 3 (Continued)

```

33: CASE INSTR OF
34: 0: WRITE('LIT ',MODIFIER#,' ',OPERAND#,CR);
35: 1: BEGIN
36:     WRITE('OPR ');
37:     CASE OPERAND OF
38:     0: WRITE('RETURN');
39:     1: WRITE('NEGATE');
40:     2: WRITE('ADD');
41:     3: WRITE('SUBTRACT');
42:     4: WRITE('MULTIPLY');
43:     5: WRITE('DIVIDE');
44:     6: WRITE('TEST ODD');
45:     7: WRITE('MODULO');
46:     8: WRITE(' = ');
47:     9: WRITE(' <> ');
48:     10: WRITE(' < ');
49:     11: WRITE(' >= ');
50:     12: WRITE(' > ');
51:     13: WRITE(' <= ');
52:     14: WRITE(' OR ');
53:     15: WRITE(' AND ');
54:     16: WRITE(' NOT ');
55:     17: WRITE(' SHL ');
56:     18: WRITE(' SHR ');
57:     19: WRITE(' +1 ');
58:     20: WRITE(' -1 ');
59:     21: WRITE(' COPY ');
60:     ELSE WRITE('INVALID')
61:     END;
62:     WRITE(CR);
63:     END;
64: 2: WRITE('LOD ',MODIFIER#,' ',OPERAND#,CR);
65: 3: WRITE('STO ',MODIFIER#,' ',OPERAND#,CR);
66: 4: WRITE('CAL ',MODIFIER#,' ',OPERAND#,CR);
67: 5: WRITE('INT ',MODIFIER#,' ',OPERAND#,CR);
68: 6: WRITE('JPC ',MODIFIER#,' ',OPERAND#,CR);
69: 7: BEGIN
70:     WRITE('CSP ');
71:     CASE OPERAND OF
72:     0: WRITE('INCHR');
73:     1: WRITE('OUTCHR');
74:     2: WRITE('INNUM');
75:     3: WRITE('OUTNUM');
76:     4: WRITE('INHEX');
77:     5: WRITE('OUTHEX');
78:     6: WRITE('INKEY');
79:     8: WRITE('OUTSTR');
80:     9: WRITE('GRAPHICS');
81:     10: WRITE('COLOR');
82:     11: WRITE('PLOT');
83:     12: WRITE('POINT');
84:     13: WRITE('TEXT');
85:     14: WRITE('HGRAPHICS');
86:     15: WRITE('HCOLOR');
87:     16: WRITE('HPLOT X,Y');
88:     17: WRITE('HPLOT X,Y TO A,B');
89:     18: WRITE('ABS');
90:     19: WRITE('SQR');
91:     20: WRITE('PDL');
92:     21: WRITE('TONE');
93:     ELSE WRITE('INVALID')
94:     END;
95:     WRITE(CR);
96:     END;
97: 10: WRITE('LODX',MODIFIER#,' ',OPERAND#,CR);
98: 11: WRITE('STOX',MODIFIER#,' ',OPERAND#,CR);
99: 15: BEGIN LASTPCODE:=TRUE; WRITE('EOF ',CR) END
100: ELSE WRITE('INVALID P-CODE INSTR. ')
101: END;
102: PCTR:=PCTR + 3;
103: NUMINSTR:=NUMINSTR + 1;
104: END;
105: WRITE('# INSTRUCTIONS DECODED-->',NUMINSTR#,CR);
106: END.

```

*** 106 LINES IN FILE ***

Listing 4

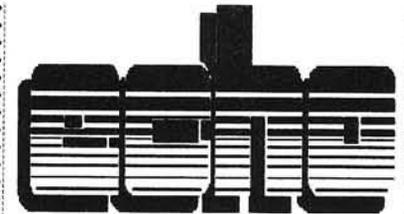
```

ABACUS SOFTWARE
TINY PASCAL INTERPRETER
ENTER FILE NAME OF P-CODE DISASSEM
TRACE ACTIVE(Y/N)?N
ENTER P-CODE STARTING LOCATION-> 8000

8000 006F 0001 0000 JPC 15 1
8003 0050 0006 0000 INT 0 6
8006 0000 0000 0000 LIT 0 0
8009 0030 0003 0000 STO 0 3
800C 0020 0004 0000 LOD 0 4
800F 0030 0003 0000 STO 0 3
8012 0020 0004 0000 LOD 0 4
8015 0020 0005 0000 LOD 0 5
8018 0010 0002 0000 OPR ADD
801B 0030 0003 0000 STO 0 3
801E 0020 0004 0000 LOD 0 4
8021 0020 0005 0000 LOD 0 5
8024 0010 0003 0000 OPR SUBTRACT
8027 0030 0003 0000 STO 0 3
802A 0020 0004 0000 LOD 0 4
802D 0020 0005 0000 LOD 0 5
8030 0010 0004 0000 OPR MULTIPLY
8033 0030 0003 0000 STO 0 3
8036 0020 0004 0000 LOD 0 4
8039 0020 0005 0000 LOD 0 5
803C 0010 0005 0000 OPR DIVIDE
803F 0030 0003 0000 STO 0 3
8042 0020 0004 0000 LOD 0 4
8045 0020 0005 0000 LOD 0 5
8048 0010 0007 0000 OPR MODULO
804B 0030 0003 0000 STO 0 3
804E 0020 0004 0000 LOD 0 4
8051 0070 0013 0000 CSP SQR
8054 0030 0003 0000 STO 0 3
8057 0010 0000 0000 OPR RETURN
805A 00FF 00FF 0000 EOF
# INSTRUCTIONS DECODED-->62
*** EXIT PASCAL INTERPRETER ***
3255 INSTRUCTIONS EXECUTED
HIGHEST STACK ADDRESS USED = $

```

ACRO



THE ULTIMATE
HI-RES SCREEN PRINT PROGRAM FOR
THE EPSON MX-80 OR MX-100

- Totally menu-driven, leading the user through the selection process.
- Single keystroke menu selection.
- Stacking of several images for subsequent, UNATTENDED printing.
- Inverse and OVERLAYED printing.
- Picture pre-view (including inverse and overlaid).
- Load images from disk automatically.
- Centered output, user titles ... more.

The program requires a 48K Apple II, or Apple II plus with DOS 3.3, and an Epson MX-80 or an MX-100 (equipped with the Grafrax option). ECHO may be used with the following parallel interface cards:
1) Apple 2) Epson 3) Tynac 4) CCS.

Price: \$49.95

Dealer inquiries invited.

(N.J. add 6% sales tax. Foreign add \$5.00 air mail)

Send check or money order to:

HeadWare

P.O. BOX 871, N. ARLINGTON, NJ 07032

*Apple - Trademark of Apple Computer Inc.

MICRO

BUSINESS WORLD INC.
 Information Line (213) 996-2252
TOLL FREE MAIL ORDER LINES
 (800) 423-5886 Outside Calif.

COMPUTERS

	List	Our Price	SAVE
Apple II-16K	\$1330.00	\$999.00	\$331.00
Apple II-32K	1430.00		\$
Apple II-48K	1530.00		\$
Apple II-64K	1725.00		\$
Apple III 128-K	3915.00	2997.00	918.00

ALTOS 8CS 8000-15 8990.00 **4450.00** **1540.00**

SHARP-64K Z80 FULL KBD YX-3200 **CALL**

NEC PC 8001 1295.00 **1050.00** **245.00**

ATARI PERSONAL COMPUTERS

	List	Our Price	SAVE
400 16K Bytes of Ram	595.00	337.45	257.05
800 16K Bytes of Ram	\$1080.00	739.00	342.00
410 Program Recorder	90.00	77.00	13.00
810 Disk Drive	600.00	457.00	143.00
825 Printer (80 col-Centronic 737)	999.95	769.00	230.00
820 Printer (40 col-impact)	450.00	373.00	77.00
830 Acoustic Modem	200.00	155.00	45.00
850 Interface Module	220.00	192.00	28.00
Atari Visicalc	200.00	164.00	36.00
Atari 400-16K	595.00	327.00	304.00

HEWLETT PACKARD

	List	Our Price	SAVE
HP-125 Microcomputer	3750.00	2990.00	760.00
HP-85 Microcomputer	3250.00	2475.00	775.00
HP-83 Microcomputer	2250.00	1777.00	473.00
16K Exp-Memory Module	295.00	255.00	40.00
Graphics Plotter 7225	2450.00	2075.00	375.00
Personality Mod. for 7225	750.00	665.00	85.00
2631B impact/printer/hvy dty	3950.00	3250.00	700.00
Option 020 for 2631B	150.00	125.00	25.00
8 Drives to choose from 829025	1300.00	1125.00	195.00
9895A 8" Dual Drive	6850.00	5500.00	1350.00
Graphics Tablet 9111A	2050.00	1678.00	374.00
HP-41 CV New 2.2 bytes mem	325.00	250.00	75.00
HP-41-C Calculator	250.00	185.00	65.00
Card Reader for 41 CV/C	215.00	162.00	53.00
Printer for 41 CV/C	385.00	289.00	101.00
Optical Wand for 41 CV/C	125.00	97.00	28.00
Quad Ram equals 4 Mem. Mods	95.00	81.00	14.00
Memory Modules for 41C		25.00	\$
HP-67 Programmable Printer	750.00	595.00	175.00
HP-67 Programmable Calculator	375.00	295.00	80.00
HP-34C Programmable Scientific	150.00	117.00	33.00
HP-38C Programmable Bus. R/E	150.00	117.00	33.00
HP-32E Adv. Scientific	55.00	48.00	7.00
HP-37E Business Mgmt.	75.00	57.00	18.00

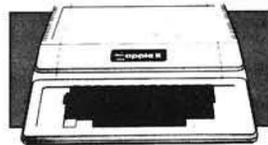
We carry a large inventory of Libraries, accessories and supplies.

PRINTERS

	List	Our Price	SAVE
EPSON			
MX 80 FT	745.00	549.00	196.00
MX 80 IMPACT	645.00	450.00	195.00
MX 70 IMPACT	500.00	390.00	110.00
MX 100	995.00	765.00	230.00
APPLE SILENTTYPE	645.00	299.00	346.00
ANADEx 9501	1650.00	1299.00	351.00
NEC			
5510	3195.00	2445.00	750.00
5545	3295.00	2545.00	750.00
3510	2495.00	1795.00	700.00
3545	2545.00	1849.00	696.00
OKIDATA			
MICROLINE 80	545.00	395.00	150.00
MICROLINE 82	649.00	549.00	100.00
MICROLINE 83	1050.00	769.00	281.00
PAPER TIGER			
445G with Graphics	795.00	695.00	100.00
460G with Graphics	1,304.00	899.00	495.00
560G New full size	1,695.00	1,139.00	556.00
DIABLO (LETTER QUALITY)			
630 R102 bi-directional	2,965.00	2,350.00	615.00
1640K109 keyboard			
tractors	4,000.00	2,899.00	1,100.00
630 RO Receive Only	2,710.00	2,250.00	460.00
1650K 136 keyboard			
tractors	4,000.00	3,100.00	900.00

SPECIAL OF THE MONTH

APPLE II PLUS
 48K W/16K
 EXPANSION BOARD = **64K**



Our price \$1199.00

List price \$1780.00

Our price \$1199.00

Save \$581.00

APPLE II STUDENT SYSTEM

- Apple II Plus System-48K RAM
- Disk II Floppy Disk & Interface (DOS 3.3)
- 12" Grn. Phs. Video Monitor

SAVE \$655

Our Price **\$1795**

List \$2450.00

MONITORS

	List	Our Price	SAVE
NEC Grn. Phs. 12"	\$285.00	239.99	\$46.00
BMC Green Phs. 12"	275.00	229.00	46.00
Zenith 12"	159.00	119.00	30.00

SANYO MONITORS

High Resolution, Number 1 seller

	List	Our Price	SAVE
13" Color (new) high quality	\$550.00	388.00	\$162.00
12" Green Phosphorus	360.00	240.00	120.00
12" Black & White	340.00	217.00	123.00
15" Black & White	370.00	235.00	135.00
9" Black & White		235.00	145.00

The Best Seller!

DISKETTES

SOLD IN BOXES OF 10 (Min. Purchase)

BUY \$100 of the Following Diskettes

	List	Our Price	SAVE
DYSAN			
1041 1 5" SOFT SECTOR	6.00	3.99	\$ 2.01
1041 1 5" DBL DEN. SOFT SEC.	6.40	4.60	1.80
3740 1 8" SOFT SECTOR	7.25	4.75	2.50
3740 1 8" DBL DEN. SOFT SECTOR	10.75	6.90	3.85
MAXELL			
MD-1 5" SOFT SEC. TOR/DBL DEN.	5.00	4.00	1.00
MD-2 5" SOFT SECTOR/DBL. SIDE/DBL. DEN.	7.00	4.90	2.10
FD-1 8" SOFT SEC./DBL. DEN.	6.50	4.50	2.00
FD-2 8" SOFT SEC./DBL. SIDE/DBL. DEN.	8.50	5.95	2.55

TERMINALS

	List	Our Price	SAVE
910	699.00	599.00	100.00
912C	950.00	699.00	251.00
920C	995.00	795.00	200.00
950C	1,195.00	949.00	246.00

DRIVES

	List	Our Price	SAVE
CORVUS			
5 MBYTES	3,750.00	3,050.00	700.00
10 MBYTES	5,350.00	4,449.00	901.00
20 MBYTES	6,450.00	6,450.00	1,125.00

SOFTWARE FOR APPLE II

	List	Our Price	SAVE
Apple Fortran	\$ 200.00	\$ 147.00	\$ 53.00
DOS 3.3 (16 Sector)	60.00	45.00	15.00
Apple PILOT (16 Sector)	150.00	119.00	31.00
Apple FORTRAN (requires A28000s) (16 Sector)	200.00	159.00	41.00
Language System with Apple Pascal	495.00	399.00	96.00
BPI General Ledger	395.00	319.00	76.00
BPI Inventory Package	395.00	319.00	76.00
Visidex	200.00	159.00	41.00
Visicalc	200.00	159.00	41.00
Desktop Plan II	200.00	159.00	41.00
Microlab Database System	150.00	119.00	31.00
Stoneware DB Master	229.00	189.00	40.00
Muse SuperText II	150.00	119.00	31.00
Softtape Magic Window	99.00	72.00	27.00

TEXAS INSTRUMENTS

	List	Our Price	SAVE
TI 99/4A Console New Improved	950.00	385.95	564.05
10" Color Monitor High Resolution	374.95	317.95	57.00
32K Memory Module	399.95	312.95	87.00
Speech Synthesizer	149.95	127.95	22.00
Disk Memory Drive	499.95	390.95	109.00
RF Modulator	49.95	42.50	7.45
Telephone Coupler (Modem)	224.95	185.95	39.00
Printer (Solid State)	399.95	315.95	84.00

MODEMS

	List	Our Price	SAVE
NOVATION CAT MODEM	189.95	140.00	49.95
NOVATION D-CAT	199.00	150.00	49.00
NOVATION APPLE-CAT	349.00	310.00	39.00
HAYES MICROMODEM	379.00	295.00	84.00
HAYES SMARTMODEM	279.00	239.00	40.00

CALCULATORS

	List	Our Price	SAVE
CASIO			
HR-10	49.95	39.00	10.95
HR-12	54.95	42.00	12.95
FR-100	79.95	59.00	20.95
FR-1210	129.95	99.00	30.95
PG-20	29.95	23.00	6.95
LC-785	12.95	10.00	2.95
LC-3165	29.95	10.00	19.95
FX-8 Scientific	19.95	17.00	2.95
FX-81 Scientific	39.95	29.95	10.00
FX-3600P Scientific			
FX-602P "Computer Talk" 88 Memories Programming Upper & Lower Case Dot Matrix	129.95	99.00	30.95
FX-702P Solves Problems with Alpha-Numeric Clarity, uses Basic Language	199.95	159.00	40.95

TELE. ANSW. DEVICES

	List	Our Price	SAVE
PHONE MATE			
900	119.95	86.00	33.95
905 Remote	199.95	144.00	55.95
910	159.95	115.00	44.95
920	199.95	144.00	55.95
925 Remote	239.95	173.00	66.95
930 Remote	299.95	216.00	83.95
950 Remote	339.95	245.00	94.95
960 Remote	399.95	288.00	111.95

1 Year Extended WARRANTY

INQUIRE

MICRO BUSINESS WORLD Tele: 18852
 MAIL ORDER DEPT. WAREHOUSE
 18720 Oxnard, #108 Tarzana, CA 91356
 OUTSIDE CA CALL TOLL FREE 1 (800) 423-5886 IN CA (213) 996-2252

Name (Please Print) _____
 Address _____
 City _____ State _____ Zip _____
 Tel. _____
 Make _____ Model _____ Description _____ Price _____ Total _____

TOTAL ORDER \$ _____
 TAX (IF APPLICABLE) _____
 SHIPPING & HANDLING* _____
 TOTAL ENCLOSED \$ _____

*California residents add 6% sales tax
 **Add 3% for Shipping & Handling - Add 3% surcharge for credit cards
 Orders cannot be shipped unless accompanied by payment, including shipping and handling charges where applicable

CERTIFIED CHECK or M.O. Cash/Credit Card (Allow 2 weeks clearance for checks)
 Bank Wire Transfer

CREDIT CARD - Exp. Date _____ Signature _____

We reserve the right to correct typographical errors. This ad supersedes all previous ads.

The BEST games are from Creative Computing Software

1978: Adventure

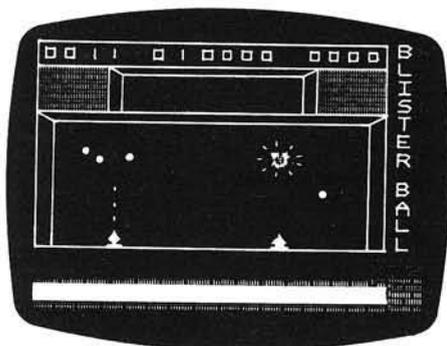
1979: Air Traffic Controller

1980: Super Invader

1981: Blister Ball
and Mad Bomber

Blister Ball

Blister Ball is the first completely original arcade-type game for a computer. Not a copy, not an adaptation, not a spinoff. **Blister Ball** is new—it's a new idea—better than Invaders, better than Circus, better than Asteroids, better than Galaxian. If you've played other games for hours, you'll play **Blister Ball** for days.



How does it work? Well, some mean but fun-loving aliens have produced some bouncing bombs. First they drop one and you've got to position yourself under it and zap it with your laser. If you miss, that's OK. It will bounce around, although each bounce is lower, and you have several chances to zap it. Got the hang of it? OK, here come two bouncing bombs. You zap them. Then you're faced with three, then four and five.

As they bounce longer and longer the walls begin to close in so you're faced with either zapping the bombs or being hit. Each hit knocks you a little further toward the gutter. But you can survive two hits which is usually enough to zap all the bombs.

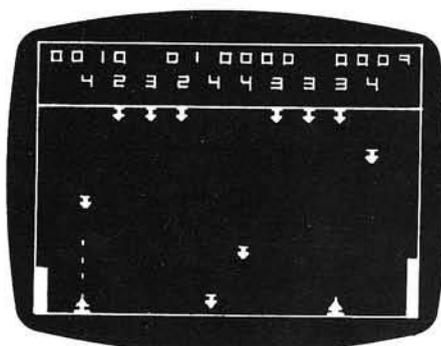
Feeling confident? Don't. Because after 5 bombs the murderous little devils drop 5 bonus bombs, worth ten times as much. These don't bounce, so you get only one shot. You need nerves of steel and the reflexes of a tail gunner.

After you complete one round, the game starts again with bombs that bounce faster and lower (and are worth more) than the previous ones.

Blister Ball is a fantastic solo game. But there are two-player options as well in which players can play as a team or as opponents. Each player can move the entire width of the screen and zap any of the bombs. Here, you're not only trying to survive, but trying to outscore your opponent. The game has two skill levels.

Mad Bomber

In **Mad Bomber** you are faced with aliens in a huge ship hovering overhead. They have bomb racks which they constantly fill with bombs. Your object is to move from side to side on the ground and zap the bombs in the bomb racks or as they fall.



As the game progresses, the aliens fill up their bomb racks more quickly and the bombs fall faster. You lose after ten bombs have hit the area which you are defending.

Mad Bomber can be played by one player solo or by two players as a team or as opponents. Two skill levels.

Order Today

Blister Ball and **Mad Bomber** are available together for \$24.95 on disk (DOS 3.2) only and require a 48K Apple with paddle controls. (We recommend using the Super Paddles from Peripherals Plus).

To order send \$24.95 plus \$2.00 shipping and handling to the address below. Credit card customers should include card number and expiration date of Visa, MasterCard or American Express card. Credit card orders may also be called in to our toll-free number in the continental U.S.

If you also wish to order a set of Super Paddles from our Peripherals Plus subsidiary, the cost is just \$39.95. The paddles are backed by a 90-day limited warranty from the manufacturer as well as Peripherals Plus' moneyback guarantee of satisfaction.

Blister Ball and **Mad Bomber** are colorful, challenging, fast and noisy. They are the games of the year from Sensational Software.

Creative Computing

Attn: Gladys
39 E. Hanover Avenue
Morris Plains, NJ 07950
Toll-free 800-631-8112
In NJ 201-540-0445

PROGRAMMER

PROGRAMMER is a newsletter that offers tips on software technique and invaluable marketing information.

You'll learn who is selling software and who isn't. What markets are hot and what markets are dead. Industry features keep you informed about your rights as a freelancer.

Don't be without it!

SEND CHECK OR MONEY ORDER TO: PROGRAMMER
P.O. BOX 3210
MANCHESTER, N.H. 03105

NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

CHECK BOX FOR SAMPLE ISSUE—\$2.00 *D-2

**CHARTER PRICE
6 MONTHS
JUST \$13.00**

OSI *NEW* OSI

Le Mans

FAST ACTION MACHINE CODE RACING FROM DAVE EDGON, THE WIZARD OF 6502! YOUR *CHALLENGER* IS THE FASTEST CAR ON THE TRACK, BUT CATCHING AND PASSING SLOWER CARS CAN BE HAZARDOUS TO YOUR HEALTH! SEE HOW FAR YOU CAN GO ON ONE TANK OF FUEL WHILE TWISTING AND DODGING THROUGH THE PACK. **C1 CASSETTE ONLY** OF COURSE IT'S GOT SOUND! - IT'S FROM PRETZELLAND ISN'T IT? 8K REQUIRED\$9.95

STAR SECTOR DEFENSE

YOUR STAR SECTOR IS UNDER ATTACK! WHILE YOUR SHIELDS HOLD OUT, YOU'VE GOT TO HELP THE ENEMY SPACECRAFT! AS YOU ROTATE AND THRUST YOUR SHIP, YOU CAN USE THE BLACK HOLE IN THE CENTER TO HYPERSPACE OUT OF DANGER, BUT THEN AGAIN, YOU MIGHT RE-ENTER INTO EVEN BIGGER TROUBLE! AS AN ADDED BONUS, SSD HAS A "TWO PLAYER" OPTION! YOU AND A FRIEND CAN HAVE A "SPACE WAR" AFTER YOU PRACTICE AGAINST THE COMPUTER! COLOR & SOUND, 8K CASSETTE. SPECIFY YOUR SYSTEM!\$9.95



ON PATROL IN YOUR GALACTIC FIGHTER, YOU ENCOUNTER WAVE AFTER WAVE OF ALIEN ATTACK CRAFT, TRYING TO PENETRATE YOUR DEFENSES AND ATTACK YOUR HOME PLANET! IF YOU LET ANY SHIPS SLIP PAST YOU, THE ENEMY WILL SEND ANOTHER SQUADRON OF THE SAME TYPE OF SHIP. AFTER EACH ATTACK WAVE, A SPACE TANKER WILL TRY TO RENDEZVOUS AND REFUEL YOUR FIGHTER. EACH SQUADRON IS WORTH MORE POINTS, BUT EACH ATTACK WAVE HAS MORE SHIPS! HOW LONG CAN YOU HOLD OUT? COLOR & SOUND, 8K CASSETTE. SPECIFY YOUR SYSTEM!\$9.95

GALACTIC FIGHTER

Introductory Offer



EXPIRES 2/25/82
TRY 2 OR MORE OF THESE NEW SOFT PRETZELS AND TAKE A \$1.00 DISCOUNT ON EACH ONE!
OR, SEND \$1.00 FOR A PHOTO-ILLUSTRATED CATALOG AND GET A \$1.50 CREDIT GOOD ON YOUR FIRST ORDER!

ALL PROGRAMS AVAILABLE ON CASSETTE ONLY!
Pretzelland Software
2005 D WHITTAKER RD.
YPSILANTI, MI. 48197

EDITRIX GRAPHTRIX

EDITRIX + GRAPHTRIX = THE MOST POWERFUL WORD PROCESSOR
THIS SIDE OF A NEWSPAPER COMPOSITION ROOM

EDITRIX™ TEXT EDITOR

EASY TO USE

- Friendly, COMPLETE instructions that you or your secretary can understand.
- Easy to remember 1 or 2 keystroke commands.
- Fully Menu Driven.

POWERFUL

- Full Cursor Control.
- Full Print Size and Emphasis Control.
- Underline - Superscript - Footnotes.
- Search - Replace - Block Move.
- Automatic Graphic Insertion and Formatting.
- All Justify Modes and Full Margin Control

FLEXIBLE

- 40 or 80 Column Display.
- Printout through GRAPHTRIX to 11 different Printers WITHOUT CHANGING YOUR TEXT FILE!

REQUIRES: Apple II with 48K, Applesoft in ROM, DOS 3.3 and the GRAPHTRIX Matrics Graphics System

GRAPHTRIX™

TEXT PRINTER AND GRAPHICS SCREEN DUMP

EASY TO USE

- Complete READABLE documentation.
- Fully Menu Driven.
- Self-running Introduction and Demonstration.

POWERFUL

- Graphic Magnification, Normal/Inverse, Page Centering, Hi and Low Crop Marks, Title String.
- Automatic Formatting of Graphics in your Document.
- Print Size, Emphasis, Underline, Superscript, Footnotes, Chapters, controlled from your text file.

FLEXIBLE

- Prints ANY HI-RES Graphic your Apple II can create.
- Formats Text files from Applewriter OR EDITRIX.
- Use as a Menu Driven Screen Dump OR from in YOUR OWN Applesoft Program.
- Compatible with 11 different Matrix Line Printers AND 7 different Parallel Interface Cards.

REQUIRES: Apple II with 48K, Applesoft in ROM, DOS 3.3 and one of the following line printers: EPSON MX-70/MX-80/MX-100, ANADEX 9500/9501, IDS 440G/445G/460G/560G, CENTRONICS 739, MPI 88G, SILENTYPE.

FROM DATA TRANSFORMS, INC., THE GRAPHICS LEADER

EDITRIX and GRAPHTRIX are the trademarks of Data Transforms Inc., a division of Solarstatis Inc.
Apple II and Applewriter are trademarks of Apple Computer Inc.
(c) Copyright 1981 Data Transforms, Inc. 906 E. Fifth Ave. Denver, CO 80218 (303) 722-8774
All Rights Reserved

M.D. SOFTWARE



Presents

Disc-O-Doc II

By Stanley M. Dratler, M.D.

The original **Disc-O-Doc** has been hailed by educators and programmers alike as the only disk utility program of its kind for the APPLE II. Now, it is even better and more powerful as **Disc-O-Doc II**. With it you will be able to read any diskette - *copyable or not*, repair crashed diskettes, change D.O.S. commands at will and even undelete programs deleted by mistake.

Disc-O-Doc II will save you many hours of work on files that have been ruined, and programs that need to be modified. You can now see how diskettes were created to be uncopyable and even learn how to do it yourself. Finally, the secrets of D.O.S. will be secrets no more. Along with the extensive documentation included you will be able to learn many facets of the workings of D.O.S. Easy to use, too powerful not to!

And now **Disc-O-Doc II** contains many unique new features.

- **HALF-TRACKING** — now you can even read those diskettes that are half-tracked. Track 1.5, 2.5, etc.
- **PRINTER OUTPUT** — send all of the information you find out to any standard printer card
- **SELF DIAGNOSIS** — tells you instantly what part of D.O.S. has been changed on any disk to make it uncopyable.
- **AUTO TREATMENT** — just tell **Disc-O-Doc II** what to do and it will change D.O.S. in all the right places.
- **SINGLE SECTOR OR WHOLE TRACK** — your choice read or write all or part only.

Disc-O-Doc II is supplied on a write protected diskette with complete bound documentation for only **\$99.95**

Word Processor II

This is a text editor that outperforms any other on the market. Compare it to any word processor and you'll buy **Word Processor II** without a doubt. Just check the review in Oct. 1981 Call-A.P.P.L.E.

- **Form Letters** - makes individual letters that seem to be personalized with up to 255 different fields.
- **Text Files** - works with any standard sequential text file including most 6502 assemblers.
- **Conditional Text** - checks for a certain condition and inserts necessary text completely formatted
- **Speed** - ultra fast loading and saving of text. Puts formatter into any 16K card for instant printing.
- **Compatibility** - works with most 80 column cards without any modifications - DOS 3.3 or 3.2.
- **True Upper/Lower Case** - both on the screen with adaptors and in the file.
- **Economy** - compare the price and you'll be convinced

WP II only \$75.00 Lowercase Rom for Rev. 7. + **\$45.00**

Introducing

SIGHT n SOUND

By Ray Balbes, Ph.D.

Enhance any stereo or cassette recording with a fantastic, fully **SYNCHRONIZED HI-RES** light show. Use basic designs of your own creation - or use those supplied - to enjoy an unlimited number of visual images with the sound. The images are controlled by the sound frequencies in real time.

- ★ Kaleidoscope light shows
- ★ Guitar player who sings & plays to the beat
- ★ Geometric design light shows
- ★ Fast machine language programs are used to synchronize audio & visual
- ★ Take your own 'EKG'
- ★ 23 page, clearly written manual tells:
 - How to create new light shows
 - How to add light shows to your own programs
- ★ Watch your voice on the 'oscilloscope'
- ★ Powerful design/editor for creating light shows
- ★ Introductory price **\$24.95**

For any 48K Apple II or II+ with Applesoft & a disk drive (DOS 3.2 or 3.3) No hardware modifications



FOR CHARGE OR
C.O.D. ORDERS
CALL TOLL-FREE

800-227-1617 ASK FOR **372**
IN CALIF. — 800-772-3545 EXT.

OTHER CALLS
AND INFORMATION
314-725-1110

Add \$2 postage & handling for each program ordered. Foreign orders add \$7 for AIR MAIL POSTAGE

7225 CLAYTON ROAD, ST. LOUIS, MISSOURI 63117

*Apple II is a registered trademark of Apple Computer Inc.

6502 Bibliography: Part XXXX

1153. **Compute! 3, No. 4, Issue 11 (April, 1981)**
- Stewart, C.A., "OSI C1P Control Functions," pg. 110-113.
A method to implement commands (RUN, LOAD, SAVE, LIST, etc.) by a single keystroke.
- Mason, James L., "Double the Cassette Baud Rate of Your OSI Superboard II/1P," pg. 114-115.
A hardware modification for the Superboard.
- Butterfield, Jim, "Relative File Mechanics," pg. 122-124.
An instructional article on relative files for the PET.
- Hinrichs, William L., "Matrix Row Operations," pg. 56-63.
A mathematics classroom teaching aid (Apple/PET) including a program in BASIC.
- DeJong, Marvin L., "A Floating Point Binary to BCD Routine," pg. 66-73.
Machine language routines for 6502 micros.
- Harvey, Francis A. and Collins, Rosann W. and Hines, Theodore C., "Fill the Screen with Your Message," pg. 80-86.
Generating large multi-colored characters using Apple low-resolution graphics.
- Kelly, Derek, "Decrementing the FOR...NEXT and Endless Loops," pg. 88-90.
An instructional article for Applesoft users.
- Stewart, Ed., "Unleash the Power of Your Atari CPU," pg. 102.
How to get a 30% increase in speed from your Atari CPU.
- Brannon, Charles, "String Arrays in Atari BASIC," pg. 103-104.
A method to simulate string array handling in Atari BASIC.
- Butterfield, Jim, "Working with BASIC 4.0," pg. 136.
Tips on getting printed output from the machine language monitor in PET's BASIC 4.0.
- Butterfield, Jim, "Disabling the STOP Key," pg. 141.
How to disable the PET's STOP key.
- Turco, Francis, "Dissecting C.W. Moser's ASSM/TED 1.0," pg. 142-144.
Assistance for the user of this PET utility.
- Deal, Elizabeth, "How to Get Started in Machine Code," pg. 146-151.
For PET users taking their first steps in machine code.
- Herman, Harvey B., "KIM Tidbits," pg. 163-164.
Expanding the KIM system.
- Olivo, Richard F., "Printing a Symbol Table for the AIM 65 Assembler," pg. 165.
Assistance for AIM 65 users.
1154. **Interface Age 6, Issue 5 (May, 1981)**
- Baker Al, "Game Corner," pg. 27-29.
An Apple program for measuring the readability (Fog Index) of plain text.
1155. **Peelings II 2, No. 2 (March/April, 1981)**
- Staff, "Apple Software Evaluation," pg. 5-44.
Reviews of 11 educational programs, 4 communications packages, 3 utilities and several miscellaneous programs.
1156. **OSI User's Independent Newsletter, No. 9 (April, 1981)**
- Anon., "Printer Driver," pg. 6.
Source code for a driver for a serial EMAKO printer and CA-10X card.
- Anon., "PEEK and POKE," pg. 7-8.
PEEK and POKE for Pascal on the OSI systems.
1157. **Nibble 2, No. 2 (April, 1981)**
- Thompson, C.J., "Applesoft NIFFUM," pg. 49-53.
NIFFUM.FP for the Apple will transfer Applesoft files from DOS 3.3 to 3.2 diskettes.
- Mottola, R.M., "Inputting Strings with Commas," pg. 57.
A utility for the Apple.
- Black, Preston R., "Disk Snooping — Part 1," pg. 63-70.
The first of a series on disk utilities for the Apple disk.
- Thompson, C.J., "BSAVE Can be Easy," pg. 71.
How to figure out the A\$ and L\$ parameters for binary saves on the Apple.
- Reynolds, William III, "Using Text Files from Machine Language," pg. 71-74.
Tips on using Apple text files.
- Chipchase, Frank D., "Chaining Applesoft Without a Chain," pg. 77.
A technique for Apple programmers.
1158. **Recreational Computing 9, No. 6, Issue 51 (May/June, 1981)**
- Thornburg, David D., "Pilot's Turtle Graphics for Atari," pg. 16-20.
Atari Pilot offers a simple way to develop graphics on the Atari.
1159. **Spreadsheet 1, Issue 3 (March, 1981)**
- Barker, Thomas, "Visitip #7," pg. 1.
How to set up a label to your worksheet on the prompt line, on VisiCalc.
- Bostater, John, "Introducing a Bit of Logic into a Model," pg. 5.
Here is an algorithm for VisiCalc to match numbers, with an example of sorting out information by a code number.
1160. **POKE-Apple 3, No. 3 (April, 1981)**
- Holderby, Michael and Hamilton, Al, "Integer BASIC Token Scheme," pg. 10-14.
An instructional article on Apple's use of tokens.

6502

FORTH

- adheres to the FORTH-79 STANDARD
- performs FLOATING POINT MATH
- contains a 6502 MACRO ASSEMBLER
- handles STRINGS much like BASIC
- includes VIRTUAL MEMORY MANAGER
- is ROMABLE
- costs under \$100
- is available for KIM-1, AIM 65 and SYM-1
- manual has extensive FORTH TUTORIAL

For more information and an ordering form

contact: Eric C. Rehnke
1067 Jadestone Lane
Corona, CA 91720
(714) 371-4548

OSI Disk Users

Double your disk storage capacity Without adding disk drives

Now you can more than double your usable floppy disk storage capacity—for a fraction of the cost of additional disk drives. Modular Systems' DiskDoubler™ is a double-density adapter that doubles the storage capacity of each disk track. The DiskDoubler plugs directly into an OSI disk interface board. No changes to hardware or software are required.

The DiskDoubler increases free user disk space from 50K to 120K for mini-floppies, from 201K to 420K for 8-inch floppies. With the DiskDoubler, each drive does the work of two. You can have more and larger programs, related files, and disk utilities on the same disk—for easier operation without constant disk changes.

Your OSI system is an investment in computing power. Get the full value from the disk hardware and software that you already own. Just write to us, and we'll send you the full story on the DiskDoubler, along with the rest of our growing family of OSI-compatible products.

™ DiskDoubler is a trademark of Modular Systems

Modular Systems

P.O. Box 16A Oradell, NJ 07649
201-262-0093

1161. Mini'App'Les 4, No. 4 (April, 1981)

Anon., "Driver Demo," pg. 9.

A BASIC driver demo program to send block graphics to an Epson MX-80 with modified Apple Epson board.

Anon., "Dan On Printers," pg. 13.

Some tips on using the Epson MX-80.

Murrell, Mike, "Addendum to Dan on Printers," pg. 13.

Notes on using the SSS AIO board with the MX-80.

Thiesfeld, Chuck, "Chuck on Printers," pg. 14-16.

How to modify the Epson Apple interface board so your MX-80 can print block graphics.

1162. Apple-Can 1, No. 1 (December, 1980)

Radford, Bob, "Pascal with One Drive," pg. 15-16.

How to improve the one-drive system by breaking up the Apple/Pascal system programs among a number of disks according to the use that is made of each disk.

1163. Apple-Can 1, No. 2 (February, 1981)

Falkner, Keith, "The Truth of Magnetism," pg. 17-18.

An interesting article dispelling some of the myths about tapes or disks being excessively sensitive to magnetic fields. It takes a very substantial field strength to cause loss of data!

Pugh, John, "Soft Copy to Screen," pg. 24.

A utility for users of the Magic Window word processing system.

Hurd, John C., "The Sorcerer: A Program for Converting Machine Code to Source Text," pg. 28-32.

A utility for the user of Apple assembly language.

1164. Apple-Can 1, No. 3 (April, 1981)

Wojdylo, Tomasz, "Apple Repair Tips," pg. 14.

Some tips on what to look for when your disk drive gives up and issues a burnt plastic odor!

Vella-Zarb, Pierre, "Sorcerer Extension: A Cheap Disassembler," pg. 23-28.

A utility for the Apple.

1165. Atari Computer Enthusiasts 2, Issue 4 (April, 1981)

Goff, Stacy A., "Fileindx — Part Two," pg. 10-11.

A utility to allow you to index your disks and directories, for the Atari.

1166. Apple Assembly Line 1, Issue 7 (April, 1981)

Sander-Cederlof, Bob, "Text File in Assembly Language Programs," pg. 2-4.

How to read or write a text file from your Apple assembly language program.

Sander-Cederlof, Bob, "Applesoft Entry Points," pg. 4-5.

A useful table for Apple programmers.

Sander-Cederlof, Bob, "Commented Listings of DOS 3.2.1 and #.# Formats," pg. 11-17.

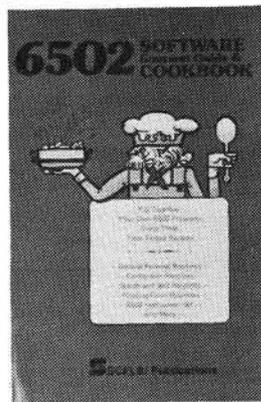
The Format routines of the two DOS for the Apple disks are disassembled and explained.

1167. The Apple-Dillo (April, 1981)

Sethre, Tom, "Program Utility Printer."

This program assists you in printing listings of programs in a wider format than appears on your screen — for the Apple.

- 1168. Electronics 54, No. 6 (March 24, 1981)**
Wyatt, Michael A., "Laplace Transform for the Apple," pg. 163.
A time domain display of a Laplace transform.
- 1169. The G.R.A.P.E. Vine 2, No. 3 (April, 1981)**
Lawson, Steve, "13- and 16-Sector DOS," pg. 5.
How to cope with 13- and 16-sector disks using several approaches.
- 1170. Dr. Dobb's Journal 6, No. 55, Issue 5 (May, 1981)**
Pittman, Tom, "Analysis of an Analysis," pg. 4.
Discussion of 6502 opcodes.
- 1171. The Apple Barrel 4, No. 2 (April, 1981)**
Gilbreth, Lee, "Son of a ... File Cabinet," pg. 5-6.
A round-up of modifications for the popular Apple utility, File Cabinet.
- 1172. PEEK(65) 2, No. 4 (April, 1981)**
Williams, Jim, "Two Dollar BSR X-10 Interface," pg. 5-6.
Hardware and software for a wireless AC remote control system.
Loos, James, "C1P as a Dumb Terminal," pg. 6-8.
Machine language routine for OSI systems such as C1P.
Jones, David A., "Cassette Corner," pg. 8, 21-22.
Notes on saving machine language code on OSI systems.
- 1173. F.W.A.U.G. Newsletter 2, No. 4 (February, 1981)**
Meador, Lee, "Disassembly of DOS 3.2," pg. 2-6.
A continuation of this popular series.
- 1174. T.A.R.T. Newsletter 2, Issue 2 (April, 1981)**
Sand, Paul A. and Koerin, Sid, "Pretty Listing," pg. 22-29.
A program to modify your program listings to reformat into a more readable form.
- 1175. The Apple Orchard 2, No. 1 (Spring, 1981)**
Weiglin, Peter C., "Screen Formatting of Text," pg. 9-14.
An instructional article for Apple owners.
Good, R.H., "Practical Super Hi-Res Graphics," pg. 20.
Plot on the Apple with a resolution of 560 x 192.
Reynolds, Lee, "S.H. Lam Routine Utility," pg. 28-29.
A routine to set up machine language routines within a BASIC program on the Apple.
Nareff, Max J., "Matrix Functions with the Apple," pg. 36-38.
How to reconstruct those matrix functions missing from Applesoft.
Mack, Art, "Sorting in BASIC," pg. 68.
A simple sort routine for Apple.
Golding, Val J., "Proper Printer Protocol," pg. 91.
A suggested standard BASIC printer call subroutine.
- 1176. Abacus II 3, Issue 3 (March, 1981)**
Howard, Clifton M., "Directory Title Formatting," pg. 5-24.
A concept of directory title formatting including a series of utilities for disk management for the Apple.



6502 COOKBOOK
For the machine language programmer who knows it is time to get serious! Here are search and sort routines, utilities, I/O & interrupt procedures, conversion routines, stack operations. Contains flow charts, source listings, explanations. Machine codes provided in both octal and hexadecimal. Tens of thousands of our programmer's cookbooks are in use.

Order publication: 6502 SOFTWARE COOKBOOK
Price in United States: just \$12.95 + \$1.00 s/h by mail.

Please include remittance with order. Allow 3 - 4 weeks for delivery. MasterCard & VISA credit cards accepted. Our phone line for credit card orders is (203) 888-1946. Foreign price list available. Write for more information.

Check here for descriptive literature & catalog.

Name: _____
Addr: _____
City: _____ State: _____ Zip: _____
MC/VISA # _____ Bank: _____
Signature: _____

SCELBI Publications

35 Old State Road, Oxford, CT 06483

Ohio Scientific ★ AT LAST!

EAP Extended Arithmetic Processor

Copyright North East Financial Systems 9/81

MULTIPLE PRECISION MATH 65D3 and 65U

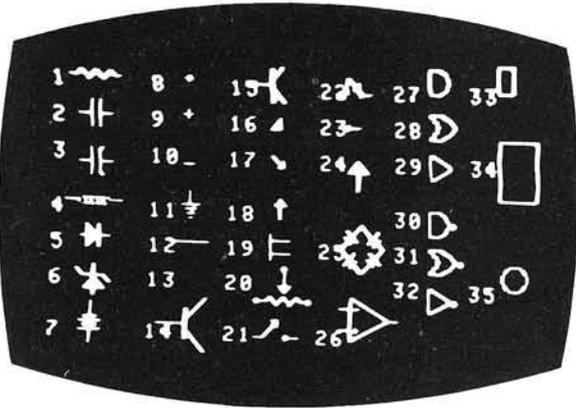
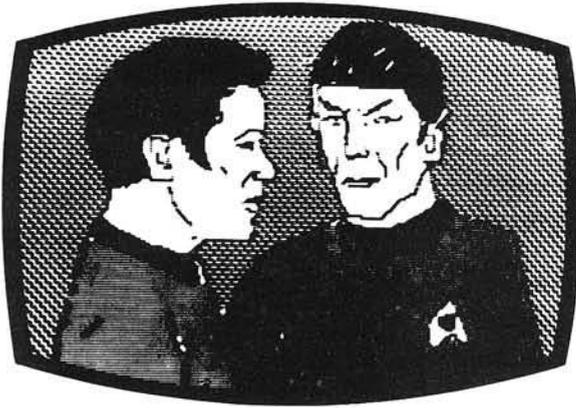
- 13-Digit Input — 26-Digit Output
- Complete Rounding Function
- Completely Integrated into 9-digit MICROSOFT BASIC
- \$95.00 End User License — 8" Disk, 39-page Manual
- OEM and Distributor License — Inquire

NORTH EAST FINANCIAL SYSTEMS
16 Maple Avenue
West Nyack, New York 10994
(914) 358-2898

MICRO



VersaWriter



What is VersaWriter?

- VersaWriter is an inexpensive drawing tablet for the APPLE II that lets you trace a picture and have it appear on TV display.
- VersaWriter is a comprehensive software drawing package which lets you color in drawings with over **100** different colors.
- VersaWriter is a shape compiler that converts anything on the screen automatically into a standard shape table.
- VersaWriter is a text writer for labeling pictures with text in six colors and five sizes. Use English or Greek, upper or lower case letters.
- VersaWriter is much more! Draw with brush, create schematic drawings, compute area and distance, edit pictures, save, recall and more.

VersaWriter requires ROM APPLESOFT and 48K memory.

\$299 Suggested Retail

UNIQUE OFFER

Send us YOUR disk and \$1. We will promptly return the disk with a slide package of 10 color pictures drawn with VersaWriter.

- Enclosed is \$1 and my disk. Send me the slide package.
- Send more information including VersaWriter dealers in my area.

DEALER INQUIRIES INVITED.

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Send To: Versa Computing, Inc. • 887 Conestoga Circle • Newbury Park, CA 91320 • (805) 498-1956

A feast of computing ideas.

**ONE
LAST CHANCE**
for readers & subscribers:
Order before January 31
at last year's price—
\$18 U.S.

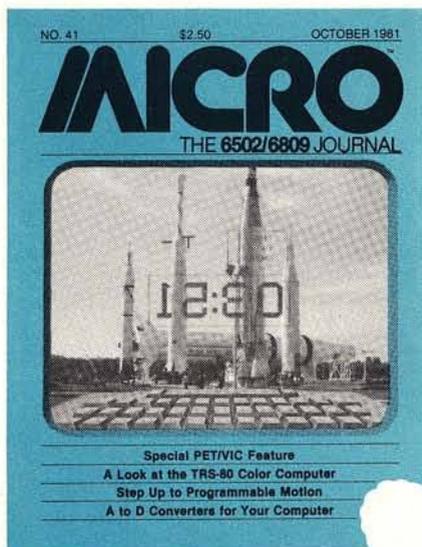
If you work with a 6502/6809-based system, you're probably hungry for the facts and ideas that will help you understand the inner workings of your computer. You want to go beyond canned software—use your computer for more than games—learn the advanced programming techniques that enable you to get the most out of your 6502/6809 system.

MICRO, The 6502/6809 Journal, gives you page after page, month after month, of solid information to sink your teeth into. **MICRO** is the premier how-to magazine for serious users of the Apple, PET/CBM, OSI, Atari, AIM, SYM, KIM, and all 6809 based systems including the TRS-80 Color Computer. It's a resource journal internationally respected by professionals in business, industry, and education. Every issue of **MICRO** keeps you informed with up-to-the-minute data on new products and publications:

- **hardware catalog** with organized, concise description
- **software catalog** in an easy-to-use format
- **new publications** listed and annotated
- **reviews and evaluations** of significant products

And there's much more:

- **In-depth hardware tutorials** bring expert advice into your home or office.
- **Detailed discussions of programming languages** deepen and broaden your programming ability.
- **Complete program listings** enable you to increase your machine's capabilities.
- **Bibliography of 6502/6809 information** helps you to find pertinent articles in a timely manner.
- **Special monthly features** with in-depth treatment of one subject or



You'll love every byte.

YES! I want to get more from my microcomputer. Please send me _____ year(s) of MICRO at \$ _____/year. (Outside U.S. and Canada, please indicate via surface or air mail.)

Name _____

Company _____

Street _____

City _____ State _____ Zip Code _____

- Check enclosed for \$ _____
 Charge my credit card account
 VISA MasterCard

Signature _____

Card number _____

Expiration date _____

system increase your knowledge of the field.

- **Balanced mix of machine-specific and general articles** for your everyday use as well as long-range reference needs.

- **Informative advertising** focused specifically on 6502/6809 machines keeps you abreast of latest developments.

- **Reader feedback** puts you in touch with other micro-computerists.

MICRO is the magazine you need to get the most from your own 6502/6809 system!

To order, send your check or international money order (payable to MICRO) and the order form at left, to:

Subscription Fulfillment
MICRO, Dept. M1
34 Chelmsford Street
P.O. Box 6502
Chelmsford, MA 01824

Or, for your convenience, call our toll-free number:

1-800-227-1617, Ext. 564
(In California, 800-772-3545, Ext. 564)

and charge your subscription to your MasterCard or VISA. (All orders must be prepaid in U.S. dollars or charged to your MasterCard or VISA.)

SUBSCRIPTION RATES (U.S. dollars)
Yearly subscription (ISSN 027-9002) saves 20% off the single-issue price.
U.S. \$24*

Canada \$27

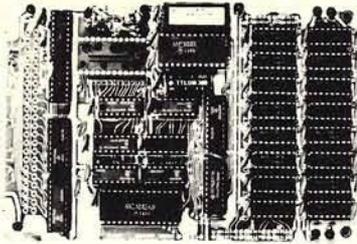
Europe \$27 (\$42 by air mail)

Mexico, Central America, Mideast, North and Central Africa \$27 (\$48 air)

South America, Far East, South Africa, Australasia \$27 (\$72 air)

* **SPECIAL OFFER—U.S. ONLY:**

Save even more—30% off single-issue price: 2 years, \$42



BETA 32K BYTE EXPANDABLE RAM FOR 6502 AND 6800 SYSTEMS

AIM 65 KIM SYM PET S44-BUS

- Plug compatible with the AIM-65/SYM expansion connector by using a right angle connector (supplied).
- Memory board edge connector plugs into the 6800 S44 bus.
- Connects to PET using an adaptor cable.
- Uses +5V only, supplied from the host computer.
- Full documentation. Assembled and tested boards are guaranteed for one full year. Purchase price is fully refundable if board is returned undamaged within 14 days.

Assembled with 32K RAM.....\$349.00
 & Tested with 16K RAM..... 329.00
 Bare board, manual & hard-to-get parts... 99.00
 PET interface kit. Connects the 32K RAM board to a 4K or 8K PET.....\$ 69.00

See our full-page ad in
BYTE and INTERFACE AGE

wabash



8" or 5 1/4" flexible diskettes certified 100% error free with manufacturer's 5-year limited warranty on all 8" media. Soft-sectored in boxes of 10. 5 1/4" available in 10-sector.

(Add \$3.00 for plastic library cases)
 8" single sided, single density.....\$ 27.50
 8" single sided, double density..... 35.50
 8" double sided, double density..... 45.50
 5 1/4" single sided, single density..... 27.50
 5 1/4" single sided, double density..... 29.50
 5 1/4" single sided, double density, 10-sector\$ 29.50

TERMS: Minimum order \$15.00. Minimum shipping and handling \$3.00. Calif. residents add 6% sales tax. Cash, checks, Mastercard, Visa and purchase orders from qualified firms are accepted. (Please allow two weeks for personal checks to clear before shipment.) Product availability and pricing subject to change without notice.

INTERNATIONAL ORDERS: Add 15% to purchase price for all orders. Minimum shipping charge is \$20.00. Orders with insufficient funds will be delayed. Excess funds will be returned with your order. All prices are U.S. only.

PAPER TIGER PRINTERS

IDS 460G 9x9 Dot Matrix Printer..... \$890.00
 IDS 560G Wide Carriage Printer..... 1099.00

TERMINALS

ADDS Viewpoint \$569.00
 TeleVideo 910 579.00
 TeleVideo 912C 679.00
 TeleVideo 920C 729.00
 TeleVideo 950 929.00

8" DISK DRIVES

Shugart 801R..... \$399.00
 NEC FD1160 (double sided)..... 569.00

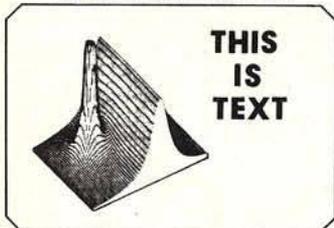
DYNAMIC RAMS

4116 (200ns) set of 8 \$24.00
 4164 (64Kx1) \$18.00

BETA
 COMPUTER DEVICES
 1230 W. COLLINS AVE.
 ORANGE, CA 92668
 (714) 633-7280



Double Density HGR

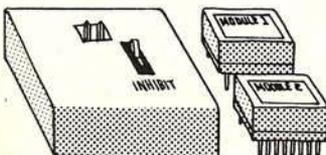


THIS IS TEXT

Hi-Res Graphics+Text



Lo-Res Graphics+Text

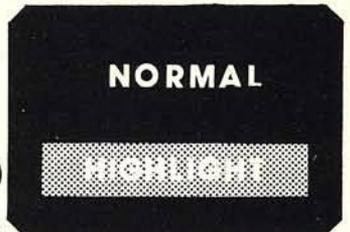


COSMOS SCREEN MIXER

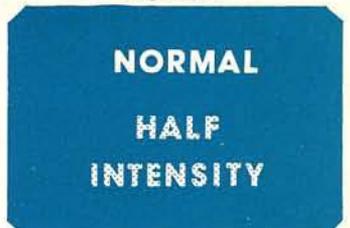
SCREEN MIXER is a set of three modules for APPLE-II. Just plug-in these modules to your Apple-II, and you will have the Apple-II with more features you could not expect till now----

SCREEN MIXER provides:

- The mixed screen of any two of screens available for the Apple-II. Please note that all of HGR, LGR and Text screen has two pages. The mixing is done with hardware, not like Hi-Res Text Generator Programs, thus you need no software and the scroll speed is not reduced. Also, you can scroll the text without any effect to the graphic patterns.
- The Double Density High Resolution Graphics. Yes, you can plot 580 dots in one line. You have only 280 dots in one line on ordinary Apple-II. (Software is required)
- One of the most advanced character display. Besides Normal and Inverse characters which are already built-in you will have the choice of Half-Intensity and Highlighted characters. And more, you may Over-Write or Over-Type any character to other character if you want to do so! (Software is included)



Highlight



Half Intensity



Over Write

\$60 Introductory price **\$50**
 Offer ends Apr. 31, '81

COSMOS
 WORLD WIDE COMPUTER SUPER SHOP

Dealers inquiries invited.
 For more information call or write to ASTAR INTERNATIONAL CO.
 5676 FRANCIS AVE., CHINO, CA 91710 Phone 714-627-9887

Apple-II is a registered trademark of Apple Computer Inc.

MICRO

Software Catalog

Name: **Real-time Clock Software**
System: KIM-1
Memory: 1K
Language: 6502 Machine Language
Hardware: CMOS Real-time Clock Chip MSM5832RS
Description: *Real-time Clock Software* for KIM-1 occupies ¾K bytes plus pointers in zero page. 70-page manual includes detailed assembler listing, machine language dump and extensive documentation. User-friendly system prompts for time-settings of year, month, day, hour, minute, and seconds in a 24-hour format. Major subroutines include Read Clock, Display Time, and Write Timesetting to Clock. All subroutines are well-documented for easy modification. Manual also documents Real-time Clock circuitry required for easy construction and interconnection to KIM-1.
Price: \$10.00 for Real-time Clock Software/
 Hardware Manual. \$1.00 for specifications/notes.
Author: Hunter Technical Services
Available: Hunter Technical Services
 P.O. Box 359
 Elm Grove, WI 53122

Name: **Lesson-tutorgraph™ — Shore Features and Weather**
System: Apple II, Apple II Plus with Applesoft in ROM or Language System
Memory: 48K, DOS 3.3
Language: BASIC
Hardware: Apple II or Apple II Plus, 1 disk
Description: Programmed presentation of lesson material with branching, review, full color, Hi-Res illustrations, and tests. "Weather Fronts" includes front characteristics, frontal movement, and weather characteristics of different fronts. "Shore Features" teaches about beach/shore, berm, dunes, low/high tides.
Price: \$24.95 includes diskette, manual with objectives, options, suggestions for use
Author: Patrick C. Moyer and Lois B. Bennett
Available: Teach Yourself By Computer (TYC) Software™
 40 Stuyvesant Manor
 Geneseo, NY 14454

Name: **TWGI Arima**
System: Apple II, Apple II Plus
Memory: 48K
Language: Applesoft
Hardware: 1 disk (printer and 2nd disk recommended)
Description: Box Jenkins package does seasonal and non-seasonal models. Menu-driven package does identification, estimation, diagnosis and forecasting. Includes programs to create, correct and update data; left- and right-hand software keypads. Also program to do all BASIC transformations.
Price: \$250.00 includes program, test data and results, 60-page manual
Author: Eric Weiss, Ph.D.
Available: The Winchendon Group
 P.O. Box 10114
 Alexandria, VA 22310

Name: **RPL Compiler**
System: All Commodore PET and CBM-series machines
Memory: 8K minimum
Language: No additional
Hardware: No additional
Description: RPL (Reverse Polish Language) is a new language designed to compete with FORTH. RPL object code runs faster and takes up less memory space than FORTH object code. RPL is also much easier to use than FORTH, although it is just as powerful.
Price: \$49.95 and down includes RPL compiler on disk or cassette and detailed user's manual
Author: Tim Stryker
Available: Samurai Software
 P.O. Box 2902
 Pompano Beach, FL 33062

Name: **EIS General Accounting Package**
System: OS65U
Memory: 48K
Language: BASIC
Hardware: Ohio Scientific C-2 or C-3 series
Description: This package includes fully integrated accounting, payroll, and inventory systems written in standard accounting terminology and procedure. It is end-user oriented, menu-driven, and generates all necessary reports and summaries. Individual Software Catalog Entry sheets on all three portions will follow in the next three months, with your one-a-month acceptance plan.
Price: \$3,500.00 total system includes program disks, data disks, and complete manual
Author: Electronic Information Systems, Inc.
Available: Electronic Information Systems, Inc.
 P.O. Box 5893
 Athens, GA 30604
 (404) 353-2858

Name: **Rubin's Cube**
System: OSI C1P
Memory: 8K
Language: 8K BASIC in ROM
Description: Try to solve this popular cube puzzle on your computer. The program displays a large three-dimensional cube that just fits on the 24 x 24 screen and uses graphics in place of colors. The computer mixes up the cube and, through the keyboard, you can make any move that can be made with the real cube to solve the puzzle. The commands are easy to learn and only four characters long.
Price: \$5.00 includes cassette and documentation
Author: Brian Zupke
Available: B.C. Software
 9425 Victoria Drive
 Upper Marlboro, MD 20772

Name: **Accounts Receivable**
System: Apple II
Memory: 48K
Language: Applesoft or Language System
Hardware: Dual 5" drives, any 130-column printer
Description: A quality program, structured around the Osborne Accounts Receivable software, with several added enhancements. Can be used alone or integrated with *General Ledger*. Features open invoicing, credit and debit memos, full or partial payments,

Software Catalog (continued)

progress billing, invoice aging and printing of statements. System is available on DOS 3.2, DOS 3.3, or 8" drives, if additional capacities are required.

Price: \$249.00
Author: David McFarling
Available: Small Business Computer Systems
4140 Greenwood
Lincoln, NE 68504
(402) 467-1878

Name: **Type**
System: SDOS or SDOS/MT
Memory: 48K minimum
Hardware: 6800/6809 CPU with CRT, disk and printer
Description: *Type* is a document-formatting program, used in word processing or document production. Commands embedded in raw text files processed by *Type* control the formatting of that text on the output device. Output formatting includes full justification, page width and depth, page numbering, centering, spacing, titles and table of contents generation. *Type* is used in conjunction with the SD Screen Editor for easy data entry.

Price: \$140.00 includes program, 100-page manual
Author: AMS
Available: Software Dynamics, exclusively
2111 W. Crescent, Su. G.
Anaheim, CA 92801
(714) 635-4760

Name: **Fast Facts**
System: Apple II, Apple II Plus
Memory: 48K
Language: Applesoft
Hardware: Disk 3.2 or 3.3, line printer desirable

Description: This selection of programs was created and designed by a certified financial planner for quick analysis of the personal investment planning needs of his clients. It was professionally programmed for efficient and accurate operation. *Fast Facts* operates easily with single key program selection and printing commands. In many cases the entire planning sequence is completed in less than 60 seconds. Specific program objects are divided into six systematic program fields. They are: planning for retirement; college financing; diversifying investments; results of inflation in devaluing earnings; costs of borrowing money and

loan balance at any point in time; investment calculations for compounding and future values.

Copies: Version 1.1 just released
Price: \$95.00 includes disk and instructions
Author: Monte C. Fremouw
Available: Richard Lorange CPF
c/o Richard Lorange and Associates, Ltd.
3336 N. 32nd Street,
Suite 102
Phoenix, AZ 85018

Name: **Loan Pack**
System: OSI Challenger (C2 or C3)
Memory: 48K
Language: BASIC (under either OS65-U or 65-D)
Hardware: Disk drive, CRT, printer optional

Description: *Loan Pack* is a loan analysis package. It computes either the interest rate of a loan, the principal amount of a loan, the amount of the loan payment, or the number of payments required to pay a loan, when any three of the other variables are known. It also calculates the present unpaid principal of a loan which is partially paid; and calculates and displays (or prints) a loan amortization schedule showing allocation of payments between interest charges and principal loan payments, and totals amounts of interest paid in each calendar year of the loan. Self documenting.

Price: \$5.00 for listing
\$12.00 for 8" disk (specify 65-U or 65-D)
Author: Bob Sullivan
Available: Professional Computers, Incorporated
10885 Washington Blvd.
Culver City, CA 90230
(213) 836-5005

Name: **VIC Software**
System: VIC 20
Memory: 3K
Language: BASIC and Machine Language

Description: Arcade games are now available for the VIC. *Cattle Roundup* has you round up eight cattle in a maze. *Artillery* lets you exchange fire over a mountain. *Target* is based on the arcade game *Missile Command*.

Price: \$9.95 each includes cassette and program
Author: Cliff Dudzik
Available: Computermat Software
P.O. Box 1664
2984 Daytona
Lake Havasu, AZ 86403

Name: **World and State Capitals**
System: Apple II, Apple II Plus
Memory: 36K with DOS 3.3 II or 3.2 II and FP installed
Language: Applesoft BASIC
Hardware: DOS 3.2 II or DOS 3.3 II with controller card, printer option

Description: Consists of a 100-world nation/capital and a 50-U.S. state/capital test. Both tests display a low-resolution graphic which animates dripping square-dots to fill the shape of the capital building. Right, wrong, total score points plus a bonus feature triggers this animation. The program features a simple single-key stroke answering system (except spelling test). This eliminates the standard use of the return key. The program was designed to eliminate teacher's supervision and encourage student's spelling accuracy, knowledge of the U.S. and the world. The score results are retrievable for teacher's use only (by date and name, stored score order sequence). In addition to above, the teacher can produce his or her own test, using the same features and format for up to 100 questions.

Price: \$25.00 for both programs with test report and test editor/report on a single diskette
Author: American Avicultural Art & Science Inc.
Available: American Avicultural Art & Science, Inc.
3268 Watson Road
St. Louis, MO 63139

Name: **Household Finance**
System: Commodore VIC-20
Memory: 3.5K User RAM (unexpanded VIC)
Language: BASIC
Hardware: Commodore VIC-20 with cassette unit

Description: Four programs to record household expenses and income in 16 categories. Provides monthly and yearly totals in tabular and graphic form. Handles budgeting, and sums tax-deductibles.

Price: \$34.95 includes two cassettes containing four programs, instruction booklet.
Author: John C. Doering, and Paul Zuzelo
Available: Creative Software
201 San Antonio Circle
#270
Mountain View, CA
94040
(415) 948-9595

Software Catalog (continued)

Name: **Geomap**
 System: Apple II or III (adaptable to other systems)
 Memory: 32K
 Language: Machine
 Hardware: One disk, printer and/or plotter

Description: This is a contour mapping package with the following features: menu driven; easy to use; choice of several map styles; adapts to user's printer width; maps are made in strips the width of printer or plotter paper (no limit to strip length or number of strips in single map); accepts either gridded or irregular data; large regions are subdivided into small parcels which can be run individually and randomly to form a contiguous, integrated whole (which minimizes RAM requirements and permits excessively long runs to be broken down into several small runs — an important feature for micros); modular design; choice of gridding algorithms; training available.

Price: \$2,000.00 (Manual alone \$5.00. Refundable with purchase.)

Author: Mason Christner
 Available: Geosystems, Inc.
 802 E. Grand River
 Williamston, MI 48895

Name: **6809 Pascal Compiler**
 System: 6809 FLEX™ or 6809 UniFLEX™
 Memory: 56K minimum
 Language: Pascal
 Hardware: Any that supports standard 6809 FLEX or UniFLEX

Description: Native-code Pascal compiler generates assembly language source which is assembled into true 6809 object code. This results in faster program execution speeds than common "P-code" interpreters. Supports nearly all of the Jensen & Wirth Pascal specifications plus additional features. Includes both integer and floating point math with up to 16.8 digits of accuracy.

Price: \$200.00 for FLEX version; \$300.00 for UniFLEX version. Includes user's manual, *Pascal User Manual* & *Report* by Jensen & Wirth, and object code on diskette.
 Available: Technical Systems Consultants, Inc.
 P.O. Box 2570
 West Lafayette, IN 47906
 (317) 463-2502
 Telex: 276143

takes up the entire disk. You must cross mountains, forests, great plains, and oceans to seek your fame and fortune! This game has full color graphics as well.

Price: \$29.95 includes comprehensive 8-page manual

Author: Steve Brown
 Available: Interesting Software
 15217 Campillos Rd
 La Mirada, CA 90638

Name: **Egbert RTTY Program**
 System: Apple II, Apple II Plus
 Memory: 48K
 Language: Applesoft (ROM) and Machine Language
 Hardware: Apple disk with DOS 3.2 or 3.3

Description: Transmit and receive RTTY without any expensive interface hardware. The Apple cassette ports connect directly to the transmitter/receiver — no additional hardware required! The Apple generates and decodes the RTTY tones. Program capabilities include 60, 67, 75, and 100 WPM Baudot and 110 Baud ASCII, unique receiver tuning using the Hi-Res graphics, type-ahead-buffer, break without dumping the type-ahead-buffer, canned messages, save received text/pictures to disk, automatic C.W.I.D., game port-driven push-to-talk, plus more.

Price: \$39.95 (California residents add 6% tax) includes program disk and instruction manual

Author: G.W. Egbert
 Available: W.H. Nail Co.
 275 Lodgeview Dr.
 Oroville, CA 95965

Name: **Presidential Campaigns**
 System: Ohio Scientific
 Memory: 8K
 Language: BASIC
 Hardware: C2-4P, C2-8P, C-4P, C-8P (Polled Keyboard)

Description: The program gives the user the opportunity to vote for every U.S. President from 1788 to 1980, and advises if his or her candidate won or lost, giving the name of the winner and his Vice-president.

Price: \$9.95 includes cassette
 Author: John and Mary Neally
 Available: Soundustrial Electronics, Incorporated
 4066 Polaris Avenue
 Joshua Tree, CA 92252
 (714) 366-9572

Name: **Jabbertalky**
 System: Apple II, TRS-80
 Memory: 16K TRS-80 cassette, 32K TRS-80 disk, 48K Apple disk
 Language: Applesoft or TRSDOS
 Hardware: Apple II, TRS-80 (model I, level II and model III), cassette or disk drive

Description: A programmable word game for one or more players, *Jabbertalky* includes two game features and a utility program. "Alphagrammar," an anagram game, challenges players to unscramble entire grammatically correct sentences. In "Cryptogrammar," a code breaking game, the player must decode sentences in which each letter of the alphabet is substituted for by another. The utility program lets players create their own sentences. *Jabbertalky* has eight skill levels and is for ages seven through adult.

Price: \$29.95 includes game box, rule book, loading instructions and disk or cassette
 Available: Automated Simulations, Inc.
 P.O. Box 4247
 Mountain View, CA 94040

Name: **Lightning-Bolt**
 System: OSI C4PMF
 Memory: 24K
 Language: BASIC
 Hardware: One disk drive
 Description: The finest D&D adventure for the OSI computer yet! This adventure is so comprehensive that it

Name: **Painter Power**
 System: Apple II or Apple II Plus
 Memory: 48K
 Language: Applesoft in ROM
 Hardware: Disk II

Description: Anyone can create computer art. Using the beginner or advanced mode, children and adults can create original art designs then use them, or any other saved screen, to prepare slide shows and art demonstrations.

Price: \$39.95
 Author: Eric Podietz
 Available: Micro Lab
 2310 Skokie Valley Rd.
 Highland Park, IL 60035

MICRO

Get more out of your Apple with the MICRO on the Apple series.

VOLUME 2— just released!

You liked Volume 1—You'll love
Volume 2!

More than 40 new programs on
diskette to help you get more from your
Apple:

- Machine Language Aids
- I/O Enhancements
- Runtime Utilities
- Graphics and Games
- Hardware and Reference Information

MICRO's new book for Apple users
lets you:

1. Speed up machine language programming using 5 powerful machine language aids.
2. Add additional editing and input/output features at no cost!
3. Enhance the capabilities of Applesoft and Integer BASIC to include sorting, print using, and MORE.
4. Use your high-resolution graphics to plot graphs and display "compressed" pictures.
5. Add an interesting hardware project to your Apple.
6. Play the intriguing game "Galactic Cube"—

And much, much more!

31 choice articles

46 tested programs on diskette
(13 sector DOS 3.2 format)

Buy **MICRO on the Apple 2** at your
local computer store

or

Call **1-800-227-1617, ext. 564 TOLL
FREE** (in CA, 1-800-772-3545, ext.
564) and charge it to your Mastercard
or VISA

or

Send check for **\$24.95** plus \$2.00
surface or \$5.00 air shipping to:

MICRO, Dept. MI
P.O. Box 6502
Chelmsford, MA 01824

Volume 1 also available at \$24.95. Together **MICRO on the Apple 1 & 2** provide more than 60 programs on diskette for less than \$1.00 each. No need to type in hundreds of lines of code.

MICRO on the Apple

Volume 2

INCLUDES
DISKETTE



Please allow 4-6 weeks for surface mail delivery.

Massachusetts residents add 5% sales tax.

Name: Execom 80
System: CBM/PET
 2001/3000/4000 Series
Memory: Additional 1K
Language: Operating System
Hardware: 1 4" x 5" and 1 2" x 2" circuit board with an optional 2" x 2" circuit board

Description: 80-column expansion that allows the user to switch between 80-column and 40-column displays, from program control, or directly from the keyboard. Requires some circuit modification to CBM/PET circuit board.

Price: \$275.00 includes all necessary hardware and ROMS, demo diskette (4040 format)

Available: Execom Corp.
 1901 Polaris Ave.
 Racine, WI 53404

Name: HILOT Plotters
System: TRS-80, 1/2/3, Atari, Apple, PET
Memory: 16 K
Language: User's Choice
Hardware: High-resolution pen plotter and interface card (if needed)

Description: HILOT Plotters is a very high quality alternative. Multiple pen colors is an add-on option. Resolution is typically 200 points/inch. Several different models are available in different sizes and options. A high-level plotting language drives the Z-80-based hardware. Software is available.

Price: \$1025 - \$2000
Available: Houston Instruments
 One Houston Square
 Austin, TX 78750

Name: Analog Peripheral
Hardware: Any system with RS-232 port

Description: Self-contained 8-bit analog-to-digital converter. RS-232C output line is switch-selectable from 110 to 9600 baud. For faster data transfer, there is also a 26-pin parallel output. Plug-in transducers eliminate need for breadboarding transducer circuits. Four input channels permit logging of

several variables at once. Fast conversion speed of 100 microseconds. One BASIC instruction begins data logging.

Price: \$449.00
Available: Cambridge Development Laboratory
 36 Pleasant Street
 Watertown, MA 02172

Name: Sabrina
System: SCS-10
Memory: 10 to 120 megabytes
Language: Apple 3.3 DOS, CP/M, Pascal 1.1, TRS DOS
Hardware: Winchester disk subsystem

Description: Sabrina is the SCS-10 8" Winchester hard disk storage system that will interface to over 9 different major microcomputers including Apple II, TRS-80, S-100, Multibus, and the IBM personal computer.

Price: Starting at \$4,995.00 includes everything required to run the hard disk to the host

Available: Santa Clara Systems
 560 Division St.
 Campbell, CA 95008
 (408) 374-6974

Name: Sun-Flex Touch Pen System

Description: Microprocessor-based, stylus-operated, graphic-capable interface, which enables a CRT operator to bypass the keyboard and communicate directly with the CPU. Available in sizes up to 25".

Price: \$250.00 - \$1,000.00 includes transparent screen panel, stylus, microprocessor
Available: Sun-Flex Company, Inc.
 20 Pimentel Court
 Novato, CA 94947

Name: The Grappler
System: Apple II, Apple II Plus
Language: All
Hardware: Parallel interface board for Apple

Description: The Grappler interface is the first universal parallel interface card to provide sophisticated on-board firmware for Apple high-resolution graphics. No longer does the user need to load clumsy software routines to dump screen graphics — it's all in the chip. Actually, it's our EPROM, and there are versions to accommodate numerous printers. The Grappler accepts 18 simple software commands accessible through the keyboard or user program, making it the most intelligent Apple interface available. It is also Pascal- and CP/M-compatible.

Price: Includes 5 ft. cable and manual
Available: Orange Micro
 3150 E. La Palma, Suite 1
 Anaheim, CA 92806
 (800) 854-8275

Waybern
 13911 Enterprise Dr.
 Garden Grove, CA 92643
 (714) 554-4520

CompuCable
 2081 Business Center Dr.
 Suite 180
 Irvine, CA 92715
 (714) 635-7330

Name: HTS General Expansion Boards

System: KIM-1 and OSI C1P
Memory: 2K bytes 2114L Static RAM, 4K bytes 2716 PROM

Hardware: 32 lines I/O port
Description: Low-cost general expansion boards for the KIM-1 or OSI C1P. Occupies 8K block of memory, location is switch selectable on any 8K boundary. Sixty-plus page manual describes two board designs, GEB1 uses 2K of 2114L RAM while GEBII uses two 2K x 8 RAM chips. GEBII ports overlap 64 bytes at upper boundary of RAM. Both boards provide 32 port lines using 6532 ports with instructions included for substituting 6522 VIA. Manual provides wiring diagrams, wire lists, parts lists and instructions for wire-wrap or point-to-point construction on Vector boards. Buffered bus is similar to KIM-1 structure. I/O connections made via DIP sockets. Connection details for KIM-1 and OSI C1P extensively detailed in manual. Can also be used for AIM 65 and SYM.

Price: \$10.00
Available: Hunter Technical Services
 P.O. Box 359
 Elm Grove, WI 53122

Next Month in MICRO

FORTH Feature

- **LIFE in FORTH and BASIC** — FORTH and BASIC versions of the educational game LIFE are presented, with a detailed description and comparison.
- **Using FORTH with the 6502** — A complete extension, a debugging or decompiling tool, and an application utility all built into a flexible FORTH enhancement, with enough room for other similar expansions and applications.
- **Stepper Motor Control — A FORTH Approach** — Stepper motors translate digital commands to motion, bridging the gap between computers and robots. A flexible command language, written in FORTH, translates natural, English-like commands to precisely controlled movement.
- **FORTH: A Viable Alternative** — An introduction to FORTH, from FORTH, Inc.

Other Features

Inspector (for the TRS-80C Color Computer)
AIM Assembler Listings
List-Corrupted SYM-bols
Atari Countdown Timer
Applesoft Input Anything
Fast Joystick Input for C1P
Credit Box Creator for the Apple

Columns

Pet VET
 From Here to Atari
New! The Single Life (for single board users)

Plus Our Regular Departments

Software Catalog
 Hardware Catalog
 6502 Bibliography
 ...and more!

40% OFF

**More MICRO for Less Money When
 When You Subscribe, until December 31st**

Your money goes farther when you subscribe. During the course of a year, when you subscribe, you save 40% (in the U.S.).

Pay only \$18.00 (\$1.50 a copy) for 12 monthly issues of MICRO sent directly to your home or office in the U.S.

But on the newsstand — if you can locate the issue you want — you pay \$30.00 a year (\$2.50 a copy).

Save 40% **and** make sure you get every issue. Subscribe to MICRO today.

MICRO
34 Chelmsford Street
P.O. Box 6502
Chelmsford, MA 01824

Please send me MICRO for 1 year 2 years
 NOTE: Airmail subscriptions accepted for 1 year only.

Check enclosed \$ _____
 Charge my VISA account
 Mastercard account

No. _____

Expiration date _____

Name _____

Address _____

City/State _____ Zip _____

Subscription Rates Effective January 1, 1982

Country	Rate
United States	\$24.00 1 yr. 42.00 2 yr.
Foreign surface mail	27.00
Europe (air)	42.00
Mexico, Central America, Mid East, N. & C. Africa	48.00
South Am., S. Afr., Far East, Australasia, New Zealand	72.00

* Airmail subscriptions accepted for only 1 year.
 For U.S. and Canadian 2-year rates, multiply by 2.

Job Title: _____

Type of Business/Industry: _____

STONE of Sisyphus

INCLUDES 2 JAM PACKED DISKS OF DATA BUT
WILL WORK ON YOUR 1 DRIVE MICROCOMPUTER!

AVAILABLE ON DISK ONLY FOR:

TRS-80 MODEL 1 32K	012-0100	\$29.95
TRS-80 MODEL 3 48K	012-0100	\$29.95
Apple 2 Applesoft in ROM	042-0100	\$29.95
ATARI 40K	052-0100	\$34.95

 **Adventure**
INTERNATIONAL

A DIVISION OF SCOTT ADAMS, INC.
BOX 3435, LONGWOOD, FL 32750
(305) 862-6917

ORDER FROM YOUR FAVORITE DEALER
or CALL TOLL FREE (800) 327-7172

SHIPPING & HANDLING ARE EXTRA. PRICES SUBJECT TO CHANGE WITHOUT NOTICE

We want to take you on a journey — a journey into an age undreamed of. When a man's worth was measured by his courage and his cunning. With **STONE OF SISYPHUS**, we have re-created the wonderment of that ancient era. The **Maces & Magic** Series allows you to interact with the adventure on an intensely personal level. You create your own character, giving him (or her) the attributes of strength, IQ, constitution, dexterity and charisma. You then arm and prepare your creation for the challenges ahead. Amazingly, your character will evolve and grow as the journey progresses. Prepare yourself — breathe deeply, and step into the enchantment of **STONE OF SISYPHUS** and the **Maces & Magic** Series.

ART COPYRIGHT
1981 RAYMOND BAYLESS

HUNTINGTON COMPUTING

ONE OF THE WORLD'S LARGEST INVENTORIES

VisiCalc List \$200.00now **\$149.00**

VisiFile List \$250.00now **\$199.00**

Horriblescope (Disk) List \$15.00now **\$3.99**

MISCELLANEOUS

Escape from Acturus	\$29.95	now	\$25.39
Basic Mailer	\$69.95	now	\$59.49
Memory Management II	\$49.95	now	\$42.89
Castle Wolfenstein	\$29.95	now	\$25.39
Upper Reaches of Apshai	\$19.95	now	\$16.89
Bridge Tutor	\$39.95	now	\$35.19
PASCAL Animation Tools			\$65.99
Hand Holding BASIC			\$84.99
UT-100 Emulator			\$65.99
Space Quark	\$29.95	now	\$25.39
Beneath Apple DOS (book)	\$19.95	now	\$16.89
Birth of the Phoenix	\$14.95	now	\$12.69
Goblins	\$27.50	now	\$23.29
Painter Power	\$39.95	now	\$33.89
U.S. Constitution	\$29.95	now	\$25.39
Merger	\$49.95	now	\$42.49
Super Stellar Trek	\$39.95	now	\$33.89
LISA	\$79.95	now	\$67.89
V-Plot (Yuccipa)	\$29.95	now	\$25.39
V-Stat	\$29.95	now	\$25.39
V-Print	\$29.95	now	\$25.39
Brain Surgeon	\$49.95	now	\$42.49
Info Master	\$150.00	now	\$127.49
Waterloo II	\$49.95	now	\$42.39
Fantysland 2U41	\$59.95	now	\$50.99
Torpedo Terror	\$24.95	now	\$21.19
Speedstar	\$139.95	now	\$114.69
Kaves of Karkhan	\$49.95	now	\$42.39
Dos Boss	\$24.00	now	\$20.39
Memorex Disks			10 for \$24.99
Verbatim Datalife-plain w/hubs			10 for \$27.99
Dysans			10 for \$49.99
Flipsort Box			\$29.80
Scotch Disk Cleaner	\$29.95	now	\$26.99
Atari /TRS-80 /Pet*			Write for Information

GAMES

Hi-Res Soccer	\$29.95	now	\$25.39
Apple -Oids	\$29.95	now	\$25.39
Wurst of Huntington Computing			\$19.99
Gobbler	\$24.95	now	\$21.19
Ultima	\$39.95	now	\$33.89
Autobahn	\$29.95	now	\$25.39
Battle Cruiser Action	\$44.95	now	\$38.89
Gorgon	\$39.95	now	\$33.89
Super Stellar Trek	\$39.95	now	\$33.89
Hellfire Warrior	\$39.95	now	\$33.99
Gamma Goblins	\$29.95	now	\$25.39
Mission Asteroid	\$19.95	now	\$17.99
Wizardry	\$49.95	now	\$42.49
Star Mines	\$29.95	now	\$25.39
Warp Factor	\$39.95	now	\$33.99



WURST OF HUNTINGTON

Read Softalk's review on page 87 of the October issue

\$19.99

NEW PROGRAMS

Sneakers	\$29.25	now	\$25.39
Copts & Robbers	\$34.95	now	\$29.69
Pot-O-Gold I	\$39.95	now	\$33.89
Pot-O-Gold II	\$39.95	now	\$33.89
Ring of Saturn	\$39.95	now	\$33.89
Streets of the City & Trucker	\$24.95	now	\$21.19
President Elect	\$39.95	now	\$33.89
Dis-o-Doc	\$72.39	now	\$61.49
Med Fly Mania	\$29.95	now	\$24.39
Hungry Boy	\$24.95	now	\$21.19
Anova	\$74.95	now	\$63.79
Solitaire	\$29.95	now	\$25.39
The Source	\$100.00	now	\$89.99
Race for Midnight	\$29.95	now	\$25.39
Hi-Res Secrets	\$125.00	now	\$104.19
Banners I	\$34.95	now	\$29.69
Complete Graphics (Tablet)	\$119.95	now	\$101.89
Special Effects (Tablet)	\$69.95	now	\$60.79
Inkwell Apple - III	\$150.00	now	\$130.49
Snack Attack	\$29.95	now	\$25.39
V-Plot	\$29.95	now	\$25.39
Disasem/65	\$29.95	now	\$25.39
The Inspector (Disk or Prom)	\$49.95	now	\$42.39
The Book	\$19.95	now	\$11.97
Don I (Book)	\$8.95	now	\$8.05
Using 6502 Assembly Language	\$19.95	now	\$16.89
Expandaport	\$59.95	now	\$50.89
Firebird	\$29.95	now	\$25.39
Thief	\$29.95	now	\$25.39
Threshold	\$23.97	now	\$20.38
Target Planner	\$195.00	now	\$165.49
Paddle-Adapple	\$29.95	now	\$26.89
So. Cal Research	\$14.95	now	\$13.45
Word Handler	\$250.00	now	\$212.49

GAMES

Microsoft Adventure	\$29.95	now	\$25.39
Wizard and the Princess	\$32.95	now	\$28.99
Flight Simulator	\$34.95	now	\$29.49
Odyssey	\$29.95	now	\$25.39
Sargon II	\$34.95	now	\$29.69
Space Eggs	\$29.95	now	\$25.39
Hi-Res Cribbage	\$24.95	now	\$21.19
Lords of Karma (cass.)	\$20.00	now	\$16.99
Oh Shoot		now	\$19.99
ABM	\$24.95	now	\$21.19
Computer Conflict	\$39.95	now	\$35.99
Computer Air Combat	\$59.95	now	\$52.99
Temple of Apshai	\$39.95	now	\$33.89
Zork	\$39.95	now	\$33.99
All Nibble Software		15% off list	
Robot Wars	\$39.95	now	\$33.99
Cranston Manor	\$34.95	now	\$29.69
Dragon's Eye	\$24.95	now	\$21.19
Computer Acquire	\$20.00	now	\$16.99
Twala's Last Redoubt	\$29.95	now	\$25.39
Alien Rain	\$24.95	now	\$21.19
Alien Typhoon	\$24.95	now	\$21.19
Raster Blaster	\$29.95	now	\$25.39
3-D Skiing	\$24.95	now	\$21.19
Creature Venture	\$24.95	now	\$21.19
Galaxy Space War I	\$39.95	now	\$33.99
Meteoroids in Space	\$19.95	now	\$16.99
Dragon Fire	\$49.95	now	\$42.49
Pool 1.5	\$34.95	now	\$29.69

NEC Green Screen Monitor List \$285.00now **\$199.00**

Zenith Green Screen Monitor List \$159.00now **\$109.00**

Ulysses List \$34.95now **\$29.69**

Speed/asm List \$39.95now **\$33.89**

Lisa 2.5 List \$79.95now **\$67.89**

Dinosaurs List \$15.00now **\$12.69**

BMP Joystick

Here's a joystick you won't want to be without. It's the only joystick we know about that allows you to change the axis with a flip of a switch. Only the highest quality parts are used.

A real bargain at

\$49.95

Apple®

HUNTINGTON COMPUTING

Post Office Box 787
Corcoran, California 93212



We take MasterCard, VISA or American Express (Include card # and expiration date). California residents add 6% tax. Include \$2.00 for postage. Foreign and hardware extra. Send for free catalog. Prices subject to change.

ORDER BY PHONE
800-344-4111 (outside Calif.)
800-692-4143 (inside Calif.)
209-992-5411 (foreign or local)

Apple® is a registered trademark of Apple Computer, Inc