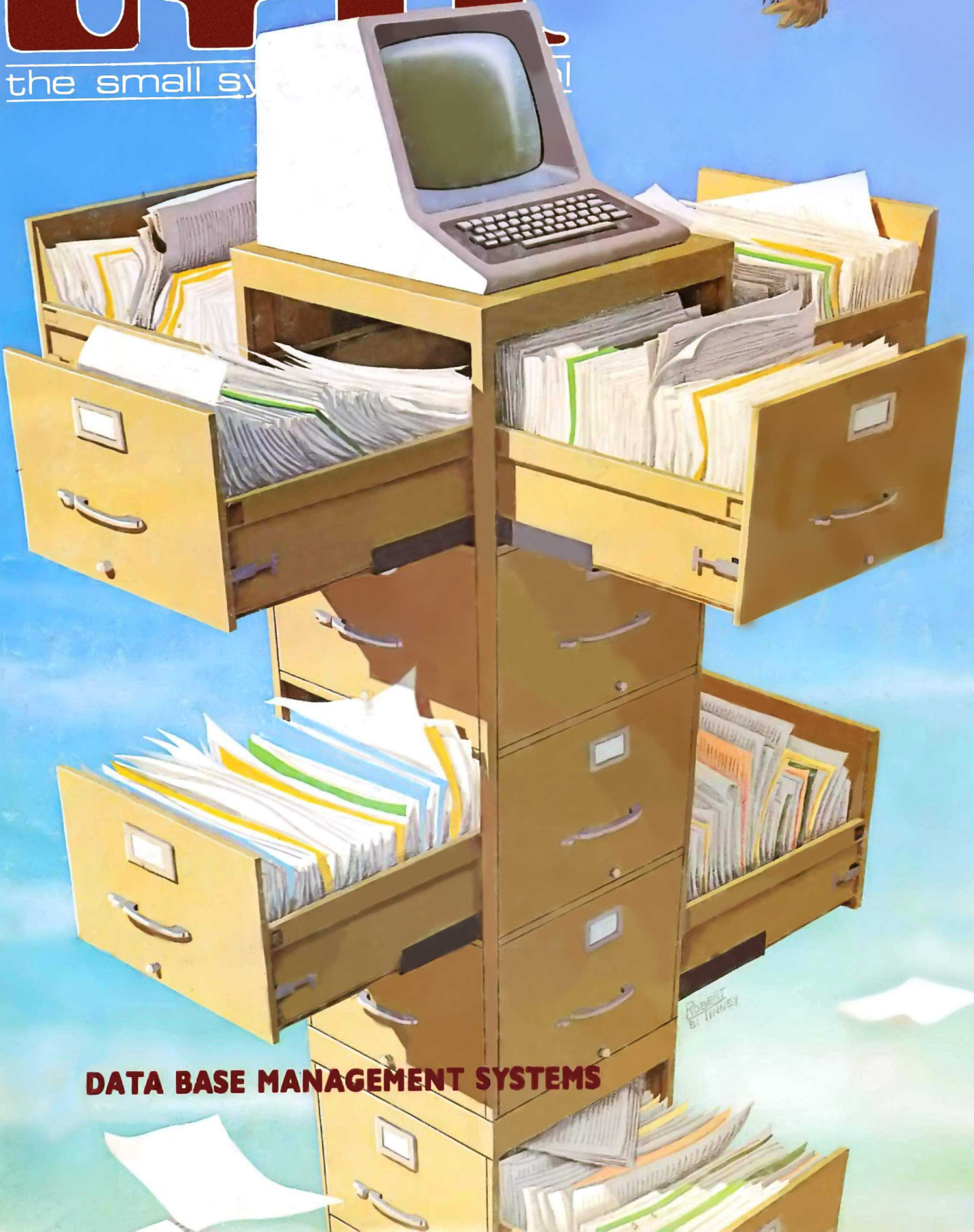


BYTE

the small system

®

NOVEMBER 1981 Volume 6, Number 11
\$2.50 in USA/\$2.95 in Canada
A McGraw-Hill Publication



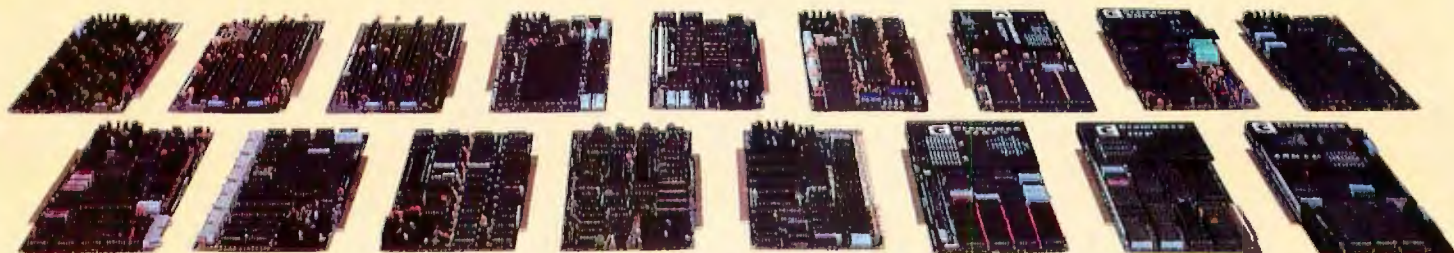
DATA BASE MANAGEMENT SYSTEMS

ROBERT
BY TUNNEY

A new small computer that won't limit you tomorrow



New Cromemco System One shown with our high-capability terminal and printer.



Expandability

Circle 118 on inquiry card.

Here's a low-priced computer that won't run out of memory capacity or expandability halfway through your project.

Typically, computer usage tends to grow, requiring more capability, more memory, more storage. Without a lot of capability and expandability, your computer can be obsolete from the start.

The new System One is a real building-block machine. It has capability and expandability by the carload.

Look at these features:

- **Z80-A processor**
- **64K of RAM**
- **780K of disk storage**
- **CRT and printer interfaces**
- **Eight S-100 card slots, allowing expansion with**
 - color graphics
 - additional memory
 - additional interfaces for telecommunications, data acquisition, etc.
- **Small size**

GENEROUS DISK STORAGE

The 780K of disk storage in the System One Model CS-1 is much greater than what is typically available in small computers. But here, too, you have a choice since a second version, Model CS-1H, has a 5" Winchester drive that gives you **5 megabytes** of disk storage.

MULTI-USER, MULTI-TASKING CAPABILITY

Believe it or not, this new computer even offers multi-user capability when used with our advanced CROMIX* operating system option. Not only does this outstanding O/S support multiple users on this computer but does so with powerful features like multi-

ple directories, file protection and record level lock. CROMIX lets you run multiple jobs as well.

In addition to our highly-acclaimed CROMIX, there is our CDOS*. This is an enhanced CP/M† type system designed for single-user applications. CP/M and a wealth of CP/M-compatible software are also available for the new System One through third-party vendors.

COLOR GRAPHICS/WORD PROCESSING

This small computer even gives you the option of outstanding high-resolution color graphics with our Model SDI interface and two-port RAM cards.

Then there's our tremendously wide range of Cromemco software including packages for word processing, business, and much more, all usable with the new System One.

ANTI-OBSOLESCENCE/LOW-PRICED

As you can see, the new One offers you a lot of performance. It's obviously designed with anti-obsolence in mind.

What's more, it's priced at only \$3,995. That's considerably less than many machines with much less capability. And it's not that much more than many machines that have little or nothing in the way of expandability.

Physically, the One is small — 7" high. And it's all-metal in construction. It's only 14 1/8" wide, ideal for desk top use. A rack mount option is also available.

CONTACT YOUR REP NOW

Get all the details on this important building-block computer. Get in touch with your Cromemco rep now. He'll show you how the new System One can grow with your task.

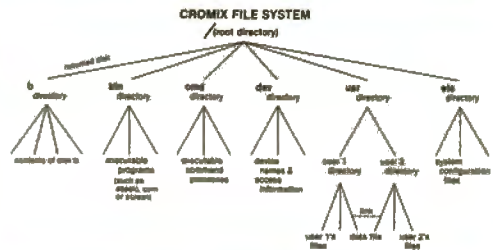
*CROMIX and CDOS are trademarks of Cromemco Inc.
†CP/M is a trademark of Digital Research



Cromemco™
I n c o r p o r a t e d

280 BERNARDO AVE., MOUNTAIN VIEW, CA 94040 • (415) 964-7400

Tomorrow's computers today



CROMIX* — Cromemco's outstanding UNIX†-like operating system

CROMIX is just the kind of major development you've come to expect from Cromemco. After all, we're already well-known for the most respected software in the microcomputer field.

And now we've come up with the industry's first UNIX-lookalike for microcomputers. It's a tried and proven operating system. It's available on both 5" and 8" diskettes for Cromemco systems with 128K or more of memory.

Here are just some of the features you get in this powerful Cromemco system:

- Multi-user and multi-tasking capability
- Hierarchical directories
- Completely compatible file, device, and interprocess I/O
- Extensive subsystem support

FILE SYSTEM

One of the important features of our CROMIX is its file system comprised of hierarchical directories. It's a tree structure of three types of files: data files,

*CROMIX is a trademark of Cromemco, Inc.
†UNIX is a trademark of Bell Telephone Laboratories

directories, and device files. File, device, and interprocess I/O are compatible among these file types (input and output may be redirected interchangeably from and to any source or destination).

The tree structure allows different directories to be maintained for different users or functions with no chance of conflict.

PROTECTED FILES

Because of the hierarchical structure of the file system, CROMIX maintains separate ownership of every file and directory. All files can thus be protected from access by other users of the system. In fact, each file is protected by **four separate access privileges** in each of the three user categories.

TREMENDOUS ADDRESS SPACE, FAST ACCESS

The flexible file system and generalized disk structure of CROMIX give a disk address space in excess of one gigabyte per volume — file size is limited only by available disk capacity.

Speed of access to disk files has also been optimized. Average access speeds far surpass any yet implemented on microcomputers.

'C' COMPILER AVAILABLE, TOO

Cromemco offers a wide range of languages that operate under CROMIX. These include a high-level command process language and extensive subsystem support such as COBOL, FORTRAN IV, RATFOR, LISP, and 32K and 16K BASICS.

There is even our highly-acclaimed 'C' compiler which allows a programmer fingertip access to CROMIX system calls.

THE STANDARD O-S FOR THE FUTURE

The power and breadth of its features make CROMIX the standard for the next generation of microcomputer operating systems.

And yet it is available for a surprisingly low \$595.

The thing to do is to get all this capability working for you now. Get in touch with your Cromemco rep today.



Cromemco™
i n c o r p o r a t e d

280 BERNARDO AVE., MOUNTAIN VIEW, CA 94040 • (415) 964-7400
Tomorrow's computers today

Features

18 **Writing with a Data-Base Management System** by Edward E Brent Jr / Word-processing systems work fine after you know what you're going to say, but a data-base management system can help you get it all together.

36 **Switching Power Supplies, An Introduction** by Steve Ciarcia / You can experiment with a simple design for a nonisolated single-ended switching voltage regulator

48 **Fundamentals of Relational Data Organization** by Joel Neely and Steve Stewart / How you can apply a set of mathematically elegant principles to the organization of your data base.

62 **Build a Bar-Code Scanner Inexpensively** by Bradley W Bennett / In one package, Hewlett-Packard has incorporated the optical heart of a scanner system.

84 **The Microcomputer as a Laboratory Instrument** by Daniel Cosgrove / The microcomputer can become a standard laboratory instrument for running experiments and analyzing the results.

97 **Data-Base Management Systems: Powerful Newcomers to Microcomputers** by Michael Gagle, Gary J Koehler, and Andrew Whinston / A brief introduction to data-base systems leads to a look at how one microcomputer implementation works.

174 **DIF: A Format for Data Exchange between Applications Programs** by Candace E Kalish and Malinda F Mayer / Software Arts proposes a solution to the problem of inaccessible data.

208 **A Survey of Data-Base Management Systems for Microcomputers** by Kathryn S Barley and James R Driscoll / Data-base management systems are becoming a popular software item. Check this survey for the one that interests you.

236 **PDQ: A Data Manager for Beginners, Don't Reinvent the Wheel** by Paul Swanson / A well-known technique makes a good compromise between speed and ease of programming.

312 **The Atari Tutorial, Part 3: Player-Missile Graphics** by Chris Crawford / The Atari player-missile system allows you to move game figures across the screen quickly and easily—even in BASIC.

370 **Toward a Structured 6809 Assembly Language, Part 1: An Introduction to Structured Assembly Language** by Gregory Walker / The problem with the goto construct is that it is too general a programming form.

384 **PROLOG, A Step Toward the Ultimate Computer Language** by Ron Ferguson / This high-level language approaches English in ease to use.

400 **PS—A FORTH-Like Threaded Language, Part 2** by Valo G Motalygo / PS overcomes some of the problems FORTH has with low-level word definitions.

472 **Linking a Pascal Microengine to a Cyber 170** by Steven M Sedlet and Jonathan Dust / A simple file-transfer process combines the best of both worlds.

493 **Information Hiding In Pascal, Packages and Pointers** by Michael B Feldman / Hiding unnecessary details improves high-level programming.

Reviews

76 **Reversal, Othello for the Apple II** by Mark Friedman

126 **The Exatron Stringy Floppy Data-Storage System** by Keith Carlson

138 **The Datahandler from Miller Microcomputer Services** by Allyn Richardson

152 **Microsoft Softcard** by Mark Peiczarski

166 **CourseWare Magazine** by Elaine Holden

264 **Orchestra-80** by Elizabeth Cooper and Yvon Kolya

274 **Apple II File-Management Systems** by Ken Blochowiak

342 **ENHBAS** by Mahlon G Kelly

434 **Five Spelling-Correction Programs for CP/M-Based Systems** by Phil Lemmons

Nucleus

6 Editorial: Can We Agree on Standards?

10 Letters

8, 308 BYTE's Bits

134 BYTE Comment: Reviewing the Microcomputer Revolution

302 BYTELINES

364 Ask BYTE

409 Languages Forum: A View from the Lectern: What's Wrong with Technical Writing Today?

413 Technical Forum: Where Am I? A Proposal for a New Microprocessor Instruction

414 Programming Quickies: WRITELONG, A Pascal Simulation of Long-Integer Output

449 User's Column

458, 463 Book Reviews

464 Software Received

465 Clubs and Newsletters

466 Event Queue

490 Books Received

499 System Notes: A Voice for the Apple II without Extra Hardware

505 What's New?

558 Unclassified Ads

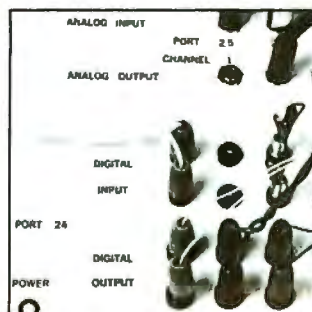
559 Reader Service

560 BOMB, BOMB Results

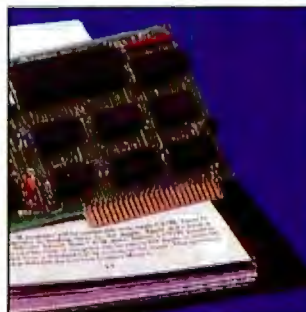
BYTE



Page 36



Page 84



Page 152



Page 342



Editor in Chief
Christopher Morgan

Managing Editor
Mark Haas

Technical Editors
Gregg Williams, Senior Editor;
Richard S Shuford; Curtis P Feigel;
George Stewart; Arthur Little;
Stanley Wszola; Charles Freiberg,
New Products Editor; Steve Ciarcia;
Mark Dahmke; Philip Lemmons,
Consulting Editors; Jon Swanson,
Draftsman

Copy Editors
Beverly Cronin, Chief; Faith Hanson;
Warren Williamson; Anthony J Lockwood;
Ann Graves; David R Anderson;
Bob Reinert; Linda M Evers

Assistants
Faith Ferry; Debe Wheeler;
Karen A Cilley; Susan Ferber;
Marie Hennessy

Production
Nancy Estle, Director; Christine Destrempe,
Asst Director; Jonathan M Graves, Creative
Consultant; Wai Chiu Li; Patrice Scribner;
Damian Henriques; Jan Muller;
Linda J Sweeney; Sherry McCarthy,
Chief Typographer; Debi Fredericks;
Donna Sweeney; Valerie Horn

Advertising
Thomas Harvey, Director; Marion Carlson;
Rob Hannings; Marilyn Williams;
Deborah Porter; Vicki Reynolds;
Jacqueline Earnshaw,
Reader Service Coordinator

Circulation
Gregory Spitzfaden, Manager;
Andrew Jackson, Asst Manager;
Agnes E Perry; Barbara Varnum;
Louise Menegus; Pinky Krulis;
James Bingham, Dealer Sales;
Deborah J Cadwell, Asst.

Controller's Office
Daniel Rodrigues, Controller;
Mary E Fluhr, Acct. & D/P Mgr; Karen Burgess;
Jeanne Cilley; Linda Fluhr; Vicki Bennett

Traffic
N Scott Gagnon; Michael Bacon

Receptionist
Joanne Colburn

Publishers
Virginia Londoner; Gordon R Williamson;
John E Hayes, Associate Publisher;
Cheryl A Hurd; Michele P Verville, Publisher's
Assistants

Officers of McGraw-Hill Publications Company: Paul F McPherson, President; Executive Vice Presidents: James E Boddorf, Gene W Simpson; Group Vice President: Daniel A McMillan; Senior Vice President-Editorial: Ralph R Schulz; Vice Presidents: Kemp Anderson, Business Systems Development; Robert B Doll, Circulation; James E Hackett, Controller; Eric B Herr, Planning and Development; H John Sweager, Marketing.

Officers of the Corporation: Harold W McGraw Jr, Chairman and Chief Executive Officer; Joseph L Dionne, President and Chief Operating Officer; Robert N Landes, Senior Vice President and Secretary; Ralph J Webb, Treasurer.



In This Issue

Office workers who bravely face that ever-growing mountain of paper will tell you that keeping track of information becomes more difficult daily. How to impose order? As Robert Tinney's cover suggests, the answer is something like an electronic file cabinet.

This month's theme concerns the problems of data management. Joel Neely and Steve Stewart will get you started with "Fundamentals of Relational Data Organization." From there you can move on to "Data-Base Management Systems: Powerful Newcomers to Microcomputers," "A Survey of Data-Base Management Systems for Microcomputers," and "PDQ: A Data Manager for Beginners." "DIF: A Format for Data Exchange between Applications Programs" presents a strong argument for standardization of data formats. Apple II file-management systems are reviewed. And you can learn how to write with your data-base management system. Is spelling a nightmare? If so, you'll be interested in Phil Lemmons' review of the five major CP/M spelling-correction programs. Of course, there's Ciarcia's Circuit Cellar, BYTELINES, and our other regular features, too.

BYTE is published monthly by BYTE Publications Inc, 70 Main St. Peterborough NH 03458, phone (603) 924-9281, a wholly-owned subsidiary of McGraw-Hill, Inc. Address subscriptions, change of address, USPS Form 3579, and fulfillment questions to BYTE Subscriptions, POB 590, Martinsville NJ 08836. Second class postage paid at Waseca, Minnesota 56093 - USPS Publication No. 528890 (ISSN 0360-5280). Canadian second class registration number 9321. Subscriptions are \$19 for one year, \$34 for two years, and \$49 for three years in the USA and its possessions. In Canada and Mexico, \$21 for one year, \$38 for two years, \$55 for three years. \$43 for one year air delivery to Europe. \$35 surface delivery elsewhere. Air delivery to selected areas at additional rates upon request. Single copy price is \$2.50 in the USA and its possessions, \$2.95 in Canada and Mexico, \$4.00 in Europe, and \$4.50 elsewhere. Foreign subscriptions and sales should be remitted in United States funds drawn on a US bank. Printed in United States of America.

Address all editorial correspondence to the editor at BYTE, POB 372, Hancock NH 03449. Unacceptable manuscripts will be returned if accompanied by sufficient first class postage. Not responsible for lost manuscripts or photos. Opinions expressed by the authors are not necessarily those of BYTE. Entire contents copyright © 1981 by BYTE Publications Inc. All rights reserved. Where necessary, permission is granted by the copyright owner for libraries and others registered with the Copyright Clearance Center (CCC) to photocopy any article herein for the base fee of \$1.00 per copy of the article or item plus 25 cents per page. Payment should be sent directly to the CCC, 21 Congress St, Salem MA 01970. Copying done for other than personal or internal reference use without the permission of McGraw-Hill is prohibited. Requests for special permission or bulk orders should be addressed to the publisher.

BYTE® is available in microform from University Microfilms International, 300 N Zeeb Rd, Dept PR, Ann Arbor MI 48106 USA or 18 Bedford Row, Dept PR, London WC1R 4EJ England. 

Subscription WATS Line: (800) 258-5485

Office hours: Mon-Thur 8:30 AM - 4:30 PM, Friday 8:30 AM - Noon, Eastern Time

NATIONAL ADVERTISING SALES REPRESENTATIVES:

NORTHEAST (617) 444-3946
Hajar Associates
280 Hillside Ave
Needham Heights MA 02194

MIDWEST (312) 966-0160
Hajar Associates
5225 Old Orchard Dr
Skokie IL 60076

MID ATLANTIC (212) 682-5844
Hajar Associates
521 Fifth Ave
New York NY 10017

NORTHWEST (415) 964-0706
Hajar Associates
1000 Elwell Ct, Suite 227
Palo Alto CA 94303

SOUTHWEST (714) 540-3554
Hajar Associates
3303 Harbor Blvd
Suite K-4
Costa Mesa CA 92626

SOUTHEAST (305) 886-7210
Hajar Associates
1220 Prairie Lane
Apopka FL 32703

MicroAngelo™ and beyond.

SCION Corporation pioneered advanced information display systems with the elegantly simple MicroAngelo™ high resolution S100 single board graphics computer. With MicroAngelo™ came a powerful, flexible CP/M® compatible, high level firmware called Screenware.™ For MicroAngelo™ Color System, Colorpak software evolved. Easy to integrate, easy to convert and easy to use. This software gave MicroAngelo™ unparalleled capacity to manipulate color transparencies. Beyond MicroAngelo™ with the prototype Advanced Congressional Workstation developed for the U.S. Congress, SCION Corporation proved an interactive, very high resolution text/graphics display system can be built with existing technology. SCION Corporation grows at its unprecedented rate by evolving beyond today's triumphs, to develop graphics engines to solve tomorrow's problems.

SCION Corporation. More than a graphics company.

For information on the next generation of advanced information display systems, call today. If the image is important, it has to be SCION.

SCION

If the image is important.

12310 Pinecrest Road/Reston, Virginia 22091
703/476-6100 TWX: 710-833-0684

MAINTAIN PROJECT CONTROL WITH MILESTONE™



Put your microcomputer to work...

As a project manager, you know the value of careful planning. An oversight here, a miscalculation there, and in no time, you could be in a lot of trouble.

Now, thanks to MILESTONE™, it's easy to obtain and keep complete project control.

MILESTONE is an easy to use computer program that puts your desk top microcomputer to work using the same proven "critical path" techniques previously available only on big, expensive computers. Now, regardless of your type of project, you can plan and control manpower, dollars, and time.

Available in most microcomputer formats: CP/M,* CP/M-86,* Apple PASCAL, UCSD PASCAL. Call or write:

SOFTWARE
SOFTWARE
DIGITAL MARKETING
DIGITAL MARKETING

2670 CHERRY LANE
WALNUT CREEK • CA 94596
(415) 938-2880

*CP/M and CP/M-86 are trademarks of Digital Research

*MILESTONE is a trademark of Organic Software

Editorial

Can We Agree on Standards?

by Chris Morgan, Editor in Chief

Recipe for a heated debate:

- Put two or more personal computer users in a room.
- Ask them to agree on a hardware or software standard.
- Stand back.

Somewhat cynical? Perhaps, but the mere mention of a proposed standard often raises a whole crop of hackles. I suspect there are several reasons for this attitude: computer scientists are notoriously individualistic (not to say curmudgeonly); we are often reactionary because of our inbred love of ritual (if you doubt this, ask any psychologist who has studied computer people); and, perhaps most important, many personal computer industry standards are lacking in many ways.

For example, we seem to have been poured into the BASIC mold, like it or not. (Although, ironically, BASIC is possibly the *least* standardized of the high-level languages.) One hundred ten baud is not exactly Mach 1. Standard television receivers leave much to be desired. The S-100 bus has only recently become a serious hardware standard, thanks mostly to the Institute of Electrical and Electronics Engineers (IEEE).

I remember the day when, fresh from seven years as an aerospace electronics engineer, I entered the BYTE offices and first saw an S-100 board. I was appalled at the number of connector pins—a design approach anathema to anyone whose circuits have to survive the vibrations of a moving aircraft. There simply was no excuse for putting 100 pins on a printed-circuit board when half that number would do.

Today I know that, far from being a disaster, the S-100 standard has proved its worth (although I *still* wouldn't want an S-100-based computer in the cockpit of a plane). So I guess I'm a bit of a curmudgeon myself. In fact, I've been known to take inordinate delight in approaching a group of good-natured hackers at a computer convention and innocently expressing my preference for BASIC over APL as "much the superior language," or the like. The resulting debate is often enough to activate nearby smoke detectors.

But returning to the question of standards, I want to bring to your attention a standard that just about everyone should like: it's called DIF (for Data Interchange Format). DIF was developed by Dan Bricklin and Bob Frankston at Software Arts (the developers of VisiCalc), aided by Mitch Kapor, inventor of VisiPlot. It's comprehensively described this month in an article called "DIF: A Format for Data Exchange between Applications Programs," by Candace E Kalish and Malinda F Mayer, on page 174. Briefly, DIF is a standard method for representing data in a program so that it can be transported directly to other programs, without time-consuming modifications. For example, a VisiCalc user might want to plot some calculated data using VisiPlot. (In fact, this is why DIF was initially developed.) Since both programs accept the DIF standard, the process becomes quick and straightforward.

As Bricklin explains it, "If you're building a box with pipes going in and out of it, it would be nice if there were one pipe that you knew other boxes could connect to. With DIF, we essentially define the diameter of that pipe and the



New! **Z** Controller and **Z** Drives . . .

Expect more from Percom. You won't be disappointed.

Percom's **double-density Z Controller** for the H-89 is now available.

Check its many outstanding features.

And keep in mind its from Percom, a company that introduced its first disk system in 1977.

- Controls up to four single- or double-headed mini-disk drives.
- Handles 35-, 40-, 77- and 80-track drives, and other standard track densities.
- Formatted data storage capacity of 80-track diskettes is over 368 Kbytes. Forty-track diskettes store over 184 Kbytes. Capacities for other track densities are proportional. A Z system with four double-headed, 80-track drives provides almost 3 megabytes of on-line data.
- The Z Controller co-resides with your H-89 disk drive controller. Your software can select either, and you don't have to move drives around when switching between systems.
- The Z Controller includes Percom's proven digital data separator circuit and a dependable write-precompensation circuit. Expect reliable disk operation for a long, long time under 'Z' control.
- The Percom Z Controller is priced at only \$249.95, complete with HDOS-compatible disk drivers on diskette, internal interconnecting cable and comprehensive users manual.

System requirements – H-89 Computer with 24 Kbytes memory (min), Replacement ROM Kit H-88-7 and HDOS 2.0.

Add-On Z Drives for H-89, H-8 Computers

- Forty- and eighty-track densities in either 1- or 2-drive modules.
- All drives are rated for single- and double-density operation. With a Z Controller, an 80-track drive can store over 364 Kbytes (formatted, one-side), a 40-track drive can store over 184 Kbytes.
- Some models permit "flippy" storage, letting you flip a diskette and store files on the second side.
- Z drives are fully tested, including a 48-hour operating burn-in to prevent shipment of drives with latent defects.
- Assembled and tested one-drive units from only \$399, two-drive units from only \$795.

System requirements – H-89 or H-8 computer with 16-Kbyte RAM, Heath first-drive floppy disk system, HDOS and drives interconnecting cable. (Two-drive interconnecting cable optionally available from Percom)

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Watch for announcement of 'Z' CP/M.

Yes . . . I'd like to know more about Percom Z drives and the Z Controller. Rush me free literature.

Send to
PERCOM DATA COMPANY, Inc., Dept. 26 -B02
 11220 Pagemill Rd. Dallas, TX 75243

name _____

street _____

city _____ state _____

zip _____ phone number _____

MAIL TODAY!



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

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

© 1981 PERCOM DATA COMPANY, Inc.
 PERCOM, ZFD-40 and ZFD-80 are trademarks of Percom Data Company.
 CP/M is a trademark of Digital Research Corporation

Pascal/Z

NEW 4.0

SYMBOLIC DEBUGGER

This fourth generation version of our reliable, Z-80 native code compiler adds the two features professionals ask for:

- ◆ **SWAT™**—an interactive symbolic Pascal debugger that allows easy error detection.
- ◆ **Overlays**—that allow larger programs to run in limited memory.

A compiler for Professional programmers

Pascal/Z is a true Pascal. It closely follows the Jensen and Wirth standard with a minimum of extensions designed to aid the serious program developer in producing extremely compact, bug-free code that runs FAST.

Pascal/Z generates Z-80 native code that is ROMable and Re-entrant. Permits separate compilation, direct file access, external routines and includes a relocating macro assembler and Microsoft compatible linker. And code written for Pascal/Z is fully compatible with I-PAS 8000, our new native code Pascal compiler for Z-8000, to guarantee graceful migration to 16 bit operation.

Get "The FACTS about Pascal"

Confused about which Pascal to buy? Pseudo-code... Native code... M, MT or Z? Compare the *unbiased* benchmarks in our new booklet. **Don't buy a Pascal compiler until you've read it.**



Call us for a free copy:
800-847-2088
(outside NYS)
or 607-257-0190

And ask your local full-service computer dealer about our Pascal/Z demo package.

InterSystems™

Ithaca Intersystems Inc.

Micros for bigger ideas.

Ithaca Intersystems Inc.

1650 Hanshaw Rd • Ithaca, NY 14850 • TWX 510 255-4346

U.K. Distributor:

Ithaca Intersystems (U.K.) Ltd.

Coleridge Road London N8 8ED Phone: 01-341 2447 Telex: 299568

Editorial

number of threads per inch." Another positive feature of DIF is the ease with which it can be used by novice programmers as well as experienced hackers.

Software Arts is actively promoting DIF through the nonprofit DIF Clearinghouse, POB 527, Cambridge MA 02139. Anyone adopting DIF will have his or her program added to the list of DIF-compatible programs, which can be obtained by writing to the clearinghouse. Several programs currently support the DIF standard (see the aforementioned article for a complete list). DIF appears to be a standard that has everything going for it, and I endorse it.

I'd like to hear from readers about the whole question of standards in our industry. Are our attempts to organize our lives futile? Should we even try? Is it inevitable that economics will be the lone arbiter of tomorrow's standards? I suspect this may be the case. ■

We recently received word that Dan Bricklin is this year's winner of ACM's Grace Murray Hopper award for the most valuable contribution to the field by someone under age 30. Congratulations from all of us at BYTE...CM

Articles Policy

BYTE is continually seeking quality manuscripts written by individuals who are applying personal computer systems, designing such systems, or who have knowledge which will prove useful to our readers. For a more formal description of procedures and requirements, potential authors should send a large (9 by 12 inch, 30.5 by 22.8 cm), self-addressed envelope, with 28 cents US postage affixed, to BYTE Author's Guide, POB 372, Hancock NH 03449.

Articles which are accepted are purchased with a rate of up to \$50 per magazine page, based on technical quality and suitability for BYTE's readership. Each month, the authors of the two leading articles in the reader poll (BYTE's Ongoing Monitor Box or "BOMB") are presented with bonus checks of \$100 and \$50. Unsolicited materials should be accompanied by full name and address, as well as return postage.

BYTE's Bits

Networking Scheme for the TRS-80 Model II

Tandy Corporation has arranged to use Datapoint Corporation's Attached Resource Computer (ARC) technology, software, and protocols for a high-speed TRS-80 Model II local network. Called ARCNET, the new network will let up to 255 Model IIs share peripherals and data bases. ARCNET can include Datapoint file processors, computers, printers, and 137-megabyte hard disks. For an ARCNET network, you will need a \$400 board, which Tandy will sell and install, plus RG-62 coaxial cable and junction boxes to link the computers. One in four Model IIs on the network will function as a file processor.

Since Model IIs on the ARCNET network can share access to a large hard disk, there will be a version of the machine without a built-in floppy disk. Future Tandy computers will be ARCNET-compatible. Tandy will not adapt the TRS-80 Model III for the network, citing different screen parameters and operation speeds as the reason. ■



*RUN CP/M
2 to 4 TIMES FASTER!*

The ultimate single user machine

The PDS-80™ with Cache BIOS™ is a professional system designed for the most rigorous single user CP/M* environments ... in business, software development, scientific, educational and industrial research ... where speed and program space are critical factors.

SymBIOSis quadruples speed

No matter what high-level language you use ... Cobol, Basic, Fortran, PL/1, or Pascal ... PDS-80 offers more speed, power and reliability than any other floppy based CP/M system currently on the market. The InterSystems Cache BIOS fully exploits the advanced DMA and interrupt features of our reliable Series II hardware to buffer whole tracks in extended memory so most operations run two to four times faster than on other floppy based systems ... actually equals the speed of many small hard disk systems. And Cache BIOS also provides many sophisticated system test and protection features to assure reliable operation.

An advanced CP/M application system

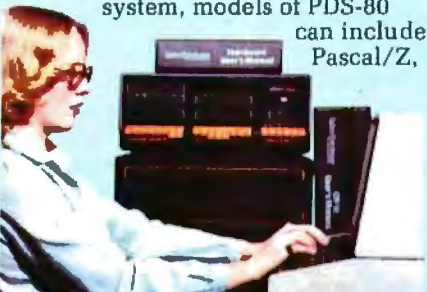
PDS-80 has all you need for commercial systems integration and applications software development ... including a choice of the industry's only integral 8 bit front panel. Best of all, PDS-80 allows the systems integrator or applications developer addressing a vertical market to develop on the same components he configures for resale. The highly expandable modular design with

20 slot S-100 mainframe allows almost unlimited options to suit any end use environment ... including a choice of tabletop or rackmount design.

InterSystems will work with you at whatever level is appropriate to configure the target system you need ... right up to fully assembled and tested systems with floppy and Winchester disk drives.

Full software support

In addition to InterSystems' Cache BIOS and the CP/M operating system, models of PDS-80 can include Pascal/Z.



our highly acclaimed Z-80® native code Pascal compiler, and InterPak 80™, a special set of utilities including a powerful screen editor and versatile spelling editor to assist in the rapid editing, proofing and documentation of your code. These powerful programming aids are also available as standalone products.

It's upgradeable!

Both hardware and software are designed to provide for upgrade to 16 bit operation. Programs written for Pascal/Z are fully compatible with I-Pas 8000™, our Z-8000® native code compiler, and all PDS-80 systems are upgradeable to our 16 bit multi-user DPS-8000.

We build micros for bigger ideas.

Your big ideas. We're dedicated to providing the computer professional ... Systems Integrators, commercial program developers, scientific and industrial programmers ... with professional hardware and software tools. And we support our customers to the fullest, with complete, professional documentation, application engineering consultation, and prompt, responsive service both from the factory and through factory-authorized service centers.

Call us toll free: 800-847-2088

for complete information on any of our 8 or 16 bit systems and software products.



Distributor Inquiries Invited

InterSystems™
Ithaca Intersystems Inc.

Circle 209 on Inquiry card.

Micros for bigger ideas.

Ithaca Intersystems Inc. • 1650 Hanshaw Road • Ithaca, NY 14850 • Phone (607) 257-0190 • TWX: 510 255 4346
U.K. Distributor Ithaca Intersystems (U.K.) Ltd. Coleridge Road London N8 8ED Phone: 01-341 2447 Telex: 299568

*Z-80 and Z-8000 are registered trademarks of Zilog, Inc. **Trademarks of Ithaca Intersystems Inc. ***Registered trademark of Digital Research

Music Board Draws Criticism

Having read Rob Moore's article "Mountain Computer's MusicSystem" (see the July 1981 BYTE, page 60), I feel I must comment on some of the technical errors that give an incorrect impression of other synthesizers available for the Apple, particularly since our ALF synthesizers are mentioned several times in the article.

First, Mr Moore has an incorrect impression of the definition of "synthesizer." Contrary to his statements, all music cards available for the Apple that I'm aware of are truly synthesizers, not just Mountain Computer's. A "music synthesizer" is simply a device that creates music by "synthesis," i.e., by control of two or more parameters (each of which is only part of a sound) to produce a complete sound of the desired nature. Mr Moore seems to think that an ability to imitate conventional instruments is necessary in a synthesizer, but such is not the case. Actually, no synthesizer available for the Apple (and, for that matter, virtually no synthesizer of any sort) can imitate conventional instruments. Only Mountain Computer claims to be able to do this. A few moments of listening will convince anyone that the claim is advertising "hype": the unit simply cannot imitate most instruments well enough to fool even the moderately careful listener, much less someone very familiar with the instrument being imitated. Responsible companies make no such claim; the goal of synthesizers is to create music that sounds good and has sufficient variety, not to duplicate a conventional instrument's sounds exactly.

Mr Moore places the Mountain Computer synthesizer in the same class with Moog and ARP synthesizers, although they are almost totally different (the Mountain Computer unit, for example, uses additive synthesis and the Moog and ARP units are almost exclusively subtractive synthesis). Then he degrades the attack-decay-sustain-release method used on the ALF units, although this method is identical to the envelopes used on the expensive Moog and ARP. He specifically mentions that this method is difficult to use for piano-like envelopes, since they decay during sustain. This is incorrect. The fact that a piano decays during sustain simply means that the sustain level should be adjusted to zero and a very slow decay rate used. The abrupt drop upon

key release is, of course, managed with a fast release rate setting.

In the realm of music notation, Mr Moore claims that music printed by the PRINT command can be cut and pasted to form an orchestral score. This, too, is incorrect. In an orchestral score (actually "full score"), the measure bars will line up from part to part; the PRINT command does not adjust the music printout as it would be in a typical musical score. In fact, the PRINT command output is missing so many music features, notably beaming of notes shorter than quarter notes, that to an untrained eye it might not even resemble the original score, even if the various parts are pasted together.

Mr Moore also fails to understand the limits of the Apple's processor, except when discussing the particularly difficult case of software-driven D/A (digital-to-analog) synthesis. He mentions that three ALF 3-voice cards can be used for nine voices, which is true, but he states that an advantage of this card is that more voices can be added simply by using additional cards. If this were true, why not use four cards for twelve voices? In fact, the Apple processor is pressed to keep up with the nine voices. The processor-speed limitation affects every parameter controlled by the software. If the Apple were twice as fast, we would be able to have envelopes on the ALF card that were twice as smooth, which would result in a greater variety of sounds due to increased resolution and accurate control. The speed limit affects all synthesizers of all types, but the Mountain Computer system is particularly affected because the computer runs only at half speed during playback. Add the burden of 16 voices, compared to ALF's conservative nine, and you'll surely realize the Mountain Computer's software-controlled parameters (such as frequency and amplitude envelopes) must be very coarse indeed. In turn, this limits the variety of sounds available.

Mr Moore's statement that square-wave synthesizers have invariably sharp high notes and buzzy-sounding low notes is incorrect. Using Fourier analysis, which he describes on page 78, one can see that the harmonic contents of high and low notes are identical. The process he calls additive synthesis (used to create different sounds) can be done on every synthesizer available for the Apple, not just the Mountain Computer system. It is important to note that additive synthesis can be used only to

add harmonics. Therefore, a square-wave synthesizer, already rich in harmonics, cannot produce low harmonic sounds using additive synthesis. By using very detailed and rapid envelopes on several channels, extremely complex and interesting sounds can be created. Because the Mountain Computer unit cannot produce very short notes (due to processor limitations I mentioned) and because it does not have a subroutine capability (which is essential, especially for echo/reverb effects), it cannot produce the types of sounds that are available on the square-wave units.

The greatest injustice done to the various competing cards lies in the text box "Music Making" on page 84 and in Moore's conclusions. He virtually declares that all other systems have advantages and disadvantages, but the Mountain Computer system has the best of everything. Each unit has its own best and worst factors. True, the Mountain Computer unit has a price of \$545 and a full-blown ALF AMS system is \$735 (not \$795 as quoted in the article), but the ALF MC1 has as many voices as that full-blown system and costs only \$195 (not to mention having all the goodies that on page 92 he wishes the Mountain Computer system had). As one might expect, these differently priced systems offer different types of performance. Despite Mr Moore's claims, the Mountain Computer system is definitely not the most powerful synthesizer available for the Apple II—no particular unit is.

Finally, it might be nice for readers to have our address and phone number. Rob Moore gives the phone number and address of every company he mentions except ALF. Our phone number is (303) 234-0871.

Philip J Tubb
ALF Products Inc
1448 Estes
Denver CO 80215

Rob Moore Replies:

I must concede Phil Tubb's point that any device that allows control of two or more musical parameters can accurately be called a synthesizer. According to his definition, however, the Apple's speaker, with its control of frequency and volume (on or off), is also a synthesizer. But I do not know of any "professional-quality"

A Busload from SSM.



80 Character Video

With 80 characters per line our VB3 is the perfect video interface for word processing. It produces a standard 80x24 display of upper and lower case characters or as much as 80x50 for a full page of text. The matrix for graphic display goes up to 160x200. And with optional EPROM, as many as 256 user programmed characters or symbols can be produced.

VB3 is memory mapped for rapid screen updating. But it occupies memory only when activated. So one or more VB3s can be located at the same address with a full 65K of memory still available to the user.

It generates both U.S. and European TV rates and meets IEEE 696.1 standard. Other features include keyboard input, black on white or white on black, one level of grey, underline, strike thru, blinking char., blank-out char., and programmable cursor. Software includes a CP/M compatible driver and a powerful terminal simulator.



Z-80 CPU

We spent over a year designing the CB2 to assure that it is the most fully S-100 compatible Z-80 CPU on the market.

It operates at 2MHz or 4MHz by DIP switch selection and includes two sockets for 2716/2732 EPROMs or 2K RAMs. Memory sockets can be disabled. Separate run/stop and single step switches allow system evaluation without the benefit of a front panel.

CB2 also features an MWRITE signal, firmware vector jump, and an output port to control 8 extended address lines (allowing use of more than 65K of memory). Jumper options generate the new IEEE 696.1 signals.



8080 CPU

Our CB1A is identical to our popular CB1 with the exception that the on-board RAM has been increased from 256 bytes to a full 1K.

It also features an optional 2K of 2708 EPROMs, power-on/reset vector jump, MWRITE, parallel input port with status and DIP switch addressing.

Our S-100 line includes CPU, Video, I/O, 8 and 16 Bit RAM, EPROM, EPROM Programmer, Prototyping, Terminator, Extender, and Mother boards. Available assembled or as kits.

New SSM Products.

Please call for all the latest details on our newest products:

- **MB 64** 64Kb static RAM memory.
- **105** two parallel, two serial input/output ports, with complete RS-232 protocol.
- **108** multiple RS-232 serial I/Os.



SSM Microcomputer Products, Inc.

2190 Paragon Drive, San Jose, CA 95131, (408) 946-7400 Telex: 171171, TWX: 910-338-2077

Baked Apple.

Last Thanksgiving, a designer from Lynn/Ohio Corporation took one of the company's Apple Personal Computers home for the holidays.

While he was out eating turkey, it got baked.

His cat, perhaps miffed at being left alone, knocked over a lamp which started



a fire which, among other unpleasantries, melted his TV set all over his computer. He thought his goose was cooked.



But when he took the Apple to Cincinnati Computer Store, *mirabile dictu*, it still worked.

A new case and keyboard made it as good as new.

Nearly 1,000 Apple dealers have complete service centers that can quickly fix just about anything that might go wrong, no matter how bizarre.

So if you're looking for a personal computer that solves problems instead of creating them, look to your authorized Apple dealer.

You'll find everything well-done.

The personal computer.



For the authorized dealer nearest you, call (800) 538-9696. In California, call (800) 662-9238. Or write: Apple Computer Inc., 10260 Bandlely Dr., Cupertino, CA 95014.

Letters

synthesizer that does not offer some degree of waveform control, whether it is Moog, ARP, Synclavier, or even Radio Shack's new Moog unit.

In my article, I did not say that a synthesizer must be able to imitate real instruments. In fact, a synthesizer with control of a reasonable number of parameters will be able to produce recognizable instrument sounds as a by-product of its flexibility in sound production.

Mr Tubb has also apparently confused the meanings of the words imitate, simulate, and duplicate. Neither I, nor Mountain Computer, claim that the MusicSystem can duplicate the sound of real instruments; however, it can produce recognizable simulations (or imitations) of a number of conventional instruments. This is an ability that is usually attractive to newcomers who have not had much experience with music synthesis, but who might enjoy simulating the sounds of familiar instruments.

Mr Tubb is correct in his comments about the MusicSystem's PRINT command. Yet, that is why I referred to its output, when cut and pasted, as a "... sort-of-orchestral . . ." score. While unconventional, the result is still useful.

I'm afraid that it is Mr Tubb who fails to understand the capabilities of the Apple's 6502 microprocessor. If the 6502 is fast enough to generate D/A music, sampling four parts at 8 kHz each, then it certainly has the speed to sample 16 envelopes at several hundred samples per second. As a matter of fact, the MusicSystem's 8 ms envelope-sample period falls near the beginning of the 5 to 20 ms range of periods typically found in systems of this type. His comment that the envelopes must be very coarse in a 16-voice system (while smooth with the ALF's "conservative" nine voices) has no basis in fact. It sounds as though he is trying to say that "less is more"—that nine square-wave voices are somehow better at producing music than 16 variable waveform voices.

I stand by the statement that square-wave-only systems invariably have bright, sharp high notes and buzzy-sounding lows. Although both high- and low-frequency square waves have the same harmonic content, they do not have the same mix of frequencies. Additionally, the human ear's response drops off quite fast at low frequencies, so when a low-frequency square wave is played, the listener hears proportionally more of the high-frequency components—thus, the "buzzy" sound.

Regarding additive synthesis: Just as Fourier analysis decomposes a waveform into its simplest component parts (i.e., sine waves with frequencies that are integer multiples of the note's fundamental frequency), Fourier synthesis is used to construct a waveform from these same components. Although additive synthesis is often used as a synonym for Fourier synthesis, it may also consist of adding various arbitrary waveforms to synthesize the final result. But I cannot agree that a fixed-waveform music device can accomplish additive synthesis. Certainly some interesting and sometimes pleasant sounds can be produced, but rapid envelope variations are not the same as additive synthesis.

Mr Tubb is correct when he mentions, as I did in the article, that the Mountain Computer MusicSystem has no musical subroutine capability, while the ALF does. Fortunately, this is only a software limitation that will be corrected in the next software release and not a hardware limitation.

I do not believe that any injustice was done in the "Music Making" textbox in the article. When products of any sort are produced to meet specific cost goals, various trade-offs have to be made to stay within those limits. Inevitably, the trade-offs vary and different products will have their own strengths and weaknesses. Also, as electronic technology advances, prices will come down and allow features to be included that might have been too expensive a few years ago.

Mr Tubb also manages to confuse the terms most powerful and best. The MusicSystem is the most powerful synthesizer currently available for the Apple II. It offers more voices and control of more musical parameters than any of the others. It is also relatively expensive and a bit more difficult to use than some of the lower-cost units. This is not to say that it is always the best choice for a given individual. The best choice is the unit that fits within the user's budget and offers the most acceptable combination of features.

I'm sure that many people will find the ALF MC1 to be a good choice. With its nine voices and the excellent ALF software, the MC1 is a very good value.

DUE TO A PRINTING ERROR, the PerCom Heath Zenith ad on page 15 of the October issue should have been the PerCom ad for the TRS-80 drive systems. We apologize for any inconvenience this may have caused our readers.

PERCOM

Quality Percom products are available from the following authorized Percom retailers. If a retailer is not listed for your area, call Percom toll free at **1-800-527-1222** for the address of a nearby retailer, or to order directly from Percom.

| | | |
|-------------------------------|----------------------------------|----------------|
| | ARKANSAS | |
| MICROCOMPUTER SYSTEMS, INC. | Hot Springs | (501) 623-5209 |
| | ARIZONA | |
| SIMUTEK | Tucson | (602) 886-5880 |
| | CALIFORNIA | |
| ALPHA BYTE STORES | Calabasas | (213) 883-8594 |
| BERKELEY MICRO COMPUTERS | Berkeley | (415) 848-7122 |
| COMPUTER INFORMATION EXCHANGE | San Luis Rey | (714) 757-4849 |
| COMPUTER SERVICE CENTER | Hollywood | (213) 851-3434 |
| DESMAR ELECTRONICS | Santa Clara | (408) 988-2208 |
| HOBBYWORLD | Northridge | (213) 886-9200 |
| WHOLESALE TECHNOLOGY | Santa Ana | (714) 979-1700 |
| | COLORADO | |
| MICROCOMPUTER APPLICATIONS | Denver | (303) 922-6410 |
| | DISTRICT OF COLUMBIA | |
| THE PROGRAM STORE | Washington | (202) 337-4691 |
| | FLORIDA | |
| EN-TRON, INC. | Largo | (813) 586-5012 |
| MICROCOMPUTER CONSULTANTS | Ormond Beach | (904) 673-5787 |
| MICROSYSTEMS SOFTWARE, INC. | Hollywood | (305) 983-3390 |
| | GEORGIA | |
| DAVIS SYSTEMS, INC. | Atlanta | (404) 634-2300 |
| | HAWAII | |
| COMPUTER CENTER | Honolulu | (808) 488-2171 |
| | IDAHO | |
| OFFICE MAGIC COMPUTERS | Boise | (208) 376-4613 |
| | ILLINOIS | |
| GARCIA & ASSOCIATES | Chicago | (312) 782-9750 |
| | KANSAS | |
| BESCO ELECTRONICS | Shawnee | (913) 268-7633 |
| CARDENS, INC. | Hutchinson | (316) 669-8261 |
| | KENTUCKY | |
| COMPUTER MAGIC | Louisville | (502) 893-9334 |
| | MASSACHUSETTS | |
| OMNITEK | Tewksbury | (617) 851-4580 |
| | MARYLAND | |
| DAMASCUS RADIO SHACK | Damascus | (301) 253-2101 |
| | MICHIGAN | |
| ALTERNATE SOURCE | Lansing | (517) 487-3358 |
| | MINNESOTA | |
| THE CODE ROOM | Eden Prairie | (612) 934-1826 |
| | MISSOURI | |
| LEMBERGER CO. | Vienna | (314) 422-3353 |
| SOFTWARE CENTER | Florissant | (314) 838-7755 |
| | NEBRASKA | |
| COLUMBUS TV | Columbus | (402) 564-5531 |
| CURTRONICS | Lincoln | (402) 423-7771 |
| | NEW HAMPSHIRE | |
| HARDSIDE | Millford | (800) 258-1790 |
| | NEW JERSEY | |
| CHANNEL 1 RADIO SHACK | Medford | (609) 654-7454 |
| | NEW MEXICO | |
| AUTEL ELECTRONICS | Albuquerque | (505) 255-6451 |
| | NEVADA | |
| PCS COMPUTER | Las Vegas | (702) 870-4138 |
| | NEW YORK | |
| H & E COMPUTRONICS | Spring Valley | (914) 425-1535 |
| 80 MICRO COMPUTER SERVICES | Cohoes | (518) 235-9007 |
| MICRO 80 SYSTEMS | Brooklyn | (212) 748-3236 |
| STONY CLOVE | New York City | (212) 391-8337 |
| | OHIO | |
| FELDMAN ENTERPRISES | Akron | (216) 724-5583 |
| JERRY'S COMPUTER | Cleveland | (216) 641-6719 |
| | PENNSYLVANIA | |
| ADVANCED MECHANIZATION | Wyland | (215) 672-9000 |
| COMPUTER ANALYSTS | New Brighton | (412) 846-9323 |
| SUNRISE ELECTRONICS | Chambersburg | (717) 264-8214 |
| | TENNESSEE | |
| COMPUTER WORLD, INC. | Nashville | (615) 255-8330 |
| | TEXAS | |
| ACCESS UNLIMITED | Richardson | (800) 527-3475 |
| COMPUTEX | Webster | (214) 690-0206 |
| QUALITY SOFTWARE | Dallas | (713) 488-8022 |
| TEXAS COMPUTER SYSTEMS | Brady | (214) 484-2976 |
| | UTAH | |
| MICRO MNEMONICS | Sunset | (801) 298-6809 |
| | WASHINGTON | |
| COMPUTER SERVICES | Kennewick | (509) 582-9759 |
| | WISCONSIN | |
| BYTE SHOP MILWAUKEE | Greenfield | (414) 281-7004 |
| FINAMORES | Marshfield | (715) 384-9610 |
| | FOREIGN DEALERS | |
| | AUSTRALIA | |
| DICK SMITH ELECTRONICS | P.O. Box 321 North Tyde NSW 2113 | |
| | CANADA | |
| VALERIE AND ASSOC. | Guelph Ontario | (519) 824-7041 |
| DVR ELECTRONICS | Surrey B.C. | (604) 576-1045 |
| | MEXICO | |
| CIBERMATIC, S.A. | Mexico | (905) 592-3433 |
| COMPUTADORAS Y ASESORAMIENTO | Rio Patwco 14 Mexico 5 D.F. | |
| | DOMINICAN REPUBLIC | |
| RADIO SHACK | Santo Domingo | (809) 565-9121 |



Disk Storage: It's No Place to Compromise.

A dependable disk system means everything to the high-performance operation of your computer. At Percom, we know this. And we do something about it.

For example, the connectors on our TFD drive systems are gold plated.

Why? Because solder-plated contacts oxidize, forming an insidious insulation that can cause erratic operation. And then total failure.

Gold-plated connectors are just one way we make better drive systems than the competition.

Now #1 for the Model III

Quality Percom TFD drives provide more features, cost less. Add-on drives start at only \$439.00. Complete First-Drive Systems start at only \$749.95. Features: "Flippy" Capability — Record your

programs and data on either side of a diskette. **Greater Storage Capacity** — Store 180 Kbytes — formatted — on one side of a 40-track TFD drive. Store over twice as much on a TFD 80-track drive. **Think Megabytes** — Your TFD drive controller will handle up to four drives. You can access almost 1.5 million bytes of on-line program and data files. **Either Add-in or Add-On** — Your TFD First Drive System can be either internal (add-in) or external (add-on). In either case, you get a complete system including the disk controller, drive, power supplies and disk-operating software. **BASIC-Language DOS** — Included on diskette with each First Drive System is Percom's OS-80/III™. This easy-to-use disk-operating system loads into 7 Kbytes of RAM and then frees the drive for other use. With OS-80™ programs, you can have full, read-write interchangeability between Model I and Model III diskettes. **Or Model III TRSDOS*** — TFD 40-track drives work with Tandy's Model III TRSDOS, without modification. For 80-track operation, TRSDOS can be easily modified with diskette patches supplied.

Still #1 for the Model I

Besides greater storage capacities, more quality control measures and lower prices, all Percom Model I drives are rated for double-density operation.

Plug a DOUBLER™ in your Expansion Interface and enjoy the same double-density disk storage capacity as Model III owners. Included with each DOUBLER is a TRSDOS compatible double-density disk-operating system. DOUBLEZAP programs are available for upgrading other popular DOSs for DOUBLER opera-

tion. And our double-density version of OS-80™ costs just \$49.95.

Of course you don't **have** to upgrade your Model I for double-density operation to use Percom disk drives. But it's nice to know you can.

Percom TFD drives for the TRS-80* Model I are available in 40-, 77- and 80-track versions, in 1-, 2- and 3-drive configurations. Prices start at \$399.00.

System requirements: Model III TFD drives work with a 16-Kbyte system (min) and Model III BASIC. The initial drive must be a first-drive system. An optional interconnecting cable is available for expanding with external drives #3 and #4. Model I TFD drives work with a 16-Kbyte system (min) equipped with an Expansion Interface, Level II BASIC and DOS software, and an interconnecting cable. Two- and four-drive interconnecting cables are available from Percom.

To order products, or for the name of your authorized Percom retailer, call toll free:
1-800-527-1222

PERCOM

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

*trademark of Percom Data Company, Inc.
*trademark of Tandy Radio Shack Corporation which has no relationship to Percom Data Company

Yes I'd like to know more about the best for my TRS-80 computer. Send me free literature about quality Percom products.

Model I Model III

Send to
PERCOM DATA COMPANY, Inc., 8-B
11220 Pagemill Rd. Dallas, TX 75243

name _____

street _____

city _____ state _____

zip _____ phone number _____

MAIL TODAY!

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Letters

If the buyer can afford \$545 or so, he or she should consider the MusicSystem. While its software could be improved in some areas, the MusicSystem's capabilities cannot be duplicated at this time.

An experimenter who wants to learn computer music from the inside out could take advantage of the excellent and inexpensive D/A music products offered by Micro-Technology Unlimited if he or she is willing to do some of the software work.

There are also a number of other inexpensive music cards—I have not tried them all. In short, there is no single system best for everyone. I suggest that readers go to a store and try out as many as possible and let their ears and budget decide.

I apologize for the inadvertent omission of ALF's address.

Mountain Computer Responds:

While the overall tone of Mr Philip Tubbs' letter is extremely patronizing toward his own product and critical toward ours, I must say that Rob Moore's fine rebuttal covers many of the complaints that we would have in that particular category. There are one or two technical points that I will elaborate on here.

Our use of envelope control is one that represents a true envelope and how it actually occurs in an instrument, rather than in a conventionally synthesized method. This allows for the proper length and decay factors giving a more natural sound. Mr Tubbs also fails to mention that his system cannot print any scores.

Another point that he brings out is that the computer runs at half speed on playback. While this is true, it is not a drawback because we can use the DMA capabilities of our system to our advantage. We service 16 voices without the information for the waveforms because the board has integrated intelligence. It can produce enough information for itself and the 16 voices simultaneously without the need for the Apple's 6502 processor's time. The ALF board, on the other hand, must be tied to the 6502 processor, continually using it to service the 9 voices and the envelopes. In short, we have very fine resolution on our waveforms and envelope controls, and ALF only has the envelope at a very low resolution point.

Additionally, the 9 voices (and that's only with three boards) are still not equal to or as versatile—that is the word Mr

Moore used—as the Mountain Computer system. Without any argument on any other manufacturer's part, you will find the most capable and versatile system to be the Mountain Computer system.

Kent C Greenough, Director of Sales
Mountain Computer Inc
300 El Pueblo Rd
Scotts Valley CA 95066

A Little Ada Clarification

Having read "BYTELines" in the August 1981 BYTE (page 224) and having received several phone calls as a result of the article "Ada and Little Ada Released," I am prompted to write and clarify what may be a bit of a confusion.

TeleSoftware is wholly owned by a company called TeleSoft. TeleSoft does indeed have the first commercially available Ada compiler. It's called TeleSoft-Ada.

The juxtaposition of TeleSoftware's implementation of Ada and some information about "Little Ada" was unfortunate. There is absolutely no connection between TeleSoft-Ada and Little Ada.

Perhaps the confusion has arisen because only one address was printed at the end of the article, not ours!

Peter Dine, President
TeleSoft
10639 Roselle St
San Diego CA 92121

Setting the Record Straight

In the August BYTE, our Multi/OS for 8080 and Z80 systems was mentioned in "BYTELines." BYTE incorrectly stated that "like the others, it also maintains CP/M compatibility." We are not similar to the others, they are similar to us! InfoSoft has been the trailblazer in CP/M compatibility since we created the game with CDOS. Everyone else is trying to catch up to us. Multi/OS is a new product based on our single-user I/OS that has been around for more than four years. We have maintained CP/M compatibility for just as long.

Richard Roth, Vice President
Software Development
InfoSoft Systems Inc
25 Sylvan Rd S
Westport CT 06880 ■

Visit Your Heathkit Electronic Center*

where Heath/Zenith Products are displayed, sold and serviced.

PHOENIX, AZ
2727 W Indian School Rd.
602-279-6247

ANAHEIM, CA
330 E. Ball Rd.
714-776-9420

CAMPBELL, CA
2350 S. Bascom Ave
408-377-8920

EL CERRITO, CA
6000 Potrero Ave
415-236-8870

LA MESA, CA
8363 Center Dr
714-461-0110

LOS ANGELES, CA
2309 S. Flower St
213-749-0261

POMONA, CA
1555 N. Orange Grove Ave
714-623-3543

REDWOOD CITY, CA
2001 Middlefield Rd
415-365-8155

SACRAMENTO, CA
1860 Fulton Ave
916-486-1575

WOODLAND HILLS, CA
22504 Ventura Blvd.
213-883-0531

DENVER, CO
5940 W 38th Ave
303-422-3408

AVON, CT
395 W. Main St. (Rt. 44)
203-678-0323

HALEAH, FL
4705 W. 16th Ave.
305-823-2280

PLANTATION, FL
7173 W. Broward Blvd
305-791-7300

TAMPA, FL
4019 W. Hillsborough Ave.
813-886-2541

ATLANTA, GA
5285 Roswell Rd
404-252-4341

CHICAGO, IL
3462-66 W. Devon Ave.
312-583-3920

DOWNERS GROVE, IL
224 Opden Ave
312-852-1304

INDIANAPOLIS, IN
2112 E. 62nd St
317-257-4321

MISSION, KS
5960 Lamar Ave
913-362-4486

LOUISVILLE, KY
12401 Shelbyville Rd.
502-245-7811

KENNER, LA
1900 Veterans
Memorial Hwy
504-467-6321

BALTIMORE, MD
1713 E. Joppa Rd
301-661-4446

ROCKVILLE, MD
5542 Nicholson Lane
301-881-5420

PEABODY, MA
242 Andover St
617-531-9330

WELLESLEY, MA
165 Worcester Ave
617-237-1510

DETROIT, MI
18645 W. Eight Mile Rd
313-535-6480

E. DETROIT, MI
18149 E. Eight Mile Rd
313-772-0416

HOPKINS, MN
101 Shady Oak Rd.
612-938-6371

ST. PAUL, MN
1645 White Bear Ave
612-778-1211

BRIDGETON, MO
3794 McKelvey Rd
314-291-1850

OMAHA, NE
9207 Maple St.
402-391-2071

ASSBURY PARK, NJ
1013 State Hwy 35
201-775-1231

FAIR LAWN, NJ
35-07 Broadway (Rt. 4)
201-791-6935

AMHERST, NY
3476 Shendan Dr
716-835-3090

JERICHO, L.I. NY
15 Jericho Turnpike
516-334-8181

ROCHESTER, NY
736 Jefferson Rd
716-424-2560

N. WHITE PLAINS, NY
7 Reservoir Rd
914-761-7690

CLEVELAND, OH
28100 Chagrin Blvd
216-292-7553

COLUMBUS, OH
2500 Morse Rd.
614-475-7200

TOLEDO, OH
48 S. Byrne Rd
419-537-1887

WOODLAWN, OH
10133 Springfield Pike
513-771-8850

OKLAHOMA CITY, OK
2727 Northwest
Expressway
405-848-7593

PORTLAND, OR
— see Vancouver, WA

FRAZER, PA
630 Lancaster Pike
(Rt. 30)
215-647-5555

PHILADELPHIA, PA
6318 Roosevelt Blvd
215-268-0180

PITTSBURGH, PA
3482 Wm Penn Hwy
412-824-3564

WARWICK, RI
558 Greenwich Ave
401-736-5150

DALLAS, TX
2715 Ross Ave
214-826-4053

FORT WORTH, TX
6825-A Green Oaks Rd
817-737-8822

HOUSTON, TX
1704 W Loop N
713-869-5263

SAN ANTONIO, TX
7111 Blanco Road
512-341-8876

MIDVALE, UT
58 East 7200 South
801-566-4626

ALEXANDRIA, VA
6201 Richmond Hwy
703-765-5515

VIRGINIA BEACH, VA
1055 Independence Blvd
804-460-0997

SEATTLE, WA
505 8th Ave. N
206-682-2172

TUKWILA, WA
15439 53rd Ave S
206-246-5358

VANCOUVER, WA
516 S. E. Chkalov Drive
206-254-4441

MILWAUKEE, WI
5215 W. Fond du Lac
414-873-8250

*Units of Ventechonology Electronics Corp. CP-199R2

WHAT'S THE KEY TO BUYING A COMPUTER?

Look beyond the computer. Look at how the total system—hardware, software, support, service—meets your needs, today and tomorrow. That's the key. When you choose a computer source, you choose a long term partner who must stand by you with total support. And no one stands by you like Heath/Zenith.

Software

Including word processing, business applications, versatile utility programs, and the Heath Users' Group library of over 500 low-cost programs for home, work or play.

And a choice of three operating systems, including CP/M by Digital Research for compatibility with thousands of popular CP/M programs.

Languages

For your own custom programs, Microsoft languages are available in BASIC (compiler and interpreter), FORTRAN and COBOL.

Self-Study Courses

Learn at your own pace with *Programming Courses* that teach you to write and run your own programs in Assembly, BASIC, Pascal or COBOL.

For the business person, *Computer Concepts for Small Business* helps you evaluate the ways a computer can benefit your business. And for the novice, *Personal Computing* is a complete introduction to computer fundamentals and BASIC Programming.

Support

Before and after the sale we work with you to configure the system that serves you best. We help you get your system up and running smoothly. Assistance is always just a phone call away.

Service

Friendly, experienced technicians are available, either over the phone or at any of the 56 Heathkit Electronic Centers nationwide.

Visit your Heathkit Electronic Center*

Pick the store nearest you from the list at left. And stop in today for a demonstration of how Heath/Zenith Computer Systems can serve you. If you can't get to a store, send \$1.00 for the latest Heathkit Catalog and the new Zenith Data Systems Catalog of assembled commercial computers. Write to Heath Co., Dept. 334-834, Benton Harbor, MI 49022.

Pick a strong partner.
Heath/Zenith & You.

HEATH/ZENITH

Your strong partner



*Units of Veritechnology Electronics Corporation in the U.S.
Specifications subject to change without notice.

Writing with a Data-Base Management System

Edward E Brent Jr, PhD
The Idea Works Inc
506 South Garth
Columbia MO 65201

Nearly every microcomputer user appreciates the benefits of writing with a word-processing program. Pencil, paper, and typewriter can't match keyboard, video display, and line printer for speedy writing, editing, and printing of almost any kind of copy.

But word processing works best at relatively late stages in the writing process—after you've recorded your research results, compiled references, and constructed an outline for the project. In this article I show how another type of program, the data-base management system, can help you in the earlier stages of your writing. In fact, such a system can be *more* powerful than a word-processing program when you must perform a major reorganization of your text.

I first identify the stages of the writing process where a data-base management system (DBMS) can be most useful. Then I discuss the capabilities of such systems, detail their benefits, and recommend strategies for using the DBMS to maximum advantage.

About the Author

Edward Brent is assistant professor of sociology and family and community medicine at the University of Missouri in Columbia. He is also president of The Idea Works Inc, a research and consulting firm specializing in computer applications in research and design.

Although everyone has a favorite writing strategy, the process of writing can be broken down into several basic steps. After selecting a topic, the writer takes notes on ideas he may want to include. Next he outlines the article by organizing ideas and selecting a manner of presentation. The outline serves as a guide for composing the text, which is then revised until it satisfies the writer.

Limitations of Word Processing

When it comes to composing text, correcting it, and printing it out in an acceptable form, word-processing programs provide obvious advantages. But such programs lend themselves less well to note taking, outlining, and making major revisions. For these tasks, a DBMS can save time and energy.

When taking notes, you need a mechanism for recording ideas so that they will be easily accessible later. Note taking also calls for a system to minimize effort without distracting you from the task at hand. Both note taking and outlining involve only small amounts of text—text that's rough and tentative at best. Word-processing programs don't deal well with text in this form.

At the revision stage, word-processing programs do an efficient

job with minor changes. But if you must add many new ideas, delete many old ones, or drastically change the logic of your presentation, you may be better off with a DBMS.

DBMS Characteristics

To understand how a computerized data-base system can help you write, you must first understand its characteristics. A generalized DBMS is a set of related programs that allows you to enter a wide variety of data into a computer *file*, organize it for storage, then retrieve, update, reorganize, and print it out in the form of a summary report. Each file, a collection of related data, can contain almost any type of information you desire, so long as it meets the minimal structural requirements of the DBMS.

File Structure. Before entering any data into a file, you must first define the file structure. Files consist of a number of *records*, each containing similar information and referred to by a unique number or keyword. In writing, each record might contain a note on a particular idea, or a point made in another book or article to be cited in the paper. A record is a collection of *fields*, each having a name, length and position. Within each field are data describing each aspect of a record. Field names such as "title"

DUAL RAM POWER

RAMPLUS+

From Mountain Computer

Compatible with Apple® Language Card

16K RAM Provided

**Additional 16K RAM Chips Available,
utilized by user-generated software.**

No Chip to Pull

No Cables to Attach

Works In our Expansion Chassis™

**See your Apple® dealer or
contact us for information.**



Mountain Computer
INCORPORATED

300 El Pueblo

Scotts Valley, CA 95066

TWX: 910 598-4504

408 438-6650

Apple II is a trademark of Apple Computer Inc.

Ram Photo—Animals Animals Enterprises/©Marty Stouffer Productions

Mountain Photo—©Avery E. Dee

DECIS

Minicomputer performance in

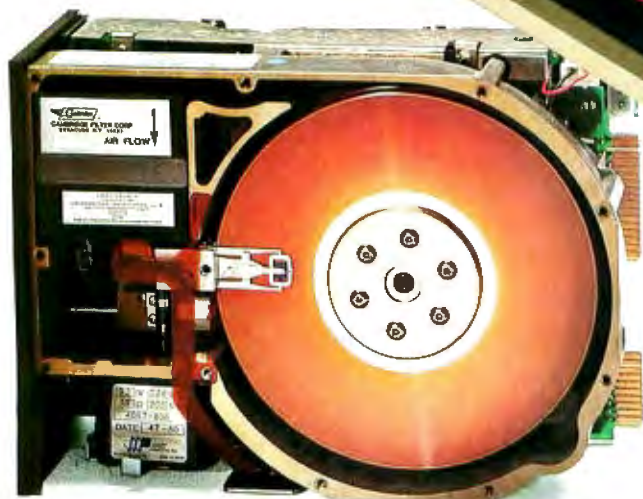
Multi-user. Multi Tasking. Decision I™ memory management hardware includes a memory map that is similar to the IBM 360,™ and IBM 370.™ It supports up to 16 tasks or 15 users and a supervisor without swapping. And, more with swapping. Each task or user enjoys complete memory protection and dynamic memory allocation. One task may be delegated as a supervisor to privileged system functions forbidden to ordinary tasks or users. Such functions (I/O calls, unauthorized memory access, etc.), will trap to the supervisor. If supervisory functions are not required the system can be configured for turnkey multi-user operation.

Multi-purpose IEEE696/S-100. Decision I utilizes the Morrow Designs IEEE Standard S-100 Wunderbuss.™ That means you can configure it to your specific applications. Add a floating point processor, add memory (to a full mega-byte), add I/O, add controllers...add boards from dozens of manufacturers. And S-100 has a major advantage over single-board computers: If a board goes down, you simply replace it. And keep running. If you want to expand your system. Add boards and terminals.

An unmatched software base. Decision I runs on the M/OS™ operating system. M/OS supports all system calls source

compatibly with UNIX.™ Thus, UNIX programs will compile directly and UNIX documentation is almost totally applicable. Morrow CP/M™ has been configured to run under M/OS and communicate with both CP/M and UNIX standard media for maximum portability. Languages available include BASIC, COBOL, FORTRAN, RATFOR, Pascal and C. That means Decision I offers you a software base unmatched in its price/performance arena.

The OEM machine. A basic multi-user system at \$5,225 includes the Decision I, 4 Mhz Z80A-based CPU, sophisticated memory



IBM 360 and 370 are trademarks of IBM Corp.
Wunderbuss is a registered trademark of Morrow Designs
Decision I and M/OS are trademarks of Morrow Designs
UNIX is a trademark of Bell Laboratories, Inc.
CP/M is a trademark of Digital Research Corp.

ION I

a multi-user Microcomputer.



management hardware, CP/M 2.2, M/BASIC 5.2, 3 serial and 2 parallel I/O ports, 14 I/O slots with S-100 connectors, supervisor control in both hardware and software, 128K of RAM and two quad-density disk drives (800K) with DMA controller. Plus, cabinet (either desk-top or rack-mount), and power supply. The same system with 8" floppies and a full Megabyte of formatted storage costs \$5,659. And, we offer OEM pricing.

A better microcomputer. Whether you're building a single or multi-user system, the Decision I offers you a hardware/software combination unmatched in the field. Decision I is not simply an improved 8-bit microcomputer. It's a breakthrough. In both computing power and price.

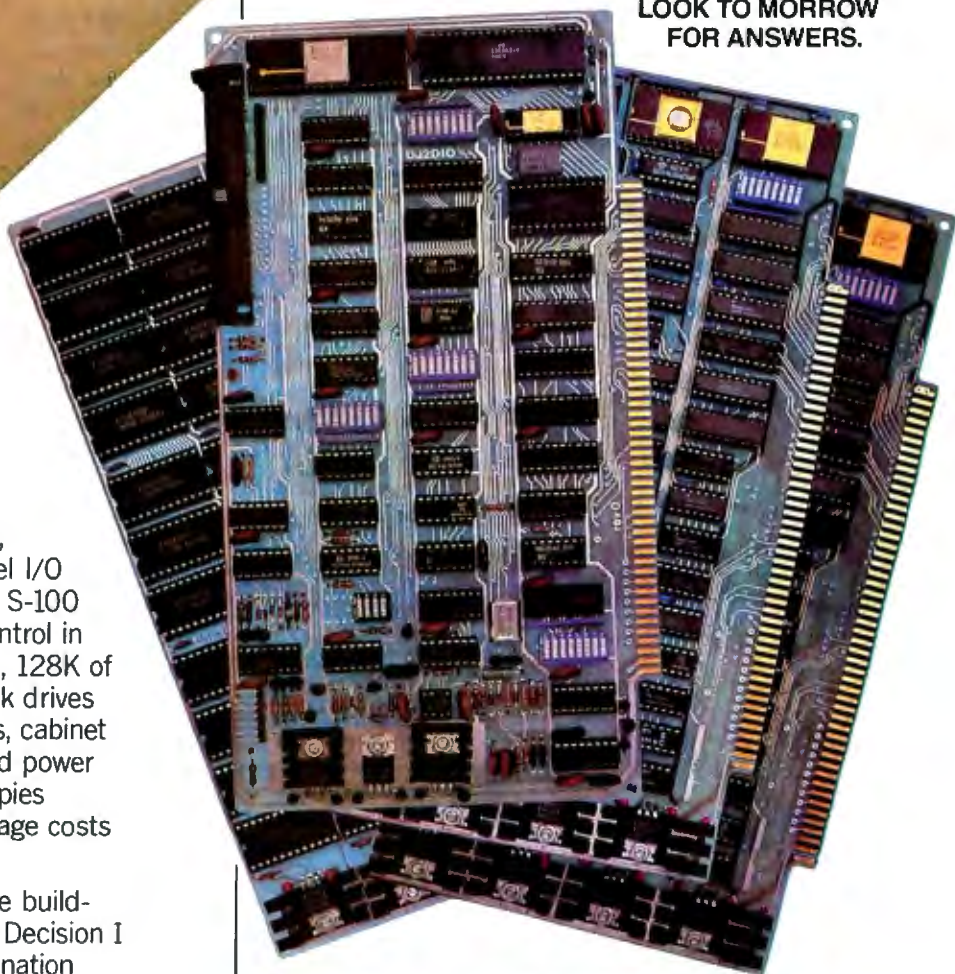
Systems your way. Morrow Designs' full range of hard and floppy disk memory, add-in memory boards, I/O

boards, controllers and software allow you to configure your system your way...through a single supplier.

The decision is yours. Compare the Decision I, feature-for-feature with mini or microcomputers on the market today. Compare capabilities. Compare flexibility. Compare utility. Then, compare price. We think Decision I will change the way you think about microcomputer systems.

Complete information? See your computer dealer. Or, write Morrow Designs.

LOOK TO MORROW FOR ANSWERS.



MORROW DESIGNS

5221 Central Avenue, Richmond, CA 94804
(415) 524-2101

Circle 287 on inquiry card.

See us at COMDEX Booth 575



and "author" identify the type of information stored in each field. The DBMS uses the length and position of the field to retrieve specific information.

Capabilities. Typical data-base management programs can perform a number of operations, including defining or creating a file; adding, modifying or deleting records; sorting the file according to some specific field; searching the file for records with certain values; and generating reports. You can store the data base created by these programs on a disk for future reference, and you can update it as your work on the paper progresses. Most data-entry programs prompt the user for relevant information and check to see that input data meet specified criteria. Others have sophisticated "query" languages that can perform arithmetic or Boolean algebraic manipulations on data in various fields. After computing percentages, totals, or other summary data, the program can store the data in another field or print it out. In

essence, the DBMS is an electronic filing cabinet, storing information in various records and accessing and retrieving that information on command. Any particular record can be cross-indexed on many different key variables at the same time, and retrieved based on the value of those keys.

In microcomputers, a common method of sorting and retrieval used by the DBMS is the indexed sequential-access method (ISAM). This method uses a sequential access file to store the records as they are entered. An index is then created for that file, ordered by the values in the key field. The index is a table containing the key and the machine address of the record associated with each key. Records in the file may then be used according to their keys. The ISAM method provides the advantage of fast retrieval time.

Figures 1a, 1b, and 1c present a typical data base in terms of file structure, report format, and sample data records. These records are part of an extensive data base I used in writing

this paper. In the TEXT field, each record contains a topic covered in this paper. A number of additional fields are used to take advantage of the capabilities of the DBMS to sort, search, and retrieve information. The characteristics of this data set are not particularly unusual, and you could use a similar strategy with many data-base management programs now available for microcomputers. The following sections discuss the advantages of the DBMS at each stage of writing.

Note Taking

If you can type, a DBMS can provide a fast and convenient means of recording notes. These may include quotes, summary notes referring to other sources, or your own ideas. A DBMS can be especially helpful when you spend a long time taking notes and then wait a while before actually drafting the paper. It is important to have some mechanism for recording ideas or references as they occur and then retrieving them later, when the

"I have recently used Spellguard and I can only echo the evaluations of a recent Infoworld review: excellent all the way."

Mark Garetz
Infoworld 25
May 1981

"Spellguard is an example of the new standard—fully professional microcomputer software."

Bill Burns
Infoworld 30 March
1981

"... Spellguard was given the manuscript from my first book. This version had been corrected after several (human) proofreaders thoroughly reviewed it. I therefore expected it to be relatively error free. Not so. Spellguard was

able to discover numerous typographical errors..."

Allan Miller
Interface Age
June 1981

"This easy to use, operator-oriented program has saved me

countless hours of proofreading, and from the embarrassment of submitting a manuscript with typos. Unlike most spelling test programs, Spellguard is fast..."

Tony Dowden
Microcomputing
May 1981

EXPERTS AGREE

SPELLGUARD™ IS THE FASTEST EASIEST TO USE MOST POWERFUL AND RELIABLE SPELLING CHECKER YOU CAN BUY

InfoWorld

Software Report Card



| | Poor | Fair | Good | Excellent |
|----------------|--------------------------|--------------------------|--------------------------|-------------------------------------|
| Usefulness | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Documentation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Ease of Use | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Error Handling | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

System Requirements

- CP/M (1.4 or later)
- 32 K bytes of memory
- One or two disk drives

Price: \$295



INNOVATIVE SOFTWARE APPLICATIONS
240 Sheridan Avenue, Suite 300
Palo Alto, CA 94306
P.O. Box 2797 Menlo Park, CA 94025
(415) 326-0805

OPTIMUM™

BROADEN YOUR HORIZONS

UVEON proudly announces OPTIMUM.™ OPTIMUM is an easy to use, total concept data management program for CP/M® and MP/M™ systems. Breaking through traditional DMS barriers, OPTIMUM provides large scale data management capability to broaden your computer horizons. Developed for individual computer users and applications builders, OPTIMUM supports user-defined forms and files, dictionaries, powerful reporting, storage efficiency, speed and unique cross-referencing. Everything you want in data management is now complete in one system.

USER-DEFINED FORMS AND FILES

With OPTIMUM, implementing an application is simple. The user defines screen forms to fit the data and describes how the data is to be stored. Once this is complete, data entry may begin. Input editing, validation and cross-referencing during data entry extend OPTIMUM's range. If the need exists, OPTIMUM can handle complex or multiple screen forms for the same file. Screen forms may be modified and expanded as needed.

DICTIONARIES

OPTIMUM maintains a dictionary of terms for each file. This dictionary contains information on each data element in the file and describes operations to be performed. Alterations and additions to the dictionary may be made as required.

MICRO-ENGLISH™ REPORTING

OPTIMUM Micro-ENGLISH lets the user request standard or custom reports from the OPTIMUM files. Sophisticated selecting and sorting capability give Micro-ENGLISH all the power of a large scale interactive inquiry processor. A dictionary based vocabulary keeps the user interface simple.

OPTIMUM STORAGE EFFICIENCY AND SPEED

OPTIMUM stores all information in a compact variable-length format. OPTIMUM files are designed for interactive speed; a single file item may be retrieved from among hundreds in an instant.

OPTIMUM DATA CROSS-REFERENCING

A unique feature of the OPTIMUM system allows a user to cross-reference data elements. Once information is entered, it may be retrieved using key words in the data.

From simple applications to complex systems, OPTIMUM manages it all. Broaden your horizons using the total concept data management system with the power of such industry forerunners as Prime Information, Honeywell Ultimate and Microdata Reality. Call or write UVEON today for more information on OPTIMUM. 1-800-525-1637.

CP/M and MP/M are trademarks of Digital Research, Inc.
OPTIMUM and Micro-ENGLISH are trademarks of UVEON
Computer Systems, Inc.

UVEON

The Future in Software.

UVEON Computer Systems, Inc.
899 Logan Street
Denver, Colorado 80203

Circle 420 on inquiry card.

THE ONLY NAME

YOU NEED

**TO KNOW FOR KEYED
FILE ACCESSING IS**

MICRO B+™

**Since 1979, MICRO B+
has delivered:**

- **PERFORMANCE:** search an index of over 10,000 key values in less than one second on a floppy.
- **CONVENIENCE:** no need to reorganize index files.
- **SUPPORT:** our bug-free code is backed by the best programmer support in the industry; just call us to see.
- **INNOVATION:** the 1st and most complete implementation of B-Tree index structures for micros.
- **DOCUMENTATION** that you can read.

AND NOW

FairCom has added

- **MULTI-USER** support under MP/M for MICRO B+.

IF YOU PROGRAM IN:

**MICROSOFT's BASIC, COBOL,
or FORTRAN
DIGITAL's PL/I-80
CBASIC-2
PASCAL/MT+**

**WE'VE GOT WHAT
YOU NEED**

for \$260. Manual alone \$20. Shipping \$4 North America, \$8 elsewhere.

**LANGUAGE C VERSION
OF OUR B-TREE ALGORITHM
IS AVAILABLE FOR \$2600.**

FAIRCOM

© 1981 FairCom

**2606 Johnson Drive
Columbia, MO 65201
(314) 445-3304**

**WE ACCEPT VISA &
MASTERCARD**

MP/M & PL/I-80 are trademarks of Digital Research. CBASIC is a trademark of Compiler Systems, Inc. PASCAL/MT+ is a trademark of MT Micro Systems.

paper is being outlined or written.

In many ways, note taking with a DBMS resembles note taking with note cards. For the note cards to be most useful, Lester (see references at end of article) suggests you put only one item of information on each card and include a brief citation or reference to the source of the idea. He also suggests you label the note card at the top for speedy recognition of the topic. When you record only one idea on each card, you can later sort the cards according to your outline for the paper.

All the functions performed by note cards can be carried out more efficiently by a DBMS. For each idea or quotation, you can create a record in the data-base file which includes as its main text the quotation or a statement of the idea. Key fields can be identified for reference to the author, journal, page, and date. To help you organize the ideas later, you can use other key fields to include a brief phrase that summarizes the context of the record. Several additional key fields could contain other types of information to sort the files in many different ways.

Because the DBMS can perform the tedious tasks of creating the indices and sorting the records, it requires far less effort on your part than note cards do. Once note taking becomes less burdensome, you can devote more effort to the task of developing new ideas.

Data-base management programs typically require you to define a structure before entering the data or notes. The programs then use that structure to prompt you for specific types of information as the notes are entered. When the information is complex, this prompting and structure can help you by assuring that you don't inadvertently leave out critical information (the author of a reference book, for example).

In addition to the structural constraints on data entry, data-base management programs typically include procedures which check the data for proper form during input. If you mistakenly enter alphabetic data in a numeric field, for example, the data may be rejected, and you will be

asked to start again. In addition, more sophisticated programs allow you to specify other criteria which may be examined before the data are accepted—helping to assure the quality of the data entered and improving the quality of the notes.

Outlining

While data-base management programs save time and improve quality at the note-taking stage, these benefits pale in comparison to the benefits for outlining. Much writing, particularly for research papers or technical papers, involves keeping track of a mass of information on various topics. Managing all this information quickly and efficiently is an awesome job for even the most gifted writer.

For example, in writing a paper reviewing several different software programs or comparing various hardware options, you need to keep track of many details to provide a clear picture of what is available. Writing such papers requires a vast amount of relatively simple but time-consuming work such as compiling lists, sorting references and ideas, and reorganizing points to fit a consistent argument or theme (to say nothing of the many data-handling tasks involved in generating the notes in the first place). The computer can do all these things without overlooking important ideas or misplacing relevant citations, and it can work faster than the most efficient writer.

But the savings in time and effort aren't the only advantages to using a DBMS for writing. By allowing you to organize and reorganize your notes with minimal effort, the system frees you to consider many different approaches to your subject. This luxury can lead to valuable insights and significant improvements in the paper.

Revising

The sorting, retrieving, and updating capabilities that make the DBMS so useful for outlining also make the system valuable when your work needs major revisions. You can delete entire sections, add others, or reorganize your paper to fit a new

ISAAC™ turns Apples into laboratory computers...



...and data acquisition costs tumble!

ISAAC teams with the Apple Computer to give you automated control of laboratory instruments, data acquisition, electronic test, process control and front end processing for centralized systems.

Its LABSOFT extended BASIC language makes ISAAC easy to use wherever real time signals must be recorded, manipulated, related, analyzed, stored, displayed or printed out. Color charts and graphs are a breeze.

Major ISAAC Hardware Features:

- 16-channel, 12-bit A/D converter
- 4-channel, 12-bit D/A converter
- 16 binary inputs
- 16 binary outputs
- 16 bit timer
- 8 channel counter
- Real-time clock
- RS-232C and IEEE 488 (optional)
- 4 programmable Schmitt triggers

Typical Applications:

CHEMISTRY

- Spectroscopy ● Chromatography ● Electrochemistry

ENGINEERING

- Bioengineering ● Electronic test ● Materials testing

PSYCHOLOGY

- Biofeedback ● Stimulus response ● Cognitive learning

PHYSIOLOGY

- Human performance testing ● Neurological waveform analysis

PROCESS CONTROL

- Flow, pressure and temperature measurements
- Current and voltage measurements

ISAAC plus Apple. A lot of technical computing power for a little money. For complete information, circle reader service number, or call us toll free at 1 (800) 343-4494.



Circle 123 on Inquiry card.

Cyborg Corporation, 342 Western Avenue, Boston, MA 02135

Apple is a trademark of Apple Computer. ISAAC, LABSOFT and CYBORG are trademarks of Cyborg Corporation.

Surprising Symmetries in Design and Letterforms . . .



Inversions:

A Catalog of Calligraphic Cartwheels
by Scott Kim

Foreword by Douglas Hofstadter
Backword by Jef Raskin

Illusion . . . calligraphy . . . visual magic—Scott Kim's new book delights the eye and enchants the mind. Filled with intriguing designs, words that read the same right-side-up and upside-down, words within words and unexpected symmetries, these compositions create a fresh way to look at the alphabet. The text includes the visual principles of symmetry, lettering and problem solving that are basic to these images. The author also draws parallels to related exercises in perception in such diverse areas as art, music, wordplay and mathematics. Scott Kim's original inversion designs first appeared in *Omni* magazine, inspiring an overwhelming reader response. An irresistible challenge, invertible writing appeals to everyone who loves beauty in mathematics and design.

Scott Kim is a doctoral student in Computer Science at Stanford University and is a concert pianist and composer.

ISBN 0-07-034546-5
128 pages; softcover
\$8.95

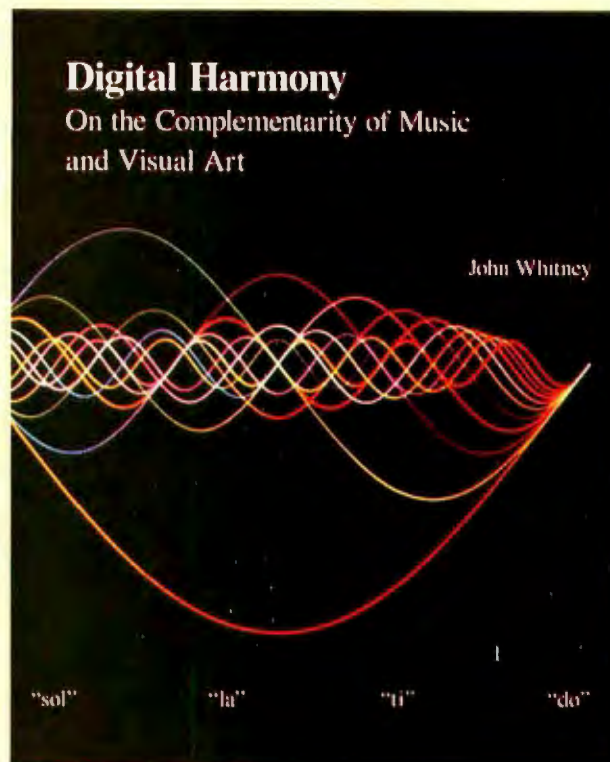
"Scott Kim has perfected a personal art form—one with grace, elegance, subtlety, and surprises."

Douglas Hofstadter, author
Gödel, Escher, Bach: an Eternal Golden Braid

"Scott Kim's *Inversions* . . . is one of the most astonishing and delightful books ever printed."

Martin Gardner
Scientific American

A New Frontier Between Sight and Sound . . .



Digital Harmony by John Whitney

On the Complementarity of Music and Visual Art

BYTE Books is pleased to offer *Digital Harmony*, a major new work by John Whitney, whose film art, known around the world, has been an influence on technological art and cinema special effects from 2001 to *Star Wars*. His book explores a special union of music and computer graphics and defines a new frontier between sight and sound, integrating the two to create a new art form.

Whitney shows what can be done with small computers, spells out a thorough theoretical background, and includes listings and programs for those interested in joining in the exploration of his unified field theory of art. *Digital Harmony* lays the foundation for an audio-visual art made possible by computers. It is must reading for all enthusiasts with interests in art, music, video, film, computers, education, artificial intelligence, psychology, and futurology.

John Whitney is on the Faculty of the Department of Art at the University of California, Los Angeles.

ISBN 0-07-070015-X
240 pages; hardcover
\$21.95

"Digital Harmony is a peek into the future when computerization will bridge the gap between art, science, and self-understanding. I loved it."

Seymour Papert
Author, Professor
Massachusetts Institute of Technology

BUILD YOUR OWN Z80 COMPUTER

by Steve Ciarcia

For the engineer, computer technician, student and anyone interested in building a computer rather than buying one, this practical guide shows how to build a working computer based on the Zilog Z80 microprocessor. Each computer subsystem is fully explained and supported by proven design and testing information.

ISBN 0-07-010963-1

330 pages, softcover \$15.95

YOU JUST BOUGHT A PERSONAL WHAT?

Thomas Dwyer and Margot Critchfield

Intended for both the novice programmer and the experienced computer enthusiast, this book presents practical ideas for personal computer use.

Its approach is especially suitable for educational purposes. Written by the leading contributors of computer education material, this book is an entertaining and resourceful tool.

ISBN 0-07-018492-5

343 pages, softcover, 78 illustrations \$11.95

BEYOND GAMES: SYSTEM SOFTWARE FOR YOUR 6502 PERSONAL COMPUTER

Creating programs for the Apple, Atari, Challenger and PET computers by Kenneth Skier

At last, a complete programming guide-book. A self-contained course in structured programming and top-down design, this book presents a powerful set of tools for building an extended monitor, disassembler, hexadecimal dump routine and text editor programs.

ISBN 0-07-057860-5

440 pages, softcover \$14.95

THE BYTE BOOK OF PASCAL

Blaise W. Liffick, Editor

Written for both potential and established users, this book introduces the Pascal language, examining its merits and possible implementations. Featured are two versions of the Pascal compiler, one written in BASIC and the other in 8080 assembly language; a p-code interpreter written in both Pascal and 8080 assembly language; a chess-playing program; and an APL interpreter.

ISBN 0-07-037823-1

334 pages, hardcover \$25.00

CIARCIA'S CIRCUIT CELLAR

Practical uses for home computers by Steve Ciarcia

Imaginative and practical, Ciarcia's Circuit Cellar details a variety of microcomputer projects. A collection of the best articles from the popular series in BYTE magazine, this volume includes:

- D/A conversion
- Programming EPROMS
- AC remote controlled appliances
- digitized speech
- touch input video display

ISBN 0-07-010960-5

125 pages, softcover; color photographs and diagrams \$8.00

CIARCIA'S CIRCUIT CELLAR, VOLUME II

More practical uses for home computers by Steve Ciarcia

Composed of popular articles from BYTE magazine, this volume tells how microcomputers can be interfaced uniquely with our environment.

Projects include:

- building a computer - controlled home security system

- computerizing appliances
- transmitting digital information over a beam of light
- building the Intel 8086 microprocessor system design kit
- input-output expansion for the TRS-80

ISBN 0-07-010963-X

224 pages, softcover; photographs and diagrams \$12.95

BEGINNER'S GUIDE FOR THE UCSD PASCAL SYSTEM

The most popular Pascal version explained by its creator by Kenneth L. Bowles

Written by the originator of UCSD Pascal System, this informative book is an orientation guide to the UCSD Pascal System. For the novice, this book steps through the System, bringing the user to a sophisticated level of expertise. Once familiar with the System, the reader will find the guide an invaluable reference tool for creating advanced applications.

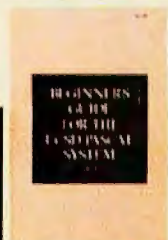
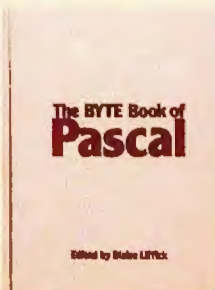
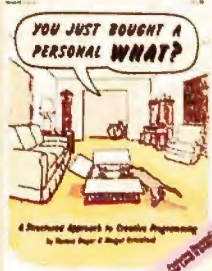
ISBN 0-07-006745-7

204 pages, softcover \$11.95

BUILD YOUR OWN Z80 COMPUTER



by Steve Ciarcia




BYTE BOOKS

BYTE Books' reputation is based on their providing technically accurate, timely and useful information. Established on the same principle as BYTE magazine, BYTE Books evolved in response to the rapidly expanding audience of home and business computer

users. These BYTE Books will expand your knowledge and expertise.

To order, call toll free 800/258-5420 or fill out your choices on this coupon and return it with check, money order or charge card number to:

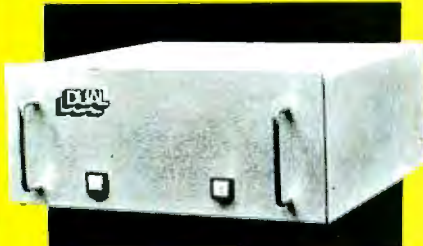
BYTE Books
70 Main Street
Peterborough
New Hampshire 03458

| Name | Title | Price | Quantity | Amount |
|---|--------|-------|----------|--------|
| _____ | _____ | _____ | _____ | _____ |
| Address | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| City | State | Zip | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| Check Enclosed | Amount | _____ | _____ | _____ |
| Bill Visa Card Number | _____ | _____ | _____ | _____ |
| Bill MasterCard Card Number | _____ | _____ | _____ | _____ |
| Expiration Date | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| Add 75¢ per book to cover shipping costs: | | | | _____ |
|  Total | | | | _____ |

68000 μ P on the S-100 Bus?

YES, AVAILABLE NOW FROM DUAL SYSTEMS!

- 8 MHz 68000 microprocessor.
- 16-megabyte direct addressing.
- 32-bit internal arithmetic.
- Minicomputer type instructions including MULTIPLY.
- FULL IEEE-696 S-100 compliance. Runs with all 4 MHz S-100 boards and automatically runs faster when accessing Dual Systems memory boards, for FULL SPEED OPERATION OF THE 68000.
- Powerful vectored interrupts. 7 Vectored interrupts, including NMI, as well as alternate mode having up to 256 interrupts.
- On board monitor ROM for immediate use.
- Connector for future addition of memory management unit for multi-user operating systems.
- Built to the highest industrial standards with 200 hour burn-in.



CPU/68000 CPU board. . . . \$1195
 32K-byte 8/16-bit NONVOLATILE RAM board, for secure storage of programs you are developing. Allows FULL SPEED CPU operation. CMEM-32K, per 32K-bytes . . \$895
 32K-byte 8/16-bit EPROM board, EPROM-32K \$245
 Serial I/O board, SIO-2 \$285
 All of the above with cabinet, power supply and backplane. \$3685

OEM and Dealer pricing is available.
 Sales representatives in most metropolitan areas.



system reliability/system integrity

DUAL SYSTEMS CONTROL CORPORATION
 720 Channing Way, Berkeley, CA 94710
 (415) 549-3854 • TWX 910 366-2035

| Field Name | Length |
|------------|--------|
| HIERARCHY | 25 |
| ORDER | 3 |
| SUMMARY | 8 |
| KEY1 | 8 |
| KEY2 | 8 |
| TEXT | 180 |

Figure 1a: In a data-base management system used for writing, the data-base file consists of records, which in turn consist of fixed-length fields.

| HIERARCHY | | ORDER | SUMMARY |
|-----------|------|-------|---------|
| KEY1 | KEY2 | | |
| TEXT | | | |

Figure 1b: The report format used for printing out the records in the data base. The records in figure 1c follow this format.

STRAT.STRUCT.CHANGE S06 CHANGE
 STRUCTURE NOTES IDEALLY, IT SHOULD BE
 POSSIBLE TO CHANGE THE STRUCTURE AFTER
 THE IDEAS HAVE CHANGED SUFFICIENTLY THAT
 IT IS NECESSARY TO MAKE IT RETAIN ITS
 USEFULNESS.

STRAT.PROC.VOCAB S07 VOCAB
 PROCESS OUTLINE TO TAKE MAXIMUM ADVANTAGE
 OF SORTING, SEARCHING, AND RETRIEVAL
 CAPABILITIES OF DBM PROGRAMS IT IS NECESSARY
 TO CONTROL WORDS USED TO AVOID SYNONYMS.

STRAT.PROC.THESAU S08 THESAUR
 PROCESS OUTLINE WHERE SYNONYMS MUST
 BE USED, A THESAURUS MAY BE USED TO HELP
 CONNECT THE APPROPRIATE WORDS.

STRAT.PROC.HIER S09 HIERARC
 PROCESS OUTLINE HIERARCHICAL DATA STRUCTURES
 MAY BE INCORPORATED INTO THE KEY FIELDS
 THROUGH SUCCESSIVE SMALL FIELDS OR A SINGLE
 LARGE ONE.

STRAT.PROC.INVERT S10 INVERTED
 PROCESS OUTLINE THE USE OF INVERTED
 INDICES SUCH AS IN THE ISAM PROCESS IS LIMITED
 AND ONLY WORKS WELL FOR SMALL FIELDS WHERE
 ALPHABETIC OR NUMERICAL ORDER MAKES SENSE.

STRAT.PROC.SEQ S11 ORDER
 PROCESS OUTLINE STRATEGY: ONE OR MORE
 KEYS MAY BE SET ASIDE TO BE USED TO ORDER
 THE RECORDS LATER BY INSERTING KEY VALUES
 APPROPRIATE TO SOME ORDER.

STRAT.PROC.UPDATE S12 UPDATE
 PROCESS OUTLINE REGARDLESS OF HOW WELL
 THE STRUCTURE IS DEFINED, IT WILL PROBABLY
 BE NECESSARY AND DESIRABLE TO UPDATE THE
 FILE AND CHANGE THE APPROPRIATE KEYS AS
 IDEAS BECOME CLEARER.

Figure 1c: Sample records (part of the data base used in writing this article) are shown printed out in report format. A word-processing program would be needed to provide lowercase output and line endings on word boundaries.

Systems Group System 2800 computers. They're making people stand up and take notice.

But then Systems Group products have always appealed to those who appreciate sensible value, high performance, unmatched reliability and prompt, courteous service.

Through the years, Systems Group product acceptance in Z80 CPU, disk controller, I/O and memory boards have been the result of some very purposeful and carefully thought out engineering. Not to mention strict industrial quality production standards.

That same effort has made System Group's new family of expandable System 2800 computers what they are today.

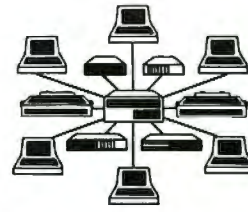
Fast, reliable and powerful.

System 2800 computer systems are designed for a single user with 64K of memory or for up to as many as six separate users with additional add-in memory. They can easily expand as your organization's needs grow.

You can handle up to 8000 customers and 24,000 inventory items in our lowest cost dual floppy model and much, much more in our 40M byte hard disk models. And you can connect up to 12 terminals or printers and other add-on Systems Group floppy, tape and hard disk single or dual drive subsystems.

Select CP/M¹, MP/M¹ or OASIS¹¹ operating systems to run all your word processing and

accounting programs. No matter what size organization you control, controlling will be easier from now on.



See the System 2800 from Systems Group, they're

what computers should have been in the first place.

† registered trademark of Digital Research
 †† registered trademark of Phase One Systems

See us at COMDEX '81 Booth No. 1305

Systems Group

A Division of MEASUREMENT systems & controls
 incorporated

1601 Orangewood Avenue
 Orange, California 92668, (714) 633-4460
 TWX/TELEX 910 593 1350 SYSTEMGRP ORGE

Be Permanently Impressed.

The Expandable Computer Family from Systems Group.



1981

Today's Requirements

Dual floppy single or multi-user system

Circle 450 on inquiry card.

1983

Tomorrow's Requirements

10M byte hard disk and floppy drive,
 single or multi-user system

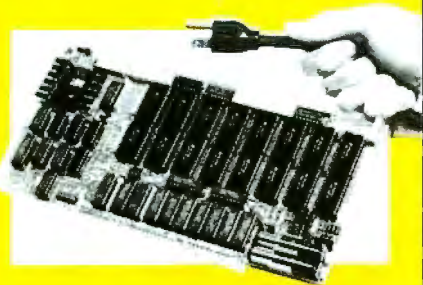
1985

Your Future Requirements

40M byte hard disk and 20M byte tape
 back-up, single or multi-user system

The Ultimate IEEE S-100 Memory Would...

- BE NONVOLATILE** holding data for up to eight years with the power off.
- RUN AT 6 MHZ** without wait states.
- RUN IN 8 OR 16-BIT** systems with 8 or 16-bit wide data paths.
- HAVE EXTENDED 24-BIT ADDRESSING** and bank select.
- HAVE DYNAMICALLY MOVABLE WRITE PROTECT AREAS** to prevent accidental erasure of programs and critical data.
- GENERATE POWER-FAIL** interrupts for orderly system shutdown & power failure recovery.

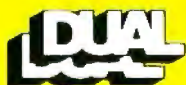


...Available Now from Dual Systems

The Dual Systems CMEM memory boards combine high-speed CMOS memories with new 5-10 year lithium batteries to give you the nonvolatility of an EPROM board while retaining the instant writability of a high-speed read/write RAM. These industrial grade boards are ruggedly built and are burned-in for 200 hours.

- CMEM-32K, 32K-bytes ... \$895
- CMEM-16K, 16K-bytes.... \$795
- CMEM-8K, 8K-bytes..... \$695

OEM and Dealer pricing is available
Sales representatives in most metropolitan areas



system reliability/system integrity

**DUAL SYSTEMS
CONTROL CORPORATION**

720 Channing Way, Berkeley, CA 94710
(415) 549-3854 • TWX 910 366-2035

theme or address new issues. Word-processing programs, however, may be a better choice for making minor revisions because they can conveniently modify and print out the text in the desired format.

Strategies for Using a DBMS

The standard advice on using a tool properly is especially *à propos* when the tool is a DBMS. Unless you start with a clear plan and a good knowledge of the tool's capabilities, a data-base-management system could actually impede your work. I'll present guidelines for the two major uses of a DBMS in writing: note taking and organization.

Note-Taking Strategies. At the note-taking stage, you must first set up a structure that takes maximum advantage of the DBMS's recording, structuring, prompting, data quality checking, and updating capabilities. At the same time, the resulting data base should be designed so that you can later use the system's organizing and retrieval functions. The watchword for note taking, then, is structure. Ideally, the structure should be appropriate to the task, inclusive, and flexible.

Appropriate level of structure. You can use data fields in several ways to provide structure consistent with your thinking. The first way involves *keyword fields*. Because ideas for a paper usually develop over time, you may not always know in advance the categories that will be relevant to the final paper. For this reason, you can make some provision in the data base for storing information in a flexible form such as open keys based on keywords, rather than rigidly prescribed categories fixed in advance. The second strategy uses *labeled fields*. If you can identify categories that will be relevant for the final paper, you can set aside specific fields for information relating to those categories. These keys usually have a restricted number of acceptable responses, which you may or may not know when you first define the field. You can develop new categories of acceptable responses for the field as the paper progresses. When you know in advance the categories and variables

which define the fields, you can use abbreviated symbols called *table lookup keys* to represent the acceptable responses. You can then look up the symbols in a table if your computer cannot perform that function itself.

The sample data base in figure 1 (page 28) includes: two open key fields (KEY1 and KEY2) in which any key words may be entered; labeled fields (HIERARCHY, SUMMARY, and TEXT) in which only prescribed data may be entered; and one table lookup key (ORDER) in which only abbreviated symbols having specified meanings can be entered.

Inclusive structure. A data-base structure is of only limited use if it is not inclusive. A data base full of quotations, for example, does not help a writer unless it includes the information necessary for citing the appropriate references. During note taking, be sure to include all the information you'll need at the end; otherwise, you'll have to go back to the original sources to retrieve that information.

Flexible structure. Once you have created a data file, its structure (the number and size of data fields and the definition of permissible data for each field) is very difficult to change. You must, therefore, define the fields broadly enough to encompass likely changes in the categories without requiring major changes in the data structure. The sample data base in figure 1 contains several fields (HIERARCHY and ORDER in particular) that could not be filled out when the data were first entered, but they were very helpful later. No matter how well you plan the data structure, however, there may be times when your ideas change so much as the paper develops that the original structure no longer suffices. A few DBM systems allow you to change the structure later, but most do not. If yours falls into the latter category, you'll have to write a program if you want to change the structure. The program could convert existing data bases into new structures by deleting old key fields, adding new ones, changing the overall size of a record, or even converting values in existing fields.

THE DAWN OF A NEW AGE

The 2nd Generation™ is here!

MEASUREMENT systems & controls proudly introduces its new and exciting "2nd Generation" family of S-100* compatible products. Each has been specifically designed for use with multi-user and network operating systems such as MP/M, CP/NET, and OASIS. Every product is fully tested and burned-in, comes with a 1 year guarantee, and offers you features not currently available from any other source.

Z80 PROCESSOR BOARD — The most powerful CPU board available today. Outstanding features include 4MHz operation, high-speed serial and parallel I/O utilizing DMA or programmed control, eight vectored priority interrupts, and a real time clock.

MULTI-USER SERIAL I/O BOARD — For use in expanded systems requiring up to eight additional serial I/O ports. Features include: 16 maskable

vectored priority interrupts, RS-232C interfaces with full handshake, asynchronous or synchronous operation with asynchronous baud rates to 19,200. Available in four or eight channel versions.



DOUBLE DENSITY FLOPPY DISK CONTROLLER BOARD — controls up to four 5¼-inch or 8-inch disk drives using IBM soft sectored formats. It features 1K of on-board buffering, DMA controlled data transfers and the performance characteristics of the superior NEC 765 chip.

64K BANK SELECTABLE MEMORY BOARD — Features include I/O port addressing for bank select with 256 switch selectable I/O ports for the memory bank addressing. The memory is configured as four totally independent 16K software-selectable banks, with each bank addressable on any 16K boundary.

*All products meet the new IEEE standards.

Systems Group

A Division of MEASUREMENT systems & controls
incorporated

"Attractive Dealer & OEM Prices"
See your nearest computer dealer, or
contact us for the complete story on
The 2nd Generation.

1601 Orangewood Ave., Orange, CA 92668
TWX/TELEX: 910 593 1350 SYSTEMGRP ORGE
714-633-4460

Toughest Boards in Town... IEEE 696/S-100

NON-STOP CLOCK

Keeps time with power off. Our industrial clock utilizes a new lithium battery for 3-9 years use. Easiest clock to program you'll ever see. Runs in all S-100 systems.

- Year, date, hrs, mins, secs, msec.
- Uses new LSI CMOS chip.
- Vectored interrupts.
- CLK-24 \$250

A/D CONVERTER

IEEE696/S-100 AIM-12 industrial standard module designed for industrial analog-to-digital use.

- Runs in all S-100 systems.
- 32-channel, 16-differential 12-bit resolution/accuracy. 25-microsecond conversions.
- Instrumentation amplifier.
- BASIC program provided. AIM-12, \$695 or \$785 w/1-1000 gain transducer amplifier.

D/A CONVERTER

AOM-12 IEEE696/S-100 industrial level digital-to-analog (D/A) converter.

- 12-bit $\pm 1/2$ L.S.B. accuracy over full 0-70°C temperature range.
- Outputs 0-10, ± 5 , or ± 10 volts.
- Short circuit protection, all outputs.
- Switch-programmable for multiple boards.
- AOM-12, \$575

VIC 4-20

Standard output for industrial control 4-20 mA D/A converter. Used in conjunction with the D/A board.

VIC4-20, \$445.

DUAL 77 Data Acquisition and Control System-

Built to industrial standards; designed for severe environments. BASIC language makes programming easy. Access to hundreds of sensors. Expandability to meet your increased needs. Nonvolatile memory. Power interruption recovery with automatic restart. DUAL 77 is economical; \$5985 & up.



system reliability/system integrity

DUAL SYSTEMS CONTROL CORPORATION

720 Channing Way, Berkeley, CA 94710
(415) 549-3854 • TWX 910 366-2035

Organization Strategies. While organizing whatever you're writing, take advantage of the DBMS's ability to sort, search, and print reports. At the same time, you'll need to cope with the limitations of the DBMS. Some strategies for dealing with those limitations are discussed in the following paragraphs.

Thesaurus or vocabulary control. As you enter data into the various fields of the data base, you may encounter problems when you use more than one term for the same concept. For example, if you're writing about elderly people, a computer sort of the file may put all the "elderly" people in one place, the "aged" in another, and the "old" in still another. Computer-based data systems take expressions literally; they don't recognize synonyms. Because a file sort would not group together all the related records about elderly people, you would have to make a separate search for each possible term. One way to prevent synonyms from reducing the usefulness of the DBMS is to exercise control as the information is entered into the computer. You could also use a computerized thesaurus, which allows the computer to recognize different words that have similar meanings.

Hierarchical structures. Data fields may be used to create various types of data structures to meet your needs (see the Kerschberg reference at the end of this article). For example, many DBM programs are already set up to provide *relational* data models in which each record is classified by a common set of variables. *Hierarchical* data models store information in tree-like structures according to criteria which begin broadly and become successively more detailed. You can produce hierarchical data models with a typical DBMS in at least two ways. You can use one large key in which the hierarchical information is recorded in specified order (from most general class to most specific class) separated by delimiters such as slashes or periods. Another way is to use a series of smaller keys, each representing a specific level in the hierarchy. The first key might be the most general class; the second, the

next most general, and so on. Either way, the key fields can be used in combination to order the records by some hierarchical scheme. This strategy is illustrated in figure 1 by the HIERARCHY field, which consists of a series of abbreviated terms separated by delimiters. The terms define the hierarchical relationship between the various records.

Use inverted indices sparingly. An inverted index is one in which records are ordered according to a sort done on one key field in each record. Using the indexed sequential-access method (ISAM), such indexes allow fast searching and record retrieval—much faster than you would get with an un-ordered data base. However, inverted indices have their limitations.

First, they order files alphabetically or numerically by the values in the *first portions* of keys. Hence, long keys such as titles are ordered only by the first few letters or words, which won't help you if the keywords of interest occur later in the title. In essence, inverted indices examine only the first segments of the text and do not consistently identify keywords imbedded within the text at other points. For fields containing several words, it may be best to use a search of the entire text in that field rather than an inverted index based on that field. One way to cope with this problem when using key words is to use several small key fields, each containing a single keyword, instead of using one long key field containing several keywords. This way, you can create separate inverted indices for each keyword without having to search the entire text. However, when the same term can appear in any of the key fields, the file must be searched several times, once for each of the possible fields in which the term may appear. This problem is illustrated in figure 1 by the TEXT field. There would be little point in creating an inverted index for that field because it would order the records by the first few words in the field.

A second limitation of inverted indices is that they order the file in alphabetical or numerical order, which may not be useful for the data



The guy on the left doesn't stand a chance.

The guy on the left has two file folders, a news magazine, and a sandwich.

The guy on the right has the OSBORNE 1®, a fully functional computer system in a portable package the size of a briefcase. Also in the case are the equivalent of over 1600 typed pages, stored on floppy diskettes.

The owner of the OSBORNE 1 is going to get more work done—and *better* work done—in less time, and with less effort.

Unfold it, plug it in, and go to work like you've never worked before. . . .

Go to work with WORDSTAR® word processing, so your correspondence, reports, and memos take less time to produce, and say more of what you wanted to say. And with MAILMERGE®—the mailing system that turns out personalized mass mailings in the time you'd spend on a rough draft.

Go to work with SUPERCALC®, the electronic spreadsheet package that handles complex projections, financial planning, statistics, and "what if" questions instantly. For the more technically minded, SUPERCALC will process scientific data and calculate results.

Go to work with powerful BASIC language tools—the CBASIC-2® business BASIC, or the Microsoft BASIC® interpreter.

That's standard equipment.

Options include about a thousand different software packages from a host of vendors designed to run on the CP/M® computer system.

Go to work at the office, at home, or in the field.

Or anywhere. Optional battery packs and telephone

transmission couplers mean you need never work without the capabilities of the OSBORNE 1. That's good, because you won't want to work again without it.

All for \$1795. It's inevitable.

The OSBORNE 1 is the productivity machine that's changing the way people work. Put simply, the machine delivers a significant productivity edge—day in and day out—to virtually anyone who deals with words or numbers. Or both.

Since the entire system is only \$1795, it won't be too long before the guy on the left has an OSBORNE 1 of his own. The same probably goes for the person reading this ad. In fact, we think it's inevitable.

The OSBORNE 1 includes a Z80A® CPU, 64K bytes of RAM memory, two 100 kilobyte floppy disk drives, a business keyboard, built-in monitor, IEEE 488 and RS232 interfaces for printers and other things that get connected to computers, plus CP/M, CBASIC-2, Microsoft BASIC, WORDSTAR, and SUPERCALC. The system is available from computer retailers nationally.

\$1795. It's inevitable.



OSBORNE
COMPUTER CORPORATION

26500 Corporate Avenue Hayward, California 94545
Phone (415) 887-8080 TWX (910) 383-2021

at hand. To cope with this problem, you can make entries which, when ordered alphabetically or numerically, will meaningfully organize the data. For example, instead of labeling each strategy with a different summary label for sorting, you might start each with an identical label followed by a number. A DBMS will then place them together when sorting on that field.

When you can't use labels which naturally combine the appropriate elements in alphabetic or numeric order, try using special keys to record values that can take advantage of the sorting and retrieval capabilities of a DBMS. For example, you can make sure all comparable records end up together in a sorting analysis by using another key field to give each a distinctive letter and/or number.

This strategy is illustrated in figure 1 by the ORDER field. The "S" prefix causes the strategies to be sorted together and the following number determines the sequence in which the strategies will appear.

Update data as structures evolve. Although the structures of a data base are difficult to change, the data within those structures can be easily changed as errors are noted or ideas evolve. Be sure to take full advantage of this ability to modify the data as needed. In figure 1, for example, most of the records in the data base did not include information in the HIERARCHY or ORDER fields when I first entered them. The information was added later, as I developed a clearer picture of the paper.

In Summary

When you're undertaking a writing project, data-base management programs can be valuable supplements to word-processing programs. Together, the two programs allow you to use the computer to relieve much of the drudgery of note taking, indexing and typing draft after draft—thus freeing you to spend more time exploring new ideas. Data-base management programs are particularly useful for technical writing that in-

volves complex arguments covering many issues.

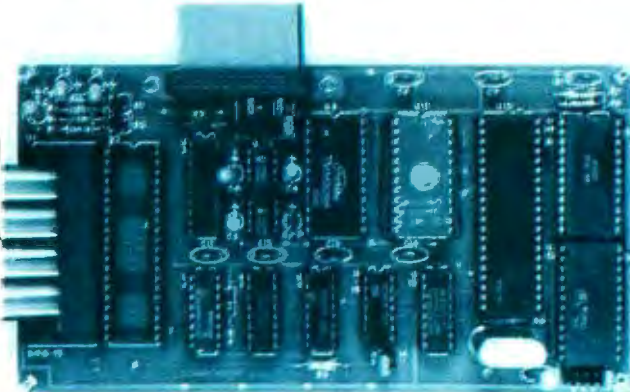
The specific strategies I have discussed suggest some ways for putting data-base management systems to work for note taking, outlining and radically revising papers. You can experiment with strategies for handling still other tasks and making even more efficient use of the DBMS for writing. It would be particularly helpful to develop DBMS and word-processing programs that are compatible with each other. In that way, the data base created in the earlier stages by a DBMS could form the beginning of a text that would be modified and revised by the word-processing program. ■

References

1. Kerschberg, L, A Klug, and D Tschritzis, "A Taxonomy of Data Models," in P C Lockemann and E J Neuhold (eds), *Systems for Large Data Bases*. New York: North-Holland, 1976.
2. Lester, J D, *Writing Research Papers: A Complete Guide*. Glenview, Ill.: Scott, Foresman, 1971.

DATAFACE GRQ SERIES INTERFACE

TURNS YOUR ELECTRONIC TYPEWRITER INTO A PRINTER/TYPEWRITER



The Dataface GRQ-11 Interface expands your Olympia ES Series electronic typewriter into a letter press quality printer for your personal or business computer. And, you still have a fully featured electronic typewriter—two machines in one.

The GRQ Series Interface features:

1. Standard EIA RS-233-C Serial Interface and Parallel (Centronics compatible).
2. Standard asynchronous ASC11 code, 7 bit data; 1 start bit; accommodates 1 or 2 stop bits automatically; accommodates odd, even or absence of parity bit.
3. Fifty thru 9600 Baud data rate options.
4. Two K buffer; supports X-on, X-off protocol as well as RTS signals.

5. Circuit board is installed inside typewriter back panel along side logic board. The connection between boards accomplished by 40 pin jumper cable using existing socket. No soldering required. Power is provided to the GRQ thru two pins of the 40 lead cable. Installation in 10 minutes.

End user, Dealer, Distributor and OEM inquiries are welcome. For additional details, specifications and computer compatibility contact:

DATAFACE INC.

2372 A WALSH AVE., SANTA CLARA, CA 95050
(408) 727-6704

Circle 126 on inquiry card.

In this age of runaway inflation...

Look what \$895* will buy



The HIPAD™ digitizer

Inexpensive input to your computer

The HIPAD™ digitizer can be used for both converting graphic information into digital values and as a menu. Utilizing either the stylus or the optional cursor, the operator can input graphic data into the computer by locating individual points on the digitizers 11" x 11" (28cm x 28cm) active area. In the "stream mode" a continuance of placements of coordinate pairs may be input.

Not a kit, the HIPAD™ comes complete with both RS-232-C and parallel interfaces and has its own built-in power source. The origin is completely relocatable so coordinates may be positive or negative for a true reference value and oversized material may be input by simply resetting the origin.

Accurate positional information, free form sketches, even keyboard simulation

All can be entered using the multi-faceted HIPAD™ digitizer. Its capabilities and low price make the UL listed HIPAD™ a natural selection over keyboard entry, inaccurate joysticks, or expensive approximating light pens. It's perfect for inputting isometric drawings, schematics, X-rays, architectural drawings, business graphs, and many other forms of graphic information, as well as creating your own graphics.

Use it with Apple II™, TRS-80 Level II™, PET™ or other popular computers

The HIPAD's™ built-in RS-232-C and parallel 8 bit interfaces make it all possible. (For Apple II order DT-11A, for TRS-80 or PET order DT-11). Furthermore, you get English or metric scaling, data format (Binary/BCD/ASCII), selectable baud rates, and resolution of either .005" or .01".

For complete information, contact Houston Instrument, One Houston Square, Austin, Texas 78753 (512) 835-0900. For rush literature requests, outside Texas, call toll free, 1-800-531-5205. For technical information ask for operator #5. In Europe, contact Houston Instrument, Rochesterlaan 6, 8240 Gistel, Belgium. Phone 059/27-74-45.



The ideal input device for the small system user.

| Model | Price | Model | Price | Model | Price |
|---------|----------|---------|----------|---------|----------|
| HIPAD 1 | \$495.00 | HIPAD 2 | \$595.00 | HIPAD 3 | \$695.00 |
| HIPAD 4 | \$795.00 | HIPAD 5 | \$895.00 | HIPAD 6 | \$995.00 |

| Model | Price | Model | Price | Model | Price |
|----------|-----------|----------|-----------|----------|-----------|
| HIPAD 7 | \$1095.00 | HIPAD 8 | \$1195.00 | HIPAD 9 | \$1295.00 |
| HIPAD 10 | \$1395.00 | HIPAD 11 | \$1495.00 | HIPAD 12 | \$1595.00 |

Available with stylus or optional cursor.



Available with optional display.

*U.S. Suggested retail price

TM HIPAD is a trademark of Houston Instrument
 TRS-80 is a trademark of Tandy Corporation
 APPLE is a trademark of Apple Computer Inc.
 PET is a trademark of Commodore Business Machines, Inc.

Circle 187 for literature
 Circle 188 to have representative call

houston instrument

GRAPHICS DIVISION OF

BAUSCH & LOMB



Switching Power Supplies

An Introduction

Steve Ciarcia
POB 582
Glastonbury CT 06033

Since the advent of the three-terminal integrated-circuit voltage regulator, it seems that everyone has become a power-supply expert. No longer are ten pages of calculations required to produce a design for even a modest power supply, thanks to the wide tolerances and relatively sturdy architecture of these devices. After you have purchased a few readily available parts, you can have your completed supply running in a few hours.

Three-terminal regulators have become so easy to use that few experimenters stop to consider how inefficient they are. For example, if we were to design a 5-volt 1.5-amp power supply from commonly avail-

able parts, we would probably use a 12.6 VAC transformer, a bridge rectifier, a filter capacitor, a three-terminal regulator (such as an LM317), and a few discrete components. (A 6.3 VAC transformer is only marginally usable.)

Set up normally, the transformer, rectifier, and filter produce about 16 volts. With the LM317's output adjusted for 5 volts, 11 volts would be dropped across the regulator. ("Dropped" really means "consumed" in this case.) Power is dissipated by the regulator in an amount equivalent to the difference between the regulator's input and output voltages multiplied by the current through it. In this instance,

$$(16V - 5V) \times 1.5 A = 16.5 W$$

The conversion efficiency is

$$V_{OUT}/V_{IN} = 5/16 = 31\%$$

The LM317 and similar linear regulators (shown in figure 1) such as the 7805 and LM340 are all called *series dissipative regulators*. They function in a linear mode, simulating a variable resistance between the input-voltage source and the load. There are other factors involved, but basically the linear series regulator simulates a varying resistance. Within a specified range of variation in the input voltage and load current, the regulator maintains a constant output voltage by dissipating the excess power as heat. Unfortunately, as

we see in this example, it consumes 16.5 watts producing the desired 7.5-watt output.

In most applications, however, the ease of use and relative low cost of linear series regulators far outweigh the inherent lack of efficiency. The linear series regulator is well suited for medium-current applications with a small voltage differential, where the power dissipation can be handled with heat sinks and cooling fans. When electricity costs only five cents per kilowatt-hour (1000 watts for one hour), it's hard to get concerned about losing 16.5 watts.

Why Use a Switching Regulator?

Power-supply efficiency usually isn't important unless size, heat dissipation, or total power consumption is limited. If the power source for our regulator were a battery, we would have to be more careful about how much energy is converted for useful work and how much is thrown away as heat.

Efficiency is really the name of the game. In a series dissipative regulator, conversion efficiency is directly related to the input/output voltage differential. As the difference between the two voltages increases, efficiency decreases. The power radiated by the regulator represents a loss to the system and limits the amount of power deliverable to the load.

It would be far better if the regulator consumed no power and if all the power were channeled to the



Photo 1: Ferrite toroids and pot cores are available in various sizes and compositions. These units are from the Ferroxcube Division of Amperex Electronics Corporation, 5083 Kings Hwy, Saugerties NY 12477, (914) 246-2811.

load. While perfect conversion efficiency is impossible, the inherent fault in using series dissipative regulators is the linear operating mode of the series-pass transistor.

If, however, the transistor is used as a *switch* (in saturated operation) rather than as a variable resistor (in linear mode), the series-pass transistor consumes very little power. (This is not a new discovery. Designers have always been aware of the technique, but it required some time to develop cheap, fast switching transistors and inexpensive, low-loss ferrite materials from which cost-effective switching supplies could be built.)

A regulator constructed to operate in this manner is called a *series switching regulator*. The same series-pass transistor switches between cutoff and saturation at a high frequency, producing a pulse-width-modulated square wave of amplitude V_{IN} . This waveform is then filtered through a low-pass LC (inductance/capacitance) filter, producing an average DC output potential (V_{OUT}) proportional to the pulse width and frequency. The efficiency of such a regulator is generally independent of the voltage differential and can approach 95% in good designs.

Switching regulators come in various circuit configurations, a few of which are the flyback, feed-forward, and push-pull types. I am limiting this discussion primarily to another type, nonisolated single-ended (single-polarity) switching regulators, because they are the easiest to understand and build. Although simple, they are nonetheless quite useful. Unlike the typical three-terminal dissipative regulator, the switching regulator can be directly configured to operate in any of three modes: step-down, step-up, or polarity-inverting.

Switching-Regulator Basics

Figures 2a through 2c on page 39 outline the three common modes of switching-regulator operation.

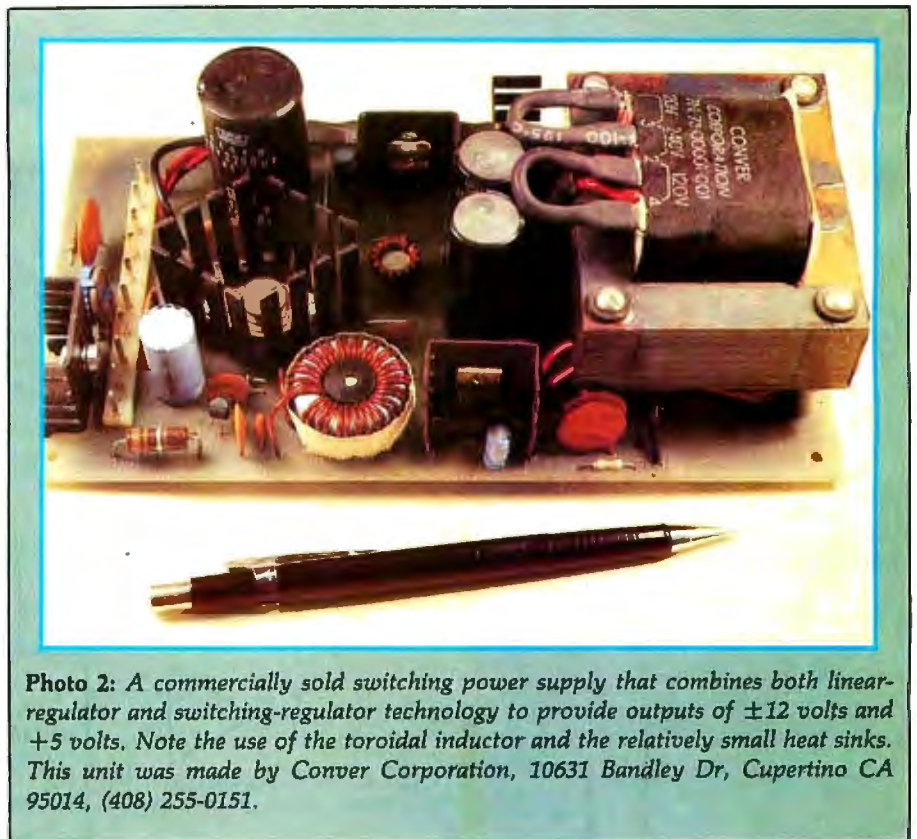


Photo 2: A commercially sold switching power supply that combines both linear-regulator and switching-regulator technology to provide outputs of ± 12 volts and $+5$ volts. Note the use of the toroidal inductor and the relatively small heat sinks. This unit was made by Conver Corporation, 10631 Bandlely Dr, Cupertino CA 95014, (408) 255-0151.

Basically, the switching regulator consists of a power source which supplies a voltage V_{IN} , a "switch" Q1, and an LC filter. (It is assumed in all cases that a load is connected between the output and ground and that Q1 is actually a transistor controlled through external circuitry.) The way the components are connected determines the output mode.

In the *step-down* regulator of figure 2a, the basic circuit operation is to close switch (transistor) Q1 for a time T_{ON} , and then open it for time T_{OFF} . The total, $T_{ON} + T_{OFF}$, is called the switching period T . Neglecting the saturation voltage of Q1 (V_{SAT}) and the diode (V_{DIODE}), the voltage at the input to the inductor is $+V_{IN}$ during the time T_{ON} and zero during T_{OFF} . (But remember, these other voltage drops must be included in our calculations when we are choosing actual components.)

When Q1 is closed, a step increase in voltage is applied to the inductor coil, which has the value L . However, current flowing through an inductor cannot change instantaneously; instead it increases linearly according to the factor $L(di/dt)$, building a

magnetic field. This reduces any instantaneous current change seen by the load. When Q1 opens, the magnetic field in the inductor decays linearly, supplying power to the load. The current path is completed through the forward-biased flyback diode D1.

In this type of switching regulator, the inductor and capacitor form a low-pass filter. High-frequency pulses are applied to the input, and an averaged DC level comes out. The peak-to-peak ripple voltage is a function of the switching period T and the values of the inductance L and capacitance C . As the frequency of operation is increased, the voltage ripple is reduced, but the supply becomes less efficient.

Figure 2b illustrates the circuit configuration of the basic *step-up* switching-type voltage regulator. In this type of regulator, closing Q1 during T_{ON} charges the inductor. When Q1 is opened, the inductor discharges through D1 into the load. The output voltage is determined by the rate of discharge according to the equation

$$V = L(di/dt)$$

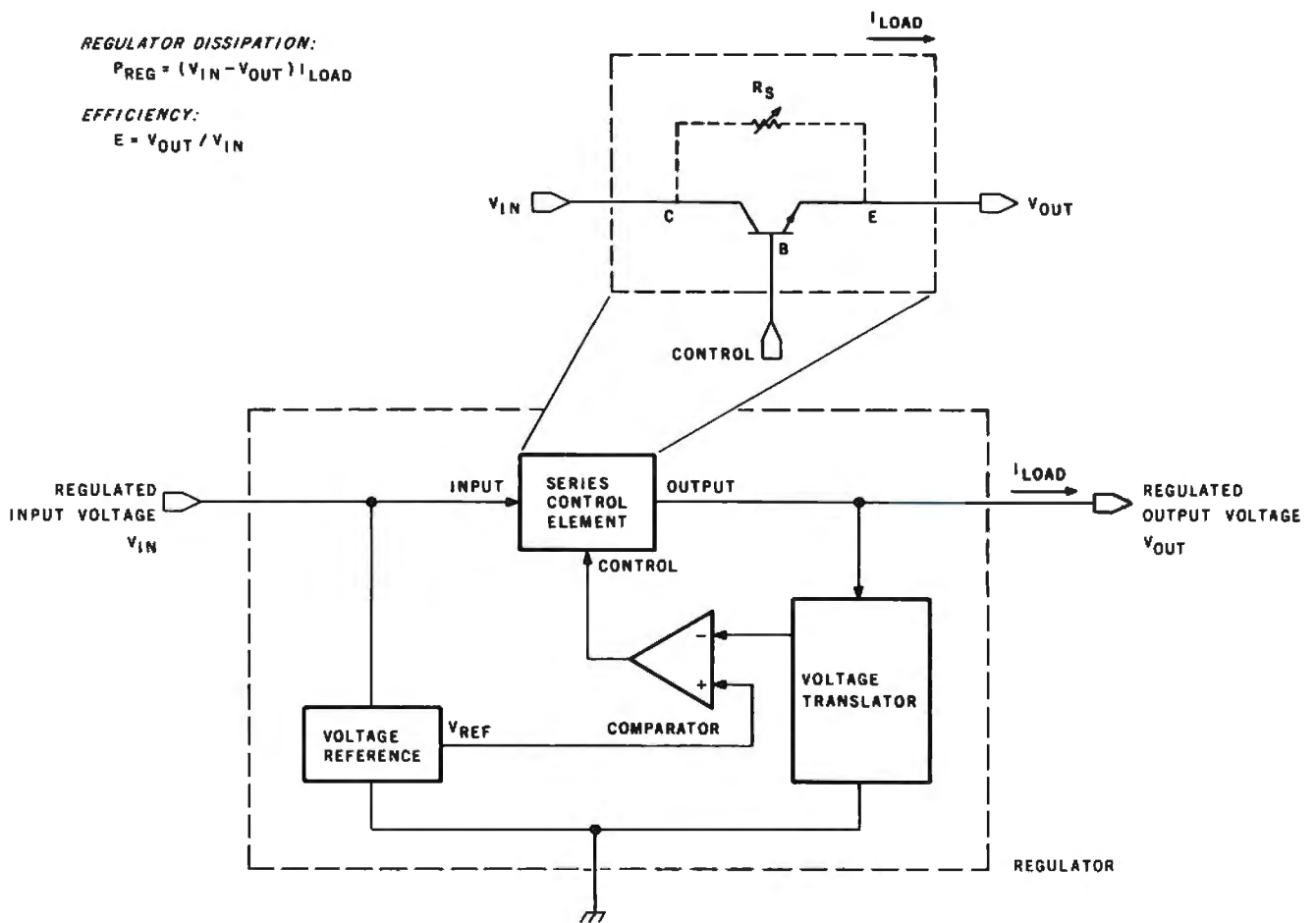


Figure 1: Block diagram of a typical linear series voltage regulator, such as the LM317, LM340 or 7805. The series regulator acts as a varying resistance, dissipating excess power as heat to maintain a constant output voltage.

A fast discharge delivers an output voltage higher than input V_{IN} .

Figure 2c shows a *polarity-inverting* switching regulator. As in the other cases, closing Q1 charges the inductor during T_{ON} . When Q1 is opened during T_{OFF} , there is a "kickback" voltage produced by the inductor as it discharges. This effect occurs elsewhere, too. For years, many of you have probably been putting reverse-biased diodes across relay coils, perhaps without thinking about it. The purpose of the diode is to dampen the high-voltage spike produced when a pulse is applied to the inductive relay coil. In the power-supply situation, rather than short out the voltage, diode D1 directs this opposite-polarity voltage to the load.

Generally speaking, in all three cases, the output voltage V_{OUT} is

regulated by controlling the ratio of T_{ON}/T . This *duty cycle* can be altered in a number of ways depending upon the control method. Two of the more common approaches are variable

You can experiment with a simple design for a nonisolated single-ended switching voltage regulator.

pulse width (pulse-width modulation) and variable frequency. In a pulse-width-modulated switching regulator, the switching period T is fixed and the "on" time T_{ON} varied. Conversely, in a variable-frequency regulator, T_{ON} is fixed and the "off" time T_{OFF} varied.

The variable-frequency switching regulator is generally easier to design and build, since the magnetic flux developed in the inductor coil during the fixed on-time determines the amount of power deliverable to the load. This eases the design of the inductor because the inductor's operating region within its characteristic curve is precisely defined. Operating frequency, which increases proportionally with the load, is primarily a function of the inductance L , capacitance C , and voltages V_{IN} and V_{OUT} .

The fixed-frequency pulse-width-modulated switching regulator varies the duty cycle to change the average power delivered to the load. This method is particularly advantageous for systems employing transformer-coupled output stages and is most

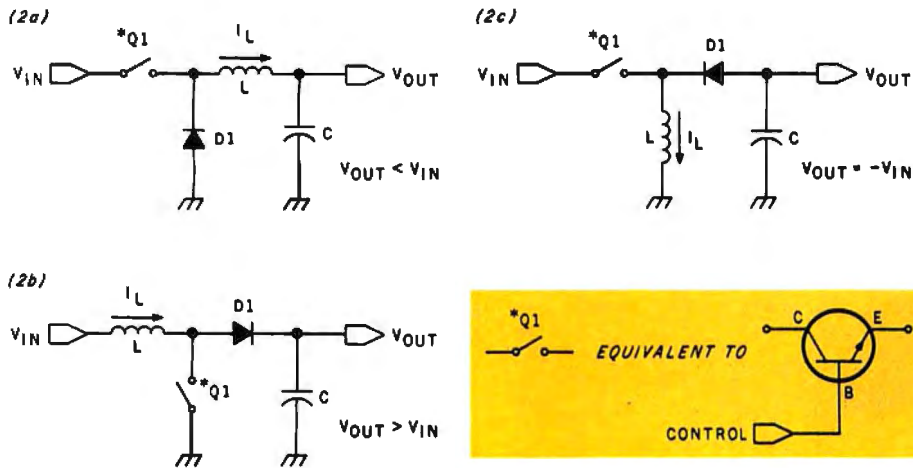


Figure 2: The configurations of switching voltage regulators: the voltage-step-down (2a), voltage-step-up (2b), and polarity-inverting (2c) arrangements are depicted. The component shown as a switch is assumed to be a bipolar transistor driven in saturated switching mode. Some commercial designs may use field-effect transistors.

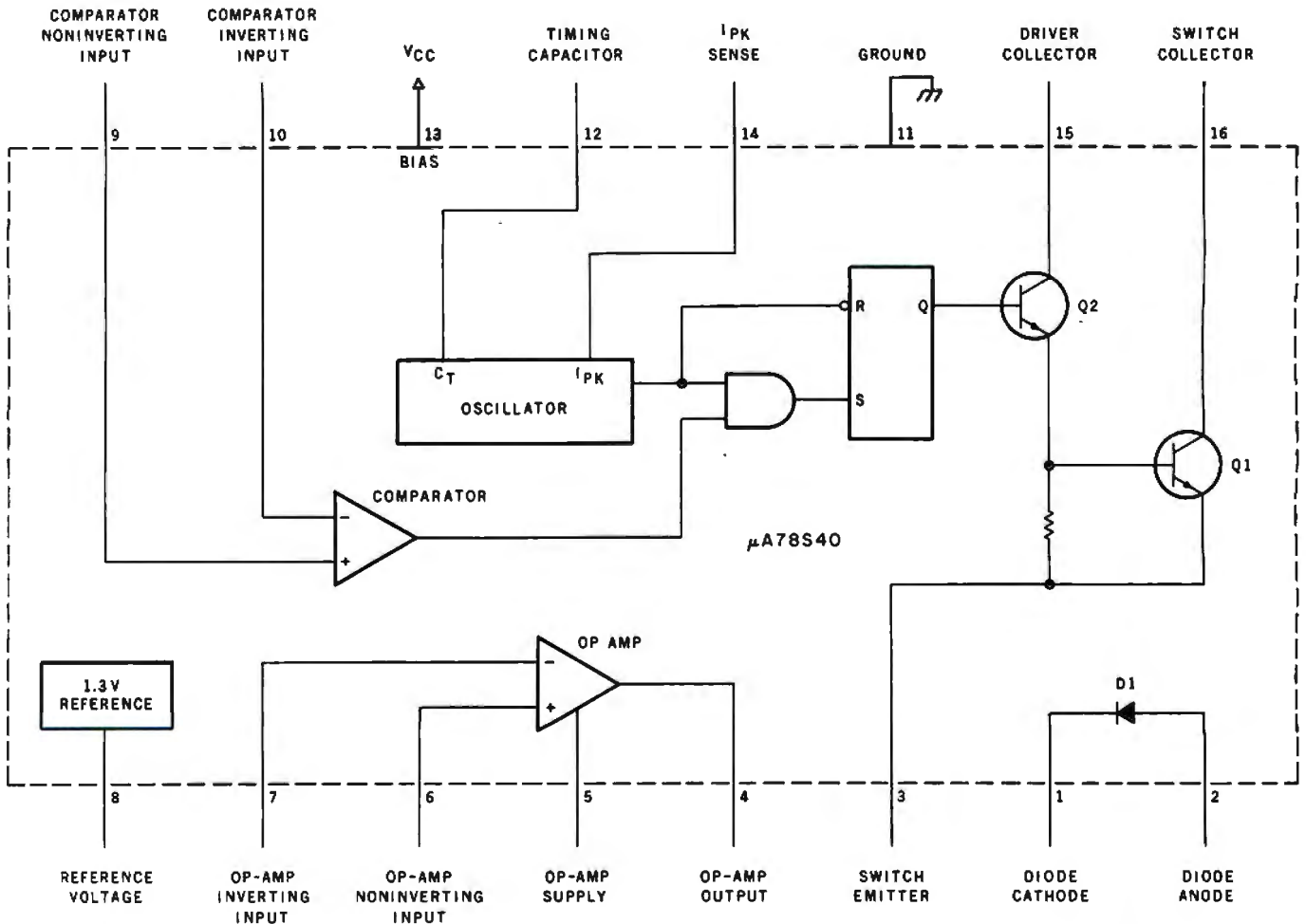


Figure 3: Functional block diagram of the Fairchild 78S40 switching-regulator integrated circuit. This component may be obtained from the supplier listed on page 45.

often used in commercial switching supplies with multiple outputs. This method is more complex and uses more components than variable-frequency supplies, but the advantages outweigh the extra cost in high-current applications.

Typical operating frequencies of

switching regulators range from 10 to 50 kHz. However, there are some trade-offs. High frequencies reduce the ripple voltage at a price of decreased efficiency and increased radiated electrical noise. If the frequency is lowered, greater efficiency and less electrical noise will result,

but larger coils and capacitors are needed. Also, a switching power supply operating at 10 kHz can become quite annoying to listen to after a while.

The most effective frequency range for optimizing efficiency and size with the components presently available is around 20 kHz. This is out of the range of human hearing yet low enough to be within the switching speeds of most inexpensive transistors and diodes. As switching speeds of newly developed high-current semiconductors increase and new ferrite components are introduced, practical operating frequencies will rise.

There are many kinds of switching regulator circuits that I could present. My previous article, "No Power for Your Interfaces? Build a 5 W DC to DC Converter" (reference 3), discussed the construction of a 5-watt converter which produced ± 12 volts from a +5-volt input. This circuit was intended to facilitate powering linear interfaces and op amps (operational amplifiers) when the only source available was the 5-volt logic supply. If you have such a requirement, I refer you to that article.

This time, however, I'd like to present circuits to meet a different need. In the example of the conventional power supply with which I began this article, the input/output voltage differential was so great that more heat than useful energy was produced by the supply. In a small electronic package which requires several watts, dissipated heat can be difficult to remove if the enclosure has no vents. This points out a need for a more efficient 5-volt regulator. While we're at it, we might as well make one that can accommodate up to 30-volt inputs without significantly increased losses.

One power supply that seems to be in demand lately is one with a +25-volt output for programming EPROMs (erasable programmable read-only memories, as discussed in last month's Circuit Cellar; see reference 2). While a three-terminal regulator can be used for this voltage, I see this as a ripe opportunity to demonstrate the step-up variety of



Photo 3: *Winding the inductor for the switching supply of figure 6a. The turns of wire are neatly wound around a plastic bobbin, evenly distributed.*

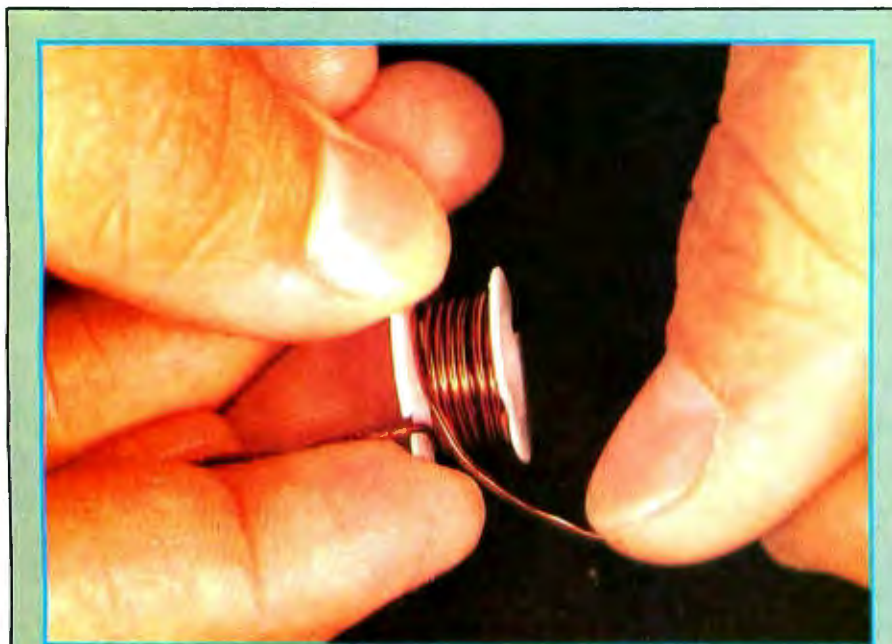


Photo 4: *Having been wound, the wire bobbin is placed between the two halves of the pot core, which are screwed together to form the finished coil.*

switching regulator. One circuit we'll look at will therefore be a +5-volt to +25-volt converter suitable for EPROM-programming use.

78S40 Switching Regulator

In recent years, monolithic (everything built on one semiconductor chip) linear voltage regulators have simplified power-supply design. Most systems have employed linear regulators because of their excellent reliability, low external parts count,

and low cost. However, recent improvements in high-speed switching transistors and low-loss inductors have made switching supplies more attractive. The real breakthrough came with low-cost LSI (large-scale integration) monolithic switching regulators, which contain practically everything but the inductor on a single chip.

One of the many such integrated regulators available is the Fairchild 78S40, which is shown in the block

diagram of figure 3. The 78S40 contains a current-controlled oscillator, current-limit sensor, voltage reference, high-gain comparator, high-current op amp, transistor switch, and power-switching diode. A single capacitor sets the frequency range (adjustable between 100 Hz and 100 kHz, but normally used at 20 to 30 kHz), and one external resistor provides current-limiting protection for the transistor and diode. Other than a few discrete resistors to set the output

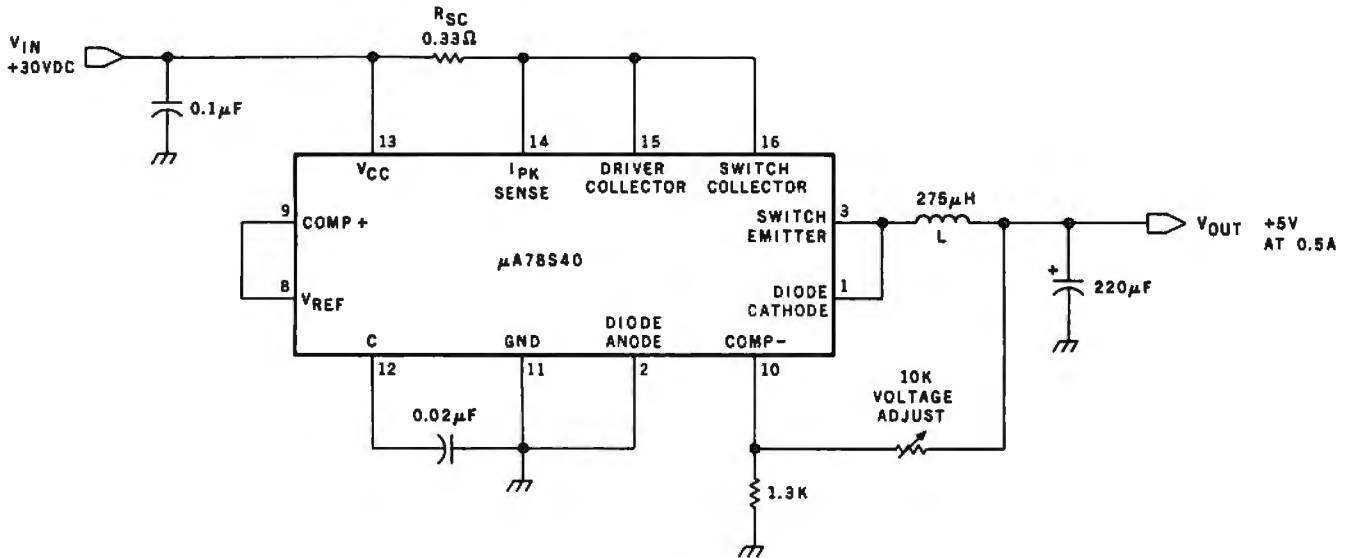


Figure 4: Schematic diagram of a 5-volt, 1/2-amp step-down switching voltage regulator. For low currents, the 78S40's internal switching transistor and diode may be used.

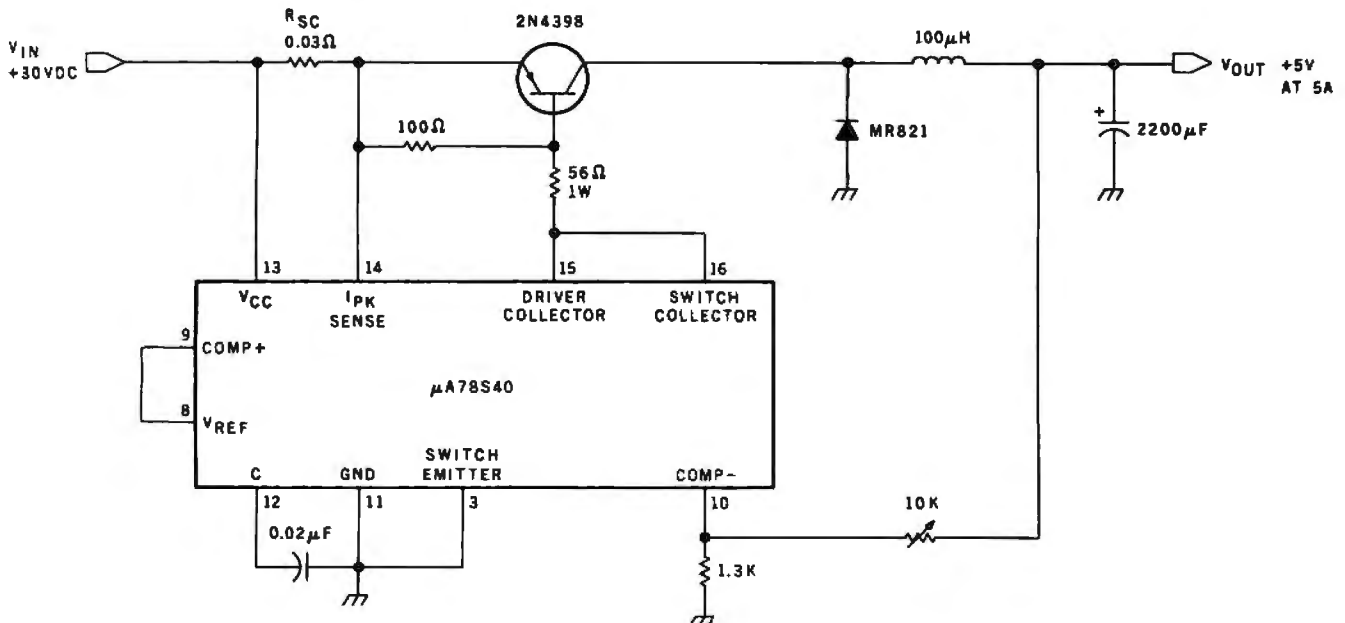


Figure 5: Schematic diagram of a 5-volt, 5-amp step-down switching regulator. An external heat-sinked transistor and diode are needed for the higher current.

voltage, only an inductor and capacitor are required to make a highly efficient switching power supply. The internal Darlington-configured transistor switch and diode are capable of handling up to 1.5 amps (peak) at 40 volts.

While virtually no calculation is re-

quired to design a circuit that uses a three-terminal linear regulator, you have to do some math to arrive at the correct values for the external components to use with switching regulators. A simple circuit to demonstrate the math is a standard step-down regulator, as shown in the

schematic diagram of figure 4. This circuit is a 30-volt input, ½-amp, +5-volt regulator, with a computed efficiency of about 82%. The computation appears in the text box "Component-Value Calculation" on pages 44 and 45.

In applications where the peak current is greater than 1 amp or where you need voltages greater than 40 volts, an external diode and transistor should be used with the 78S40. If you want to experiment, figure 5 shows a regulator designed to provide +5 volts at 5 amps. The component values were selected using the same equations described in the text box. After I had actually built the unit, however, I was unable to get a current greater than 3 amps out of it. I attributed this to using thinner wire in my inductor winding than I should have.

Another switching-power-supply circuit that might prove useful to you is shown in figure 6. Configured as a basic voltage-step-up regulator, this simple circuit converts +5 volts to +25 volts. With the voltage-adjustment pot shown, the circuit's output actually can be adjusted within a range of +8 to +28 volts. Set to +25 volts, it can be used as an EPROM-programmer supply. The design current rating is 200 milliamps, but this is dependent upon the output voltage. At 8 volts I measured 175 milliamps, but at 25 volts the maximum current was only 30 milliamps. Overall efficiency was about 70%. To achieve higher output currents at 25 volts, it is necessary to use an external switching transistor.

Winding the Inductor

The inductor coil in a switching regulator is designed for high power and large currents. Typically, the windings are around a ferrous core that is toroidal in shape, somewhat like a doughnut. The selection of a specific core size and core material for a desired inductance at a given steady current level is done through a set of iterative calculations using analytic curves showing permeability reduction versus DC magnetizing force (measured in oersteds).

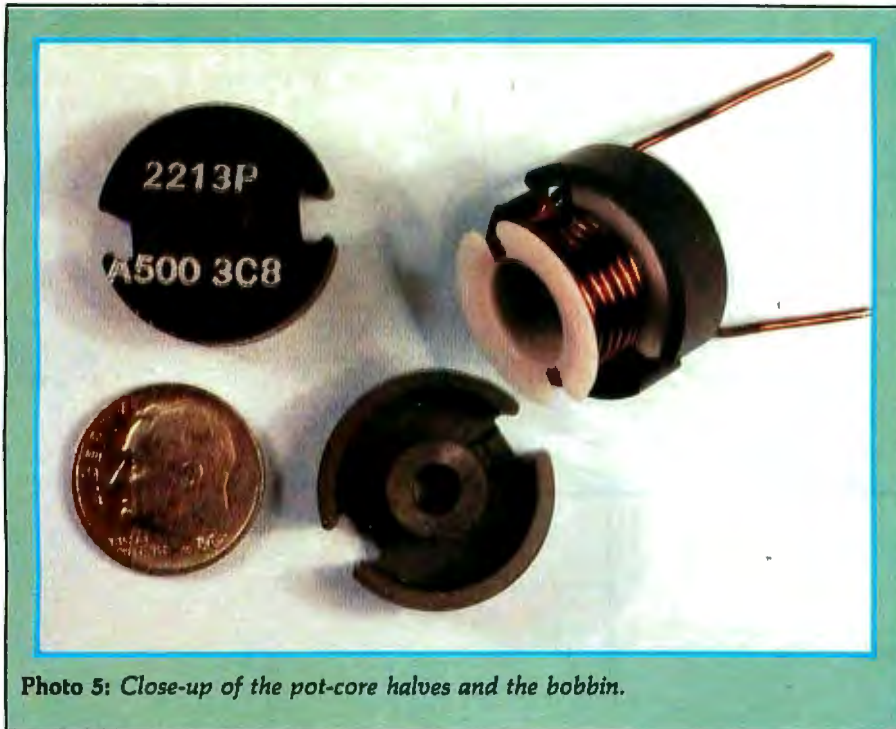


Photo 5: Close-up of the pot-core halves and the bobbin.

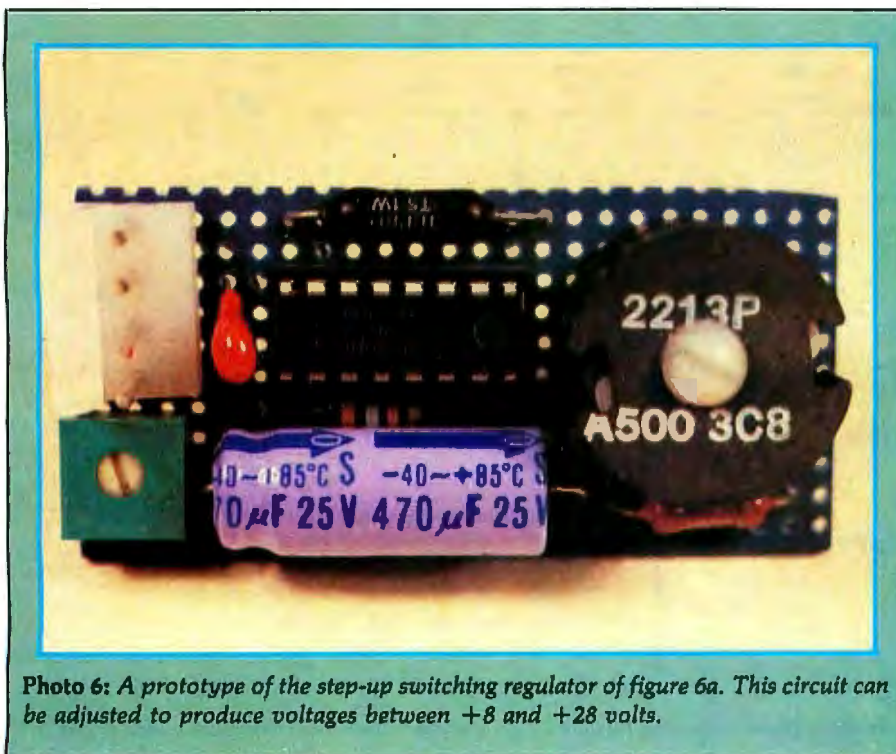


Photo 6: A prototype of the step-up switching regulator of figure 6a. This circuit can be adjusted to produce voltages between +8 and +28 volts.

The problem in selecting a core of suitable size and permeability is that all these parameters are interrelated. Rather than attempt to make everyone understand the curves and calculations, I prefer to take a little poetic license, by choosing a core which is optimal for the types of switching supplies I have just described. The remaining calculations are minor and less likely to discourage you from winding your own inductor.

The core I have chosen is the Ferroxcube 2213PA500-3C8, a pot-core set which differs from a pure toroid in that it consists of two cups which are secured together around a bobbin, around which, in turn, the windings are wound. Since the wire is wound on a bobbin rather than around the ferrite material itself, it is easy to change bobbins and experiment with various inductances produced by different numbers of turns and kinds of wire. Figure 7 outlines the characteristics of type-2213 pot core.

Two other factors are noteworthy in this selection. The type-2213 core is made in a variety of ferrite materials. I have chosen to use a type of material known as 3C8, which is a manganese-zinc ferrite substance with medium permeability and low losses. It is designed specifically for high-flux-density applications such as power supplies.

The 2213PA500-3C8 is a fixed-gap pot core. Flux saturation is avoided by introducing an air gap in series with the magnetic path. The effect of this 0.025-inch gap is to flatten the hysteresis loop, allowing greater cur-

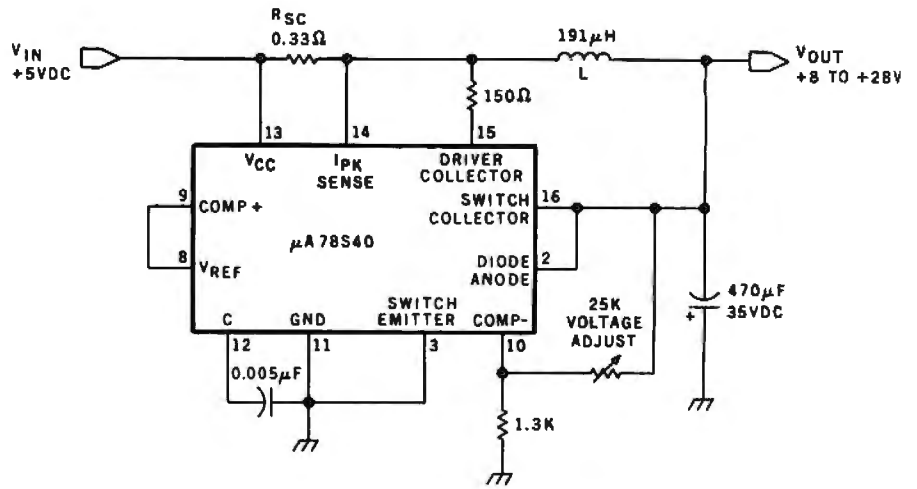


Figure 6a: A step-up regulator that converts +5 volts to +25 volts, possibly for use in an EPROM programmer. The output voltage may be adjusted within the range of +8 to +28 volts. Current capacity depends on fine points of construction and on the voltage desired.

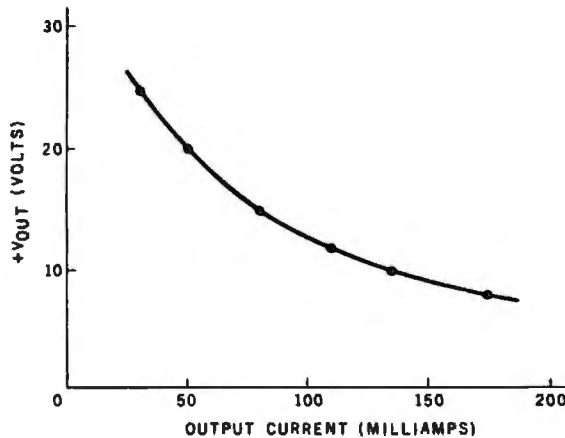
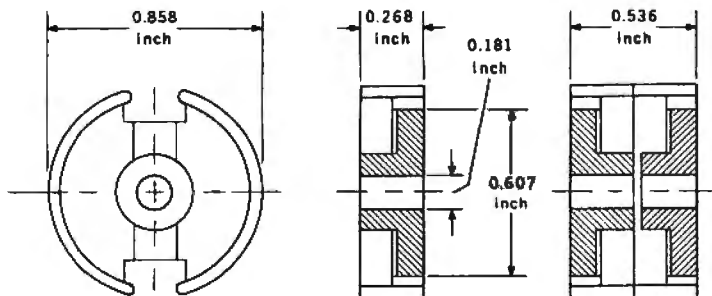


Figure 6b: The measured curve of output voltage plotted against current for the step-up switching regulator of figure 6a.



| | | |
|-----------------------------|--------------------------|---|
| MAGNETIC PATH LENGTH | l_0 | 1.23 inches 3.15 cm |
| CORE CONSTANT | $\Sigma \frac{l_0}{A_0}$ | 12.6/inch 4.97/cm |
| EFFECTIVE CORE AREA | A_0 | 0.0985 inch ² 0.635 cm ² |
| EFFECTIVE CORE VOLUME | V_0 | 0.122 inch ³ 2.00 cm ³ |
| MILLIHENRIES PER 1000 TURNS | A_L | 500 |

Figure 7: Physical and electromagnetic characteristics of the Ferroxcube 2213PA500-3C8 pot core. The coil turns are wound around a plastic bobbin that fits between the two core halves, easing experimentation with different numbers of turns and different gauges of wire.



SOFTWARE FREE OFFER

WITH PURCHASE OF ANY 3 PROGRAMS, YOU WILL RECEIVE FREE THE ORIGINAL ADVENTURE GAME, CONVERTED TO LOAD ENTIRELY INTO 48K RAM ON APPLE. NOTHING LEFT OUT. AMAZING!



SOFTWARE

| | | | |
|--|----------|-----|----------|
| <input type="checkbox"/> Adventures #1, 2, 3..... | \$39.95 | NOW | \$32.50 |
| <input type="checkbox"/> Adventures #4, 5, 6..... | \$39.95 | NOW | \$32.50 |
| <input type="checkbox"/> Adventures #7, 8, 9..... | \$39.95 | NOW | \$32.50 |
| <input type="checkbox"/> Adventures #10, 11, 12..... | \$39.95 | NOW | \$32.50 |
| <input type="checkbox"/> Project Omega..... | \$24.95 | NOW | \$19.50 |
| <input type="checkbox"/> Pro Picks..... | \$24.95 | NOW | \$19.50 |
| <input type="checkbox"/> 16K Expansion Card..... | \$195.00 | NOW | \$149.50 |
| <input type="checkbox"/> Hodge Podge (age 2/5)..... | \$23.95 | NOW | \$21.50 |
| <input type="checkbox"/> Teacher's Pet..... | \$15.95 | NOW | \$14.50 |
| <input type="checkbox"/> Temple of Apsah..... | \$39.95 | NOW | \$32.50 |
| <input type="checkbox"/> Hellfire Warrior..... | \$39.95 | NOW | \$32.50 |
| <input type="checkbox"/> Crush, Crumble and Chomp..... | \$29.95 | NOW | \$24.50 |
| <input type="checkbox"/> Book of Apple Software..... | \$19.95 | NOW | \$15.50 |
| <input type="checkbox"/> Apple Panic..... | \$29.95 | NOW | \$24.50 |
| <input type="checkbox"/> Raster Blaster..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Alien Rain (Galaxian)..... | \$24.95 | NOW | \$22.50 |
| <input type="checkbox"/> Alien Typhoon..... | \$24.95 | NOW | \$22.50 |
| <input type="checkbox"/> Snoggle (Puckman)..... | \$24.95 | NOW | \$22.50 |
| <input type="checkbox"/> Space Warrior..... | \$24.95 | NOW | \$20.50 |
| <input type="checkbox"/> HEAD ON..... | \$24.95 | NOW | \$22.50 |
| <input type="checkbox"/> Fantasyland 2041..... | \$59.95 | NOW | \$52.50 |
| <input type="checkbox"/> Bridge 2.0..... | \$21.95 | NOW | \$19.50 |
| <input type="checkbox"/> Ultima..... | \$39.95 | NOW | \$34.50 |
| <input type="checkbox"/> Home Money Minder..... | \$34.95 | NOW | \$29.50 |
| <input type="checkbox"/> Compu-Math Arithmetic..... | \$49.95 | NOW | \$39.50 |
| <input type="checkbox"/> Compu-Math Fractions..... | \$39.95 | NOW | \$33.50 |
| <input type="checkbox"/> Compu-Math Decimals..... | \$39.95 | NOW | \$33.50 |
| <input type="checkbox"/> Algebra 1..... | \$39.95 | NOW | \$33.50 |
| <input type="checkbox"/> Spelling Bee..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> The Prisoner..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Sargon II (chess)..... | \$34.95 | NOW | \$29.50 |
| <input type="checkbox"/> Pool 1.5..... | \$34.95 | NOW | \$29.50 |
| <input type="checkbox"/> Spellguard for Apple..... | \$295.00 | NOW | \$245.50 |
| <input type="checkbox"/> Sup'R Terminal 80 Col..... | \$375.00 | NOW | \$309.50 |
| <input type="checkbox"/> Memorax 3401 Box of 10..... | \$45.00 | NOW | \$24.50 |
| <input type="checkbox"/> Word Star..... | \$375.00 | NOW | \$275.50 |
| <input type="checkbox"/> Z-80 Softcard With CP/M..... | \$399.00 | NOW | \$299.50 |
| <input type="checkbox"/> Robot Wars..... | \$39.95 | NOW | \$34.50 |
| <input type="checkbox"/> 12" Hi-Res Green Mon..... | \$285.00 | NOW | \$236.00 |
| <input type="checkbox"/> A.B.M..... | \$24.95 | NOW | \$22.50 |
| <input type="checkbox"/> Castle Wolfenstein..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Mission Asteroids..... | \$19.95 | NOW | \$17.50 |
| <input type="checkbox"/> Mystery House..... | \$24.49 | NOW | \$21.50 |
| <input type="checkbox"/> Wizard and the Princess..... | \$32.95 | NOW | \$29.50 |
| <input type="checkbox"/> Cranston Manor..... | \$34.95 | NOW | \$29.50 |
| <input type="checkbox"/> Pegasus II..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Hi-Res Football..... | \$39.95 | NOW | \$34.50 |
| <input type="checkbox"/> Hi-Res Soccer..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Soft Porn Adventure..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Gobblers..... | \$24.95 | NOW | \$19.50 |
| <input type="checkbox"/> Zork..... | \$39.95 | NOW | \$33.50 |
| <input type="checkbox"/> VisiCalc 3.3..... | \$199.95 | NOW | \$169.50 |
| <input type="checkbox"/> Magic Wand 80 Column..... | \$395.00 | NOW | \$289.50 |
| <input type="checkbox"/> Falcons..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Fastgammon..... | \$24.95 | NOW | \$20.50 |
| <input type="checkbox"/> International Grand Prix..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Space Eggs..... | \$29.95 | NOW | \$24.50 |
| <input type="checkbox"/> Orbitron..... | \$29.95 | NOW | \$24.50 |
| <input type="checkbox"/> Gamma Goblins..... | \$29.95 | NOW | \$24.50 |
| <input type="checkbox"/> Epoch..... | \$34.95 | NOW | \$28.50 |
| <input type="checkbox"/> Pulsar II..... | \$29.95 | NOW | \$24.50 |
| <input type="checkbox"/> Autobahn..... | \$29.95 | NOW | \$24.50 |
| <input type="checkbox"/> Sneakers..... | \$29.95 | NOW | \$24.50 |
| <input type="checkbox"/> Galactic Attack..... | \$29.95 | NOW | \$25.50 |
| <input type="checkbox"/> Magic Window Word Proc..... | \$99.95 | NOW | \$84.50 |
| <input type="checkbox"/> IFD Database Manager..... | \$120.00 | NOW | \$99.50 |
| <input type="checkbox"/> D-B Master..... | \$229.00 | NOW | \$189.50 |
| <input type="checkbox"/> The Warp Factor..... | \$39.95 | NOW | \$33.50 |
| <input type="checkbox"/> Flight Simulator..... | \$33.50 | NOW | \$29.50 |
| <input type="checkbox"/> Pro Football Pl. Pred..... | \$26.95 | NOW | \$22.50 |
| <input type="checkbox"/> Win AT The Races..... | \$39.95 | NOW | \$34.50 |
| <input type="checkbox"/> Videoterm 80 Col Card..... | \$345.00 | NOW | \$279.50 |
| <input type="checkbox"/> Multiple Regression..... | \$29.95 | NOW | \$25.50 |

★ SEND FOR FREE PRICE LIST & CATALOG ★

DEDUCT 3% IF PAYMENT ACCOMPANIES ORDER. WE PAY SHIPPING AND IF YOU PHONE YOUR ORDER WE WILL CREDIT \$1.00 FOR CALL. CALIFORNIA RESIDENTS ADD 6% SALES TAX. ALL ORDERS SHIPPED FROM STOCK WITHIN 48 HOURS. WE ACCEPT MASTER CARD AND VISA. C.O.D.'s ADD \$5.00.

★ 518 E. ECHO CT.,
SAN BERNARDINO, CA 92404
PHONE ORDERS (714) 886-0761

rent densities without saturation. An added plus is that it reduces the overall inductance per turn of wire and allows more turns of wire for a given inductance value. Pot cores work best when the windings completely fill the core.

The calculations for winding the specific inductors for the power supplies I have presented are relatively simple. For each core and material, the manufacturer specifies a proportionality factor A_L , which is the inductance in millihenries per 1000 turns. The inductance for any other number of turns N is then

$$L = A_L N^2 \times 10^{-9}$$

or

$$N = \sqrt{\frac{L \times 10^9}{A_L}}$$

where

N = number of turns

L = desired inductance in henries

A_L = millihenries/1000 turns

The 5-volt ½-amp regulator presented earlier required a 275-microhenry inductor. For the 2213PA500-3C8 core, $A_L = 500$ millihenries per 1000 turns. Plugging these values into the equation:

$$N = \sqrt{\frac{0.000275 \times 1000000000}{500}}$$

$$= \sqrt{550}$$

$$= 23 \text{ turns}$$

In addition to determining the required number of turns, we must con-

Component-Value Calculation

Conditions:

V_D (diode-saturation voltage) = 1.25 volts

V_{SAT} (transistor-saturation voltage) = 1.1 volts

$V_{IN} = +30$ volts

$V_{OUT} = +5$ volts

I_{OUT} (maximum) = 0.5 amps

$V_{RIPPLE} < 1\%$ = approximately 50 millivolts

V_{REF} = (internal reference voltage) = 1.3 volts

Calculate:

$$I_{PEAK} = 2I_{OUT} \text{ (maximum)}$$

$$= 2 \times 0.5$$

$$= 1.0 \text{ amps}$$

The peak-current rating of the transistor is 1.5 amps.

Next, determine the value of the current-limiting resistor:

$$R_{SC} = 0.33/I_{PEAK}$$

$$= 0.33/1$$

$$= 0.33 \text{ ohms}$$

Calculate the T_{ON}/T_{OFF} ratio:

$$T_{ON}/T_{OFF} = \frac{V_{OUT} + V_D}{V_{IN} - V_{SAT} - V_{OUT}}$$

$$= (5 + 1.25)/(30 - 1.1 - 5)$$

$$= 6.25/23.9 = \text{approximately } 0.26$$

Therefore:

$$T_{ON} = 0.26 T_{OFF}$$

It is desirable to have the operating frequency of a switching regulator above 20 kHz (yielding a 50-microsecond period T), but neither T_{ON} nor T_{OFF} should be less than 10 microseconds for the 78S40 device. If we arbitrarily choose T_{OFF} to be 40 microseconds, then the values of the oscillator-timing capacitor (C_T) and inductor (L) are computed as follows:

sider the wire size and available space within the core. The objective is to fill the core, yet maintain a wire size that will carry the highest currents involved. There exist tables and charts of wire size, circular mils per ampere, and available-area specifications for exact determinations. As a rule of thumb, with designs like the ones presented here, the best tactic is to use the largest wire size that will fit for the required number of turns. If the pot core is not completely filled, the effect is not disastrous, but the true inductance could be as much as 10% less than calculated.

In Conclusion

I consider this subject a bit of a shot in the dark. I have found that as I build miniaturized electronic devices for my own use I can no longer tolerate the large volume, weight, and in-

efficiencies of linear-regulated power supplies. This article is a progress report on some of the circuits I have been experimenting with lately.

I don't anticipate any sudden shortage of ferrite cores as a result of the publication of this article. In my opinion, switching power supplies will come to have a very significant role, but mostly in commercially produced products. The greatest benefit of using this technology is the savings in energy and materials in large-scale production.

Next Month: *Have you ever wished you could call your computer by telephone and give it commands by pushing the buttons on a Touch Tone receiver? In December's Circuit Cellar we'll look at several schemes for decoding DTMF (dual-tone, multiple-frequency) signals.* ■

$$\begin{aligned} C_T &= 0.00045 T_{OFF} \\ &= 0.00045 \times 0.000040 \\ &= 0.018 \mu\text{F} \end{aligned}$$

Using a 0.02-microfarad standard capacitor value, T_{ON} and T_{OFF} really turn out to be:

$$\begin{aligned} T_{ON} &= 11.6 \mu\text{s} \\ T_{OFF} &= 44 \mu\text{s} \\ T &= T_{ON} + T_{OFF} = 55.6 \mu\text{s} \\ C_T &= 0.02 \mu\text{F} \end{aligned}$$

For the inductor:

$$\begin{aligned} L &= \frac{(V_{OUT} + V_D) (T_{OFF})}{I_{PEAK}} \\ &= (5 + 1.25) \times 0.000044/1 \\ &= 275 \mu\text{H} \end{aligned}$$

The output-capacitor value C is calculated from the ripple requirements:

$$\begin{aligned} C &= \frac{(I_{PEAK}) (T)}{8 (V_{RIPPLE})} \\ &= 1 \times 0.0000556/8 \times 0.05 \\ &= 139 \mu\text{F} \text{ (use standard 220 } \mu\text{F)} \end{aligned}$$

Finally, compute the values of the two resistors required for the sampling network. Assuming that the comparator-input current is 1 milliamp (the comparator will work down to 100 microamps) then:

$$\begin{aligned} R1 + R2 &= 5 \text{ k-ohms} \\ R2 &= (R1 + R2) (V_{REF}/V_{OUT}) \\ &= 5 \text{ k-ohms} \times 1.3/5 \\ &= 1.3 \text{ k-ohms} \end{aligned}$$

Select $R2 = 1.3 \text{ k-ohms}$ and use a 10-k-ohm potentiometer for $R1$.

Parts Source

A switching-regulator kit is available to experimenters. The kit contains one Fairchild 78540 integrated circuit, two 2213PA500-3C8 pot-core halves, and two plastic bobbins; it is available postpaid in the United States for \$11.50. Only prepaid orders will be accepted. Send check or money order to:

The MicroMint, Inc
917 Midway
Woodmere NY 11598

References

1. Adamian, Andy. *Voltage Regulator Handbook*. Mountain View CA: Fairchild Camera and Instrument Corporation, 1978.
2. Ciarcia, Steve. "Build an Intelligent EPROM Programmer," October 1981 BYTE, page 36.
3. Ciarcia, Steve. "No Power for Your Interfaces? Build a 5 W DC to DC Converter," October 1978 BYTE, page 22. Reprinted in *Ciarcia's Circuit Cellar*. Peterborough NH: BYTE Books, 1979, page 1.
4. Hnatek, Eugene R. *Design of Solid-State Power Supplies*. New York: Van Nostrand Reinhold, 1980.
5. Pressman, Abraham I. *Switching and Linear Power Supply, Power Converter Design*. Rochelle Park NJ: Hayden Book Company, 1978.
6. Sevastopoulos, Nello, et al. *Voltage Regulator Handbook*. Santa Clara CA: National Semiconductor Corporation, 1980.
7. Spencer, John D, et al. *The Voltage Regulator Handbook*. Dallas TX: Texas Instruments, 1977.
8. *Switched-Mode Power-Supply Control Circuits*. Sunnyvale CA: Signetics, 1975.

Editor's Note: Steve often refers to previous *Circuit Cellar* articles as reference material for the articles he presents each month. These articles are available in reprint books from BYTE Books, 70 Main St, Peterborough NH 03458. Ciarcia's *Circuit Cellar* covers articles that appeared in *BYTE* from September 1977 through November 1978. Ciarcia's *Circuit Cellar*, Volume II presents articles from December 1978 through June 1980.

Many *Circuit Cellar* projects are available as kits. To receive a complete list, circle 100 on the Reader Service card.

PRINTERS

10 DAY FREE RETURN

EPSON MX-80

Now in stock!
The MX-80 dot matrix printer. Unequaled Epson reliability. Has all the features of the MX-70 plus more power and extra functions.

C-ITOH STARWRITER: LETTER QUALITY PRINTING FOR UNDER \$2000! This daisywheel printer gives high quality at a low price. 25 cps. Parallel and serial interfaces available.

NEW INTEGRAL DATA'S 560 PRINTER/ All the exciting features of the 400 series plus 14 1/2" paper capacity. 132 col. graphics printer. **IDS 445.** Priced lower than the 440 and equipped with a better print head. With & w/o graphics. **IDS 460.** Features include correspondence quality printing, high resolution graphics.

NEC SPINWRITER FROM THE FIRST NAME IN LETTER QUALITY PRINTERS/



Spinwriter 5520

Compumart offers beautiful print quality with NEC Spinwriter Terminals. We carry all models from RO THRU KSR WITH NUMERIC KEYPAD—5510-5530. All versions give unsurpassed hard copy output!

CENTRONICS PRINTERS 3 SERIAL MODEL 737

The closest thing to letter quality print for under \$1000.
List \$1045 **SPECIAL \$795.**
737-1 Parallel Interface
List \$995 **SALE PRICE \$695.**
PLUS EXCITING REBATE OFFER ON CENTRONICS PRINTERS.

OMNI 810 PRINTER FROM TEXAS INSTRUMENTS CALL US
The 820 RO PACKAGE includes machine mounted paper tray and cable. A compressed print option and device forms control are standard features.
THE 820 KSR PACKAGE includes fully ASCII Keyboard plus all of the features of the RO.

MONITORS TERMINALS

CONFIGURATION HELP

CLEARANCE ZENITH COLOR VIDEO MONITOR \$349.

SUPER SELLING TERMINALS FROM LEAR SIEGLER/ We have the following Lear Siegler terminals in stock at prices too low to print! Call for quotes.

ADM-3A/ Industry's favorite dumb terminal for some very smart reasons/ ADM-3A + NEW from Lear Siegler. CALL!
IT IS HERE! It is the new Intermediate Terminal from Lear Siegler.

NEC COLOR MONITOR/RECEIVER HIGH RESOLUTION/ Composite video using BNC connectors. 8-Pin connector for VCR/ VTR video loop In/Out and television reception.



Sanyo 13" Color Monitor

SANYO MONITORS AT LOW COMPUMART PRICES/ Sanyo's new line of CRT data display monitors are designed for the display of alphanumeric or graphic data.

9" SANYO B/W \$169.
12" SANYO B/W
12" SANYO W/
GREEN SCREEN
13" SANYO COLOR

Visit our giant

ANN ARBOR STORE

1250 North Main Street
Ann Arbor, Michigan

FREE CATALOGS

MICRO

The original and most complete catalog of micro-computers, accessories and peripherals.

DEC PDP/LSI-11

Systems configured and integrated with other manufacturers compatibles. The first, best DEC based systems catalog.

Send for them!

CALCULATORS MISC

TOLL FREE ORDERING

NOVATION CAT ACOUSTIC MODEM Answer Originate.

NEW! D-CAT Direct Connect Modem from Novation.

MATROX PRODUCTS/ Compumart stocks the complete line.

DYSAN DISKETTES/ Single side, single density. Hard or Soft Sector **\$5. ea.**

MEMOREX 3401's/ 5 1/4" disks **\$3.25.**
/with hub ring for Apple **\$3.50.**

MEMORY INTEGRATED CIRCUITS/ Call for quantity discounts when ordering over 50 units.

MOTOROLA 4116 (200 Nano-second Plastic) \$4.50

SYSTEMS SOFTWARE

RM EXPANSION ACCESSORIES FOR AIM— CALL SPECS AND PRICES

APPLE III IS IN STOCK/Apple III Information Analyst Package— 128K Apple III, Black and White Monitor 12", and information analyst software.

TOP SOFTWARE PACKAGES FROM COMPUMART

VISICALC/ FOR APPLE/ FOR HP/ FOR COMMODORE/ FOR ATARI

SOFTWARE FROM APPLE/ Apple Plot (the perfect graphic complement for Visicalc/Dow Jones News & Quotes/Apple Fortrom/Apple Writer/Pascal Language System/Controller Business System

PERSONAL SOFTWARE/ Visidex/ VisiTrend/VisiPlot/VisiTerm MUSE/Super Text



Apple Software

MOUNTAIN COMPUTER/

Expansion accessories for Apple/ Super Talker/The Music System/ROM plus board with Keyboard filter/ROM Writer/Clock Calendar/AtD and Dto A Converter/ Clock for Apple/CPS Multifunction Board

VIDEX/ Video Term (80 col. x 24 line, 7x9 Matrix plug in compatible board for Apple II) w/w graphics EPROM/SSM Serial & Parallel, Apple Interface/ABT's Numeric Key Plan/California Microcomputer Keyboard

NEW!

VIC 20 PERSONAL COMPUTER FROM COMMODORE

\$299.

IMPORTANT ORDERING INFORMATION

CALL 800 343-5504, in Massachusetts (617) 491-2700, phones open from 8:30 a.m. to 7:00 p.m. Mon-Fri. 11:00 a.m. to 4:00 p.m. Sat. **PO's** Accepted from Dun & Bradstreet rated companies—shipment

contingent upon receipts of signed purchase order
SALE PRICES: Valid for month of magazine date only—all prices subject to change without notice. Our Ann Arbor retail store is open 11:00 a.m. to 7:00 p.m. Tues-Fri. 10:00 a.m. to 5:00 p.m. on Saturdays

SYSTEMS

APPLE II STARTER

\$1895

SAVE OVER \$200 ON OUR BEST SELLING APPLE SYSTEM/ System includes a 48K Apple II, Apple Disk, DOS 3.3 and Controller and a Sup R MOD RF Modulator.

List \$2209.

EXCLUSIVE FOR THE APPLE: Magic Wand, Videx, Z-80 softcard (Requires 48K Apple and disk).

COMPLETE SUB-SYSTEM \$925.

APPLE ACCESSORIES

CHOOSE FROM: Silentype Printer w/x face/Light Pen/Easy Writer (80 col. need a Videx)/Clock for Apple.

FROM MICROSOFT: 16K RAM Board/FORTRAN.

FROM COMPUTER STATION: Hi-Res Dump for 460 Printer.

OUR APPLE INVENTORY IS COMPLETE. WE'VE GOT IT ALL—



SYSTEMS

CORVUS NETWORK

CONSTELLATION Backend Network with up to 64 CPUs.

MIRROR Videotape backup and up to 20Mb storage.

CALL US FOR PRICES ON YOUR SPECIFIC CONFIGURATION.



SYSTEMS

XEROX 820 IS HERE

CALL US FOR PRICES ON YOUR SPECIFIC CONFIGURATION.

SYSTEMS

AIM 65 STARTER

\$795

FROM ROCKWELL

THE SMALL SYSTEM FOR CHRISTMAS BUYING

Our AIM Starter System for Educational & Laboratory use includes 4K AIM/BASIC & ROM/ASSEMBLER & ROM/POWER SUPPLY EG1 ENCLOSURE/CRAIG TAPE RECORDER.

ACCESSORIES FOR AIM STARTER: PL 65 High Level Language/Paper for the Aim (roll)/Rockwell's 4 slot Motherboard/

WE ALSO CARRY RM EXPANSION ACCESSORIES FOR THE AIM-65.



 **apple computer**
Authorized Dealer
Accept No Less

 **Rockwell International**
Authorized Dealer
Accept No Less

Systems
Customized

800-343-5504

IN MASS CALL 617-491-2700

COMPUMART

65 Bent Street, Dept 111
PO Box 568, Cambridge, MA 02139

From THE LEADER...

We just might be the largest independent small systems dealer in the country. Here's why: COMPUMART has been serving the computer needs of industry since 1971.

We stock, for immediate shipment, only those products from the finest micro-computer manufacturers.

And any product, except software, can be returned within 10 days for a full refund—even if you just change your mind. We also honor all manufacturers' warranties. Our expert technicians will service any product we sell.

Call us for more information on products, product configuration and service. Our phones are open Monday thru Friday, 8:30 a.m. to 7:00 p.m. and Saturday 11:00 a.m. to 4:00 p.m.

We have a staff of highly knowledgeable sales people waiting to hear from you, and to help. Because service is what we're all about.



Circle 79 on Inquiry card.

Fundamentals of Relational Data Organization

Joel Neely and Steve Stewart
Janus Systems
POB 266
Henderson TN 38340

Both mathematicians and computer scientists use the word *elegant* to describe a concept of exceptional clarity, simplicity, and utility. By those standards, the relational model of data organization is most elegant. One of the principal advantages of this model is its foundation upon a formal mathematical theory that allows its concepts to be defined and examined with great precision.

This article discusses the basic concepts of the relational approach to data organization and looks informally at the practical benefits of the model. We should point out that our emphasis is on data organization, to the exclusion of other interesting and important issues in data-base system design, such as the syntax and features of the data-definition and data-manipulation languages.

The Sample Data Base

As an example of the capabilities of the relational model we will use a personnel data base, which is to be developed for the use of a data-processing manager. It should contain the following information: the name of each employee (EMP), the languages that the employee is familiar with (LNG), the number of years the employee has used each language (USE), the employee's position within the organization (POS), the employee's years of experience with the company (EXP), the employee's hourly pay rate (PAY), the current project to which the

employee is assigned (PRJ), and the project manager on each of these projects (MGR).

PERSONNEL1 (see table 1) shows a small sample of data that might be stored in this data base and gives the structure of the data base. (In the structure diagram headings, parentheses enclose groups of data that may be repeated, while an underline indicates *key* columns whose values identify an entire entry.)

With the design of PERSONNEL1, any request of the form:

Tell me something about employee E

may be satisfied easily. However, it is much more difficult to respond to the following requests:

List the names of all employees who use language L
Tell me the manager of project P
Display the names of all employees assigned to project P
Change the manager of project P to employee E

Through a process known as *normalization*, the organization of the data may be revised to increase the flexibility with which it can be used. Before presenting the details of this process, we need to establish some terminology.

A *relation* is a two-dimensional table (as in PERSONNEL1) consisting of horizontal rows and vertical columns. The advantage of this form is that almost everyone is familiar with data presented as a simple table. No two rows in the relation may be identical; there must be some combination of columns—a *key*—whose values will uniquely identify each row. In our example, we gave each employee a unique name, so EMP may be used as a key in

About the Authors

Joel Neely, an adjunct associate professor in the Mathematical Sciences department at Memphis State University, is president of Janus Systems, a custom software firm.

Steve Stewart is vice president of Janus Systems.

THE WAR ON BUGS

C O N T I N U E S

with
CRTFORM™

CRTFORM™ is a comprehensive package for creating interactive programs.

Good programming starts with clear specifications. CRTFORM saves time by gathering those specifications with a field-oriented editor. The editor can be used to manipulate and modify input and system fields, as well as to assert any of a complete group of input specifications.

A forms manager maintains the specifications. It allows the analyst to create and modify random access files of forms. The form files contain the field attributes of forms as well as author, comment, and revision information.

System analysts can easily produce documentation by using CRTFORM to print field attributes and images of forms. In addition, a special Test mode allows the end user to test and verify the forms before any code is produced.

CRTFORM's code generator produces the Pascal, BASIC, COBOL, FORTRAN, PL 1, Z-80, or Ada source text necessary to interface to the runtime module.

The runtime module assures the user of consistent interaction with the com-

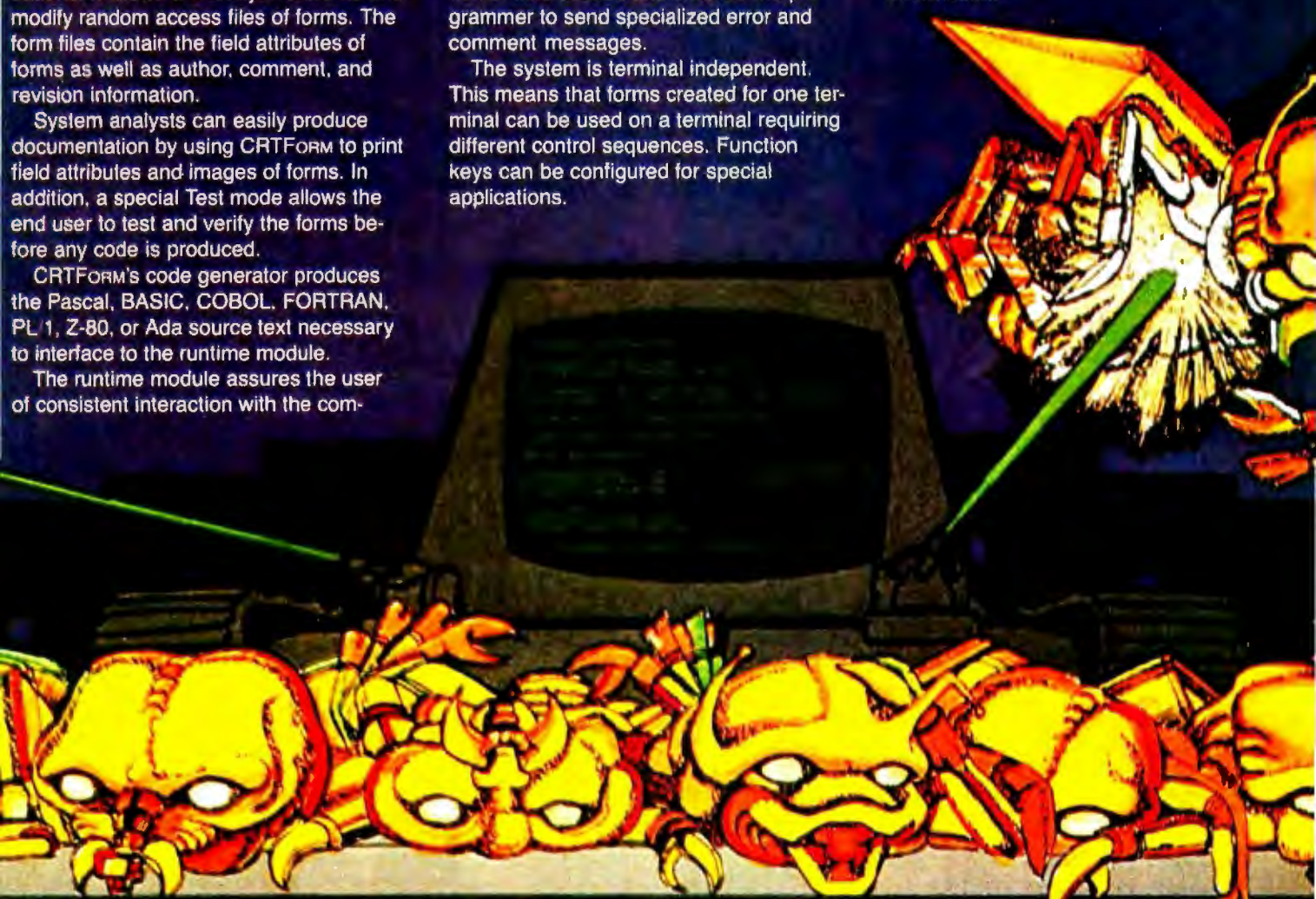
pleted application program. This reduces training time, and eliminates the frustration common in the use of many large programs.

The package automatically produces documentation and provides capabilities for runtime enhancements. The programmer can dynamically lock and unlock displays, erase, skip, and reset fields. In addition, the system provides for redirection of field access and enables the programmer to send specialized error and comment messages.

The system is terminal independent. This means that forms created for one terminal can be used on a terminal requiring different control sequences. Function keys can be configured for special applications.

CRTFORM is intended for use by system houses, program developers and OEMs. It is available under the CP/M, UCSD, Apple Pascal, RT-11, and RSX-11M operating systems.*

Statcom is a corporation specializing in software development tools and techniques. In addition to CRTFORM, we offer an end user oriented report generation package. Please call or write for further information.



PROGRAMS THAT WRITE PROGRAMS

STATCOM
CORPORATION

5766 BALCONES SUITE 200
AUSTIN TEXAS 78731
PHONE 512/451-0221

Our incredible low prices just got 2% lower.

Have a merry computer and a happy software.

Take an additional 2% off our listed prices, until December 24.

16 K RAM KITS

NEC 4116 200 ns 17.95

DISKETTES

MD 525-01,10,16 26.50
 MD 550-01,10,18 44.50
 MD 577-01,10,16 34.80
 MD 557-01,10,16 45.60
 FD 32 OR 34 -9000 36.00
 FD 32 OR 34 -8000 45.60
 FD 34-4001 48.60

DISKETTE STORAGE

5 1/4" PLASTIC LIBRARY CASE 2.50
 8" PLASTIC LIBRARY CASE 3.50
 PLASTIC STORAGE BINDER WITH INSERTS ... 9.95
 PROTECTOR 5 1/4" 21.95
 PROTECTOR 8" 24.95

INTEGRATED COMPUTER SYSTEMS

NORTHSTAR CALL
 ALTOS CALL
 ZENITH Z89 CALL
 CALIF. COMPUTER SYSTEMS CALL
 MORROW DESIGNS CALL

PRINTERS

ANADEX DP 9500 1295.00
 ANADEX DP 9501 1295.00
 CENTRONICS 739 765.00
 C-ITOH 25 CPS PARALLEL 1440.00
 C-ITOH 25 CPS SERIAL 1495.00
 C-ITOH 45 CPS PARALLEL 1770.00
 C-ITOH 40 CPS SERIAL 1870.00
 C-ITOH TRACTOR OPTION 195.00
 EPSON MX-80 \$CALL
 EPSON MX-80 F/T \$CALL
 EPSON MX-100 GRAPHIC \$CALL
 EPSON GRAPHICS ROM 90.00
 IDS-445G PAPER TIGER 779.00
 IDS-460G PAPER TIGER 945.00
 IDS-560G PAPER TIGER 1195.00
 INFOSCRIBE 500 9X9, 150 CPS 1495.00
 MALIBU 200 DUAL MODE 2995.00
 NEC SPINWRITER 3510 SERIAL RO 2195.00
 NEC SPINWRITER 3530 PARALLEL RO 2195.00
 NEC SPINWRITER 7710 SERIAL RO 2645.00
 NEC SPINWRITER 7730 PARALLEL RO 2645.00
 NEC SPINWRITER 7700 D SELSUM OPTION ... 2795.00
 NEC SPINWRITER 3500 SELSUM OPTION ... 2295.00
 OKIDATA MICROLINE 80 399.00
 OKIDATA MICROLINE 82A 569.00
 OKIDATA MICROLINE 83A 899.00
 OKIDATA MICROLINE 84 1199.00

MODEMS

NOVATION CAT ACOUSTIC MODEM 145.00
 NOVATION D-CAT DIRECT CONNECT MODEM ... 155.00
 NOVATION AUTO-CAT AUTO
 ANSWER MODEM 219.00
 NOVATION APPLE-CAT 349.00
 UDS 103 LP DIRECT CONNECT MODEM 175.00
 UDS 103 JLP DIRECT CONNECT/AUTO
 ANSWER 209.00
 D.C. HAYES MICROMODEM II (Apple) 299.00
 D.C. HAYES 100 MODEM (S-100) 325.00
 D.C. HAYES STACK Smart Modem (RS 232) ... 249.00
 LEXICON LX-11 MODEM 115.00

APPLE HARDWARE

VERSA WRITER DIGITIZER 209.00
 ABT APPLE KEYPAD 119.00
 MICROSOFT Z-80 SOFTCARD 299.00
 MICROSOFT RAMCARD 170.00
 ANDROMEDA 16K CARD 170.00
 VIDEX 80 X 24 VIDEO CARD 299.00
 VIDEX KEYBOARD ENHANCER 99.00
 M & R SUPERTERM 80 X 24 VIDEO BOARD ... 315.00
 NEC 12" GREEN MONITOR 235.00
 SANYO 12" MONITOR (B & W) 249.00
 SANYO 12" MONITOR (Green) 279.00
 SANYO 13" COLOR MONITOR 469.00
 TEECO 12" HIGH RES GREEN MONITOR 159.00
 SSM AIO BOARD (INTERFACE) A&T 165.00
 SSM AIO BOARD (INTERFACE) KIT 135.00
 SSM IEEE 488 INTERFACE 369.00

MOUNTAIN HARDWARE

| | |
|------------------------------------|--------|
| CPS MULTIFUNCTION BOARD | 209.00 |
| SUPERTALKER SD200 | 259.00 |
| ROMPLUS WITH KEYBOARD FILTER | 179.00 |
| ROMPLUS W/O KEYBOARD FILTER | 130.00 |
| KEYBOARD FILTER ROM | 49.00 |
| COPYROM | 49.00 |
| MUSIC SYSTEM | 459.00 |
| ROMWRITER | 149.00 |
| APPLE CLOCK | 252.00 |
| A/D + D/A | 299.00 |
| EXPANSION CHASSIS | 625.00 |

VISTA COMPUTER CO.

| | |
|--|--------|
| APPLE 40 Track Drive A40 (163 K Bytes) | 389.00 |
| APPLE 80 Track Drive A80 (326 K Bytes) | 549.00 |
| APPLE 160 Track Drive A160 (652 K Bytes) | 799.00 |
| APPLE 80 Column Card | 329.00 |
| APPLE 8 Inch Disk Drive Controller | 549.00 |

CALIF. COMPUTER SYSTEMS

S-100 BOARDS

| | |
|--|--------|
| 2200A MAINFRAME | 359.00 |
| 2032A 32K STATIC RAM | 599.00 |
| 2065C 64K DYNAMIC RAM | 499.00 |
| 2422 FLOPPY DISK CONTROLLER & CP/M | 339.00 |
| 2710 FOUR SERIAL I/O | 249.00 |
| 271B 2 SERIAL/2 PARALLEL I/O | 269.00 |
| 2720 FOUR PARALLEL I/O | 199.00 |
| 2810 Z-80 CPU | 249.00 |

APPLE BOARDS

| | |
|---|--------|
| 7710A/D ASYNCHRONOUS SERIAL INTERFACE | 139.00 |
| 7712A SYNCHRONOUS SERIAL INTERFACE | 149.00 |
| 7424A CALENDAR/CLOCK | 99.00 |
| 7728A CENTRONICS PRINTER INTERFACE | 99.00 |

APPLE SOFTWARE

| | |
|---|--------|
| MAGIC WINDOW WORDPROCESSOR | 89.00 |
| MAGIC WAND | 275.00 |
| WORDSTAR—APPLE | 259.00 |
| MAILMERGE—APPLE (REQUIRES WORDSTAR) | 90.00 |
| SPELLSTAR—APPLE (REQUIRES WORDSTAR) | 169.00 |
| DATASTAR | 199.00 |
| EXPEDITER II APPLESOFT COMPILER | 89.00 |
| PFS: PERSONAL FILING SYSTEM | 79.00 |
| PFS: REPORT GENERATOR | 79.00 |
| ASCII EXPRESS TERMINAL PROGRAM | 59.95 |
| Z—TERM COMMUNICATIONS SOFTWARE | 89.95 |
| MICROSOFT FORTRAN | 165.00 |
| MICROSOFT COBOL | 550.00 |
| DB MASTER 2.4 | 179.00 |
| VISICALC 3.3 | 169.00 |
| VISIPILOT | 149.00 |
| VISIDEX | 169.00 |
| CCA DATA BASE MANAGER | 99.00 |
| A-STAT COMPREHENSIVE STATISTICS PKG | 119.00 |

APPLE GAME SOFTWARE

| | |
|----------------------|-------|
| SPACE EGGS | 24.95 |
| POOL 1.5 | 29.95 |
| RASTER BLASTER | 24.95 |
| GORGON | 32.95 |
| APPLE PANIC | 24.95 |

CP/M SOFTWARE

| | |
|--|--------|
| MICROSOFT BASIC-80 | 299.00 |
| MICROSOFT BASIC COMPILER | 319.00 |
| MICROSOFT FORTRAN-80 | 399.00 |
| PEACHTREE SYSTEMS | CALL |
| MAGIC WAND (REQUIRES CP/M®) | 275.00 |
| WORDSTAR (REQUIRES CP/M®) | 325.00 |
| MAILMERGE (REQUIRES WORDSTAR) | 110.00 |
| SPELLSTAR (REQUIRES WORDSTAR) | 199.00 |
| DATASTAR | 249.00 |
| SPELLGUARD | 239.00 |
| CP/M PICKLES & TROUT FOR TRS-80 II | 175.00 |

MORROW DESIGNS

FLOPPY DISK SYSTEMS

| | |
|---|---------|
| Controller, P.S., Cables, Microsoft Basic, CP/M®, A & T | |
| DISCUS I (Single Drive—250 K) | 799.00 |
| DISCUS I (Dual Drive—500 K) | 1429.00 |
| DISCUS 2D (Single Drive—500 K) | 869.00 |
| DISCUS 2D (Dual Drive—1 MEG) | 1499.00 |
| DISCUS 2 + 2 (Single Drive—1 MEG) | 1099.00 |
| DISCUS 2 + 2 (Dual Drive—2 MEG) | 1999.00 |

HARD DISK SYSTEMS

| | |
|--|---------|
| Controller, P.S., Microsoft Basic, CP/M, A&T | |
| DISCUS M10 (10 Megabytes) | 2949.00 |
| DISCUS M20 (20 Megabytes) | 3829.00 |
| DISCUS M26 (26 Megabytes) | 3949.00 |

DECISION 1 COMPUTER

| | |
|--|------|
| Z-80A, CP/M, NIX (UNIX Identical), 32 to 1 MEG of memory | |
| Floppy and/or Hard Disk | CALL |

SD SYSTEMS

S-100 BOARDS

| | |
|------------------------------|--------|
| VERSAFLOPPY II A&T | 389.00 |
| VERSAFLOPPY II KIT | 329.00 |
| SBC 200 (Z-80 CPU) A&T | 369.00 |
| SBC 200 (Z-80 CPU) KIT | 299.00 |
| Z-80 STARTER KIT | 289.00 |
| EXPANDORAM II KIT (OK) | 220.00 |

We built a reputation on our prices and your satisfaction.

Alpha Byte STORES

(213) 706-0333

31245 LA BAYA DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91362

TRS-80 MOD I HARDWARE

| | |
|-------------------------------------|--------|
| PERCOM DATA SEPARATOR | 27.00 |
| PERCOM DOUBLER II | 159.00 |
| DOUBLE ZAP II/80 | 45.95 |
| TANDON 80 TRACK DISK DRIVE | 429.00 |
| TANDON 40 TRACK DISK DRIVE | 299.00 |
| LNW DOUBLER WITH DOSPLUS 3.3D | 159.00 |

TRS-80 SOFTWARE

| | |
|--|--------|
| NEWDOS/80 2.0 MOD I | 139.00 |
| LAZY WRITER MOD I | 125.00 |
| PROSOFT NEWSOFT MOD I,III | 99.00 |
| SPECIAL DELIVERY MOD I,III | 119.00 |
| X-TRA SPECIAL DELIVERY MOD I,III | 199.00 |
| TRACKCESS MOD I | 24.95 |
| OMNITERM SMART TERMINAL MOD I,III | 89.95 |
| MICROSOFT BASIC COMPILER FOR MOD I | 165.00 |

CORVUS

FOR S-100, APPLE OR TRS-80 MOD I,II

| | |
|--|---------|
| Controller, Case/P.S., Operating System, A&T | |
| 5 Megabytes | 3245.00 |
| 10 Megabytes | 4645.00 |
| 20 Megabytes | 5545.00 |
| MIRROR BACK-UP | 725.00 |

SUPPLIES

AVERY TABULABLES

| | |
|---------------------|-------|
| 1,000 3½ X 1¼ | 8.49 |
| 3,000 3½ X 1¼ | 14.95 |
| 5,000 3½ X 1¼ | 19.95 |

UARCO PAPER (Prices F.O.B. S.P.)

| | |
|----------------------------|-------|
| 9½ X 11 18 lb white | 29.00 |
| 14½ X 11 18 lb white | 39.00 |

We stock a complete line of computer covers, printer ribbons, print wheels & NEC thimbles—CALL US FOR YOUR NEEDS.

We guarantee everything we sell for 30 days. If anything is wrong, just return the item and we'll make it right. And, of course, we'll pay the shipping charges.

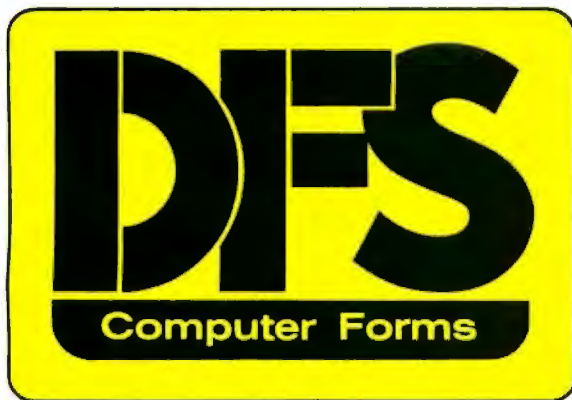
We accept Visa and Master Card on all orders. COD orders accepted up to \$300.00.

Please add \$2.00 for standard UPS shipping and handling on orders under 50 pounds, delivered in the continental U.S. Call us for shipping charges on items that weigh more than 50 pounds. Foreign, FPO and APO orders please add 15% for shipping. California residents add 6% sales tax.

The prices quoted are only valid for stock on hand and all prices are subject to change without notice.

Small Business Systems User!

WHEN BUYING CHECKS, STATEMENTS AND INVOICES — LOOK FOR THIS MARK:



ON THE DOOR OF YOUR COMPUTER STORE

DFS Computer Forms are

- Sold by a Local Business
- Satisfaction Guaranteed
- Available in Small Quantities
- Compatible with Existing Software
- Very Economical



CODE 35460

P.O. Box 643 • Townsend, MA. 01469

PERSONNEL1. In practice, there may be more than one way to construct a key to a relation. Social-security number and time-clock number are values that might also be used to identify an individual employee.

Normalizing the Data

The first step in normalizing our personnel-data design is based on the following rule:

RULE 1: For all rows, each column must take a "simple" value, ie: a single value without repetition.

In PERSONNEL1, the columns labeled (LNG, USE) and (PRJ, MGR) are in violation of this rule, because an employee may know more than one programming language and may be assigned to more than one project. By duplicating the nonrepeating values EMP, POS, EXP, and PAY for each combination of values for the repeating groups (LNG, USE) and (PRJ, MGR), the entire relation may be represented in first normal form, as shown in PERSONNEL2 (see table 2).

Notice that in PERSONNEL2, the column EMP is no longer sufficient to identify a row. Multiple rows may be present for an employee who has more than one entry for language use or project assignment. One possible solution is to consider the combination of EMP, LNG, and PRJ as a key, since those three values together are sufficient to identify a single row.

It would appear at first that PERSONNEL2 represents a step backward, not only because it requires much more space than PERSONNEL1, but also because responding to the requests

- Change employee E's position to S
- Add the assignment of employee E to project P
- Make employee E the manager of project P

has become much more difficult. This problem is addressed by the remaining normalization steps, which are based on the concept of *dependence*.

PERSONNEL1:

| EMP | (LNG, USE) | POS | EXP | PAY | (PRJ, MGR) |
|--------|---|---------|-----|-------|----------------------------------|
| Bogard | COBOL,3 FORTRAN,2 | Sr Prog | 4 | 25.00 | Payroll,Smith A/R,Jonas |
| Dalton | COBOL,2 PL/1,1 RPG,3 | Sr Prog | 3 | 24.00 | Inventory,Fitch |
| Fitch | COBOL,4 | Prj Mgr | 2 | 32.50 | Inventory,Fitch |
| James | COBOL,5 GPSS,2 | Sys Anl | 2 | 29.00 | A/R,Jonas Datacomm, Spivey |
| Jonas | AMBIT,1 BLISS,2 COBOL,1 Pascal,3 | Prj Mgr | 1 | 31.00 | A/R,Jonas |

Table 1: PERSONNEL1, a sample of a personnel data base set up as a nonnormalized table.



Actual Size, $\frac{5}{8} \times 2\frac{3}{4} \times 6\frac{7}{8}$ "

169⁹⁵
Reg. 229.95

Give Radio Shack's TRS-80[®] Pocket Computer and Save \$60

Printer Cassette Interface Save \$20



Reg. 149.95 **129⁹⁵**

Lets you use a recorder to load and save your programs and data on cassettes. Get hard copy printouts, too. With AC adapter/charger, three rolls of paper.

Cassette Interface Save 39% **29⁹⁵**



Store and load programs on cassettes. Cable and plugs included. Batteries extra. Recorder not included.

The first programmable computer so small it fits in a Christmas stocking. Like a calculator, it has 15 built-in functions that are immediately available. Plus, there's 26 memories and numeric output with a 10-digit mantissa and a 2-digit exponent. To compute trig and angular functions, for example, it works just like a calculator and with the same precision.

Unlike a calculator, the *real* power of the Pocket Computer is in its ability to run our own, or user-written, programs in BASIC. The 1424-step memory can be partitioned into multiple programs.

And the full alphanumeric display permits writing programs that prompt in plain English and display

answers with comments. The Edit and Debug mode make programming easier than it is with a programmable calculator. Inputting is simplified with the typewriter-style keyboard and separate 20-key numberpad. The LCD shows 24 characters with automatic scrolling and manual playback for longer lines. Another thing, memory is retained even when the power is off.

By adding the Cassette Interface, anyone can immediately run our software. And look what's available! Electrical and Civil Engineering, Aviation, Surveying, Real Estate, Business Statistics, and more. You can't buy a smarter gift. Better hurry — sale ends Dec. 27th.

Radio Shack

The biggest name in little computers[™]

A DIVISION OF TANDY CORPORATION • OVER 8000 LOCATIONS WORLDWIDE

Prices may vary at individual stores and dealers

PERSONNEL2:

| EMP | LNG | USE | POS | EXP | PAY | PRJ | MGR |
|--------|----------|-----|---------|-----|-------|-----------|--------|
| Bogard | COBOL | 3 | Sr Prog | 4 | 25.00 | Payroll | Smith |
| Bogard | COBOL | 3 | Sr Prog | 4 | 25.00 | A/R | Jonas |
| Bogard | FORTTRAN | 2 | Sr Prog | 4 | 25.00 | Payroll | Smith |
| Bogard | FORTTRAN | 2 | Sr Prog | 4 | 25.00 | A/R | Jonas |
| Dalton | COBOL | 2 | Sr Prog | 3 | 24.00 | Inventory | Fitch |
| Dalton | PL/I | 1 | Sr Prog | 3 | 24.00 | Inventory | Fitch |
| Dalton | RPG | 3 | Sr Prog | 3 | 24.00 | Inventory | Fitch |
| Fitch | COBOL | 4 | Prj Mgr | 2 | 32.50 | Inventory | Fitch |
| James | COBOL | 5 | Sys Anl | 2 | 29.00 | A/R | Jonas |
| James | COBOL | 5 | Sys Anl | 2 | 29.00 | Datacomm | Spivey |
| James | GPSS | 2 | Sys Anl | 2 | 29.00 | A/R | Jonas |
| James | GPSS | 2 | Sys Anl | 2 | 29.00 | Datacomm | Spivey |
| Jonas | AMBIT | 1 | Prj Mgr | 1 | 31.00 | A/R | Jonas |
| Jonas | BLISS | 2 | Prj Mgr | 1 | 31.00 | A/R | Jonas |
| Jonas | COBOL | 1 | Prj Mgr | 1 | 31.00 | A/R | Jonas |
| Jonas | Pascal | 3 | Prj Mgr | 1 | 31.00 | A/R | Jonas |

Table 2: PERSONNEL2, the data from PERSONNEL1 arranged into first normal form.

Data Dependencies

If, for each row, the value of a column A1 uniquely determines the value of a column A2, then A2 is *functionally dependent* on A1. For example, in PERSONNEL1, since each employee has only one position we may say that EMP determines POS, and that POS is functionally dependent on EMP. If the value in column A1 limits the possible values of column A2 to a specific set, then A2 is *set dependent* on A1. PRJ is set dependent on EMP, because each employee is assigned to a specific set of projects. Figure 1 illustrates the dependencies in the sample data by using single-headed arrows to show functional dependence and double-headed arrows to show set dependence. This dependence diagram allows the problem of PERSONNEL2 to be clearly visualized.

The remaining problems are all violations of the following rule:

RULE 2: In every row, each column must be dependent on every part of the key.

For example, the columns POS, EXP, and PAY are not dependent on the entire key of PERSONNEL2. These

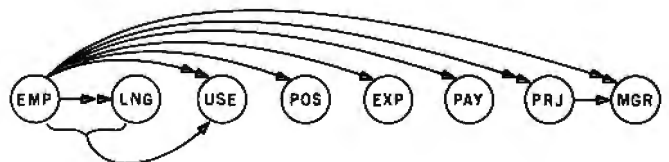


Figure 1: This diagram illustrates the two types of data dependencies. The single-headed arrows show functional dependence and the double-headed arrows show set dependence.



It Makes Kids Think.

The Turtle is the perfect teaching and learning tool for mathematics or programming because abstract ideas are made visible and concrete. This small robot is easy to connect and simple commands can be mastered in minutes. Students absorb powerful ideas while having fun programming the Turtle to move, blink, beep, draw, or use its touch sensors. Interfaces for APPLE, Atari and S-100 bus computers are available. The following books are also available from Terrapin. Mindstorms \$12.95 Artificial Intelligence \$18.95, Katie and the Computer \$6.95, Small Computers \$9.95, Turtle Geometry \$20. Add \$2.00 shipping for 1 book and \$1 for each additional book. MA residents add 5% sales tax. For more information, write or call **Terrapin Inc.** / 678 Massachusetts Avenue / Cambridge, MA 02139 / (617) 492-8816



Take Your Cue From Vista . . .

When it comes to Apples, take your cue from Vista's A800 Eight-Inch Floppy Disk Controller. The A800 offers a cost-efficient approach to software compatible disk memory expansion for your Apple II® computer. The A800 Controller enables Apple II users to access up to five megabytes of online storage through conventional disk operating (DOS) commands.

The Control and DMA Logic provides high speed (1 microsecond per byte) transfer of data from the disk drive directly to the Apple II memory without processor intervention. Plus, the Phase-Locked Loop Data Separator provides the ultimate in data reliability.

AND THERE'S MORE.

The controller is compatible with the most popular disk operating systems for the

**It's a
Sure
Shot.**

Apple II computer. It also interfaces to all Shugart/ANSI Standard Eight-Inch Floppy Disk Drives. The A800 provides complete IBM format compatibility in both single and double-density modes.

THE HOT SHOT AT A COOL PRICE.

The A800 is reasonably priced at \$595. A price you can't beat when you compare its quality and performance.

CALL YOUR SHOTS.

Vista offers you a complete line of peripheral equipment to maximize the capabilities of your Apple system including: High capacity Mini-floppy Disk Drives, the Vista Music Machine 9 and the Vista Model 150 Type Ahead Buffer. In addition, Vista offers a line of advanced components fully compatible with the TRS-80* and S-100 based computers.



Vista Computer Company
1317 E. Edinger Avenue
Santa Ana, CA 92705
(714) 953-0523

Call Toll Free 800-854-8017

© Apple II is a registered trademark of Apple Computers, Inc.
* TRS-80 is a trademark of Radio Shack, A Tandy Co.

| PERSONNEL3: | | | | BACKGROUND: | | |
|-------------|---------|-----|-------|-------------|---------|-----|
| EMP | POS | EXP | PAY | EMP | LNG | USE |
| Bogard | Sr Prog | 4 | 25.00 | Bogard | COBOL | 3 |
| Dalton | Sr Prog | 3 | 24.00 | Bogard | FORTRAN | 2 |
| Fitch | Prj Mgr | 2 | 32.50 | Dalton | COBOL | 2 |
| James | Sys Anl | 2 | 29.00 | Dalton | PL/I | 1 |
| Jonas | Prj Mgr | 1 | 31.00 | Dalton | RPG | 3 |
| | | | | Fitch | COBOL | 4 |
| | | | | James | COBOL | 5 |
| | | | | James | GPSS | 2 |
| | | | | Jonas | AMBIT | 1 |
| | | | | Jonas | BLISS | 2 |
| | | | | Jonas | COBOL | 1 |
| | | | | Jonas | Pascal | 3 |

Table 3: The data from PERSONNEL2 in second normal form. This format was achieved by splitting the relation so that there is no partial key dependence.

columns are determined by EMP alone, so we will form a new relation, PERSONNEL3 (see table 3), containing only EMP, POS, EXP, and PAY, having EMP as a key.

The value of USE is determined by both EMP and LNG, so a BACKGROUND relation (see table 3), having a composite key made of EMP and LNG, may be formed from these three columns. Since BACKGROUND contains EMP as a column, it will still be possible to associate

| PERSONNEL4: | | | | BACKGROUND: | | |
|-------------|---------|-----|-------|-------------|---------|-----|
| EMP | POS | EXP | PAY | EMP | LNG | USE |
| Bogard | Sr Prog | 4 | 25.00 | Bogard | COBOL | 3 |
| Dalton | Sr Prog | 3 | 24.00 | Bogard | FORTRAN | 2 |
| Fitch | Prj Mgr | 2 | 32.50 | Dalton | COBOL | 2 |
| James | Sys Anl | 2 | 29.00 | Dalton | PL/I | 1 |
| Jonas | Prj Mgr | 1 | 31.00 | Dalton | RPG | 3 |
| | | | | Fitch | COBOL | 4 |
| | | | | James | COBOL | 5 |
| | | | | James | GPSS | 2 |
| | | | | Jonas | AMBIT | 1 |
| | | | | Jonas | BLISS | 2 |
| | | | | Jonas | COBOL | 1 |
| | | | | Jonas | Pascal | 3 |

| ASSIGNMENTS: | |
|--------------|-----------|
| EMP | PRJ |
| Bogard | A/R |
| Bogard | Payroll |
| Dalton | Inventory |
| Fitch | Inventory |
| James | A/R |
| James | Datacomm |
| Jonas | A/R |

| PROJECTS: | |
|-----------|--------|
| PRJ | MGR |
| A/R | Jonas |
| Datacomm | Spivey |
| Inventory | Fitch |
| Payroll | Smith |

Table 4: Our final goal—the third normal form. The data from table 3 are further split into a multi-tabular format to eliminate any transitive dependencies.

BAR CODE FOR YOUR SMALL COMPUTER.



New in-depth report tells you how-at savings of up to \$40,000

"Contemporary Applications of Optical Bar Code Technology" is a new, comprehensive report from North American Technology that can save you thousands of dollars in research and development time

when programming and equipping your small computer for bar code. Written by the originators of Byte Magazine's experiments with publication of software in printed form, Walter Banks and Carl Helmers, this 512 page report is the only complete presentation of materials on keyless data entry using modern bar code technology. It will enable you to:

- Read HP-41C calculator formats into your Apple, or other suitable computer.
- Prepare and deliver machine readable printed software to your customers.
- Read a UPC code into your personal computer.
- Print Code 39 manufacturing inventory tags with your formed character or dot matrix printer.

Here, in clear, concise, understandable language is all you need to know about bar code history, software engineering requirements, 283 pages of machine independent UCSD Pascal* software in source listing form. There are 44 modules

*Trademark Regents of the State of California

to generate and read all major formats from Code 39 to HP-41C, and UPC to the new NATI text software publication format. You get information you can use to program your small computer for bar code without detail processing by a human operator. This method speeds the operation, eliminates translation and entry errors and, where desirable, permits the use of unskilled personnel for the entry function. You save thousands of dollars as a result. The \$500 purchase price of the report includes license for the commercial modification and use of all software contained therein.

For detailed information, send for our brochure. There is no cost or obligation. Mail the coupon today.



NORTH AMERICAN TECHNOLOGY, INC.

Strand Building
174 Concord St.,
Peterborough, NH 03458
(603) 924-6048

Please send me your **FREE** brochure on "Contemporary Applications of Optical Bar Code Technology."

NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____

This book can save your company a lot of money.



Rental Electronics is renting

| | |
|---|----|
| Amplifiers | 3 |
| Wave and Distortion Analyzers | 2 |
| Logic Analyzers | 2 |
| Microwave Link Analyzers | 3 |
| Data Link Analyzers | 4 |
| Network Analyzers | 4 |
| Power Line Analyzers | 5 |
| Sound and Vibration Analyzers | 5 |
| Spectrum Analyzers | 5 |
| Attenuators | 6 |
| Calibrators | 6 |
| Cameras | 7 |
| Counters | 7 |
| Couplers | 8 |
| Desktop Computers | 8 |
| Filters | 9 |
| Function Generators | 9 |
| Noise Generators | 10 |
| Pulse Generators | 10 |
| Signal Source Generators | 10 |
| Sweep Frequency Generators | 11 |
| Generators/Synthesizers | 12 |
| Analog Voltage, Current and Resistance Meters | 13 |
| Digital Meters | 13 |
| Power Meters and Thermistors | 15 |
| Microprocessor Instrumentation | 16 |
| Modulators | 18 |
| Oscillators | 18 |
| Oscilloscopes | 18 |
| Printers | 21 |
| DC Power Supplies | 21 |
| Probes | 22 |
| Digital Printing Recorders/Plotters | 23 |
| Event Recorders | 23 |
| Magnetic Tape Recorders | 23 |
| Oscillographic Recorders | 24 |
| Strip Chart Recorders | 24 |
| Temperature Recorders | 25 |
| X-Y Recorders | 25 |
| Sources | 25 |
| Stereoscopes | 26 |
| Synthesizers | 26 |
| Data Terminals | 26 |
| Graphics Terminals | 27 |
| Test Bridges | 27 |
| Test Sets | 27 |
| Test Chambers | 28 |

GSA # GS-04S-23560

Catalog

Rental Electronics, Inc.
Member of the BVMERICAL Corporation

You can rent just about any electronic instrument -- including data terminals and printers -- off-the-shelf for as short a time as 30 days.

Rental Electronics, Inc. (800) 227-8409

In California (213) 993-7368 or (415) 968-8845 or (714) 879-0561

| | |
|---|--|
| <p><input type="checkbox"/> Send me a copy of this book. Soon, please. In these inflationary times, my company would like to save money. Your Rental Catalog might help.</p> <p><input type="checkbox"/> I'd like a copy of your Equipment Sales Catalog, too.</p> <p><input type="checkbox"/> I'm interested in desktop computers. Send me a copy of your Hewlett-Packard Desktop Computer rental brochure.</p> <p><input type="checkbox"/> I'd like to see a brochure on Intel's Intellec[®] Microcomputer Development Systems now for rent.</p> | <p><input type="checkbox"/> I understand you have scads of data terminals and printers for rent off-the-shelf. Send me a brochure.</p> <p><input type="checkbox"/> I need immediate assistance. Have someone phone me quickly here: (A.C.) (number) (ext.) _____</p> <p><input type="checkbox"/> I have specific interest in the following electronic equipment: _____ _____ _____</p> |
| NAME _____ TITLE _____ | |
| ORGANIZATION _____ | |
| ADDRESS _____ MAIL STOP _____ | |
| CITY/STATE/ZIP _____ | |
| PHONE _____ | |
| Please complete this coupon and mail to: Rental Electronics, Inc./19525 Business Center Dr./Northridge, CA 91324 | |

© Rental Electronics, Inc. 1981

Called "MP/M II™"

MP/M II, the multiuser extension of our CP/M operating system, answers the lucrative business community demand for small scale distributed processing. Smart OEM's, language companies and application programmers are enthusiastically extending their offerings to satisfy this "new" market.



MP/M II Features

Record locking and file locking ensure data base validity when multiple users access the same data.

With 32 megabyte file capacity, you can daisy-chain 16 state-of-the-art disk drives, at 512 megabytes each. This gives you on-line storage of 8 gigabytes!

Fast performance is a certainty. Dispatch time between users requires as little as 600 microseconds.

Encrypted passwords provide security for user files and directories.

Time and date stamps indicate your last update of an application file and either last access or file creation.

Additional features provide increased performance with exceptionally low system overhead through streamlined housekeeping plus 30 refined utilities. 400K bytes of RAM are supported. And MP/M II is upward compatible with CP/M.

Substantial Capabilities Included

Major utilities in the MP/M II package include our RMAC™ assembler, LINK-80™ LIB-80™ run time library manager, and RDT™ debugger.

Network capability: Your product's growth to CP/NET™ is provided in MP/M II.

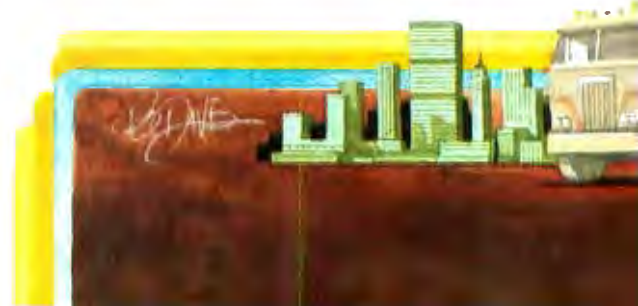
To Language & Application Companies

You're seizing the time-perishable market advantages of MP/M II. Its five manuals help extend your products to multiuser status, with accuracy and speed. LINK-80's overlay facilities help produce a higher quality. LINK-80, RMAC and RDT are powerful development aids — which don't cost you a thing.

Compatible software accelerates your entry into the multiuser market. All programs running under CP/M also run under MP/M II. This means important continuity. Couple that with a built-in growth path, and you're protecting the future of your business with MP/M II.



Extend CP/M® to Multiuser Systems: Extend Your Profits



To Hardware OEM's:

The profitable impact of multiuser configurations is profound. Compare your sum-of-the-boxes pricing: Multiuser vs. single user. No question about it. Your next move will be to re-forecast sales quotas and profit margins. MP/M II is the key. With the market demand you read about, the act of extending your systems to MP/M II will bear handsome rewards. Your next step is equally clear. Have our marketing group expedite the MP/M II data sheet, OEM price list and contract. Here's an even more positive approach. Why not call our marketing group as your first priority?

These 14 companies are extending 24 languages to run under MP/M II:

Compiler Systems, Inc.
Control-C Software, Inc.
Digital Research
Ellis Computing
Laboratory Microsystems
Micro-Ap
Micro Focus, Inc.
Microsoft
MT Microsystems, Inc.
Ryan-McFarland Corp.
Sorcim Corporation
SuperSoft Associates
Tarbell Electronics
Timin Engineering Co.

To Dealers, Distributors, System Houses:

It takes less effort to make more money by selling multiuser systems. Selling an upgrade path is easier than moving dead end, dedicated systems. MP/M II means hard disks, multiple printers and terminals—add-ons right through full networking environments. One sale can truly generate cash for an extended period. So call your OEM for delivery of MP/M II based systems.

Every new market has its share of easy sales. For a while, somebody will take those orders hand over fist. Your share of that business will probably depend on a single factor: Your ability to get product *first*.

Digital Research

Over 250,000 microcomputers use our operating systems. Over 300 OEM's and 400 independent software vendors (ISV's) use our products as the basis of thousands of applications. These are listed in our CP/M Compatible Catalog. Over 25,000 copies, per edition, generate ISV's sales. FORUM, published quarterly, and ISV seminars provide technical and business advantages.



Multiuser Demand

Multiuser demand is more than a trend. The MP/M II market is a fact of business life. It elevates the microcomputer with larger scale capabilities, and a larger dollar/sale market base. You only get one chance to make a good first (market) impression. Now is the time. We're here to help. **Call (408) 649-3896**, or write: Digital Research, P.O. Box 579, Pacific Grove, CA 93950. Europe: Vector, Intl., Leuven, Belgium, 32(16)202496. Far East: Microsoft Assoc., Tokyo, Japan, 03-403-2120

Circle 139 on inquiry card.



CP/M is a registered trademark of Digital Research. MP/M II, LINK-80, RMAC, LIB-80, and RDT are trademarks of Digital Research. © Copyright 1981 Digital Research



DIGITAL RESEARCH®

an employee's language experience with personnel data for that employee.

Splitting the Relation

Splitting the relation, as illustrated in table 3, prevents the experience part of the model from having columns that are dependent on only part of the key. A first-normal-form relation (simple values in each position of the table) that also has no partial key dependence is said to be in second normal form.

The situation with project assignments is slightly different. The employee name determines the set of projects on which that employee works, independent of the languages used by that employee. This means that a relation containing PRJ should not have LNG in its key. However, the project name uniquely determines the project manager. MGR is *transitively dependent* on EMP, since EMP determines a set of values for PRJ, and PRJ, in turn, functionally determines MGR. This transitive dependence must also be removed, according to the following rule:

RULE 3: *In every row, all columns must depend directly on the key, without any transitive dependencies through other columns.*

Because each project has only one manager, we will form the PROJECTS relation (see table 4) from columns PRJ and MGR, using PRJ as the key. (MGR could also be a key if each employee managed only one project.)

Finally, since each employee works on one or more projects, a relation called ASSIGNMENTS (see table 4) may be constructed from EMP and PRJ to form the association between PERSONNEL3 and PROJECTS. Notice that PROJECTS is "all key" with no additional dependent columns. This is due to the fact the only thing dependent on both EMP and PRJ is the fact that they are associated. An association between relations is frequently represented in this way.

A second-normal-form relation that has no transitive dependence is said to be in third normal form. All relations in the data model of table 4 are in third normal form.

At this point, the design has evolved to the point where all of the difficult queries mentioned for the initial structure are easy to fulfill. By selecting all rows of BACKGROUND with a given value of LNG, all programmers who can use a specific language may be located. Accessing ASSIGNMENTS with a given PRJ identifies all programmers on the project. Since PROJECTS is now a separate relation, associating a project with its manager, for retrieval or change, is easy. It is equally easy to find which projects a project manager is supervising.

Using the Third Normal Form

As an example of the simplicity and flexibility of third normal form, consider the query "What is the COBOL experience of senior programmers working on any pro-

ject managed by Fitch?" One approach, using the structure of table 4, would be:

1. Look in PROJECTS to find that Fitch manages the Inventory project.
2. Use ASSIGNMENTS to find that Fitch and Dalton work on Inventory.
3. From PERSONNEL4 for Fitch and Dalton, discover that Dalton is the only senior programmer.
4. Using BACKGROUND, find that Dalton has two years experience with COBOL.

By selecting one or more rows from a relation, then using column values to select from further relations, as needed, you can use the data with a high degree of flexibility. This makes it far easier to handle the unanticipated "Oh, by the way, can the computer tell me . . ." requests that invariably occur after a system has been implemented.

In Summary

Our purpose here has been to examine the data-organization aspects of the relational model. The relational concept also contains a rigorously defined set of operations that may be used to manipulate and combine relations in an algebraic fashion.

We cannot overemphasize that the relational model is concerned with a logical view of the data—apart from the physical representation used to store the data. Using only the abilities to construct multiple keys to the same data file and to find the first key greater than (or equal to) a given trial key, relational data organization may be implemented quite easily.

Although table 4 has the appearance of wasteful duplication in the stored data, a real application would likely encode all occurrences of a costly-to-store column like POS by an internal code (possibly one byte in length). Employees would most likely be identified by a unique employee code instead of by name. Thus it would be possible to have the advantages of relational organization without unreasonably high storage overhead.

In addition to the three normalization steps discussed here, there is a fourth normal form that arises in connection with certain types of complex key interdependencies. (The interested reader may find further discussion in the references.)■

References

1. Date, C. J. *An Introduction to Database Systems*. Reading MA: Addison-Wesley (The Systems Programming Series), 1977. Date presents a technically oriented discussion, including a description of fourth normal form.
 2. Kroenke, David. *Database: A Professional's Primer*. Chicago IL: SRA, 1978. Kroenke offers an interesting comparative analysis of existing commercial data-base management software.
 3. Martin, James. *Computer Data-Base Organization*. Englewood Cliffs NJ: Prentice-Hall, 1977. Martin gives an excellent set of examples for the reader who is unfamiliar with data-base organization.
-

Build a Bar-Code Scanner Inexpensively

Bradley W Bennett
238D Vairo Blvd
State College PA 16801

Printed bar-coded software has come one step closer to being a practical reality. I began to realize this after reading an item entitled "Hewlett-Packard Introduces High-Resolution Optical Reflective Sensor" (November 1979 BYTE, "What's New" column), which announced the production of the HEDS-1000 integrated high-resolution sensor.

I waited, expecting a complete and relatively simple "scanning wand" that would be suitable for reading bar-codes. Confirmation was given on the cover of the April 1980 BYTE—Hewlett-Packard announced the HEDS-3000 Digital Wand, a fine product for those who can afford to spend \$99.50. While the price is fair, as a graduate student on a fixed budget I sought a less expensive bar-code reader.

As an alternative, I constructed a homebrew bar-code scanner, based on the HEDS-1000 sensor. The do-it-yourself scanner is reliable, easily constructed, and, best of all, costs about \$35 (including the \$29 sensor). For those who are willing to spend time, rather than money, it represents a practical alternative to the preassembled units.

The HEDS-1000 optoreflexive sensor is the eye of the scanner. Hewlett-Packard has incorporated a 700 nm (nanometer) light source, a

photodiode detector, and the necessary focusing optics to detect *reflecting* and *absorbing* characters in a single package. As a bonus, the unit also includes an NPN transistor that can be optionally wired as a first single-stage high-gain amplifier. The internal connection diagram of the HEDS-1000 is illustrated in figure 1.

The only other operational requirement in addition to some elementary op-amp (operational amplifier) interfacing is that the

distance between the front of the sensor and the printed page be kept at approximately 4.34 mm (0.171 inch). When set at this distance the sensor is capable of resolving a 0.190 mm (0.075 inch) spot size, which is less than half the width of a normal bar-code unit. Significant departure from this setting results in loss of resolution and, if taken to extremes, complete loss of detection.

In addition to these technical requirements, the sensor should be housed in a body that fits comfortably in the human hand, is easy to construct, and is (of course) inexpensive. I decided to use the body of a ball-point pen. The "fat pens" produced by a couple of manufacturers are an ideal choice. I selected the Schaefer No Nonsense pen for the wand because it provided a sufficient amount of room in the tip. Its barrel is in two pieces that screw together, and when not in use, the screw-on cap makes an excellent protective cover for the sensor.

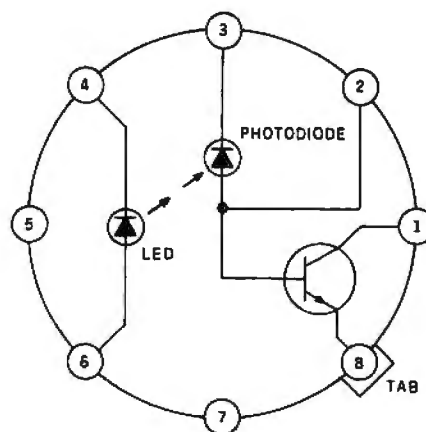


Figure 1: Pin arrangement of Hewlett-Packard's HEDS-1000 optical reflective sensor. A light-emitting diode, photodiode, NPN transistor, and focusing optics are combined in this single package.

Construction

The first step in construction involves disassembly and modification of the pen barrel. At the top of the pen is a spring, which is easily removed by drilling out from the top side. This modification becomes useful later, as it allows the scanner

dBASE II

Written in assembly language (no host language required). dBASE can handle up to 65,000 records of 32 fields and 1000 bytes each. Reads existing ASCII files. Can be run interactively or can be programmed to produce reports.

List Price: \$700.00

Microhouse Price: \$628.00/\$50.00

WORDSTAR™

New version 3.0 features horizontal scrolling and column moves.

List Price: \$495.00

Microhouse Price: \$319.00/\$40.00

SPELLSTAR™

New option for WordStar. Compares words in your text to its 20,000 word compressed dictionary. Then returns to WordStar for correction of errors. Expandable dictionary. Requires WordStar Version 3.0 (If you have another version, call for details on updates.)

List Price: \$250.00

Microhouse Price: \$165.00

SPELLSTAR™ for APPLE

List Price: \$170.00

Microhouse Price: \$145.00/\$25.00

MAILMERGE™

Option for WordStar. (Requires current version of WordStar. Call for details)

List Price: \$150.00

Microhouse Price: \$105.00/\$25.00

WORDSTAR TRAINING MANUAL

Provides sixteen sequential lessons on the operation of WordStar™ and options.

List Price: \$20.00

Microhouse Price: \$18.00

SUPERSORT™ I

List Price: \$250.00

Microhouse Price: \$170.00/\$40.00

DATASTAR™

List Price: \$350.00

Microhouse Price: \$245.00/\$40.00

WORDSTAR™ CUSTOMIZATION

Package includes diskette and manual. Specify disk format.

List Price: \$150.00

Microhouse Price: \$95.00

WORDSTAR™ for Apple.

List Price: \$375.00

Microhouse Price: \$245.00/\$40.00

SUPERSORT™ for APPLE

List Price: \$200.00

Microhouse Price: \$130.00/\$40.00

APPLESOFT™ COMPILER

List Price: \$200.00

Microhouse Price: \$167.50

MAILMERGE™ for APPLE

List Price: \$125.00

Microhouse Price: \$85.00/\$25.00

TCS/Atlanta

INTERACTIVE ACCOUNTING SYSTEM for small businesses. Ver. 5.0. Each package can be used alone or post automatically to the General Ledger.

Price listed is per package. General Ledger, Accounts Receivable, Accounts Payable, and Payroll packages available. Call for details on new Order Entry & Inventory packages. ALSO AVAILABLE FOR APPLE II. Requires Basic 80 vers. 5.x

List Price: \$530.00

Microhouse Price: \$75.00/\$25.00

ALL FOUR TCS PACKAGES

(compiled) Each module \$79.

List Price: \$530.00

Microhouse Price: \$269.00/\$90.00

TELEVIDEO 950

List Price: \$1195.00

Microhouse Price: \$975.00

TELEVIDEO 910 TERMINAL

List Price: \$699.00

Microhouse Price: \$595.00

ANADEX DP9000

List Price: \$1343.75

Microhouse Price: \$1330.00

ANADEX DP9001

List Price: \$1343.75

Microhouse Price: \$1330.00

ANADEX DP9500

List Price: \$1650.00

Microhouse Price: \$1350.00

ANADEX DP9501

List Price: \$1650.00

Microhouse Price: \$1350.00

NEC PC-8023A

Bidirectional logic-seeking dot matrix printer. 100 characters per second. 7x9 matrix for English characters, 8x8 matrix for graphics and dot graphics. Fixed or proportional spacing.

Descenders on lower case letters. Parallel only.

List Price: \$795.00

Microhouse Price: \$695.00

C ITOH STARWRITER I

Letter-quality printer uses Diablo plastic printwheels and ribbons. 25 cps bidirectional, logic-seeking. Parallel interface.

List Price: \$1895.00

Microhouse Price: \$1431.00

C ITOH STARWRITER I

Serial Version

List Price: \$1960.00

Microhouse Price: \$1502.00

DIABLO 630

Letter-quality printer uses plastic and metal printwheels. 40 cps, bidirectional, logic-seeking. Optional tractor: \$225.

List Price: \$2810.00

Microhouse Price: \$2099.00

MORROW DISCUS 2D

8 inch single-sided double-density floppy disk drive subsystem. Includes CP/M™ and MBASIC.

List Price: \$1095.00

Microhouse Price: \$925.00

MORROW HARD DISK SUBSYSTEM

10 Megabyte. Includes S-100 controller card, CP/M™, and enclosure.

List Price: \$3695.00

Microhouse Price: \$3059.00

SCITRONICS REALTIME CLOCK

For Apple II. Crystal controlled (.002% accuracy) with lithium battery on board to guard against power interruption.

List Price: \$109.00

Microhouse Price: \$98.10

NOVATION AUTO CAT MODEM

List Price: \$249.00

Microhouse Price: \$222.00

NOVATION D CAT MODEM

List Price: \$199.00

Microhouse Price: \$162.00

MICROSOFT APPLE SOFTCARD

Regular Microhouse price \$305.00. Save when purchased with MicroPro's WordStar for Apple or TCS/Atlanta Accounting System. Includes CPM™ and MBASIC.

List Price: \$349.00

Microhouse Price: \$290.00

Software & Manual/Manual Only

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

CP/M is a registered trademark of Digital Research. APPLE are registered trademarks of Apple Computers Inc.

WORDSTAR, DATASTAR, MAILMERGE, SPELLSTAR, and SUPERSORT are registered trademarks of MicroPro International.

SHIPPING: Add \$5 per manual or software package. Add \$2.50 for COD orders. Call for shipping charges on other items. Pennsylvania residents add 6 per cent sales tax.



P.O. Box 498
Bethlehem, PA 18016
(215) 868-8219

**Software:
Check This.**

**Applesoft
BASIC COMPILER**

\$167.⁵⁰

**Hardware:
Good Printers.**

**ANADEX
DP9500 OR 9501
\$1350**

Microhouse™
SAVINGS FOR YOU!

cable to exit from the top. Select a drill bit that will allow one half of a grommet to be inserted and glued into

the barrel top. Slightly lower on the side of the barrel, drill a hole of similar size for the other half of the

grommet, in which will be placed an LED (light-emitting diode). These modifications are shown in figure 2a. Although the indicator LED is optional, it does provide a convenient monitor of the wand's operation.

A critical design factor is the number of conductors in the scanner cable. My scanner employs a five-conductor cable, which permits all interfacing to be done externally from the wand. This could have been reduced to four conductors had I placed the HEDS-1000 LED current-limiting resistor (R1) inside the barrel. In fact, I did try to place the entire circuit within the pen barrel, but it was obvious that a short circuit between pin 6 and a positive power-supply terminal was a strong possibility with such a crowded arrangement. (Burning out the LED within the sensor makes the sensor little more than an expensive phototransistor.)

If you are limited to a three-conductor cable, I suggest you eliminate the barrel-mounted indicator LED and move R1 inside the barrel. By keeping the rest of the circuitry outside of the barrel, the circuit can easily be fine tuned.

Modifications to the pen tip are shown in figure 2b. The simplest way to make a clean cut, perpendicular to the pen's axis, is with a small tubing cutter. Although not absolutely critical, the cut should be made about 2.5 cm (1.0 inch) from the tip end. This will insure that enough of the threaded part of the tip remains to securely hold the sensor while permitting adjustment of the sensor-to-reflector distance. After cutting, the threaded end of the tip should be carefully drilled out so the sensor can be pressed in snugly.

Again, it is important that the distance from the sensor's front surface to the tip's cut face be kept at approximately 4.34 mm (0.171 inch). I found this easiest to do by making a calibration cylinder exactly 4.34 mm long, which fits inside the tip opening. The diameter of the cylinder must be large enough to make contact only with the sensor's metal can, and it must not obscure the transparent filter. Successively lapping the end of

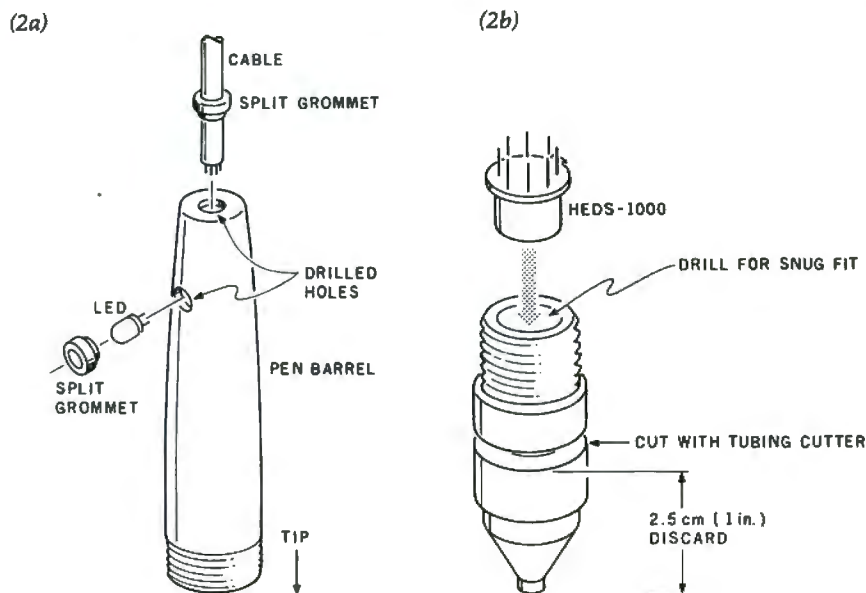


Figure 2: Modifications made to Schaefer No Nonsense pen barrel. With contents removed, the pen becomes a home for the HEDS-1000 sensor. The cable and indicator LED are affixed to the pen barrel (2a), while the sensor is mounted to the pen tip (2b).

VT 100 Owners:

THE KEY TO FAST AND EASY EDITING (OF YOUR KED EDITOR)



INTRODUCING VT 100 KEYS FOR THE KED EDITOR... These quality 3-color keys will make editing faster and simpler. They're easy to install—no overlays—just pull out the old keys and push in a new set with the KED functions clearly stated. A set of 18 3-color keys — \$40.

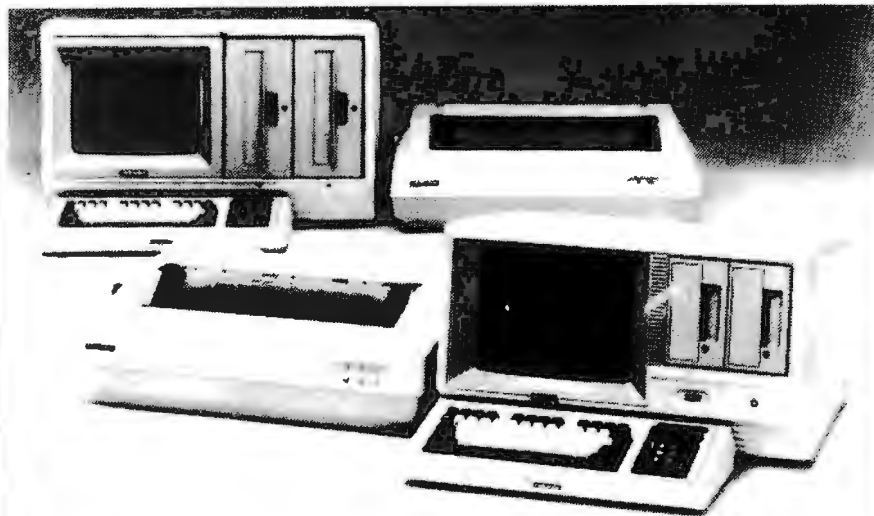
SynTronics

4 Frost St./Cambridge, MA 02140
(617) 739-7710

INTERNATIONAL

Price Performance Reliability

← **DETACHABLE INSERT**



**CMC IS MEETING TODAY'S
HIGH STANDARD OF
EXCELLENCE WITH TOSHIBA,
CMC'S OWN SUPERFIVE, A
5-MBYTE MICROCOMPUTER
AND OTHER FINE PRODUCTS**

TOSHIBA DESKTOP COMPUTERS

CMC International offers dealers the new Toshiba computer line, CP/M®-based micros with lots of flexibility...your choice of one or two drives, either 5¼ or 8 inch. Toshiba computers come with C/PM, Microsoft Basic80 and CBasic®. We're proud to offer a system with day-in, day-out dependability, backed by one of the world's largest electronics manufacturers. And, we offer a comprehensive dealer program including parts and module inventory, and prepaid freight for warranty repairs (if you ever need it).

T-200 64k RAM, 80x24 12" green phosphor screen, complete with CP/M, M Basic80 and CBasic.

| | |
|--------------------------|---------------------------|
| Model 1 | Model 2 |
| 1 5¼" 280k Disk Drive | 2 5¼" 280k Disk Drives |
| List \$3995 | List \$4495 |

ALSO DISTRIBUTING

- Corvus
- NEC
- Dysan
- Epson
- Verbatim
- Tandon
- Seagate
- MPI
- Superbrain
- CompuStar
- C.Roh
- MicroPro
- Accounting Plus
- Peachtree
- dBase II

T-250 64k RAM, 80x24 12" screen, complete with CP/M, M Basic80 and CBasic.

| | |
|---------------------------|---------------------------|
| Model 3 | Model 4 |
| 1 8" 1mbyte Disk Drive | 2 8" 1mbyte Disk Drive |
| List \$4495 | List \$5495 |

YOUR STOCKING DISTRIBUTOR



A Division of Computer Marketing Corporation

INTERNATIONAL

EXCELLENT DEALER DISCOUNTS

To Order Call Toll Free
1-800-426-2963

11058 Main, Suite 125 Bellevue, WA 98004

PHONE (206) 453-9777 TELEX: 152 556 SEATAC

← **DETACHABLE INSERT**

New Software from CompuView



MicroCraft Systems, Inc. Apple Software Development Tools

MicroCraft offers the Apple user a flexible set of development tools. This includes a low-cost full screen editor, the most powerful 6502 Macro Assembler available, and a compiled graphics language optimized for real-time applications. Each package compliments any Apple system and together they offer unequaled power and versatility.

RGL Real-time Graphics Language

Do real-time animation • Similar to 'C' • Display, move and rotate 3D objects • Compiles text files to 'BRUN'able binary object files. **\$75 / \$25 Until 10/31/81**

MacroLink Complete 6502 Assembler

Disk Assembler • Text to binary object • Standard 6502 mnemonics • Recursive macros with up to 10 arguments • Nestable conditional assembly • Links source or object code • Nestable file includes • Unlimited source file size • Editor provided **\$125 / \$20**

SuperEdit Full Screen Editor

Horizontal scrolling allows 80 columns • Uses standard text files • Move cursor by character, line or page • Find, search and replace • Block move and copy • Use with RGL or MacroLink • 80 column video board versions also available. **\$75 / \$20**

DiskScreen Disk Utility

Displays a complete disk sector in hex and ASCII, using high-res screen • Edit sector by typing over display **\$40 / \$10**

Complete Assembler System [MacroLink, SuperEdit, DiskScreen] **\$200 / \$40**

Complete Graphics System [RGL, SuperEdit] **\$120 / \$40**

Systems available to utilize extra 16K or 32K expansion boards **Please inquire**

Note: All programs require a single disk drive and 48K. When ordering please specify configuration.

Circle 106 on inquiry card.

Telephone (313) 996-1297

8086 Software

- VEDIT full screen editor for CP/M-86.
- Contact us for availability of VEDIT for SCP 86-DOS and IBM 8088 computer.
- CP/M-86 BIOS for popular S-100 disk controllers. **Source code \$185**

V-COM Disassembler

Finally a Z-80 disassembler for CP/M which produces easy to read code, a cross reference table, and handles INTEL and ZILOG mnemonics. V-COM is exceptionally fast and produces a .ASM file directly from a .COM file. V-COM can accept a user-created file containing assignments of labels to 8 and 16 bit values. A second file can specify the location of tables and ASCII strings. **\$80**

FASTSCREEN CRT emulation and Command Line Editor

Memory mapped displays offer over ten times the speed of the fastest CRT terminal but are usually not supported by application software. This is where FASTSCREEN fits in. FASTSCREEN provides a fast and highly compatible emulation of several popular CRT terminals for most memory mapped displays. It also provides editing and re-entry of any line on the screen, paging, and includes interrupt driven keyboard routines. (FASTSCREEN is provided as source code on a CP/M compatible diskette and requires assembly language modifications for installation.) **\$85**

PIICEON 24 x 80 S100 Video Board

The PIICEON V-100 is the heart of a high speed alternative to a CRT terminal. Being I/O mapped, it uses no memory space, yet runs at full processor speed. FASTSCREEN is the perfect software driver for the V-100. Fully assembled and tested by PIICEON, the company known by OEMs for reliability.

PIICEON with FASTSCREEN **\$510**
PIICEON board only **\$475**

Circle 107 on inquiry card.

CompuView is proud to carry the MicroCraft Systems, Inc. quality software for the Apple II.

CompuView Products Inc.

618 Louise, Ann Arbor, Michigan 48103 • Telephone (313) 996-1299

Customizable

*The Unique Difference that Sets
VEDIT Apart in Full Screen Editors*

Total user customizability is a predominate reason that over a thousand users find VEDIT the easiest to use full screen editor. It makes VEDIT the only editing package which allows you to determine your own keyboard layout and use the cursor and special function keys on any terminal having them. And only VEDIT fully supports all of the newly available terminals. It may come as a surprise to you, that with any other editor or word processor, you will have to memorize obscure control characters or multi-character sequences, while your terminal's extra keys and editing functions go unused. The customization extends to setting the default tab positions, scrolling methods and much more. It's almost like designing your own editor for your system, applications and preferences. And all of this is easily done with the setup program which requires no programming knowledge or 'patches', but simply prompts you to press a key or enter a parameter.

Unequaled Hardware Support

The CRT version supports all terminals by allowing you to select during setup which terminal VEDIT will run on. Features such as line insert and delete, reverse scroll, status line and reverse video are used on 'smart' terminals. All screen sizes are supported, including large ones such as the 60 X 80 format on the Ann Arbor Ambassador terminal. Special function keys on terminals such as the Heath H19, Televideo 920C and IBM 3101, and keyboards producing 8 bit codes are all supported. The memory mapped version is extremely flexible and supports bank select and hardware cursors such as on the SSM VB3. With this level of customizability and hardware support, you will feel for the first time that the software was optimally designed for your system.

Fully Compatible Replacement for Ed

Since VEDIT creates and edits standard text files of up to one diskette in length, it serves as a replacement for the CP/M

standard editor ED. Of course, you benefit from the fastest and easiest to use 'What you see is what you get' type full screen editing available, fast disk access and an editor which takes up only 12K of your valuable memory space. With VEDIT you will never again need or want to use the slow and tedious ED.

Special Features

VEDIT is more than just a full screen editing replacement for ED, it gives you many new editing capabilities, such as a scratchpad buffer for moving and rearranging sections of text, complete file handling on multiple drives and iteration macros. Among its special features you will find automatic indenting for use with structured programming languages such as Pascal and PL/I, and other special facilities for Assembler and COBOL. A real time saver is the ability to insert a specified line range of another file anywhere in the text. Unlike most software, VEDIT will even tolerate your mistakes. For example, one key will 'Undo' the changes you mistakenly made to a screen line, and the disk write error recovery lets you delete files or insert another disk should you run out of disk space.

Ordering

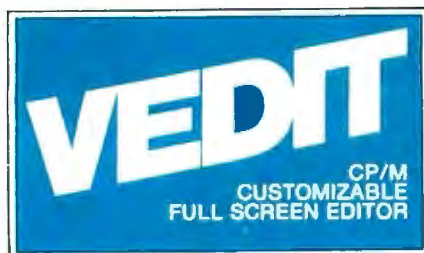
Many dealers carry VEDIT, or you may contact us for fast delivery. Specify the CRT version, your video board or microcomputer, the 8080, Z80 or 8086 code version, and disk format required.

VEDIT for 8080 or Z80: Disk and manual\$130
VEDIT for CP/M-86: Disk and manual (NEW)\$185
Manual: Price refunded with software purchase \$15

VISA or MASTERCARD Welcomed

CP/M and MP/M are registered trademarks of Digital Research, Inc. Apple II is a registered trademark of Apple Computer, Inc. SoftCard is a trademark of Microsoft. TRS-80 is a trademark of Tandy Corp.

- North Star • Cromemco • Heath H8/H89 • SuperBrain • Apple II Softcard • TRS-80 Model II E, Model I
- Most other CP/M Systems with CRT or Memory Mapped Displays • MP/M • CP/M-86



CompuView Products Inc.

618 Louise, Ann Arbor, Michigan 48103 • Telephone (313) 996-1299

RCA's remarkable new VP-3303 Interactive Data Terminal turns any home TV into a videotex display unit.

Now you can connect your family to the whole informative and entertaining world of CompuServe, The Source, Dow Jones News/Retrieval and other time-sharing and data-base networks.

All you need is our VP-3303, a modem and a modem cable, a telephone and your home TV.

You can get instant access to regional newspapers and newsletters ... weather reports and sports results ... computer games and more. You can use the VP-3303 to make airline reservations ... find restaurant recommendations in cities around the world. Plus stock market and corporate data. Or access your school or business computer. You can even send electronic mail and buy products.

What you have working for you is a versatile, feature-packed interactive data terminal which can be worth far more to you than its low price. Its unique color-locking circuitry gives you sharp color graphics and rainbow free characters. You get 20- and 40-character formats in one of eight colors and separate color backgrounds. The spill-proof, easy-to-clean keyboard is highly suitable for hostile environments. And the light touch

membrane keyboard switches give you a natural feel. With reverse video, you can emphasize certain letters, words or sentences. A built-in tone generator ... plus a white noise generator ... let you create everything from the sound of explosions to the sound of music.

The RCA VP-3303 is complete with both RS232C and 20mA current loop interfaces. It has six baud rates, eight data formats and ASCII encoding ... versatility that allows you to connect directly to a computer, as well as time-share.

The RCA VP-3303 is truly a fine videotex terminal. And don't forget, it's made by RCA ... the first name in television ... now the foremost name in videotex terminals.

See a demonstration of the new RCA VP-3303 at your local computer or electronics dealer, or order direct from RCA, toll free or by mail.

Order now ... only \$389.00 (Suggested user price.) For more information call toll free. **800-233-0094**. In Pennsylvania, call 717-393-0446. Visa or MasterCard holders may order by phone. Or send a check including \$3 delivery charge per unit plus your local sales tax.

PRIME TIME-SHARING.

a suitable piece of aluminum rod over fine emery paper will quickly achieve the required height.

Before seating the sensor at this distance with a small drop of epoxy, the small indexing tab above pin 8 must be removed so that the tip assembly can be threaded into the barrel. Careful filing does the trick. The leads should also be trimmed to guard against electrical shorting after assembly.

At this point, all that remains is to solder the cable leads and complete final assembly. In addition to soldering the cable connections on the sensor, solder a wire between pins 4 and 8 and extend it another 10 cm (4 inches). This is the ground lead for the side-mounted LED. Carefully screw the tip assembly into the barrel while rotating the cable with the tip assembly. This is easier to accomplish with two people: one holds the cable and tip assembly, the other turns the barrel.

Fish the indicator LED's ground and cable lines through the side hole and half-grommet and solder them to the LED's shortened leads. Place a small drop of epoxy on the LED and half-grommet and press them into the side hole from the outside. The scanning wand is now complete. The finished product, with calibration cylinder, appears in photo 1.

Sensing Circuit

As shown in figure 3, the circuitry to make the sensor's output TTL-(transistor transistor-logic) compatible requires only two integrated circuits. Three op amps in the LM324 packages handle amplification and comparative functions, while the 7413 NAND Schmitt trigger "cleans up" the sensor's output by only passing pulses above a threshold voltage. To stabilize the common-collector circuit using the sensor's NPN transistor, a 15 pF capacitor and 1 megohm resistor are put in parallel with the transistor. Nominal outputs at this stage are approximately +3.2 V for a light-absorbing surface (black) and +1.7 V for a reflecting surface (white). These values can be adjusted by varying resistor R10.



New Holland Avenue, Lancaster, PA 17604

Amdek

From picture perfect.

To letter perfect.



Amdek
Color-I
FCC/UL approved



Amdek
Video-300

At Amdek, we make monitors for people who demand state-of-the-art color. And for people who know that crisp, clear text display is an art in itself.

Our versatile Color-I 13" video monitor features standard NTSC composite input, front-mounted controls and a built-in speaker with audio circuit. Our popular Video-300 12" Green Phosphor monitor has an easy-to-read, non-glare screen, 18 MHz band width and 80 x 24 character display.

Both offer easy portability, with lightweight cabinetry and molded-in handles. And both are fully

compatible with most computer and word processing systems. So compare our performance with other monitors. Then compare prices. For quality and value, you'll choose Amdek.

NEW THIS FALL: our advanced high resolution Color-II monitor with interface board for Apple II compatibility. Color-II features RGB, TTL input and 560(H) x 260(V) resolution for crisp 80 x 24 character display and exceptionally sharp color graphics. Ask your dealer about an Amdek Color-II, Color-I, or Video-300 monitor today.

AMDEK

2420 E. Oakton Street, Suite "E," Arlington Heights, Illinois 60005 (312) 364-1180 TLX: 25-4786

Come see our complete line of color, green phosphor and black/white monitors at the COMDEX Show (Booth 386-8) in Las Vegas, November 19-21.

Circle 19 on inquiry card.



Photo 1: Author's bar-code scanning wand. The wand is based on Hewlett-Packard's HEDS-1000 optical reflective sensor (the metal can with eight pins), and a Schaefer No Nonsense ball-point pen. The calibration cylinder appears at the right of the HEDS-1000 module.

The signal is fed to the inverting input of one of the LM324's op amps, which is configured as a comparator. The amplifier's other input receives a reference voltage set through the voltage divider of R3 and R4. The divider network should be adjusted so that this input to the amplifier is about +2.5 V, which will ensure that the scanner produces on and off pulses approximately equal in length (while scanning equally sized absorbing and reflecting characters).

The output of the first op-amp stage is coupled to the inverting input of the second op-amp comparator, which drives the scanner's LED. The first stage's output is also sent to a voltage follower-connected op amp that drives a NAND Schmitt trigger. Besides functioning as an inverter, the Schmitt trigger provides a sharp output that is filtered by the 1000 pF capacitor. Although the addition of this capacitor does cut down on response time when scanning at extremely high rates, it poses no problem for practical hand scanning.

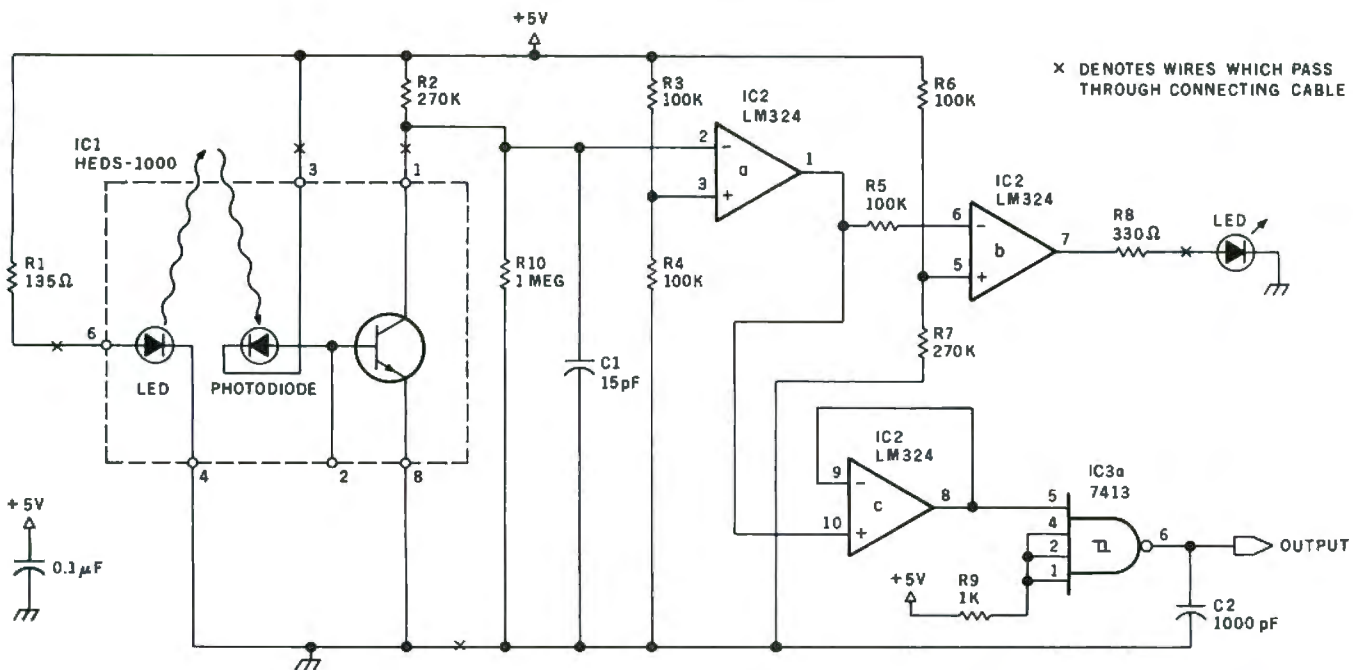


Figure 3: Schematic diagram of the circuit to make the sensor's output compatible with transistor-transistor logic. The sensor's integral NPN transistor is connected as an amplifier/driver. One section of an LM324 quad-operational amplifier is connected as an inverting comparator. The output of this stage is fed to the indicator LED (mounted on the pen barrel) through a second amplifier section. The signal also goes to a voltage-follower-connected op amp that drives a Schmitt-trigger NAND gate. The NAND gate's sharp output pulse is filtered with a 1000 pF capacitor.

| Number | Type | + 5 V | GND |
|--------|----------|-------|-----|
| IC1 | HEDS1000 | | |
| IC2 | LM324 | 4 | 11 |
| IC3 | 7413 | 14 | 7 |

897 N.W. Grant Ave. • Corvallis, Oregon 97330

THE DAWN OF A NEW ERA FOR APPLE II: THE ENHANCER II

Introducing the Enhancer II: a new Standard which is improving the relationship between Humans and Apples. The Enhancer II can help your Apple II's keyboard become more sociable by remembering words or phrases which can be entered into the Apple by the mere touch of a key. Life can become even easier because the Enhancer II can remember what you typed while your Apple was busy talking to your disc (or doing other things). Naturally, it knows the difference between upper and lower case letters and what shift keys are supposed to do. It even knows to auto repeat any key held down. The Enhancer II replaces the encoder board making installation simple.

Suggested retail price: \$149.00.



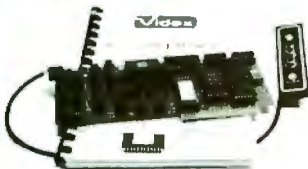
See Us At

COMPEX '81

November 19-22, 1981 / Booth No. 1618

Las Vegas Convention Center, Las Vegas, NV

VIDEO TERM



The time tested Videoterm 80 column card:

- 80 characters x 24 lines
 - True decoders
 - 7 x 9 character resolution
 - Low power consumption
 - Compatible with most word processors
 - Softcard and CP/M compatible
 - Modem compatible
 - Most popular character set of any 80 column card
 - Alternate character fonts available
- Suggested retail price \$345.00

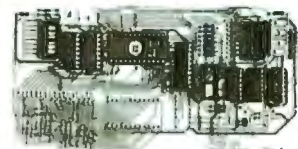
SOFT VIDEO SWITCH

The Soft Video Switch is an automatic version of the popular Switchplate. It knows

whether it should display 40 or 80 columns or Apple graphics. It does the tedious work of switching video-out signals so you don't have to. The Soft Video Switch can be controlled by software. Any Videoterm with Firmware 2.0 or greater may be used with the Soft Video Switch. The single wire shift mod is also supported. Package price is \$35.00.



KEYBOARD AND DISPLAY ENHANCER



The original Keyboard and Display Enhancer is still available for Revision 0-6 Apples (on which the new Enhancer II will not fit). These Apples have memory select sockets at chip locations D1, E1 & F1. The Keyboard and Display Enhancer allows entry and display of upper & lower case letters with fully functional shift keys. It does NOT have user definable keys nor a type ahead buffer. The price is \$129.00.

ACCESSORIES:

Videoterm Utilities Disc \$37.00 (includes)

- Font Editor
- Pascal Mid-Res Graphics
- Applesoft Read Screen Utility
- Top & Bottom Scrolling
- Pascal Vidpatch
- Graphics Template

Character Set EPROMs \$29.00 ea

- Half Intensity
- Inverse
- German
- Katakana (Japanese)
- Line Drawing Graphics (Expanded)
- Spanish
- French
- Math & Greek Symbols
- Super & Subscript

Dvorak EPROM (Enhancer) \$29.00
Lower Case Chip \$29.00

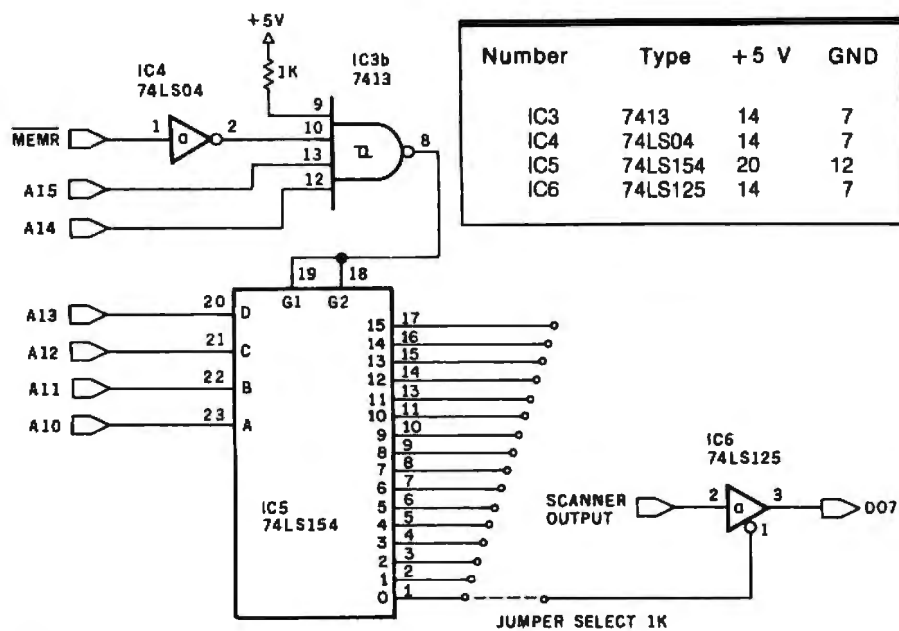


Figure 4: Memory-mapped interface to the signal bus of a microcomputer. The decoding circuitry will gate the bar-code scanner's output onto the data bus whenever an address within the selected 1 K-byte space is accessed by a memory-reference instruction. In this arrangement, the 1 K-byte space resides somewhere in the top 16 K bytes of the address space. (This interface is compatible with the software presented in Ken Budnick's book *Bar Code Loader*.)

That's all there is to making a simple bar-code scanner. The circuit in figure 4 illustrates an extremely simple interface to an 8-bit microcomputer bus. The signal from the wand's output is gated onto the computer's data bus through a memory-mapped addressing scheme. The wand's output will be available when a memory-reference instruction is executed addressing a 1 K-byte block anywhere in the top 16 K bytes of address space (the specific block is selected by a jumper connection). The high-order bit on the data bus receives the signal.

Ken Budnick's book *Bar Code Loader* (available from BYTE Books) contains bar-decoding programs for the 8080, 6800, and 6502 microprocessors which read the high-order data bit. Due to their simplicity, the routines can be easily modified to work in almost any system.

One comment should be made concerning this software. Even on my slow 2.048 MHz 8080A-based system, I found it was impossible to scan fast enough to keep the counting register from timing out (the register exceeded the counting limit of 255). By adding a DCR...JNZ (decrement register...jump on not zero) loop in the input scanner sections of the software, I solved the problem. I suspect that similar changes will have to be made to the software for other systems. Note that the addition of this time-killing loop does not result in a significant reduction in practical hand-held scanning speeds—I accurately and reproducibly scan at more than 25 cm (10 inches) per second.

Bar codes represent a reliable and convenient method of mass-distributing digital information. Hewlett-Packard's design and production of the HEDS-1000 sensor makes bar-code reading practical for me. Combining it with some simple interfacing has made printed software a reality. ■

The HEDS-1000 optical-reflective sensor can be ordered from Hamilton-Avnet, 1175 Bordeaux Dr, Sunnyvale CA 94086. Address orders to Sales Department.

LETTER QUALITY PRINTER

- DUAL USE. A PRINTER AND A TYPEWRITER
- SELF TEST PROGRAM BUILT IN

The BYTEWRITER is a printer consisting of a micro-processor controlled assembly internally connected to an SCM Coronamatic 8000 office typewriter.



\$795

OTHER FEATURES

- Back space.
- Parallel input.
- Pin compatible with TRS-80 expansion interface.
- Typewriter operation with nothing to disconnect.

TO ORDER

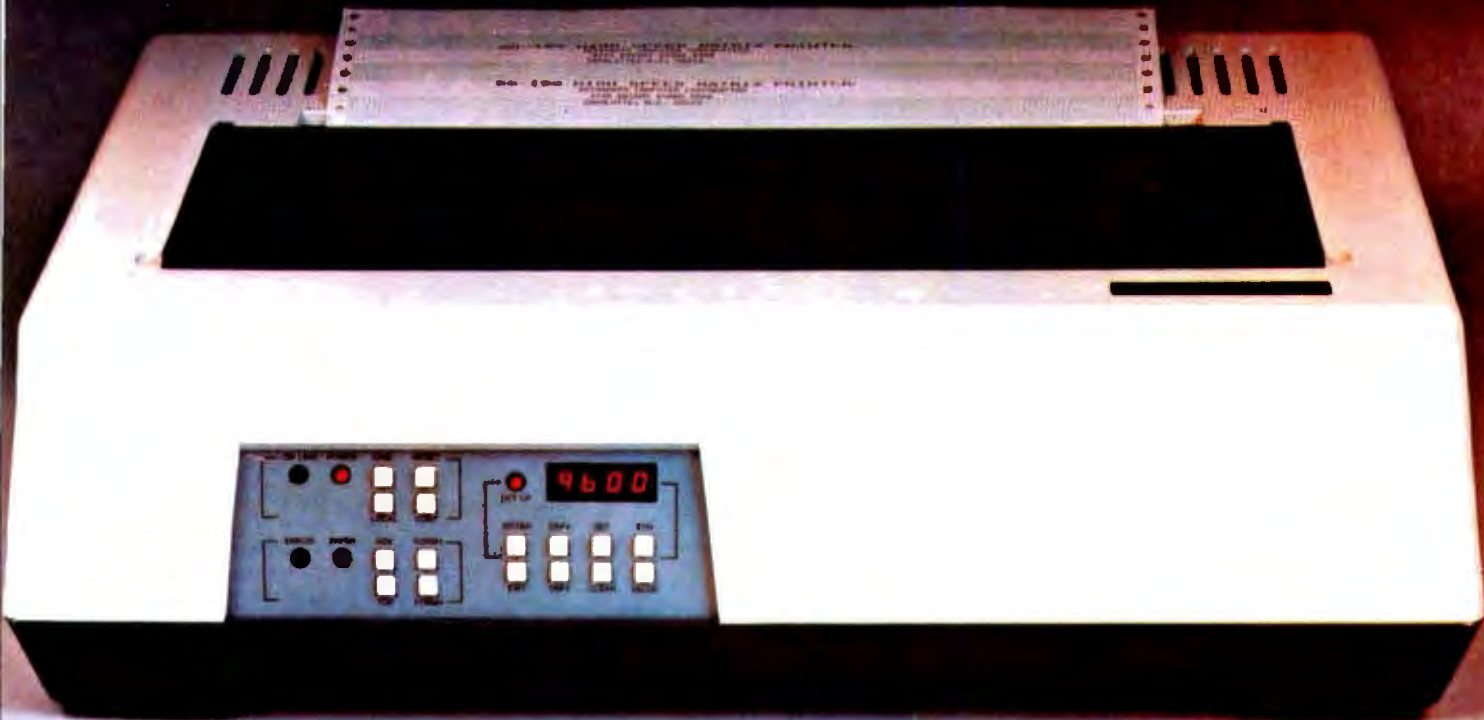
- Send certified check or money order.
- Personal checks take 2 weeks.
- We do not ship C.O.D.
- Add \$10 for shipping and handling in continental U.S.A.
- N.Y.S. residents add 7% sales tax.

BYTEWRITER

125 NORTHVIEW RD., ITHACA, N.Y. 14850
(607) 272-1132

SCM Coronamatic 8000 is a trademark of SCM Corp.
TRS-80 is a trademark of Tandy Corp.
BYTEWRITER is a trademark of Williams Laboratories

datasouth announces... **THE TOTAL PRINTER PACKAGE!**



With so many matrix printers on the market today, it may seem tough to find exactly the right one for your application. Some models may offer the speed you need, others the communications flexibility and still others the forms handling capability. But no printer offers all the features you need...until now.

The DS180 matrix printer provides the total package of performance features and reliability required for applications such as CRT slave copy, remote terminal networks and small to mid-range systems. Not a "hobby-grade" printer, the DS180 is a real work-horse designed to handle your most demanding printer requirements. And pricing on the DS180 is hundreds of dollars below competitive units.

High Speed Printing—Bidirectional, logic-seeking printing at 180 cps offers throughput of over 200 lpm on average text. A 9-wire printhead life-tested at 650 million characters generates a 9x7 matrix with true lower case descenders and underlining.

Non-volatile Format Retention—a unique programming keypad featuring a non-volatile memory allows the user to configure the DS180 for virtually any application. Top of form, horizontal and vertical tabs, perforation skipover, communications parameters

and many other features may be programmed and stored from the keypad. When your system is powered down, the format is retained in memory. The DS180 even remembers the line where you stopped printing. There is no need to reset the top of form, margins, baud rate, etc.... it's all stored in the memory. If you need to reconfigure for another application, simply load a new format into the memory.

Communications Versatility—The DS180 offers three interfaces including RS232, current loop and 8-bit parallel. Baud rates from 110-9600 may be selected. A 1K buffer and X-on, X-off handshaking ensure optimum throughput.

Forms Handling Flexibility—Adjustable tractors accommodate forms from 3"-15". The adjustable head can print 6-part forms crisply and clearly making the DS180 ideal for printing multipart invoices and shipping documents. Forms can be fed from the front or the bottom.

If you would like more information on how the DS180's low-cost total printer package can fill your application, give us a call at Datasouth. The DS180 is available for 30-day delivery from our sales/service distributors throughout the U.S.

See Us At
 **COMDEX '81**
November 19-22, 1981
Las Vegas Convention Center, Las Vegas, NV

datasouth
computer corporation

4740 Dwight Evans Road • Charlotte, North Carolina 28210 • 704/523-8500

The \$149⁹⁵ personal computer.



Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only \$149.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under \$200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in Interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only \$39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

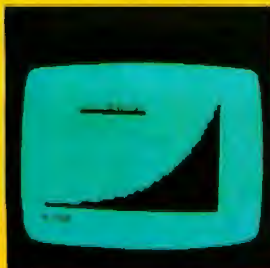
So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

Warranty and Service Program**

The Sinclair ZX81 is covered by a 10-day money-back guarantee and a limited 90-day warranty that includes free parts and labor through our national service-by-mail facilities.

**Does not apply to ZX81 kits.



NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than \$100.



16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is \$99.95, plus shipping and handling.



ZX81 MANUAL: The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A \$10.95 value, it's yours free with the ZX81.

The \$99⁹⁵ personal computer.

Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just \$99.95*. It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

How to order

Sinclair Research is the world's largest manufacturer of personal computers.

The ZX81 represents the latest technology in microelectronics, and it picks up right where the ZX80 left off. Thousands are selling every week.

We urge you to place your order for the new ZX81 today. The sooner you order, the sooner you can start enjoying your own computer.

To order, simply call our toll free number, and use your MasterCard or VISA.

To order by mail, please use the coupon. And send your check or money order. We regret that we cannot accept purchase orders or C.O.D.'s.

CALL 800-543-3000. Ask for operator #509. In Ohio call 800-582-1364. In Canada call 513-729-4300. Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your MasterCard or VISA ready.

These numbers are for orders only. For information, you must write to Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

sinclair



| AD CODE | PRICE† | QTY. | AMOUNT |
|---------|--------------------------------------|----------|--------|
| 11BY | ZX81 | \$149.95 | |
| | ZX81 Kit | 99.95 | |
| | 8K BASIC chip (for ZX80) | 39.95 | |
| | 16K Memory Module (for ZX81 or ZX80) | 99.95 | |
| | Shipping and Handling | 4.95 | \$4.95 |
| | To ship outside USA add \$10.00 | | |
| | TOTAL | | |

MAIL TO: Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

NAME _____

ADDRESS _____

CITY/STATE/ZIP _____

† U.S. Dollars

Reversal Othello for the Apple II

Mark Friedman
23 Forge Dr
Nashua NH 03060

"Winner of the software division of the First International Man-Machine Othello Tournament" is the declaration that catches your eye when you pick up the box. And if that's not intimidating enough to a casual game player, consider that Reversal is written by the Spracklens of Sargon chess fame. Is there any hope of winning? The answer is a most emphatic yes, depending on the level of play you select. At the same time, however, Reversal is capable of giving even the best player a tough run for the money.

The game is played on an eight-by-eight square board, and the object is to occupy more squares than your opponent. The game's rules are very simple: you place one piece on the board per turn and try to trap your opponent's pieces between your own; all pieces trapped become yours. It sounds simple, and, as any Othello player knows, it is . . . sometimes.

Reversal comes in the now standard Hayden Game-ware box, with a better-than-average instruction booklet and a registration card. The disk carries what seems to be its own operating system, as well as the game itself, and is, of course, both write-protected and "uncopyable." At least the few casual efforts I made to copy it failed. The registration card indicates that if your original disk becomes unusable in less than a year, it will be replaced free of charge. The instruction booklet, however, states that replacement will be free for 90 days, after which a copy will cost \$5.

Loading Reversal is simple, although a mention of its 13-sector status would make the first time even easier for those with systems that default to a 16-sector format. It

might also make you feel a little better if you were warned that several head initializations, with their usual clatter, are normal (at least they were on my system, with any drive I used). Once loaded, you are offered four choices: play a game against your Apple II; start a game with any given board layout; play against a fellow human; or exit from the program. Be forewarned that exiting delivers you into the hands of the Monitor program. You should also be aware that the instruction booklet is written in a tutorial style, which is fine for a first reading, but a table of available commands would make life easier a week later.

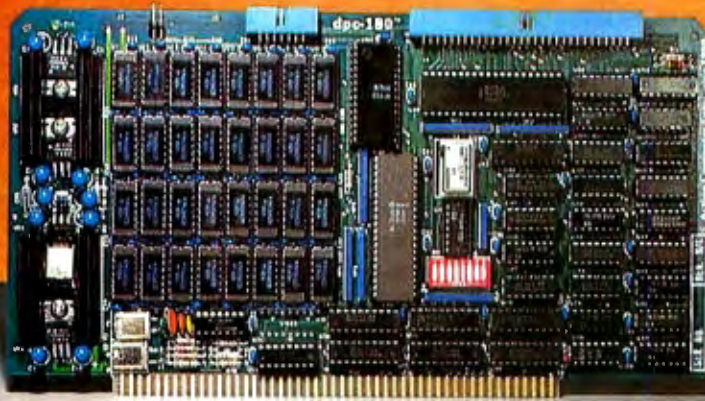
If you elect to play a game, you are asked several ques-

At a Glance

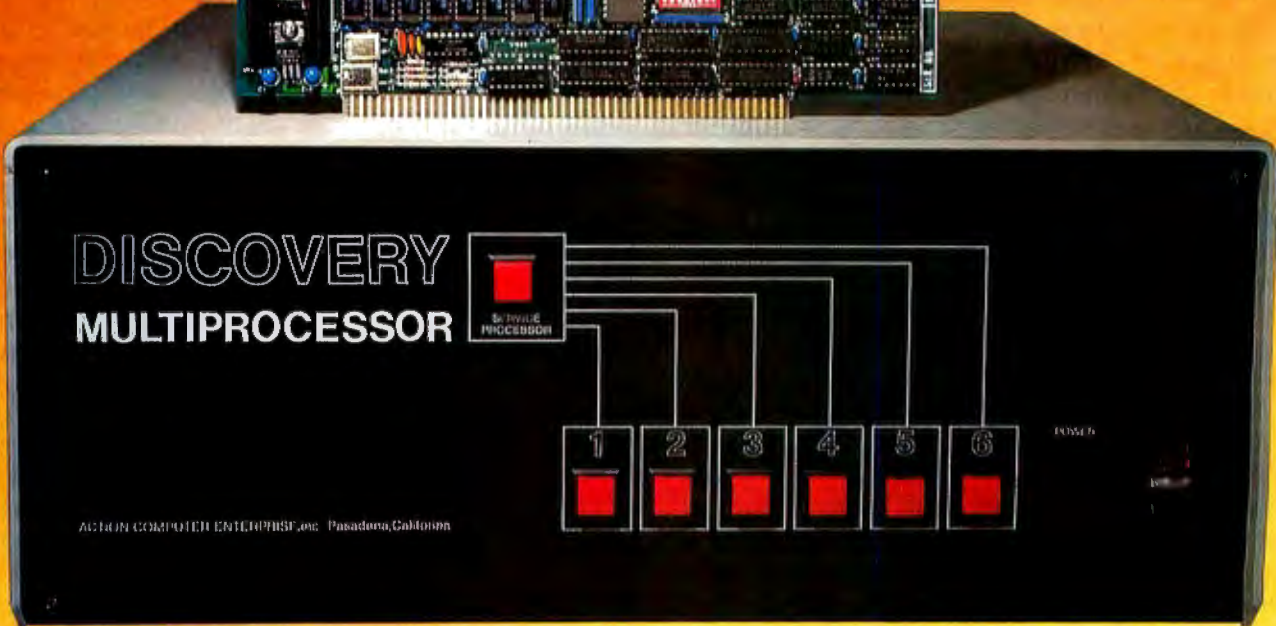
| | |
|---|--|
| Name Reversal | Apple floppy disk |
| Type High-resolution graphics game playing a version of Othello | Language Assembler |
| Manufacturer Hayden Book Company 50 Essex St Rochelle Park NJ 07662 (800) 821-3777 | Computer Apple II with at least 32K bytes of memory; tape or disk drive; video monitor or TV |
| Price \$29.95 tape; \$34.95 disk | Documentation 14-page booklet |
| Format Apple cassette or 5-inch | Audience Game enthusiasts of all ages, Othello enthusiasts in particular |

Othello is a trademark of CBS.

**This
Single
Board...**



**...is the Heart
of the
Microprocessor
World's
Best Multi-User
System ...**



THE DISCOVERY MULTIPROCESSOR

The dedicated power of this complete single board computer is provided to each user, making the DISCOVERY MULTIPROCESSOR unique among multi-user systems. With the power and expandability of distributed processing • With the economy of shared peripherals • With the flexibility of shared and public files • And all of this with full CP/M* and S-100 compatibility.

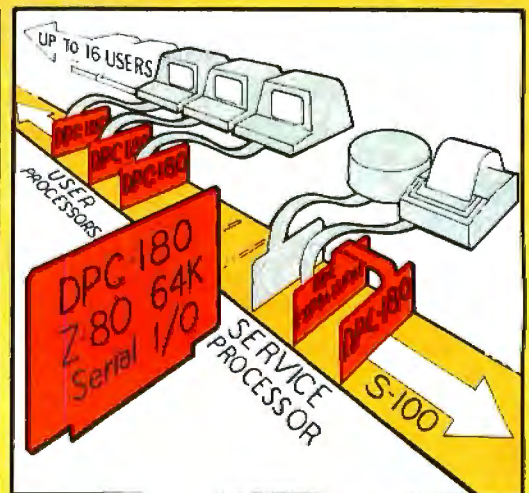
Multiprocessing Software Multiprocessing Hardware

Our Distributed Processing Operating System, **dpc/os**[®], resides in the Service Processor, establishing a CP/M environment for each user and managing access to the shared system resources. Multiuser facilities are provided for print spooling, for interprocessor communication and for private, public and shared-update files. Several processors can be employed concurrently by a single user via the enhanced batch submit facilities. And with **DISCOVERY** all CP/M compatible programs will execute without modification, thus protecting your software investment.

The ACE 64K Distributed Processing Single Board Computer, the **dpc-180**[™] gives the **DISCOVERY MULTIPROCESSOR** its own unique architecture. One DPC is dedicated to each user providing exclusive use of the onboard Z-80, 64K ram and serial I/O. Access to the shared resources is provided by an expanded DPC used as a Service Processor. Additional users can be added at any time by simply inserting additional DPC's, into the standard S-100 bus — up to a total of sixteen user processors in a single chassis!

*CP/M is a registered TM of Digital Research, Inc.

DISCOVERY has been proven in installations throughout the World. If you need the Power of Multiprocessing... it's time you discovered us!



The ACE **DISCOVERY MULTIPROCESSOR** dedicates a complete 64K Z-80 Distributed Processing single board Computer, the **dpc-180**[™] to each user. An expanded DPC coordinates all of the system activities.

Multiuser mainframes with 192K ram start at under \$6000. The 64K **dpc-180**[™] is priced at \$1395. Immediate delivery. A complete line of standard peripherals including a 26M byte hard disk subsystem can be supplied on request. Dealer and OEM inquiries are invited.

Action Computer Enterprise, Inc.
The Multiprocessing Company

55 West Del Mar Boulevard, Pasadena, California 91105 USA • Cable ACEPAS Pasadena • (213) 793-2440

tions. The first is which color, black or white, you wish to play. The two remaining questions determine the program's level of play. Your first decision is to select the level of strategy the program will use, with choices of beginner, intermediate, and advanced (advanced is billed as its championship level). Your last decision is how much time to allow the program to determine its next move. There are nine time levels, listed as ranging from 2.5 seconds to 30 minutes, providing a total of 27 playing levels for the program—more than enough to suit any level of player.

Be aware of two things while selecting the program's play level. The first is that the printed list of "approximate" response times is *very* approximate. Level 6, with a listed time of one minute, varied from just under a minute to almost three minutes during one game played at the advanced strategy level. The second detail is that while the strategy level you pick cannot change during a game, the response-time level can be changed at any time, making play even more flexible.

Reversal makes use of both the text and graphics displays during execution, showing the level of play and move list on the text page and the board itself on the graphics page. Toggling between the two displays is done with the ESC (escape) key, although once a game has started, I've found little need for the text display other than to record a game for posterity. Reversal makes good use of the Apple's graphics, with a couple of nice touches

like pieces that smile or frown depending on the score (when both sides are tied, they just stare at you). Should you find them distracting, the faces can be turned off.

Once you are looking at the game board, playing is as simple as it can be—at least the mechanics are. There is no need to memorize a list of board locations, as navigation is done with the cursor-control arrows. In addition, since the cursor will stop only on squares that represent legal moves, there is really no excuse for overlooking a possible move. Once you have found the square you would like to move to, just press Return. All trapped pieces will be flipped automatically, and the score, displayed on the sides of the screen, will be updated, as will the move list displayed on the text page. The program then begins its search for a suitable response.

Reversal is so easy to play that my five-year-old daughter was able to play her first game after five minutes of coaching. While her first game was a bit of a rout, she insisted on playing until she won, several times.

I tend to be a casual, rather than an aggressive, player, and my selection of playing levels reflected that. I got the most pleasure playing at the lower, faster-response levels, with a few highest-level (30-minute response) games thrown in for good measure. To compare the strategy levels, I played a series of games at each level. While I was able to win the majority of games at the beginner level, and half or more at intermediate, the advanced level was easily my match. In fact, one game played at

NOW!

NEW PRODUCTS!

NOW AVAILABLE FROM AUTOMATED EQUIPMENT

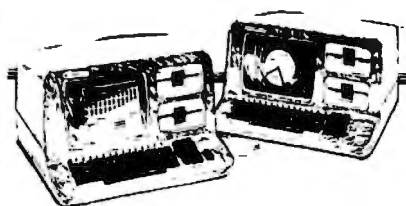
TELEVIDEO SYSTEM I

The Televideo System I is a CP/M® based single-user computer system. State-of-the-art design and single board construction accounts for Televideo's reliability and exceptional price performance. Cobal, Basic, PL/1 and Fortran are just a few of the high level languages available. As your needs grow so can your Televideo computer system. The System I can be a satellite computer of a larger network of user stations using the multi-processor multi-tasking System II or System III. System I includes TS-81 computer, Televideo 910 terminal (950 terminal available at additional cost) and CP/M® 2.2. Nation wide on-site service is available through General Electric service company.

System I specifications: Z80A, 64K Ram, 4K diagnostic Eprom, two 5" 360K drives, serial and parallel port.



CP/M® is a licensed product supplied by Digital Research, Inc.
See Televideo System Ad.



NORTHSTAR ADVANTAGE COMPUTER

The Northstar Advantage Computer is an integrated package including full graphics capability. Line charts, bar graphs, pie charts and 3 dimensional displays are all possible as part of Northstar's optional graphics/DOS operating system or CP/M® graphics package. All Northstar applications software is available for the Advantage Computer. Slots for 6 additional expansion cards are included

Specifications: Z80A CPU, 64K Ram, Green screen 12" monitor, 240 x 640 pixel graphics resolution, sculptured typewriter-like keyboard, two 5" 360K drives.

ZENITH

Zenith Data Systems with world famous quality and reliability are now available from A.E.I. The Z89 and Z90 are stand alone micro computers with a one piece design that simplifies installation and operation. With the board line of PeachTree accounting software and Micro-Pro word processing software the Zenith computers are the ideal small business systems. Heathkit/Zenith educational courses are available making the Zenith computer an excellent choice for the first time buyer.

Zenith specifications:

Z89—48K ram standard, Z80 cpu, 2 serial ports, built in 12" terminal, one 5" 100K drive, expandable.

Z90—64K ram standard, Z80 cpu, 2 serial ports, built in 12" terminal, one 5" 200K drive, expandable.



V.I.P.'s call A.E.I.

Because A.E.I. tests before shipping, has expertise on all items offered, and is price competitive.



AUTOMATED EQUIPMENT, INC.
18430 WARD STREET, FOUNTAIN VALLEY, CALIFORNIA 92708
See these products and a full line of peripheral equipment in our showroom.

(714) 963-1414
(800) 854-7635



“By expanding our potential, we help you expand yours.”

“As a Vector computer, I’d like to introduce you to the newest member of the Vector computer family: me!”

“I’m a Vector 5005 Multi-Share™ system, with all the intelligent, convenient characteristics of our 3005, and then some. I am a truly integrated word and data processing system, and I can stand alone or support up to a total of 5 terminals and 2 printers. I can be typing a letter, doing data entry, updating the general ledger, checking inventory, and doing a cash flow forecast on different terminals all *at the same time*.

“I use sophisticated, big computer error correction techniques for the security and integrity of your data. My advanced Winchester hard disk gives you 5 megabytes of storage for convenient, fast access to large amounts of information — without the inconvenience of changing floppy disks. In addition, I fit in equally well in small businesses (where the need is for perhaps 2 terminals) or in corporate environments (where I can be used as a multi-station word processor or comprehensive departmental machine).”

“For more information and your local dealer, call us at 800-423-5857. In California, call 800-382-3367. Or write to us at 31364 Via Colinas, Westlake Village, CA 91362.

“We Vector 5005s are here. Each time we get closer to our full potential, you get closer to yours.”

VECTOR
Vector Graphic Inc.

COMPUTERS FOR THE ADVANCEMENT OF SOCIETY.

Buy with Confidence from the best

GREAT PRICES, GREAT SERVICE, GUARANTEED
COMPUTERS, PRINTERS, TERMINALS

Apple
IEEE-488
card now
available

CALL TOLL FREE: 1 800 421-1520
In Calif. 213 320-4772

COMPUTERS



Apple Computers
Disk drives, accessories
software, graphics tablets.
CALL FOR BEST PRICES



Whether you want their great
computer or a wide selection of
computer calculators—we have them
HP-85 - Retail \$3250
Only \$2475

Call us for great prices:
Altos, Atari, NEC,
Zenith and other
computers

PRINTERS - MONITORS

NEW
MX 100 &
MX 80 F/T



The new 136
column Epson
printer with graphics and the
Friction/tractor MX 80 are in
stock. WE HAVE THE GRAPHIC
PACKAGE FOR MX 80. call.

SILENTYPE PRINTER
ONLY \$295.00

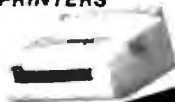
MONITORS

BMC & NEC Green Screen
NOW IN STOCK

We have the CORVUS
systems to hook up several
Apple computers at once!

NEC & DIABLO PRINTERS

Anadex, Paper
Tiger. CALL
for latest prices



Computer furniture too

ACCESSORIES - SOFTWARE

SOFTWARE

Amazing Mountain Hardware
GPS Multi-function card
ALL IN ONE:
Parallel/Serial/Clock/Calen

Visicalc 3.3 \$175/Reg. \$199
BPI GL/INV/AR/etc 299/Reg. 399
Tax Preparer by Howardsoft ... 125/Reg. 150
Real Estate Analyzer, Howardsoft 125/Reg. 150
Creative Financing, Howardsoft 125/Reg. 150
ASCII Express II by SDS 55/Reg. 65
Z-TERM (CPM) (16 sector) 85/Reg. 100
TRS 80 & ATARI SOFTWARE TOO

PLOTTERS

Bausch & Lomb plotters
for your computer by
Houston Instruments...
CALL!

MICROSOFT 16K
Ramcard \$139

CALL TOLL FREE

1(800)421-1520
In Cal (213)3204772



104/1
5 1/4" Disks only 3.95

Visit our retail store:
Net Profit Computers
521 W. Chapman Ave
Anaheim, Cal. 92802
714 750-7318

Mail orders ONLY:
NET PROFIT COMPUTERS
2908 Oregon Court, Bld G1
Torrance, Ca 90503
1(800)421-1520
in Cal: 213 320-4772



Cal residents add 6% sales tax. Minimum shipping and handling charges are \$3.00. Match, Visa, Amex prices slightly higher on sale items. Store prices differ

level A6 was the most elegant example of trap-setting I have seen in a long time. Any time I can be beaten in the last five moves as badly as 63 to 1, I know I've met my match. That game made me wish there was a command to print the entire move list, rather than having to copy it by hand during the game—the game was over before I realized it was worth saving.

The program has two additional features that can make for a more varied game: the ability to take back any move and a way to ask what the program thinks your best move is. It can sometimes take an extreme effort of will not to back a game up to where you made some "mistake," but it can be fun to check out other possibilities, and it's nice to know you can. The ability to ask the program about your best move is also a nice idea, but because it is limited by the amount of look-ahead the program did in computing its move, it is, more often than not, not your best possible response.

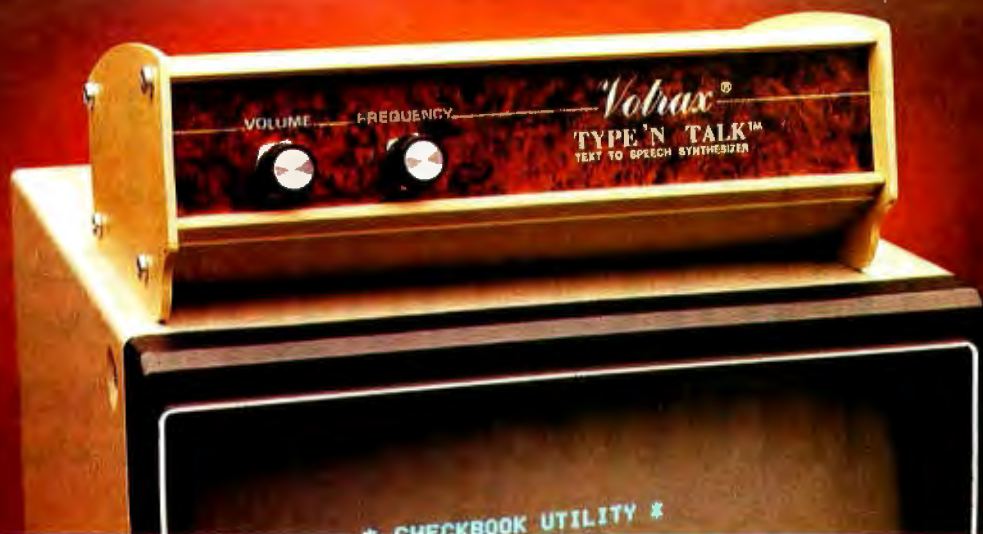
As there is no way to save a game in progress, the only way to resume an interrupted game is to record the positions of all pieces and use the facility to start a game from a given board layout, but this is a tedious process. A "Save Game" command would have solved the problem, particularly when playing at levels requiring 30 minutes per response.

As long as I'm "wishing," there are a few other things that either should be included or would be handy to have. These include the ability to change strategy level during a game, having the "Exit" command reload the system, and a table of commands in the instruction booklet. In passing, let me recommend the user's guide section entitled "Strategy Tips" to anyone who plays Reversal. The tips may be obvious, but they're valuable nonetheless.

I highly recommend Reversal to anyone who enjoys Othello or to anyone who likes strategy games in general. Reversal can also serve as a good introductory computer game for beginners of any age. The Spracklens have done a magnificent job: Reversal is everything I expected it to be when I saw who had brought it into the world.

Conclusions

- Reversal is capable of competing evenly with players of any level.
- Instructions and documentation for Reversal are better than average, but a "quick reference" table of commands would help inexperienced users. Running the game is complicated by only one fact: it is assumed you know that the disk uses Apple's DOS 3.2. An unusually large number of disk accesses occur before anything happens, so the first-time user might experience some anxiety.
- Use of graphics and the game paddle make this game well-engineered for human use, but a feature for saving unfinished games on disk would avoid making the player record, then reenter the positions of all the pieces. Other improvements could include allowing the player to change the strategy level during play and a command to end the game and reload the program. ■



TYPE-'N-TALK™ IS T.N.T.

The exciting text-to-speech synthesizer that has every computer talking.

- **Unlimited vocabulary**
- **Built-in text-to-speech algorithm**
- **70 to 100 bits-per-second speech synthesizer**

Type-'N-Talk™, an important technological advance from Votrax, enables your computer to talk to you simply and clearly — with an unlimited vocabulary. You can enjoy the many features of Type-'N-Talk™, the new text-to-speech synthesizer, for just \$375.00.

You operate Type-'N-Talk™ by simply typing English text and a talk command. Your typewritten words are automatically translated into electronic speech by the system's microprocessor-based text-to-speech algorithm.

The endless uses of speech synthesis.

Type-'N-Talk™ adds a whole new world of speaking roles to your computer. You can program verbal reminders to prompt you through a complex routine and make your computer announce events. In teaching, the computer with Type-'N-Talk™ can actually tell students when they're right or wrong — even praise a correct answer. And of course, Type-'N-Talk™ is great fun for computer games. Your games come to life with spoken threats of danger, reminders, and praise. Now all computers can speak. Make yours one of the first.

Text-to-speech is easy.

English text is automatically translated into electronically synthesized speech with Type-'N-Talk™. ASCII code from your computer's keyboard is fed to Type-'N-Talk™ through an RS 232C interface to generate synthesized speech. Just enter English text and hear the verbal

response (electronic speech) through your audio loud speaker. For example: simply type the ASCII characters representing "h-e-l-l-o" to generate the spoken word "hello."

TYPE-'N-TALK™ has its own memory.

Type-'N-Talk™ has its own built-in microprocessor and a 750 character buffer to hold the words you've typed. Even the smallest computer can execute programs and speak simultaneously. Type-'N-Talk™ doesn't have to use your host computer's memory, or tie it up with time-consuming text translation.

Data switching capability allows for ONLINE usage.

Place Type-'N-Talk™ between a computer or modem and a terminal. Type-'N-Talk™ can speak all data sent to the terminal while online with a computer. Information randomly accessed from a data base can be verbalized. Using the Type-'N-Talk™ data switching capability, the unit can be "de-selected" while data is sent to the terminal and vice-versa — permitting speech and visual data to be independently sent on a single data channel.

Selectable features make interfacing versatile.

Type-'N-Talk™ can be interfaced in several ways using special control characters. Connect it directly to a computer's serial interface. Then a terminal, line printer, or additional Type-'N-Talk™ units can be connected to the first Type-'N-Talk™, eliminating the need for additional RS-232C ports on your computer.

Using unit assignment codes, multiple Type-'N-Talk™ units can be daisy-chained. Unit addressing codes allow independent control of Type-'N-Talk™ units and your printer.

Look what you get for \$375.00. TYPE-'N-TALK™ comes with:

- Text-to-speech algorithm
- A one-watt audio amplifier
- SC-01 speech synthesizer chip (data rate: 70 to 100 bits per second)
- 750 character buffer
- Data switching capability
- Selectable data modes for versatile interfacing
- Baud rate (75-9600)
- Data echo of ASCII characters
- Phoneme access modes
- RS 232C interface
- Complete programming and installation instructions

The Votrax Type-'N-Talk™ is one of the easiest-to-program speech synthesizers on the market. It uses the least amount of memory and it gives you the most flexible vocabulary available anywhere.

Order now. Toll free.

Call the toll-free number below to order or request additional information. MasterCard or Visa accepted. Charge to your credit card or send a check for \$375.00 plus \$4.00 delivery. Add 4% sales tax in Michigan.

1-800-521-1350.

Dealer Inquiries Invited

Votrax

Distributed by Vodex
A Votrax Company — Dept. RT
500 Stephenson Highway, Troy, MI 48084
(313) 588-0341

Type-'N-Talk™ is covered by a limited warranty. Write Votrax for a free copy.

The first family of microcomputers with mainframe capability.

WICAT Systems brings four years of research and development to the market with the System 100 family of microcomputers. WICAT is the first to provide high performance, low cost computers with full feature operating systems and network capabilities. The WICAT family of systems and their supporting software have been designed to 1985 specifications. The hardware, software, and communication networks assume large main memories (up to 1.5 megabytes in the System 150 and 14 megabytes in the System 100) and large system power at each intelligent workstation.

Our 68000-based systems run at 8MHz and execute approximately one million instructions per second. The processor has a 16 bit external data path and internally supports 32 bit operations. All of our computers, with the addition of the interface board, can control videodisc players. Multibus™ devices can also easily be attached to our complete family.

WICAT's Multi-User Control System (MCS) is one of the most powerful operating systems available today. The real time, multi-user, multi-tasking system is designed to strike an uncompromising balance between the needs of the system's programmers and the general users. UNIX™/V7 and a CP/M Emulator are also available.

In addition to the three operating systems WICAT offers nine programming languages: PASCAL, Assembler, FORTRAN, COBOL, BASIC, APL, ADA, C, and LISP.

Full service maintenance is offered internationally, including 377 locations in the United States. Depot maintenance is also available.

Whether your needs are for business systems, personal computers, or sophisticated networking, the WICAT family meets those needs.

Call or write today for additional information.

WICATsystems

P.O. Box 539

1875 South State Street

Orem, Utah 84057

(801) 224-6400

T7000 Terminal



- ANSI X3.64 Terminal
- 80 x 25 rows on a 12" diagonal screen
- Optional touch panel
- Blink, blank, reverse video, half-intensity and underline

System 100



- 68000 Processor
- 20MB-900MB hard disk storage
- Up to 14MB of main memory
- Supports up to 96 intelligent terminals

System 150-IT



- 68000 Processor
- Up to 1.5MB main memory
- Single-user intelligent terminal

System 150-FS



- 68000 Processor
- Up to 1.5MB main memory
- 2, 5 1/4" floppy disk drives (1.92 MB or 320KB)

System 100-DT



- 68000 Processor
- 2, 8" dual-sided, double-density floppy disks (2.4MB)
- Up to 3MB of main memory
- Supports 4 dumb terminals

System 150-WS



- 68000 Processor
- 10MB hard disk—5 1/4" floppy disk for back-up
- Up to 1.5MB main memory
- Single-user or multi-user operating system (multi-user version supports 4 terminals)

MG8000 Graphics Terminal



- Same features as T7000 Terminal
- Monochrome graphics—400 x 300 pixel resolution
- Simultaneous support of text and graphics features (2 independent graphics planes for animation)
- Optional touch panel

System 110-DT



- 68000 Processor
- 1, 8" dual-sided, double-density floppy disk (1.2MB)
- Up to 1.5MB of main memory
- Ideal single-user workstation for video-disc and simulation

The Microcomputer as a Laboratory Instrument

Daniel Cosgrove
Botany Department
University of Washington
Seattle WA 98195

During the past three years we have actively used a microcomputer to study the biophysics of plant growth. The unit serves as a data-acquisition and stimulus-control system, as well as an analytical tool for processing and studying the resulting data. But why use a computer? Specifically, why use a microcomputer?

As a laboratory tool, the computer may be likened to a "smart" strip-chart recorder. That is, the computer not only stores data coming in from many different instruments (making it equivalent to not one but many chart recorders), but also controls external devices. For example, the microcomputer that we use in our laboratory regulates the timing and intensity of experimental light treatments given to plants. In addition, the computer permits easier, more subtle interpretations of the data involving mathematical transformations and statistical analysis.

In the past, such processes were severely limited by time and manpower. The availability of data in digital form makes sophisticated processing, such as signal averaging, smoothing, digital filtering, and curve-fitting, much easier. Thus the computer improves both the quantity and quality of experiments. In the last decade, the minicomputer has invaded the laboratory to perform these functions and more.

Acknowledgments

The author gratefully acknowledges the financial support of the National Science Foundation Graduate Fellowship, as well as the National Science Foundation Grant PCM 78-03244 awarded to Dr Paul Green of Stanford University.

The reason for selecting a microcomputer is price—they sell for a fraction of the cost of a minicomputer. Yet in many cases they have all the required capabilities. Their biggest limitation in the laboratory is one of software—programs useful to the researcher are scarce. The first part of this article will give an overview of the microcomputer as it is used in our lab; this is followed by a description of the hardware and software architecture of the system.

System Overview

The primary use of our laboratory microcomputer (see photo 1) is to control experiments and acquire data. A typical experiment would involve the continuous measuring of the

growth rate (and other parameters) of several plants over a 24- to 48-hour period, while subjecting the plants to various conditions such as light of different intensities or solutions of different osmotic strengths.

At the beginning of an experiment, the plants are connected to growth transducers, which are then connected to a multichannel A/D (analog-to-digital) converter in the computer. A BASIC program prompts the operator for the parameters of the experiment (eg: how many channels to sample, how often to sample, how many sampled points to average, when to turn the lights on and off, the total duration of the experiment) and feeds these values to the interrupt-driven



Photo 1: View of the laboratory microcomputer, showing the Soroc video console, Horizon II computer, interface box, and oscilloscope and strip-chart recorder used for graphic display of data. Plant growth transducers and other instruments located in a controlled-temperature room behind the computer are plugged into the interface box on top of the Horizon.

assembly-language program that does the real work of the experiment. When the operator is satisfied with the experimental parameters, the BASIC program will start the sampling program.

Because the sampling program is an interrupt-driven routine, data acquisition can occur while BASIC works on a completely different program. This sampling will be completely transparent to the BASIC program and to the operator because the assembly routines are fast (the worst-case time required is less than one millisecond) and take up only a small portion of the processor's time (depending, of course, on the sampling rate), while the rest of the time is devoted to the BASIC (or other) program. This allows the operator to use BASIC for other tasks, or to run a program in BASIC that monitors the status of the experiment and permits the alteration of the progress of the experiment.

Using the video terminal, oscilloscope, or strip-chart recorder as display devices, this STATUS program can display the data collected by the sampling program. Photos 2 through 4 compare the three types of

graphic displays. The oscilloscope and strip chart both have high resolution; the latter is used when hard copy is required. The video display has low resolution, but is useful when the other devices are not handy, and if you want to perform a simultaneous comparison of the data from different channels.

The data-acquisition programs are very flexible, allowing a wide range of sampling rates (up to three kHz) and control of up to sixteen different programmed events during the course of a sampling period. In addition, sampling periods may be automatically concatenated—with each period having its own parameters. I use this feature in my experiments on the effect of light on plant growth: high-frequency sampling during and shortly after the light treatment is alternated with lower-frequency sampling during the dark interval between light treatments. In addition, data points are averaged over a longer time span during the dark period, which saves both disk storage and processing time yet still provides the background growth-rate information I need.

After the computer has completed

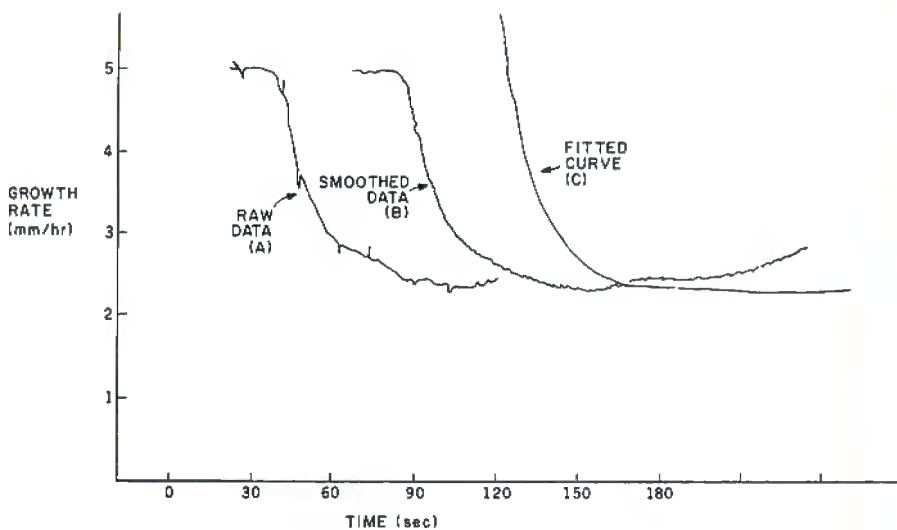
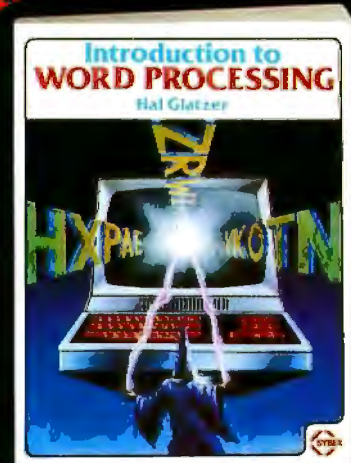


Figure 1: Sample of data obtained using the acquisition system that appears in photo 1. The results of data smoothing and curve fitting performed on raw statistical data can be aided by the use of a microcomputer. Curve A shows the raw data of a plant's growth response to blue light; curve B shows the same data after smoothing to eliminate noise; curve C is derived from a computer fit of the data to an equation of an exponential decay of the growth rate to a lower rate.



INTRODUCTION TO WORD PROCESSING

by Hal Glotzer

If you write letters, organize reference materials, produce articles, reports, contracts or any other materials a word processor will help you save time, trim labor and improve efficiency.

This book explains in plain language what a word processor can do, how it improves productivity in businesses that handle lots of words, how to use a word processor and how to buy one wisely.

300 pp., 140 illustr., Ref. W101, \$14.95

PLEASE SEND ME INTRODUCTION TO WORD PROCESSING (YOUR FREE CATALOG)

Name _____
 Street _____
 City _____ State _____ Zip _____
 Addl. C/R1 50/bank 1/PS 1/75/bank 4th class
 (add bank systems add'l)
 or charge by: VISA MC AM EX
 (CA add tax) \$ _____
 Total Amount Enclosed _____

Card No. _____ Exp. Date _____

Signature _____
 SYBEX, 3044 SIXTH STREET
 BERKELEY, CA 94710
 PHONE ORDERS: (415) 848-8224
 TOLL FREE OUTSIDE CA: 800-225-2349

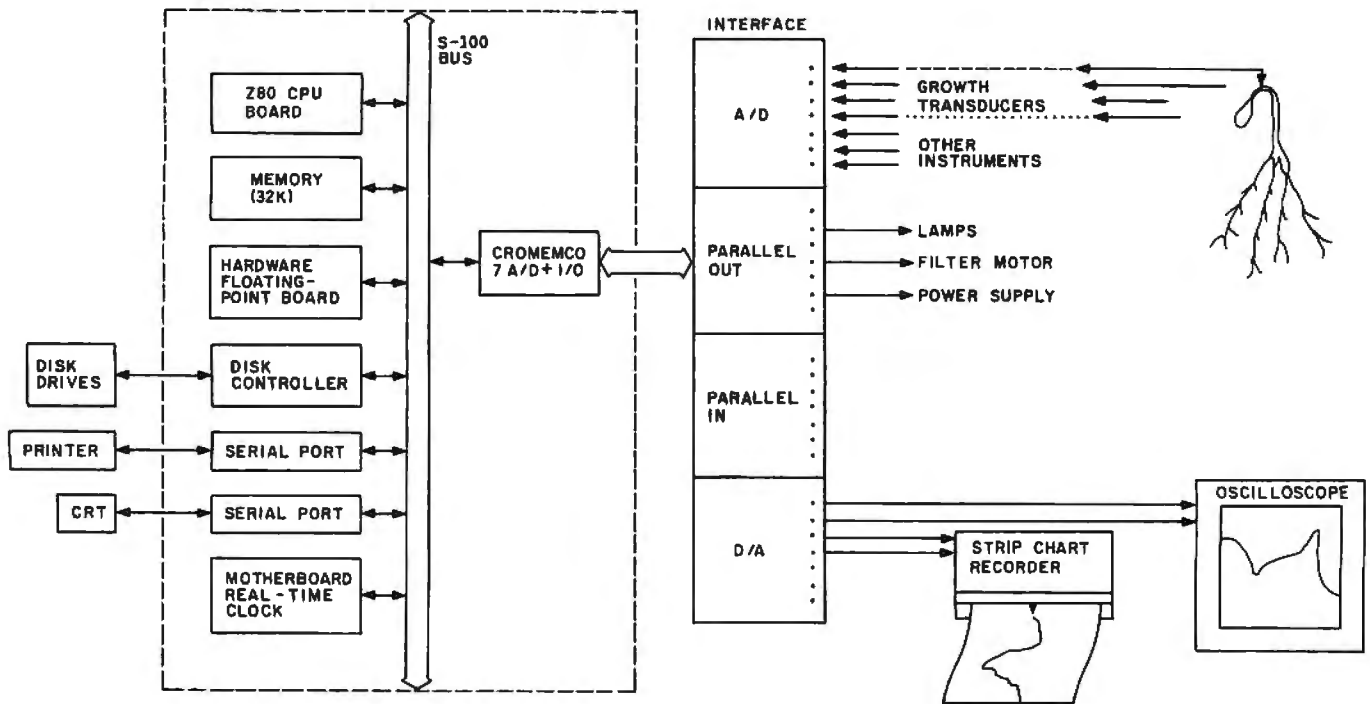


Figure 2: Block diagram of the hardware and peripherals used in the author's data-acquisition system.

an experiment, it can shut off its own power by activating a latching relay. The data that have been collected and stored on disk can subsequently be examined and processed. In our lab, such processing involves smoothing the data and fitting it to exponential curves using statistical methods. An example of this process appears in figure 1.

In the laboratory, the microcomputer is a powerful tool for data acquisition, processing, and analysis. The two major tasks involved in setting up such a tool are interfacing the computer to the lab instruments and writing the programs for data acquisition. These tasks are described in the following sections.

Hardware Requirements

What are the hardware requirements of the system? Figure 2 diagrams the setup. The microcomputer is a North Star Horizon, which uses the Zilog Z80A microprocessor as the central processor, with dual 5-inch floppy-disk drives and 32 K bytes of user memory as peripherals. The FPB (hardware floating-point board) is an optional peripheral that speeds up mathematical programs in BASIC. The Cromemco D+7A I/O

(input/output) board provides a 7-channel A/D (analog-to-digital) converter for accepting voltage signals from lab instruments, a 7-channel D/A (digital-to-analog) converter for outputting the stored data to display devices, and an 8-bit parallel port used in the lab for turning external devices on and off.

An interface between the Cromemco board and the "real world" was built to protect the board from dangerous external voltages and to facilitate connecting instruments to it. The interface is shown in photo 5 and its schematic appears in figure 3. The analog inputs are protected by zener diodes that are in series with light-



Photo 2: Sample display of data on the Soroc system console using the terminal's direct X-Y cursor-positioning ability.

emitting diodes. The zeners conduct current across the light-emitting diodes when the input voltage is outside the -2.7 to $+2.7$ V range. This protects the circuits on the A/D board and gives a visual signal to indicate either over- or undervoltage conditions.

The analog outputs are used for graphic displays of digital data by plugging an oscilloscope or strip-chart recorder into the output jacks on the interface box. The parallel port, which is used to turn lights and other devices on and off, is isolated

from outside currents by optical couplers and reed relays. The reed relays can handle up to 0.75 A and 240 V. For the larger currents used by the 500 W lamps, the relays turn on triacs (bidirectional thyristors or silicon-controlled rectifiers) that can handle up to 15 A. (For those interested in reading more about interface circuits, I have included several references at the end of the article.) As you can see, most I/O for experiments is handled via the Cromemco board and its interface box.

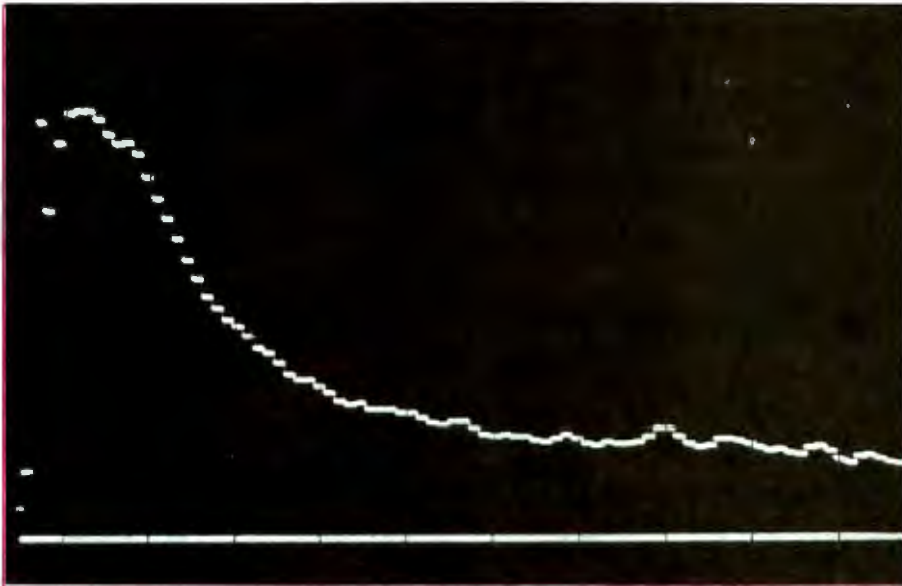


Photo 3: Graphic display of data on the oscilloscope.

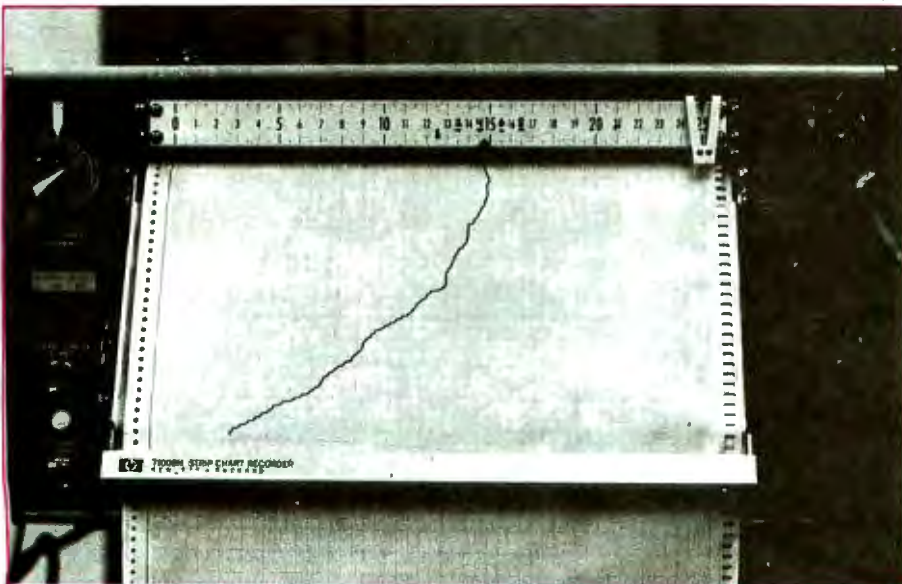
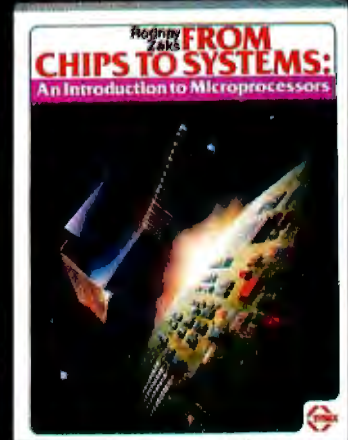


Photo 4: Graphic display of data on the strip-chart recorder.

SYBEX
PERSPECTIVE



FROM CHIPS TO SYSTEMS:
An Introduction to Microprocessors
by Rodney Zaks

This newly rewritten, updated and enhanced version of our international best seller explains everything from the basic concepts of microprocessor architecture to professional techniques of systems development. Rodney Zaks takes you on a fast paced journey through the microprocessor, its history, its support components and the design and programming of an actual system. Formerly published as MICROPROCESSORS: FROM CHIPS TO SYSTEMS.

480 pp., 150 illust., Ref. C201A, \$13.95

PLEASE SEND ME: FROM CHIPS TO SYSTEMS: An Introduction to Microprocessors
YOUR FREE CATALOG

Name _____
Street _____
City _____ State _____ Zip _____
Add: \$1.00/book UPS; \$3.00/book 4th class
\$6/book computer airmail
or charge me: VISA MC/ AM EX
ICA will bill _____
Card No. _____ Exp. Date _____
Total Amount Enclosed _____

Signature _____
SYBEX, 2044 BIRTH STREET
BERKELEY, CA 94710
PHONE ORDERS INSIDE CA 415/849-8233
TOLL FREE OUTSIDE CA 800/227-2346

The Horizon has a useful built-in interval timer (a so-called "real-time clock") located on the motherboard, which makes periodic sampling easy. To provide the clock-interrupt capability required by the data-acquisition program, the real-time clock flag is connected to one of the seven interrupt lines (V3) on the motherboard. The flag may then be enabled or disabled under program control (ie: it is armed while sampling is going on, but disarmed at other times).

One note of caution: whenever interrupts, either from the clock or other device, are enabled, the North Star Hardware Floating Point Board may not be used with reliability. In using North Star's special version of BASIC (called FPBASIC), which accesses the floating-point board, I found that the board sporadically returned erroneous results when interrupt sampling was occurring. (This happens when a clock interrupt falls in the middle of data transmission between the board and FPBASIC.) The

sampled data, fortunately, is not affected, and use of standard BASIC instead of FPBASIC circumvents this problem.

Also to be considered is the fact that interrupts during disk activity may cause detected read errors as well as undetected write errors. As a consequence, the data-acquisition program described below always disables interrupts before attempting to write the data out to disk. This is necessary to insure error-free data transmission.

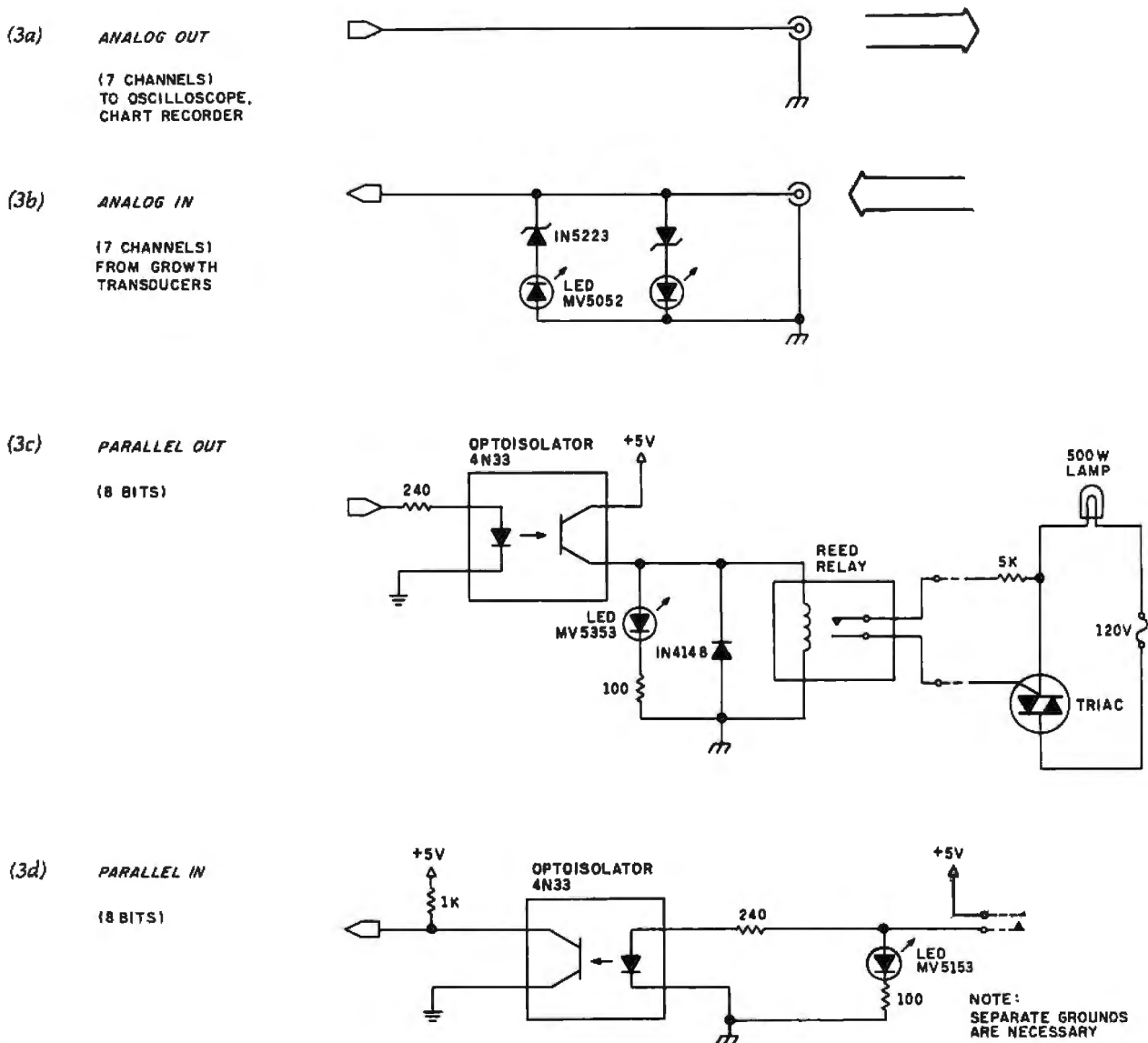


Figure 3: Schematic diagrams of the four types of I/O channels used on the laboratory microcomputer. Figure 3a is the analog output from the Cromemco 7 A/D + I/O board to the graphics peripheral (this circuit is duplicated for 7 analog output channels). Figure 3b is the analog input interface that connects the Cromemco board to the various data-acquisition devices; the zener diodes protect the analog input circuitry on the board from overvoltages, while the LEDs indicate this danger condition (also duplicated for 7 channels). Figure 3c shows a relay controller operated from one bit of a parallel output port (duplicated for 8 channels). Figure 3d is the parallel input port interface (duplicated for 8 channels). Both of these interfaces protect the computer through the use of optical isolators.

We use a Soroc IQ 120 terminal to communicate with the computer and a Teletype model ARS 33 as a printer.

Software Description

The special software used for laboratory experiments includes a variety of assembly-language programs as well as BASIC programs. The assembly-language data-acquisition programs (see listing 1) were developed using Xitan's (formerly TDL) editor and Z80 macroassembler under a CP/M operating-system environment. All of the programs were designed to use the North Star DOS (disk operating system) library

routines for writing to and from disks. Similarly, all of the BASIC programs use North Star BASIC (see listings 2 through 4). The data-acquisition routines in machine language are located in a different portion of memory from that used by BASIC (see memory map in figure 4). Thus, both may function during an experiment.

For the purpose of maximum flexibility, the laboratory software was designed as a number of modules that pass information to each other. As seen in the left half of figure 5, the sampling programs consist of three main modules: INTERRUPT HAN-

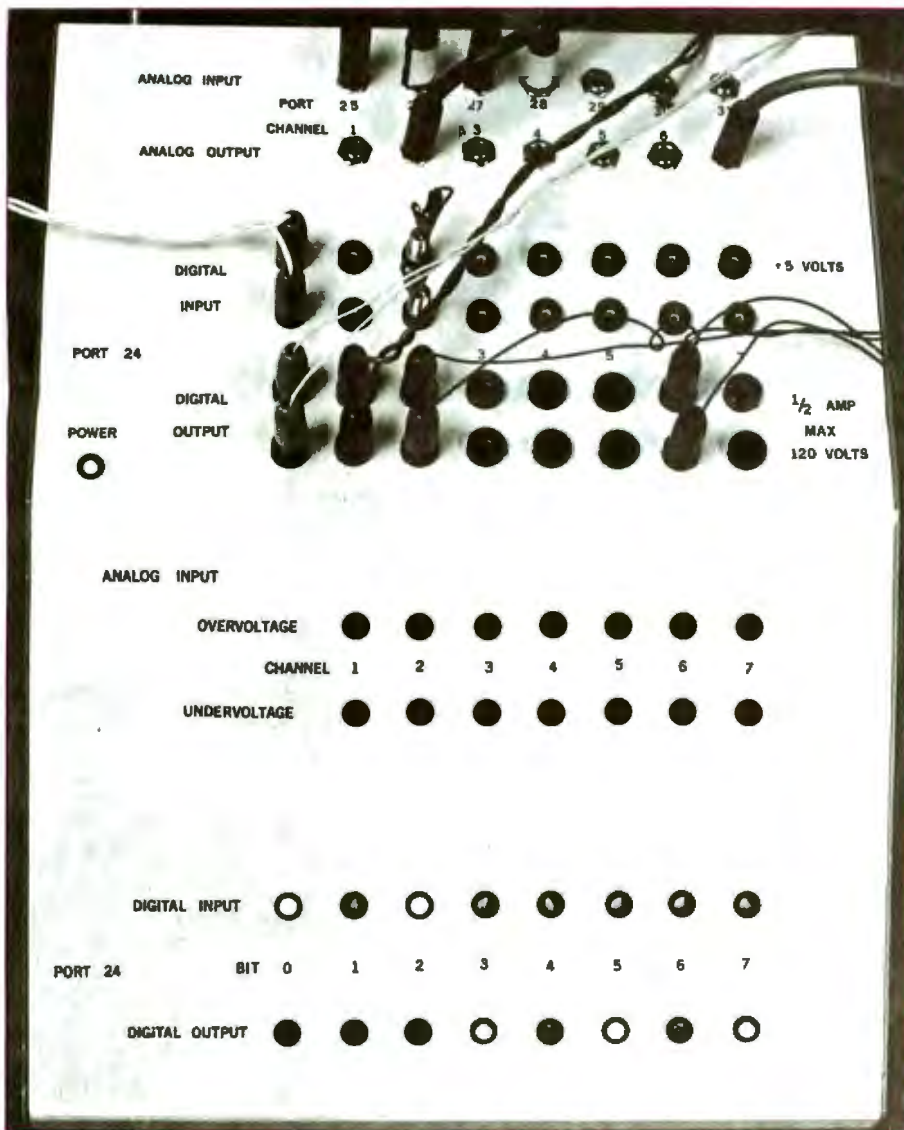
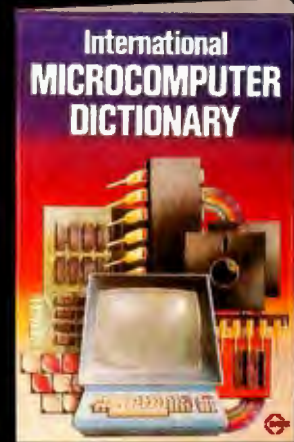


Photo 5: Close-up of the interface box. Instruments to be sampled are plugged into the computer's analog input jacks. Voltages outside the range of the A/D converter are indicated by the overvoltage or undervoltage LEDs. A display of graphic data may be obtained by plugging an oscilloscope or a strip-chart recorder into the analog output jack. Lamps, motors, and other devices are turned on and off by the digital output relays.



INTERNATIONAL MICROCOMPUTER DICTIONARY

These days everyone's talking about computers. Make sure you understand what's being said. This handy pocket-guide contains definitions of all the terms, numbers and acronyms that make-up current microcomputer jargon. It also contains a basic vocabulary of essential computer words in English and ten other languages including Italian, German, Dutch, French, Spanish and Swedish. Makes reading any computer literature easier and more understandable for everyone.

140 pp., Ref. X2, \$3.95

PLEASE SEND ME INTERNATIONAL MICROCOMPUTER DICTIONARY (YOUR FREE CATALOG)

Name _____
 Address _____
 City _____ State _____ Zip _____
 (Add \$4.00 shipping charge for orders outside the U.S.)
 Payment enclosed Bill Me VISA MC AM EX
 (All orders subject to credit review)
 Signature _____
 SYBEX, 244 NORTH STREET
 BERKELEY, CA 94704
 PHONE ORDERS: (415) 845-4800
 TOLL FREE (800) 521-5151

DLER, SAMPLER, and PROCESSOR. The first module keeps track of when data needs to be recorded, the second records the data, and the third saves the data on disk and calls special event programs.

The sampling routines function as follows (see the flowchart in figure 5): the real-time clock requests an interrupt, which causes a jump to the INTERRUPT HANDLER program. This is handled by the vectored priority-interrupt capability of the North Star Z80 processor. The INTERRUPT HANDLER decrements a timing counter and checks to see if it's time to sample. If not, the computer returns to the job it was working on before the interrupt. If it is time to sample, the SAMPLER routine is entered.

The SAMPLER routine reads data from each active channel of the A/D board and sums them with previous data stored in a temporary double buffer. This feature allows the program to do on-line averaging of from 1 to 256 points before storing the resulting values. For instance, if 16

points are to be averaged, SAMPLER is entered sixteen times. The first fifteen times SAMPLER adds the new samples to the old ones and returns immediately to the pre-interrupt job. On the sixteenth time, the routine does the summation of the new data with the sums of the old, changes an internal pointer to the other half of the double buffer, and enters PROCESSOR.

PROCESSOR has several functions. It performs the averaging of the data from each of the channels and stores this average value in the main buffer. When the buffer is full, it calls on subroutines that write the buffer out to disk. In addition, PROCESSOR keeps track of the time and the locations of programs that execute special events (like activating lights or pumps) at particular times.

For instance, when PROCESSOR is initialized, it is loaded with the locations of these special programs and the time to execute them. When the time for a particular event elapses, PROCESSOR will call the location that controls the event. After checking the time of all events, PROCESSOR returns to the pre-interrupt location.

The use of a double buffer by SAMPLER permits data points to be summed and stored in one half of the buffer while PROCESSOR is still working on the other half of the double buffer. The only restriction of this system is that PROCESSOR must finish with its half of the double buffer before SAMPLER has collected and summed all of its data points.

Two other assembler programs, the initializers for PROCESSOR and

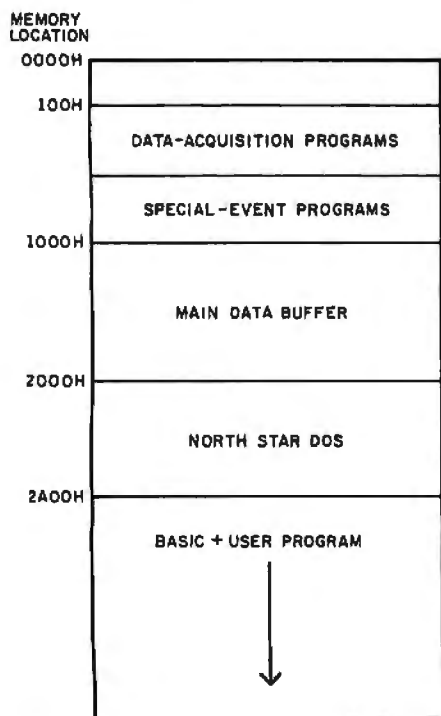


Figure 4: Memory map that shows the hexadecimal memory locations of the machine-language acquisition programs, North Star operating system, and BASIC.

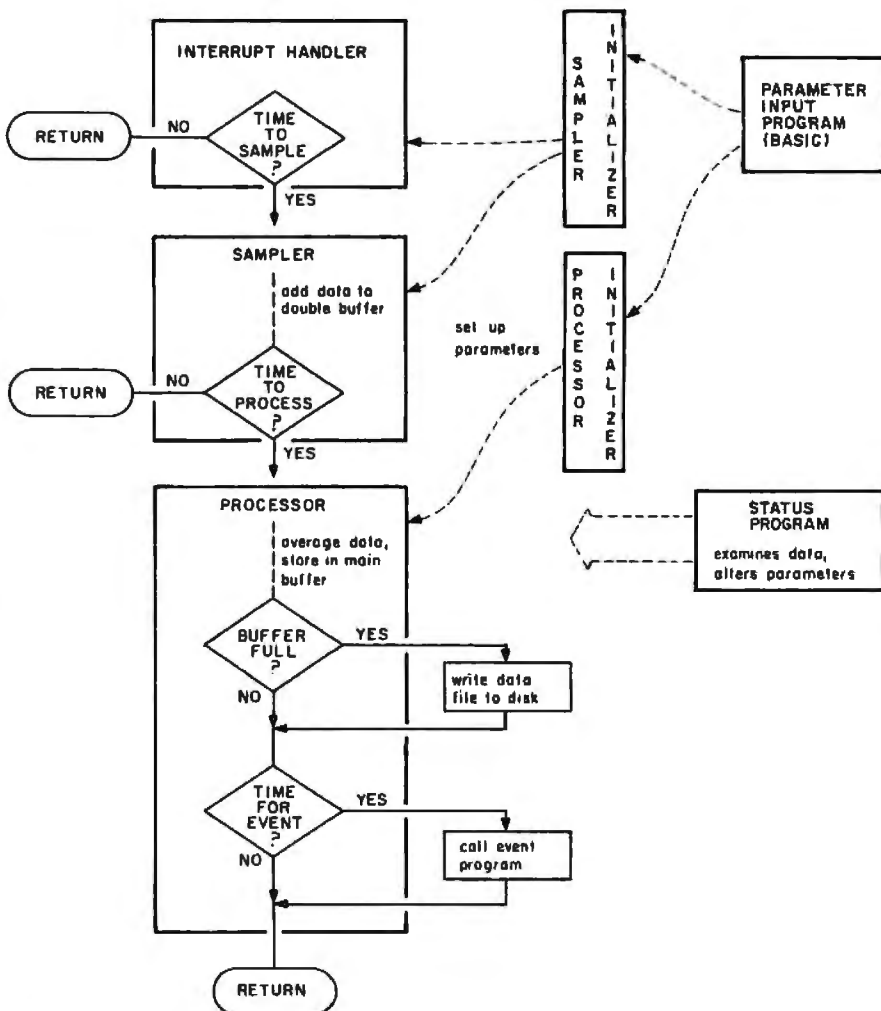


Figure 5: Flowchart of the machine-language data-acquisition programs and their interface with BASIC.



Listing 1: Z80 machine-language program that contains the subroutines necessary for maintaining an interrupt-driven data-acquisition system. Among these subroutines is an interrupt-handler, a data sampler, and a data-storage and special-event processor. The design includes provisions for interfacing with BASIC programs. This version was written using a TDL (Xitan) assembler, hence the TDL Z80 mnemonics.

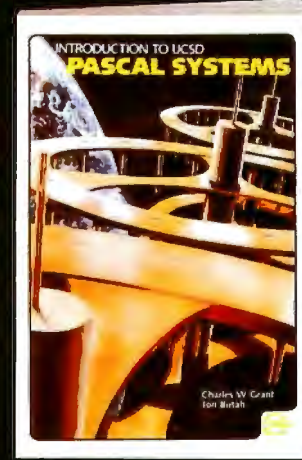
```

;*****
;**                               **
;**          DATAQU              **
;**                               **
;*****
;
;SETS UP PARAMETER LOCATIONS AND CALLS
;UTILITY PROGRAMS
;
0100      .PABS
          .LOC    100H
;
;
;OUTPUT MESSAGE AND RETURN TO DOS.
;REQUIRED FOR PROPER LOADING BY DOS.
2028      DOS = 2028H      ;DOS ENTRY POINT
;
0100      21 0109          LXI    H, .MESS      ;OUTPUT MESSAGE
;                               ;TO CONSOLE
0103      CD 047A          CALL   MESSOUT ;
0106      C3 2028          JMP    DOS      ;RET TO DOS
;
0109      3E2044415441    .MESS: .ASCIZ  /> DATA AQISITION PRGM (VERS. 1
          .2) LOADED
;
0132      0DDA
0134      0DDA00
/
;TABLE OF CONSTANTS AND VARIABLES:
;
0137      CHNL:  .BLKB    1      ;# OF CHNLS TO SAMPLE
0138      INTSS:  .BLKB    1      ;# INTRRPTS/SAMPLE
0139      S$DPT:  .BLKB    1      ;# SAMPLES/DATA PT
013A      SCNTR:  .BLKB    1      ;SAMPLE COUNTER
013B      DIVSR:  .BLKB    1      ;PROCESSING CODE
013C      N$EVTS: .BLKB    1      ;# PROGRAMMED EVENTS
013D      ETIME:  .BLKW    32D    ;EVENT TIME 1 (2 BYTES)
;                               ;ADDR EVENT 1 PRGM
;                               ;...ETC.. TO EVENT
;                               ;#N$EVTS
017D      1000      BFSTRT: .WORD    1000H    ;START ADDR MAIN BUFF
017F      1000      MBUFPT: .WORD    1000H    ;MAIN BUFFER POINTER
0181      01C8      OTMPAD: .WORD    TMPBF1    ;OLD BUFFER POINTER
0183      01E8      NTMPAD: .WORD    TMPBF2    ;NEM BUFFER POINTER
0185      202020202020 FLNAME: .ASCII  /      / ;FILENAME W/BLANK
;
;
;
          .INSERT B:INTHDLR
a;*****
a;*
a;*****
a;*      INTERRUPT HANDLER & SAMPLER ROUTINE      *
a;*
a;*****
a;
a;THIS ROUTINE IS ENTERED BY CLOCK INTERRUPT.
a;IT COUNTS THE # OF INTERRUPTS SINCE THE
a;LAST SAMPLE WAS TAKEN. WHEN THE INTERRUPT
a;COUNT = #INT/SAMPLE (AS SET UP BY "INIT")
a;THEN DATA IS INPUT FROM EACH OF THE ACTIVE
a;CHANNELS OF THE CROMEMCO D+7A I/O BOARD.
a;MODIFIED DATA IS SUMMED WITH PREVIOUS DATA AND
a;STORED BACK IN THE BUFFER. WHEN THE BUFFER
a;IS FULL (IE # OF SAMPLES TAKEN EQUALS
a;SAMPLES/DATA PT) THEN THE BUFFER ADDR'S ARE
a;UPDATED AND CONTROL GOES TO THE "PROCESSOR".
a;
a;B'= INTERRUPT COUNTER
a;
018E      D9      @INTHLD: EXX      ;SAVE REGS
018F      08      @      EXAF      ;
0190      3E50      @      MVI    A,50H    ;RESET CLOCK FLAG
0192      D306      @      OUT    6      ;
0194      05      @      DCR    B      ;TIME TO SAMPLE?
0195      2805      @      JRZ    SAMPLE   ;YES
0197      D9      @      EXX      ;NO,RESTORE REGS
0198      08      @      EXAF      ;
0199      FB      @      EI      ;
019A      ED4D      @      RETI
a;
a;SAMPLER; FOR THE FOLLOWING SECTION OF CODE
a;REGISTERS ARE USED AS FOLLOWS:

```

Listing 1 continued on page 93



INTRODUCTION TO UCSD PASCAL™ SYSTEMS
 by Charles W. Grant and Jon Butah

If you want a clear, descriptive guide through the UCSD Pascal Operating System...this is it. This book shows you what the UCSD Pascal Operating System is, how it works and how to use it. File handling, program editing, compiling, running a program, and using special features for large programs are emphasized. Included as well are many useful reference tables as appendices.

250 pp., 10 illustr., Ref. P370, \$14.95

PLEASE SEND ME COPIES OF THE UCSD PASCAL™ SYSTEMS (250) FREE CATALOG

Name _____

Address _____

City _____ State _____ Zip _____

Send no money now! We'll bill you later!

CALL NOW! (415) 339-2000

SYBEX, 344 FIFTH STREET, BERKELEY, CA 94710
 PHONE ORDERS: (415) 339-2000
 TEL. FREE IN TIME: CA 800-521-2288

SAMPLER, are shown in figure 5. These routines make it easy for BASIC to send the required sampling parameters to the data-acquisition program, to initialize the Z80 processor's alternate register set used by those routines, and to enable interrupts so that sampling may begin. The BASIC program communicates with these two initializers by first creating in memory a table that consists of the appropriate values of the parameters (obtained by prompting the operator). It then uses the CALL function to jump to the initializer and sends the address of the table in the DE register pair.

Once sampling has begun, a BASIC program can also follow the course of sampling, displaying the data contained in the PROCESSOR main buffer, altering some of the sampling parameters, stopping sampling, or terminating the experiment (which causes the data in the buffer to be saved on disk).

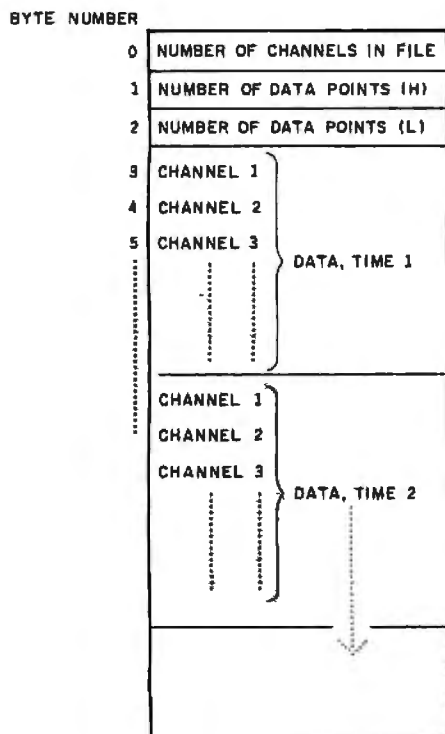


Figure 6: Map of the structure of the data file used by the author's programs. Three file-information bytes precede the actual data in the file.

Data File Structure

When the main data buffer is full or the sampling period is finished, three file-information bytes are placed in front of the buffer and it is written directly to disk using the North Star DOS library routines. The resulting disk-file structure is shown in figure 6. The first byte indicates how many channels (in binary encoding) are sampled in the file. The next two bytes indicate the total number of data points (in bytes) in the file (again, binary encoded, high byte followed by low byte). Each of the following bytes is a data point, represented in two's-complement notation, which is the form of the data returned by the Cromemco A/D board. If the number of channels in a file record is N, then the data for channel 1 will be found at every Nth byte, beginning at the fourth byte; similarly for channel 2, which begins at the fifth byte, and so on for all N channels.

There are two ways for a BASIC program to access the data in the file. North Star BASIC has a byte-access facility, so the data may be read a byte at a time by a READ statement. Alternatively, the data may be written from disk to memory, and then the EXAM (or PEEK, as it is called in some BASICs) function can read the data. I use this latter method; it reduces disk accesses and permits the graphic display on the oscilloscope to be done by fast machine-language routines.

Once the data is read into BASIC, almost any kind of manipulation can be done. As an example, curve A in figure 1 shows the raw data of the growth response of a sunflower seedling to a short pulse of light. Curve B shows the same data after smoothing (using a 9-point moving weighted average), and curve C shows the output of a program that fits the data to a first-order exponential decay to a lower asymptote.

Other Uses

I've discussed how the computer has been used in the laboratory for data acquisition, experiment control, and data processing, and up to this

point the controller aspects of the computer have been fairly rudimentary. Primarily, it has been functioning as a timer to turn devices on and off.

The next level of complexity involves having the computer examine the data as it comes in, and exert its control options contingent upon what the data look like. For example, a BASIC program could study the data contained in the main data buffer. When it detects a certain pattern, say an oscillation or the peak of an oscillation, it could then turn on a lamp or apply a voltage to electrodes; the only limit to the complexity of the controlling features is in the program itself.

In addition to these uses, the microcomputer can assist the researcher in other ways. Small- to medium-sized mathematical modeling programs can be run on these machines. A bibliography program could help the researcher keep notes in useful, accessible order. A text editor can be used to write articles. Finally, for those jobs that require a larger computer, the microcomputer can collect the primary data, then transmit the data at high speed to the mainframe computer. ■

1. Balcom, Orv. "Interfacing a Microcomputer to the Analog World." *Interface Age*, July 1978, pages 68-75.
2. Olson, Hank. "Controlling the Real World." March 1978 *BYTE*, pages 174-177.
3. Titus, J; P Rony; C Titus; D Larsen. *Microcomputer-Analog Converter Software and Hardware Interfacing*. Indianapolis: Howard W Sams & Co Inc, 1978.

Readers may obtain the programs and complete source listings as shown in this article at a nominal copying fee from the North Star Software Exchange, North Star Computer Co, Berkeley CA 94710.

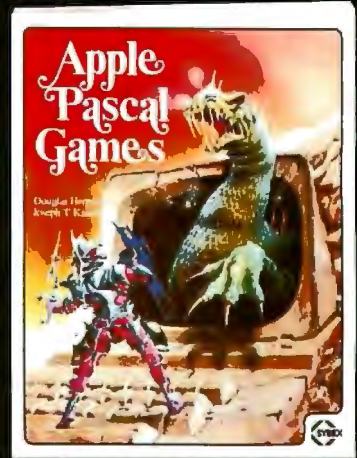
Listing 1 continued:

```

a;
a;
a;      A<=INPUT DATA
a;      B<=CHANNEL COUNTER
a;      C<=I/O PORT ADDR
a;      DE<=DATA W/SIGN BIT COMPLEMENTED
a;      HL<=PREVIOUS BUFFER DATA
a;      X<=ADDR OF BUFFER DATA (ADRDAT)
a;
019C   DDE5   @SAMPLE: PUSH    X      ;SAVE REG
019E   DD2A 0183 @        LIXD    NTMPAD ;LOAD BUFFER ADDR
01A2   0E19   @        MVI    C,31Q ;CHANNEL ADDR=31 OCT
01A4   3A 0137 @        LDA    CHNL  ;#CHANNELS
01A7   47     @        MOV    B,A  ;INTO B
01A8   1600   @        MVI    D,0  ;CLEAR
a;
01AA   DD22 01B3 @FETCH: SIXD   ADRDAT+1 ;STORE ADDR
01AE   DD22 01BC @        SIXD   STDAT+1 ;
01B2   2A 0000 @ADRDAT: LHLD   0000  ;GET DATA WHOSE ADDR IS
a;      ;STORED HERE(O NOT REAL
a;      ;ADDRESS)
01B5   ED78   @        INP    A      ;
01B7   EE80   @        XRI    128D ;COMPL SIGN BIT
01B9   5F     @        MOV    E,A  ;
01BA   19     @        DAD    D      ;ADD TO OLD DATA
01BB   22 0000 @STDAT: SHLD   0000  ;STORE DATA AT ADDR
a;      ;STORED HERE (O NOT
a;      ;REAL ADDR)
01BE   05     @        DCR    B      ;ALL CHNLS SAMPLED?
01BF   2847   @        JRZ    COUNT ;YES
01C1   DD23   @        INX    X      ;NO,UPDATE BUF ADDR
01C3   DD23   @        INX    X      ;
01C5   0C     @        INR    C      ;UPDATE PORT ADDR
01C6   18E2   @        JMPR   FETCH ;LOOP TILL DONE
a;
a;
01C8   @TMPBF1: .BLKW 16D ;BUFFER 1
01E8   @TMPBF2: .BLKW 16D ;BUFFER 2
a;
a;
a;DATA IS NOW LOADED AND STORED IN TEMP BUF
a;
0208   DDE1   @COUNT: POP    X      ;RESTORE X
020A   3A 0138 @        LDA    INT$S ;REINITIALIZE
020D   47     @        MOV    B,A  ;INTRPT CNTR
020E   3A 013A @        LDA    SCNTR ;TIME TO PROCESS?
0211   3D     @        DCR    A      ;
0212   280E   @        JRZ    UPDATE ;YES,DO PROCESS
0214   32 013A @        STA    SCNTR ;NO,STORE SAMPLE CNTR
0217   DB06   @        IN    6      ;CHECK CLOCK FLAG
0219   CB57   @        BIT    2,A  ;
021B   202B   @        JRNZ  CLK2FS ;CLOCK TOO FAST
021D   D9     @        EXX   ;OK,RESTORE REGS
021E   08     @        EXAF  ;
021F   FB     @        EI    ;ENABLE INTERRUPTS
0220   ED4D   @        RETI  ;RETURN
a;
a;
a;THIS SECTION ENTERED WHEN TEMP BUFFER
a;IS FILLED. IT UPDATES TEMP BUFFER ADDRS
a;AND SAMPLE COUNTER.
a;
0222   2A 0183 @UPDATE: LHLD   NTMPAD ;SWITCH BUF ADDRS
0225   ED5B 0181 @        LDED   OTMPAD ;
0229   22 0181 @        SHLD  OTMPAD ;
022C   ED53 0183 @        SDED   NTMPAD ;
0230   3A 0139 @        LDA    S$DPT ;INITIALIZE SAMPLE
0233   32 013A @        STA    SCNTR ; COUNTER
0236   3EFF   @        MVI    A,255 ;SET OVERFLOW FL
0238   32 0247 @        STA    OVFLAG ;
023B   DB06   @        IN    6      ;CHK CLOCK FLAG
023D   CB57   @        BIT    2,A  ;
023F   2007   @        JRNZ  CLK2FS ;CLOCK TOO FAST
0241   D9     @        EXX   ;OK,RESTORE REG
0242   08     @        EXAF  ;
0243   FB     @        EI    ;ENABLE INTRPTS
0244   C3 02DD @        JMP    PROC$R ;GOTO PROCESSOR
a;
0247   @OVFLAG: .BLKB 1 ;OVERFLOW FLAG
a;
a;
a;*****
a;
a;CLOCK TO FAST; STOP SAMPLING; CUE
a;OPERATOR AND RET
a;
0248   F3     @CLK2FS: DI    ;DISABLE INTRPTS
0249   21 0250 @        LXI    H,..MESS;OUTPUT MESSAGE
024C   CD 047A @        CALL  MESSOUT ;
024F   C9     @        RET
a;

```

Listing 1 continued on page 94



APPLE PASCAL™ GAMES

by Douglas Hergert and Joseph T. Kalash

A collection of the most popular microcomputer games programs written in UCSD/Apple Pascal. Each game includes a complete description of the rules, a sample run through the game, a guide to understanding the program itself, a structure chart graphically illustrating the organization of the program and a listing of the complete program. You are challenged not only to play the game, but also to learn how games are implemented on the computer.

300 pp., 40 illustr., Ref. P360, \$14.95

PLEASE BRING ME: APPLE PASCAL™ GAMES

YOUR FREE CATALOG:

Name _____
 Address _____
 City _____ State _____ Zip _____
 Add \$1.50 bank charge (includes all other software systems manual or charge to: VISA, MC, AMEX)
 (CA add tax) _____
 Total amount enclosed _____

SYBEX, 344 NORTH FIRST
 BERKELEY, CA 94710
 PHONE ORDERS: (415) 875-3883
 TEL. FREE OUTSIDE CA 800-521-5389

Did you know
that with
the new

UCSD*

P-SYSTEM VERSION IV

you can write
programs in



and run them on

ALTOS, APPLE, COMMO—
DORE, CROMEMCO, DEC,
IBM, INTERTEC, PHILIPS,
OHIO SCIENTIFIC, RADIO
SHACK, TERAQ, TEXAS
INSTRUMENTS, VECTOR
GRAPHIC, XEROX, ZENITH,
and many more...

without change!

(Think about that next time
you want a larger market)

We support systems
software and applica-
tions ready-to-run on
APPLE, DEC LSI-II[†], RADIO
SHACK MODEL II[‡] and AL-
TOS.

PCD SYSTEMS
P. O. Box 143
Penn Yan, NY 14527
315-536-3734

[†]TM Digital Equipment
[‡]TM of Tandy Corp.
*TM U. of California

Listing 1 continued:

```

0250          a..MESS: .ASCIZ /
0250          0D0A2A2A2A2A*****
027C          0D0A
027E          0D0A53414D50SAMPLING ABORTED: INTERRUPT RATE TOO FAST!
02AA          0D0A
02AC          0D0A2A2A2A2A*****
02D8          0D0A
02DA          0D0A00
              a/
              a;
              a; .INSERT B:PROCSR
              a; *****
              a; *
              a; *          PROCESSOR          *
              a; *
              a; *****
              a;
              a; THIS ROUTINE TAKES DATA FROM THE OLD TEMP
              a; BUFFER OF "INTHDLR", CALLS "FNXN" TO PROCESS
              a; IT, AND TRANSFERS THE PROCESSED DATA TO MAIN
              a; BUFFER STORAGE. IT KEEPS TRACK OF TIME
              a; (BY # DATA PTS) AND CALLS SPECIAL EVENT
              a; PROGRAMS AT THE APPROPRIATE TIMES. WHEN
              a; MAIN BUFFER FILLS UP, IT CALLS "DATWR"
              a; TO WRITE THE DATA OUT TO DISK.
              a; ALL REGISTERS ARE PRESERVED. ANY USER
              a; PROGRAM CALLED BY PROCSR MUST PRESERVE
              a; THE IX AND IY REGISTERS, AS WELL AS ANY
              a; OTHERS SPECIFIED AT THE CALLING POINT.
              a;
02DD          ED73 035B  aPROCSR: SSPD      STKPT  ;STORE OLD STACK PNTR
02E1          31 0100  a          LXI      SP,100H ;LOAD NEW SP
02E4          F5          a          PUSH     PSW      ;SAVE REGISTERS
02E5          C5          a          PUSH     B        ;
02E6          D5          a          PUSH     D        ;
02E7          E5          a          PUSH     H        ;
02E8          21 0247  a          LXI      H,OVFLAG;CLEAR OVERFLOW FLAG
02EB          34          a          INR      M        ;
              a;
              a; SET UP REGISTERS FOR TRANSFER:
              a;
              a;
              a;          DEC=MAIN BUFFER POINTER
              a;          BC=# OF CHANNELS
              a;          HL<=OLD TEMP BUFFER POINTER
              a;          A<=PROCESSOR CODE
              a;
02EC          ED5B 017F  a          LDDED     MBUFPT ;
02F0          0600  a          MVI      B,0      ;
02F2          21 0137  a          LXI      H,CHNL ;
02F5          4E          a          MOV      C,M      ;
02F6          2A 0181  a          LHLD     OTMPAD  ;FETCH OTMPAD
02F9          3A 013B  aNEXT:     LDA      DIVSR ;
02FC          CD 041F  a          CALL     FNXN   ;DO # CRUNCHING
              a;          ;DE, HL MUST BE SAVED
              a;          ;ON RET, (HL) SHOULD
              a;          ;CONTAIN THE DATA PT.
              a;          ;HIGH BYTE OF DATA PT
              a;          ;SHOULD BE 00 ON RET
              a;
              a;
02FF          3E7F  aTRANSF: MVI     A,127D ;CHECK OVERFLOW
0301          BE          a          CMP      M        ;
0302          CC 035D  a          CZ       BEEP  ;
0305          3E80  a          MVI     A,128D ;CHECK UNDERFLOW
0307          BE          a          CMP      M        ;
0308          CC 035D  a          CZ       BEEP  ;
030B          EDA0  a          LDI     ;DO TRANSFER
030D          2B          a          DCX     H        ;
030E          3E00  a          MVI     A,0      ;CLEAR ACC
0310          77          a          MOV     M,A     ;CLEAR BUFFER
0311          23          a          INX     H        ;
0312          23          a          INX     H        ;
0313          EA 02F9  a          JO      NEXT  ;TILL DONE
              a;
              a;
0316          ED53 017F  a          SDED     MBUFPT ;STORE MAIN BUF PNTR
031A          21 E000  a          LXI     H,-2000H;MAIN BUFFER FULL?
031D          19          a          DAD     D        ;SUBTRACT 8K
              a;          ;MAIN BUFFER GOES
              a;          ;FROM 1000H TO 2000H
031E          3A 0137  a          LDA     CHNL   ;ADD # CHANNELS
0321          C602  a          ADI     2        ;ADD TERMINATION BYTES
0323          0600  a          MVI     B,0      ;
0325          4F          a          MOV     C,A     ;
0326          ED4A  a          DADC    B        ;
0328          F4 0487  a          CP      DATWR  ;YES, WRITE OUT DATA
032B          FB          a          EI       ;ENABLE INTERRUPTS
              a;
              a;
              a; CHECK IF TIME FOR PROGRAMMED EVENTS:
              a;
032C          3A 013C  a          LDA     N$EVTS ;LOAD A W/# EVENTS
032F          B7          a          ORA     A        ;=0?
    
```

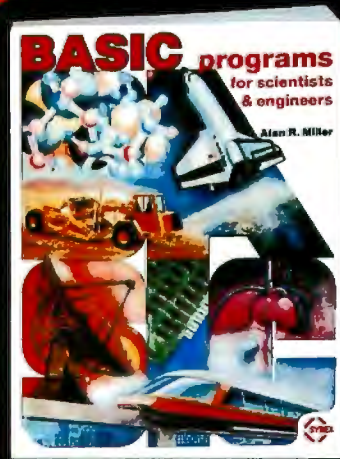

Listing 1 continued:

```

0330 CA 034B @ JZ .OUT ;YES, OUT & RET
0333 47 @ MOV B,A ;B<=#EVENTS
0334 21 013E @ LXI H,ETIME+1;LOAD LOC OF LOW
;BYTE OF TIME
;
;
0337 3EFF @ .LOOP: MVI A,-1 ;SUBTRACT 1 FROM TIME
0339 86 @ ADD M ;
033A 77 @ MOV M,A ;
033B D4 0366 @ CNC HYDCR ;NO CARRY: DECREMENT
;HIGH BYTE, RETURN WITH
;Z=0
033E CC 0362 @ CZ ENDCK ;CHECK HIGH BYTE
;RET W/Z=1 IF 00
0341 CC 036B @ CZ ESTART ;TIME FOR EVENT?
;HL MUST
;BE SAVED BY PRGMS.
;INCREMENT POINTER TO
;NEXT EVENT TIMER
; (LOW BYTE)
0344 23 @ INX H ;
0345 23 @ INX H ;
0346 23 @ INX H ;
0347 23 @ INX H ;
0348 05 @ DCR B ;
0349 20EC @ JRNZ .LOOP ;LOOP TILL ALL EVENT
;TIMERS ARE PROCESSED
;
;
034B 3A 0247 @ .OUT: LDA OVFLAG ;CHECK OVERFLOW FLAG
034E B7 @ ORA A ;SET Z FLAG
034F C4 0372 @ CNZ OVFLOW ; OOH-OOH !!
0352 E1 @ RSTORE: POP H ;RESTORE REGS
0353 D1 @ POP D ;
0354 C1 @ POP B ;
0355 F1 @ POP PSW ;
0356 ED7B 035B @ LSPD STKPT ;RESTORE OLD SP
035A C9 @ RET ;OK.RET TO STATUS
035B @ STKPT: .BLKW 1 ;STORE OLD SP HERE
;
;*****
035D 3E07 @ BEEP: MVI A,7 ;OUTPUT BELL TO CRT
035F D302 @ OUT 2 ;
0361 C9 @ RET ;
;
;*****
@ ENDCK : CHECKS THE HIGH BYTE OF A 16-BIT
@ WORD. RETURNS WITH Z FLAG SET IF THE HIGH
@ BYTE = 0. EXPECTS HL TO CONTAIN THE ADDR
@ OF THE LOW BYTE (WITH HIGH BYTE IN (HL-1)).
@ REG A SHOULD EQUAL 00 ON ENTERING.
@ ALL REGS ARE PRESERVED.
;
0362 2B @ ENDCK: DCX H ;
0363 BE @ CMP M ;
0364 23 @ INX H ;
0365 C9 @ RET ;
;
;*****
@ HYDCR: THIS SR SUBTRACTS ONE FROM HIGH BYTE
@ OF A 16-BIT WORD. EXPECTS HL TO POINT TO THE
@ LOW BYTE, WITH HIGH BYTE AT (HL-1). ALL REGS
@ ARE PRESERVED. ON RETURN Z FLAG SET TO 1 AND
@ CARRY CLEARED.
@ ASSUMES REG A NOT 00 ON ENTERING.
;
0366 2B @ HYDCR: DCX H ;DCR HIGH BYTE
0367 35 @ DCR M ;
0368 23 @ INX H ;RESTORE HL
0369 B7 @ ORA A ;SET Z=1
036A C9 @ RET ;
;
;*****
@ ESTART: SAVES REG HL ON STACK AND THEN JUMPS
@ TO PRGM. THE USER PRGM SHOULD PRESERVE IX
@ AND IY REGS AND RETURN TO THE "PROCESSOR"
@ BY <POP H ; RET >
;
036B E5 @ ESTART: PUSH H ;SAVE REGS
036C 23 @ INX H ;GET LOW BYTE ADDR
036D 5E @ MOV E,M ;LOAD JMP ADDR
036E 23 @ INX H ;INTO DE
036F 56 @ MOV D,M ;

```

Listing 1 continued on page 416



BASIC PROGRAMS FOR SCIENTISTS AND ENGINEERS

by Alan R. Miller

This second book in the SYBEX Programs for Scientists and Engineers series provides a library of programs useful for solving problems frequently encountered in science and engineering. The programs in this book can be run on most BASICs. Any implementation differences are described and clearly analyzed, helping you to develop proficiency in the use of BASIC, currently the most widely available high level language for microcomputers.

375 pp., 120 illustr., Ref. B240, \$14.95

PLEASE SEND ME: BASIC PROGRAMS FOR SCIENTISTS AND ENGINEERS (YOUR FREE CATALOG)

Name _____
 Address _____
 City _____ State _____ Zip _____
 Add: CIE 50/Book UPS C750/Book 400 direct
 150/book overseas airmail
 or charge my: VISA / MC / AM EX
 (CA add tax) _____
 Total Amount Enclosed _____
 Card No. _____ Exp. Date _____
 Signature _____

SYBEX, 2344 SIXTH STREET
 MENLO PARK, CA 94025
 PHONE ORDERS: INSIDE CA 415/848-8233
 TOLL FREE OUTSIDE CA 800/227-8349



All you need if you lose the Card. Emergency replacement around the world.

In non-emergency cases, call us and a replacement card will be mailed to your billing address.



No matter where or when in an emergency, you can get an American Express® Card replaced quickly. Usually within 24 hours. Sometimes it may be the next business day. But in any event, you'll be back on the road, fast. Because you can go to almost 1,000 of the Travel Service Offices of American Express Company, its subsidiaries and Representatives. They can also help with emergency funds. And assist you with other lost travel documents and tickets. No other card can do all this, this fast, in this many places. One more reason to carry the American Express Card. Don't leave home without it.



Data-Base Management Systems: Powerful Newcomers to Microcomputers

Michael Gagle and Gary J Koehler
Micro Data Base Systems Inc
POB 248
Lafayette IN 47902

Andrew Whinston
Krannert Graduate School of Management
Purdue University
Lafayette IN 47907

Large computers are already running many successful applications programs developed by using commercial data-base management system (DBMS) packages. DBMS packages for large computers sell in the \$50,000 to \$200,000 range and require approximately 50 K words of memory. As a result, it is impractical to apply the development concepts used on large machines to data-base management systems for the microcomputer. A more promising approach is to create a DBMS offering the best features of systems for larger computers, yet fitting the microcomputer's capabilities. Two of the authors of this article, Gary Koehler and Mike Gagle, work for Micro Data Base Systems, Inc, and have participated in the development of a data-base management system tailored to the microcomputer. Called MDBS.DMS, this data-base management package serves as the basis of most of the discussion that follows. But first we'll explain the basic concepts and terms of data-base management systems.

Data-Base Concepts and Terms

The central concept of data-base management is to create files that can be linked from different points of view. By using different linkages, the user can generate different kinds of reports based on the same data files. The DBMS makes this possible by handling all the details of data storage. When using the DBMS, the user never refers to physical storage locations, but deals instead with the conceptual structure of the data.

Many of the concepts used in commercial data-base systems were defined by CODASYL (Conference on Data Systems Languages). A brief description of impor-

tant concepts from the CODASYL report of April 1971 will help you follow the rest of this article:

Data item: A unit of data that can take on a range of values. Examples of data items are customer names, part numbers, and selling prices. Each data item may have a name assigned to it.

Record type: A collection of zero or more data items. An example of a record type is the collection of the data items customer name, address, city, and zip code. The user can give a record type a name (such as CUSTOMER, for our example). A data-base record corresponds to a logical record in programming languages such as Pascal.

Record occurrence: A record type such as CUSTOMER can have many occurrences in the data base, one occurrence for each customer. The values of the data items in each record occurrence reflect the appropriate values for the corresponding customer.

Set-type: As data items can be grouped into records, records can be linked into sets. Sets in the CODASYL sense do not correspond to mathematical sets, but rather to an ordered grouping of related records. Usually, a set consists of one record occurrence (referred to as an OWNER) that has several occurrences of some other record type (MEMBERS) associated with it. Consider again the case in which a supplier could supply various parts. A set relation could be defined between the supplier record type and the parts record type linking a supplier with different parts supplied.

In the CODASYL specifications, sets are said to be "one-to-many" sets. Any member record occurrence (such as a part) can be associated with only one owner

record occurrence (such as a supplier) through a given set-type. If several suppliers can supply the same part, there exists between supplier and part a "many-to-many" relationship. Some DBMS (such as MDBS.DMS) explicitly allow many-to-many relationships, while others can support such relationships only by creating a dummy record, called a "nub" or "link" record.

Features of Data-Base Systems

Data-base management systems offer many attractive features, including: multiple views of data, data-base flexibility, nonredundancy of data, security of data, self-description of data bases, query processing, and interfacing with a host language.

Sequential file organization is adequate for some programming purposes. Sequential files assume that all data in a file will be processed in a certain order. The ISAM (indexed sequential-access method) helps meet the need to access a particular sequential record by reference to an index or key.

For simple data structures, an ISAM-type organization works well enough. But as the interrelationships of the data become more complex, even simple reports and routine updating of data require more file handling. Furthermore, simple data structures quickly become complex as users begin to appreciate the usefulness of the computer and request more applications.

A true data-base management system is specifically de-

signed to handle complex data structures by offering multiple views of the same data; that is, a DBMS lets an applications programmer view a data structure in the way most convenient for the application at hand. Greater convenience means that the programmer spends much less time writing, debugging, and maintaining programs—enough time to offset the start-up costs of the DBMS.

Data-Base Flexibility

It's common to hear someone say, "Now that we have our inventory system computerized, it sure would be nice to have a report on _____." The blank can be filled with almost anything from "delivery times from all suppliers in Kansas" to "average inventory level of parts that cost more than \$10 each." Sometimes hindsight shows you should have included in the system some data (say a reorder point) not defined in the original data base. That's why DBMS should include the ability to add or delete types of data in the data base. Of course, changing the data-base structure often requires updating the data occurrences. If the DBMS can do this updating, the process of changing the data structure is straightforward.

In the absence of a restructuring feature, the typical user defines extra item fields for "future use" or else rebuilds the data base. The first alternative is wasteful and doesn't allow for adding or deleting record types or set relationships. The second alternative is painful to say the least.

Nonredundancy of Data

Often, one piece of information (say a supplier's name) appears in several different data files. If the supplier incorporates and changes its name, updating requires finding the old name in *each* of the data files and then making the change in each case. Further, if a file is sorted by names, the file may have to be re-sorted.

If the name of the supplier occurs only in *one* place, updating is simple. And so it is in a data base with an appropriately organized structure. The data-base system automatically performs any data reorganization necessary to maintain sorted orders. The nonredundancy feature also reduces problems caused by inconsistent data.


Security of Data

There are a variety of ways to protect the privacy and integrity of data in a data base. These include sophisticated authorization checks and password validation. The security mechanisms of the MDBS.DMS data-base management system will serve as an example.

When the user defines data to the MDBS.DMS system, the user gives each piece of information separate read- and write-access levels. Additionally, the system provides that each user may be declared and given unique read- and write-access permission and an access password. When the data base is used, the DBMS prohibits persons from reading or writing data unless their access level permits it. A clerk may be restricted to reading the

STRETCH THE POWER

Of Your HP-85 or Commodore Pet/CBM With TNW's IEEE-488 Bus System Building Blocks



TNW-2000

TNW's RS-232 SERIAL INTERFACES

Connect your PET/CBM to any RS-232 Serial Printer, Plotter, CRT Terminal, Modem, or other device.

| | | |
|-----------------|---|--------------|
| TNW-1000 | ONE CHANNEL OUTPUT ONLY | \$129 |
| TNW-2000 | ONE CHANNEL INPUT AND OUTPUT | \$229 |
| TNW-232D | TWO CHANNELS, INPUT & OUTPUT, 12 RS-232 CONTROL SIGNALS | \$369 |

TURN YOUR PET INTO A TERMINAL

Access Timesharing Systems and Bulletin Boards with TNW's Piern Software and full service telephone modem:

| | | |
|----------------|------------------------------------|--------------|
| TNW-103 | AUTO ANSWER/AUTO DIAL USE WITH DAA | \$389 |
|----------------|------------------------------------|--------------|

Piern also works with acoustical couplers and other modems interfaced to the PET with the TNW-2000 or TNW-232D. Electronic mail and TWX Terminal programs also available. All units are addressable IEEE-488 devices, complete with power supply cabinet, full documentation and one year warranty.

TNW CORPORATION

3351 Hancock St. • San Diego, CA. 92110 (714) 225-1040
TWX910-335-1194
Visa/Mastercharge Welcome • Dealer inquiries invited

A Database System that thinks like you do.

Sequitur. Its name suggests both its simplicity and its secret.

We linked a word processor and a relational database system together with a powerful minicomputer and produced one of the rarest forms of computer life: a system so sophisticated that a beginner can use it.

It helps you learn.

It's amazingly friendly. You can sit down in front of a terminal, pick up the Sequitur operating manual, and computerize your own data. So can anybody else, no matter how computer-shy. Even unassisted, it won't take more than a few hours of tinkering.

You can enter, edit, excerpt and report in a logical, orderly sequence. You just list the data you want to store. Sequitur organizes it into an easy-to-read table, which you can edit or call up at will, all or in part. Then you're ready to ask questions, make reports, print forms, write form letters or whatever.

It speaks your language.

You work with simple, clear commands. Sequitur avoids the arbitrary codes and rituals that

clutter up most systems.

To add a row to a table, you just type in the word "ADD," then fill in the blanks. In other systems, the same operation typically requires something like "INSERT INTO EMP (EMPNO, ENAME, JOB, SAL): <7989, 'CARTER', 'SALESMAN', 1500>:"

Its cost is friendly, too.

Today, Sequitur is ready to work with the multi-user Unix operating system on the powerful Onyx mini-computer.

You can install Sequitur on your Onyx for \$3495. If you've investigated serious

Unix-compatible software, you know what a good price that is.

But you'll never appreciate Sequitur until you see it in action,

which you'll be able to do at COMDEX. Or

you can get in touch with Pacific Software, 2608 Eighth Street, Berkeley CA 94710.

Phone, (415) 540-0616.

Sequitur™

Pacific Software
Manufacturing Company
Onyx Distributing, Inc.



Unix is a trademark of Bell Laboratories.

At COMDEX, you'll find Sequitur at the Pacific Software booth (A60) and the Onyx booth (430).

INNOVATIVE PRODUCTS

COMPLETE CATALOG OF COMPUTER EQUIPMENT AT DISCOUNT PRICES.

ANOTHER BOMBSHELL FROM INNOVATIVE PRODUCTS!

\$299 64K—4Mhz.—IEEE Assembled & Tested

64K S-100 DYNAMIC RAM MEMORY

BY COMPUTER SYSTEM RESOURCES

Works with Cromemco, North Star, Teletek, Tarbell, most Z80 and 8080 systems even with DMA

Guaranteed to work in your system or your money will be refunded within 15 days of purchase

ALSO AVAILABLE PARTLY POPULATED

16K.....\$239.00 32K.....\$259.00
48K.....\$279.00

Q.T. COMPUTER SYSTEMS:

| MODEL | DESCRIPTION (ALL ASSEMBLED & TESTED) | PRICE |
|------------|---|----------|
| MF-10D12A | 25 A Mainframe 12 Slot S100 Dual 8 Drive | \$625.00 |
| MF-18A | 25 A Tabletop Mainframe 18 Slot S100 | \$500.00 |
| MF-12A | 25 A Mainframe 12 Slot S100 Dual 5 Drive | \$450.00 |
| Z-80A | Single Board Z 80 Computer 2.4 Mhz 8 100 | \$185.00 |
| Z-80A-22 | Monitor Program for Z-80A & Tarbell or VI | \$100.00 |
| RAM 32 | 32K Static RAM Board Low Power S-100 | \$190.00 |
| OTC10A | 2 Serial & 4 Parallel Port I O S 100 | \$190.00 |
| OTCCCSA | Clock Calendar Board S 100 | \$125.00 |
| OTCCCAA | Clock Calendar Board for Apple | \$125.00 |
| OTCCCTR580 | Clock Calendar Module for TRS-80 | \$125.00 |

VISTA COMPUTER COMPANY:

| MODEL | DESCRIPTION (ALL ASSEMBLED & TESTED) | PRICE |
|---------|---|----------|
| V300 25 | Letter Quality Printer 25 CPS | \$109.00 |
| V300 45 | Letter Quality Printer 45 CPS | \$195.00 |
| V DRIVE | Dual 8 Disk Cabinet Power Supply Rack Mountable | \$75.00 |

COMPUTER SYSTEM RESOURCES:

| MODEL | DESCRIPTION (ALL ASSEMBLED & TESTED) | PRICE |
|---------|---|----------|
| RAM 16 | 16K Static RAM S 100 | \$179.00 |
| RAM 16C | Low Power (CMOS) Version of RAM 16 1 4 Wall | \$29.00 |
| RAM 65 | 16K Static RAM I O Port Bank Select S 100 | \$189.00 |
| RAM 65C | Low Power (CMOS) Version of RAM 65 1 4 Wall | \$71.00 |
| RAM 32 | 32K Low Power 8 Bit Static RAM 24 Address Lines | \$199.00 |
| RAM 256 | 256K 8 16 Bit Dynamic RAM Fully IEEE 646 | \$195.00 |
| I O B | 8 Port Serial I O Fully IEEE up to 200K BAUD | \$95.00 |

ORDERING INFORMATION:

Minimum Order is \$15.00. Prices quoted do not include shipping and handling. Foreign orders require prepayment by MICR or Money Order in U.S. funds. All other orders require prepayment or COD shipment

PLACE ORDERS TOLL-FREE:

1 (800) 423-5141

In Alaska, Calif., and Hawaii, call us collect at (213) 883-3244.

TO RECEIVE OUR FREE CATALOG OR FOR TECHNICAL INQUIRIES CALL (213) 883-3244

7131 OWENSMOUTH AVE. / #21D
CANOGA PARK, CALIFORNIA 91303
213 / 883-3244
800 / 423-5141

INNOVATIVE PRODUCTS

price of an item, while a manager can change the price. The system also includes precautions that make it difficult to infer information about data in the system.

Self-Description of Data Bases

An integral part of a data base is its *data directory*, which contains information about each type of data defined in the data base. This information includes the name of the data item, the data type (in the larger sense, eg: CHARACTER, REAL, INTEGER), the length of the data item, and its read/write access levels. Data items are grouped into named records, and records may be organized by sets. Thus, the data directory keeps information on the records (including the data items in the record and the read/write access levels of the record itself), and the sets (including the ordering of the set of records and the records allowed in the set).

The data directory contains all the information needed for the DBMS to maintain the data base. However, the presence of the data directory implies that generalized programs can be developed that are independent of any particular data base. These programs can extract information from the data directory and, based on this information, process the data in the data base. There are essentially two types of programs: a broad class written in a host language such as BASIC, and a generalized report writer or query processor.

Query Processing

A query system consists of programs that can add, retrieve, update, and display data from a data base. A query system is flexible in that it is not restricted to a particular data base or data structure, but will work with a wide variety of data bases. Query systems are usually intended for nonspecialists who wish to use a data base or programmers who wish to perform initial checkouts of program logic. Most query systems can be used to generate reports from data in the data base, and the more sophisticated query systems allow great flexibility in use.

Examples of query language statements might be:

- LIST CUSTOMER NAME, ADDRESS FOR STATE = 'OHIO'
- CHANGE UNIT-PRICE TO 0.75 FOR PART-NUMBER = 056127

Interface with a Host Language

Most data-base systems can be accessed by "host-language" programs. In microcomputers, this is generally done by a call to a subroutine that contains the DBMS code, which is written in machine language for optimal processing speed. Typical capabilities include:

- Create: Create an occurrence of a data record.
- Store: Store data in the data base.
- Fetch: Retrieve data from the data base.
- Insert: Put a data record in a data relationship.
- Modify: Change data in a data record.

REQUESTS

A SELF-COMPILING RELATIONAL DATABASE & APPLICATION SYSTEMS GENERATOR

DATABASE SELECTION —

- Uses screen masks to form query
- Provides extensive search capabilities
- Search arguments can include arithmetic/boolean functions, multi-field comparisons
- Queries can generate input for automatic database maintenance
- Queries can be stored in "Query Library" and executed from menu on demand
- Any number of fields can be queried concurrently
- Query output can be routed to disk, CRT report formatter, VISICALC™ or SOURCE™

DATABASE MAINTENANCE—

- Uses sophisticated screen formatting & data entry, like on IBM 3270's!
- Generates it's own screens automatically!
- Handles records up to 4K in length, using multiple screen "Pages"!
- Automatic data compression for increased disk capacity
- Uses SuperKram access method for incredibly fast access, LESS THAN .2 SECONDS FOR A RECORD!
- Automatic index creation/maintenance
- Automatic maintenance capabilities
- "Goof-Proof" error handling
- Input can come from VISICALC™ or SOURCE™

DATABASE REPORTING—

- Automatic headlines
- Automatic field editing
- Report fields can be calculated, sub-totaled & cross-footed in any manner desired
- Optional counter breaks may be set
- Automatic grand totals
- Automatic statistics

REQUIREMENTS —

SuperKram (available separately) and: Commodore Pet 32K (40 or 80 col.) and 2040/4040/8050 disk OR Apple II 48K with Applesoft or language system and 2 disk drives or CORVUS.

ONLY \$225 WITH **\$325**
SUPERKRAM FIRMWARE

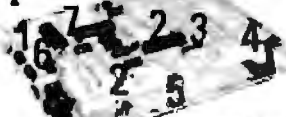
USA UNITED SOFTWARE OF AMERICA
750 THIRD AVE. NEW YORK NY 10017

Look for the RED-WHITE-BLUE United Software Display at your local computer dealer, or send check or moneyorder, plus \$3.00 shipping

(212) 682-0347 Telex 640055

FOR ONLY \$129.95 Learn Computing From The Ground Up

Build a Computer kit that grows with you, and can expand to 64k RAM, Microsoft BASIC, Text Editor/Assembler, Word Processor, Floppy Disks and more.



EXPLORER/85

Here's the low cost way to learn the fundamentals of computing, the all-important basis you'll need more and more as you advance in computer skills. For just \$129.95 you get the advanced-design Explorer/85 motherboard, with all the features you need to learn how to write and use programs. And it can grow into a system that is a match for any personal computer on the market. Look at these features: **8085 Control Processor Unit**, the microprocessor "heart" of the Explorer/85 (join the millions who will buy and use the 8080/8085 this year alone); **Four 8-bit plus one 6-bit input/output ports** from which you can input and output your programs, as well as control exterior switches, relays, lights, etc.; a cassette interface that lets you store and reload programs you've learned to write; **define 2,000 byte operating systems/monitor** makes it easy to learn computing in several important ways; **It allows simpler, faster writing and entering of programs**; **It permits access by you in all parts of the system so you can check on the status of any point in the program**; **It allows tracing each program step by step**, and provides for displaying all the contents of the CPU (registers, flags, etc.), and it does much more!

You get all this in the starting level (Level A) of the Explorer/85 for only \$129.95. Incredible! To use, just plug in your 8VDC power supply and terminal or keyboard/display — if you don't have them, see our special offers below.

- Level A computer kit (Terminal Version) ... \$129.95 plus \$2 P&H *
- Level A kit (Hex Keypad/Display Version) ... \$129.95 plus \$2 P&H *

LEVEL B — This "building block" converts the motherboard into a two-slot S100 bus (industry standard) computer. Now you can plug in any of the hundreds of S100 cards available.

- Level B kit ... \$49.95 plus \$2 P&H *
- S100 bus connectors (two required) ... \$4.95 each, postpaid.

LEVEL C — Add still more computing power; this "building block" mounts directly on the motherboard and expands the S100 bus to six slots.

- Level C kit ... \$39.95 plus \$2 P&H *
- S100 bus connectors (five required) ... \$4.95 each, postpaid.

LEVEL D — When you reach the point in learning that requires more memory, we offer two choices: either add 4k of a memory directly on the motherboard, or add 16k to 64k of memory by means of a single S100 card, our famous "JAWS".

- Level D kit (CHECK ONE) 4k on-board ... \$49.95 plus \$2 P&H *
- 16k S100 "JAWS" ... \$149.95 plus \$2 P&H *
- 32k S100 "JAWS" ... \$199.95 plus \$2 P&H *
- 48k S100 "JAWS" ... \$249.95 plus \$2 P&H *
- 64k S100 "JAWS" ... \$299.95 plus \$2 P&H *

LEVEL E — An important "building block" it activates the 6k ROM/EPROM space on the motherboard. Now just plug in one 6k Microsoft BASIC or your own custom programs.

- Level E kit ... \$5.95 plus 50¢ P&H *

MICROSOFT BASIC — It's the language that allows you to talk English to your computer! It is available three ways: **8k cassette version of Microsoft BASIC** (requires Level B and 12k of RAM minimum; we suggest a 16k S100 "JAWS" — see below); **8k ROM version of Microsoft BASIC** (requires Level B & Level E and 4k RAM; just plug into your Level E sockets. We suggest either the 4k Level D RAM expansion or a 16k S100 "JAWS" — see above); **8k Disk version of Microsoft BASIC** (requires Level B, 32k of RAM, floppy disk controller, 8" floppy disk drive) ... \$29.95 postpaid.

TEXT EDITOR/ASSEMBLER — The editor/assembler is a software tool (a program) designed to simplify the task of writing programs. As your programs become longer and more complex, this editor can save you many hours of programming time. This software includes an editor program that enters the programs you write, makes changes, and saves the programs on cassette. The assembler performs the clerical task of translating symbolic code into the computer-readable object code. The editor/assembler program is available either in cassette or a ROM version.

- Editor/Assembler (Cassette version; requires Level B) and 8k (min) of RAM — we suggest 16k "JAWS" — see above) ... \$59.95 plus \$2 P&H *
- Editor/Assembler (ROM version, supplied on an S100 card; requires Level B and 4k RAM (min.) — we suggest either Level D or 16k "JAWS") ... \$99.95 plus \$2 P&H *

8" FLOPPY DISK — A remarkable "building block" — Add our 8" floppy disk when you need faster operation, more convenient program storage, perhaps a business application, and access to the literally thousands of programs and program languages available today. You simply plug them into your Explorer/85 disk system — It accepts all IBM-formatted CP/M programs.

- 8" Floppy Disk Drive ... \$49.95 plus \$12 P&H *
- Floppy Controller Card ... \$199.95 plus \$2 P&H *
- Disk Drive Cabinet & Power Supply ... \$99.95 plus \$3 P&H *
- Drive Cables (set up for two drives) ... \$29.95 plus \$1.50 P&H *

CP/M 2.2 Disk Operating System includes Text Editor/Assembler, dynamic debugger, and other features that give your Explorer/85 access to the world of existing CP/M-based programs. \$150.00 postpaid.

NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note, disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).

- AP-1 Power Supply kit (8V @ 5 amps) in deluxe steel cabinet ... \$39.95 plus \$2 P&H *

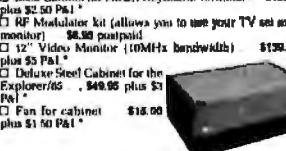
NEED A TERMINAL? We offer you choices; the least expensive one is our Hex Keypad/Display kit that displays the information on a calculator-type screen. The other choice is our ASCII Keyboard/Computer Terminal kit that can be used with either

- 1. Plug in Netronics's Hex Keypad/Display
- 2. Add Level B to convert to S100
- 3. Add 4k RAM
- 4. Plug in Level E here to receive Microsoft BASIC or Editor/Assembler in ROM
- 5. Add two S100 boards
- 6. Add your own custom cards (prototyping circuit)
- 7. Connect terminal

- CRT monitor or a TV set (if you have an RF modulator)
- Hex Keypad/Display kit ... \$99.95 plus \$2 P&H *

ASCII Keyboard/Computer Terminal kit featuring a full 128 character set, 104 case, full cursor control, 75 nham video output, convertible to baudal output, selectable baud rate: RS 232 C or 20 ma./D, 32 or 64 character by 10 line format ... \$149.95 plus \$2 P&H *

- Steel Cabinet for ASCII Keyboard/Terminal ... \$19.95 plus \$2.50 P&H *
- RF Modulator kit (allows you to use your TV set as a monitor) ... \$4.95 postpaid
- 12" Video Monitor (10MHz bandwidth) ... \$139.95 plus \$3 P&H *
- Deluxe Steel Cabinet for the Explorer/85 ... \$49.95 plus \$3 P&H *
- Fan for cabinet ... \$16.00 plus \$1.50 P&H *



ORDER A SPECIAL-PRICE EXPLORER/85 PAK — THERE'S ONE FOR EVERY NEED.

- Beginner Pak (Save \$26.00) — You get Level A (Terminal Version) with Monitor Source Listing (\$25 value), AP-1, 5-amp. power supply, Intel 8085 Users Manual. (Reg. \$199.95) SPECIAL \$159.95 plus \$2 P&H *
- Experimenters Pak (Save \$53.00) — You get Level A (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level A Hex Monitor Source Listing, and AP-1, 5-amp. power supply. (Reg. \$279.95) SPECIAL \$229.95 plus \$2 P&H *
- Special Microsoft BASIC Pak (Save \$10.00) — You get Levels A (Terminal Version), B, D (4k RAM), E, 8k Microsoft in ROM, Intel 8085 User Manual, Level A Monitor Source Listing, and AP-1, 5-amp. power supply. (Reg. \$439.70) SPECIAL \$399.95 plus \$7 P&H *

- ADD A ROM-VERSION TEXT EDITOR/ASSEMBLER (Requires Levels B and D or S100 Memory) ... \$99.95 plus \$2 P&H *

Starter 1" Disk System — Includes Level A, 1" floppy disk controller, one CDC 8" disk-drive, two-drive cable, two S100 connectors, just add your own power supplies, cabinets and hardware. (Reg. \$1085.00) SPECIAL \$999.95 plus \$13 P&H *

- 32k Starter System: \$1949.95 plus \$17 P&H *
- 48k Starter System: \$1999.95 plus \$17 P&H *
- 64k Starter System: \$1149.95 plus \$17 P&H *
- Add to any of above Explorer steel cabinet, AP-1 five amp power supply, Level C with two S100 connectors, disk drive cabinet and power supply, two sub-D connectors for connecting your printer and terminal. (Reg. \$225.85) SPECIAL \$199.95 plus \$13 P&H *
- Complete 84k System, Wired & Tested ... \$1850.00 plus \$26 P&H *

Special Complete Business Software Pak (Save \$25.00) — Includes CP/M 2.2 Microsoft BASIC, General Ledger, Accounts Receivable, Accounts Payable, Payroll Package. (Reg. \$1325) SPECIAL \$999.95 postpaid.

*P&H stands for "postage & insurance." For Connecticut orders, double this amount.

Continental Credit Card Buyers Outside Connecticut:

TO ORDER

Call Toll Free: 800-243-7428

To Order From Connecticut, or For Technical Assistance, call (203) 354-8375

★ (Clip and mail entire ad) ★

SEND ME THE ITEMS CHECKED ABOVE

Total Enclosed (Conn. Residents add sales tax): \$ _____ Paid by:

- Personal Check Cashier's Check/Money Order
- VISA MASTER CARD (Bank No. _____)

Acc. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

City _____

State _____ Zip _____

- Find: Locate a data occurrence.
- Delete: Delete a data record.
- Remove: Remove a data record from a set.

The data base may also be accessed by query systems, as mentioned previously.

Program Example

In order to explain the advantages of using a DBMS in a microcomputer environment, we will present an example using the fictitious Nibble Computer Store. This store retails components and equipment supplied by many vendors. One of the store's major concerns is to keep customers satisfied by providing speedy service. The store maintains an inventory-order system with a tracking of customer orders.

Handling this management problem requires the following reports:

- Report 1: A list of customers (sorted by name) who have placed an order within the last sixty days.
- Report 2: A list of parts that need to be reordered.
- Report 3: A list of customers whose orders have been outstanding for more than two days. Also, a list of the parts (and the name of the suppliers of those parts) that are holding up those orders.

The data requirements are as follows:

- Requirement 1: Maintain a list of customers, sorted by name and by customer number.
- Requirement 2: Maintain a list of suppliers, sorted by name and by supplier number.
- Requirement 3: Maintain a list of parts stocked, sorted by description and by part number.
- Requirement 4: Keep track of which parts are supplied by each manufacturer.
- Requirement 5: Keep track of the status of each customer's orders.

We first show a possible (although simplistic) way to implement such a system using conventional file-management techniques.

A Conventional Approach

Although there are many ways to design a system to perform the functions needed by the Nibble Computer Store, most suitable systems would require creating and maintaining a file for each particular application. Table 1 shows several types of files that might be required.

A look at the five data requirements shows why so many files are needed. Consider requirement 1. A file of customer data can be sorted either by name or number. But to sort the file by both name and number usually requires that a copy of the file be made first. Then the original file can be sorted by customer name, and the

NETRONICS Research & Development Ltd.
333 Litchfield Road, New Milford, CT 06776



Not bad for the first day.

This morning, no one in the office knew a thing about making graphs. And now secretaries and managers alike are producing crisp, concise charts and graphs for marketing analysis, industry forecasting and sales presentations. Without writing a single computer program.

Picture your data the way you want it.

The key is a graphics work-station from Hewlett-Packard. Built around our HP 2647A intelligent terminal, it's like putting an entire art department at your staff's fingertips.

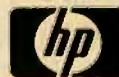
Not only can you call up your standard business reports on production performance, sales figures or market trends, but with just a

few simple keystrokes, you can turn them into clear and helpful pie charts, line and bar graphs, logarithmic charts, overhead transparencies and more. (It's also easy to tailor to more sophisticated applications.)

Draw your own conclusions.

Invite your secretary along to your nearest HP sales office for a demonstration of our graphics products (we're listed in the White Pages). And bring your company's annual report or other business data—we'll be glad to show you just how

professional an amateur artist can be. Or, if you'd like more information first, just return the coupon below.



**HEWLETT
PACKARD**

Yes, I'd like more details about your graphics workstations. Please send me your brochure.

Name _____

Title _____

Phone _____

Company _____

Address _____

City/State/Zip _____

Send to: Hewlett-Packard, Data Terminals Division,
Dept. 5967, 974 East Arques Ave., Sunnyvale, CA 94086
Attn: Tom Anderson, Marketing Manager.

PMN10/1

42001HPT15

| | | |
|---|--|--|
| <u>File 1</u> (Sorted by Customer Name) | <u>File 2</u> (Sorted by Customer Number) | <u>File 3</u> (Sorted by Supplier Name) |
| Customer Name Customer Number Street City State Zip Code | Customer Name Customer Number Street City State Zip Code | Supplier Name Supplier Number Street City State Zip Code |
| <u>File 4</u> (Sorted by Supplier Number) | <u>File 5</u> (Sorted by Part Number) | <u>File 6</u> (Sorted by Part Description) |
| Supplier Name Supplier Number Street City State Zip Code | Part Number Part Description Selling Price Quantity in Inventory Reorder Point | Part Number Part Description Selling Price Quantity in Inventory Reorder Point |
| <u>File 7</u> (Sorted by Part Number) | <u>File 8</u> (Sorted by Date Received) | <u>File 9</u> (Sorted by Order Number) |
| Part Number Supplier Number | Order Number Customer Number Date Received Date Shipped | Order Number Part Number Quantity Ordered |

Table 1: The types of files needed to handle the data-processing tasks of the Nibble Computer Store without using a data-base management system. Since different tasks require different views of the data, the programmer must maintain files sorted appropriately for each task.

copy file by customer number. So data requirement 1 gives us files 1 and 2.

The same problem of double sorts applies to data requirements 2 (suppliers) and 3 (parts). This gives us six files.

The easiest way to keep track of which parts are supplied by which supplier (data requirement 4) is to define a file containing the part numbers for each supplier (file 7).

Data requirement 5 is to keep track of each customer's orders. Several approaches are possible, but we'll handle the task by creating an order file (file 8).

Turning now to the required reports, report 1 is a list of customers who have placed an order in the last sixty days. The report can be made by scanning file 8 (orders sorted by date) for orders falling in the sixty-day period, and then writing the corresponding customer numbers on a file. That file can then be sorted and used to extract the names of customers from file 1. Then the names extracted can be listed in still another file.

A list of parts to be reordered (report 2) is trickier. The parts-on-order file (file 9) can be scanned, and then the quantity ordered for unfilled orders can be written on a scratch file. This file can then be sorted on the part number, and the quantity on order can be summed for each part. This quantity can then be compared to the number of parts in inventory and the reorder points (file 5) to show which parts must be reordered.

The conventional approach could generate report 3 in two phases. First, the orders sorted by date (file 8) can be scanned to find orders that have been outstanding for

more than two days. The customer numbers can then be written on a file, sorted, and used to extract the customers' names from file 1. A similar process will find the parts whose order quantity is larger than the quantity on hand, giving the suppliers' names.

Four other files would also be required. Files 3 and 4 maintain supplier information (with two different sort orders). File 6 maintains parts information and file 7 gives the correspondence between suppliers and parts.

Obviously, writing the needed programs and maintaining these data files would be tedious, even though this is a simple example, with other complicating factors left out. If additional requirements are placed on the system (such as a listing of suppliers that supply parts that sell for less than \$2), more programs have to be written. We also have a problem with redundant data—if a customer's address changes, we have to update two files. Even worse, if a customer's name changes, one of the files has to be completely re-sorted.

The primary problem here is that different applications require different "views" of the data. For some applications, having the order information embedded in the customer file would be best. But for other applications, the order data might need to be closely limited to the supplier file. The result is that the compromise solution of figure 1 is developed, with corresponding programming complexity.

The Data-Base Management System Approach

Figure 1 shows a data structure that could be used to represent the information needed for the inventory-order

CASH FLOW PROBLEMS?



IT'S NICE TO KNOW SOMEONE WHO HAS THE SOLUTION.

MicroAge is your Solution Store . . . that means at MicroAge Computer Stores we have a wide selection of time-saving computerized business systems designed specifically to solve the daily cash flow problems every businessman faces.

MicroAge has computerized business systems that

quickly and affordably allow you to regain control of your critical accounts receivable . . . at last making it possible for you to carry out effective collection procedures on a consistent basis. MicroAge has accounts receivable program packages to automatically display and update account information; prepare trial balance including a balance-due and delinquency aging

report, and take care of dozens of other tasks that eat into your time and profit!

Computerized business systems from the MicroAge Computer Store are available in the \$5,000 to \$15,000 range, to suit the individual budget of your small business or professional practice. MicroAge backs up every system with personalized service, warranty service and repair, installation, systems consulting, even customer training. Visit the MicroAge Computer Store in your area soon with your business problems, and let us help you with the solution.

**MicroAge.
COMPUTER STORE**

"The Solution Store"™ SM

VISIT THE STORE IN YOUR AREA:

El Paso, Texas
(915) 591-3349
Rockville, Maryland
(301) 762-7585
Tucson, Arizona
(602) 790-8959
Albuquerque, New Mexico
(505) 883-0955
Pleasant Hill, California
(415) 680-1489

Aurora, Colorado
(303) 696-6950
Rochester, New York
(716) 244-9000
Hurst, Texas
(817) 284-3413
Salina, Kansas
(913) 825-7596
Orland Park, Illinois
(312) 349-8080

Milwaukee, Wisconsin
(414) 257-1100
Mountain View, California
(415) 964-7063
Scottsdale, Arizona
(602) 941-8794
Anchorage, Alaska
(907) 279-6588
San Diego, California
(714) 278-0623

Richardson, Texas
(214) 234-5955
Minneapolis, Minnesota
(612) 338-1777
Omaha, Nebraska
(402) 339-7441
Phoenix, Arizona
(602) 265-0065
Columbus, Ohio
(614) 868-1550

Indianapolis, Indiana
(317) 849-5161
Portland, Oregon
(503) 256-4713
Norwalk, Connecticut
(203) 846-0851
St. Louis, Missouri
(314) 567-7644
Oklahoma City, Oklahoma
(405) 728-1837

Houston, Texas
(713) 270-9647
Wilmington, Delaware
(302) 998-7340
Toronto, Canada
(416) 489-4236

FOR FRANCHISE OPPORTUNITY INFORMATION CALL (602) 968-3168

system. The boxes represent record types (corresponding to customers, suppliers, parts, orders, and order quantities). The names within boxes correspond to *data* items, the basic units of data that form the records. Finally, four *set-types* are defined. Sets are used to associate records. For example, SET3 is used to associate parts with their suppliers. Since, in our simple system, each part is supplied by only one supplier, we say that the supplier "owns" parts, in accordance with the data-base terminology of *set owners* and *members*. Figure 2 shows two suppliers and the parts they supply.

Information in a data base is accessed by "traversing set occurrences." To find out what parts Acme Computer supplies, we look at the occurrence of SET3, which has Acme Computer as an owner, and examine each member of the set. This allows us to retrieve data about each part supplied by Acme.

Since sets are used to access data-base information, it follows that some sets must be defined that allow the user to "get his foot in the door" of the data base. This is done with sets having a record named "SYSTEM" as their owner. Such sets can be defined so all occurrences of a record can be accessed by traversing a system-owned set.

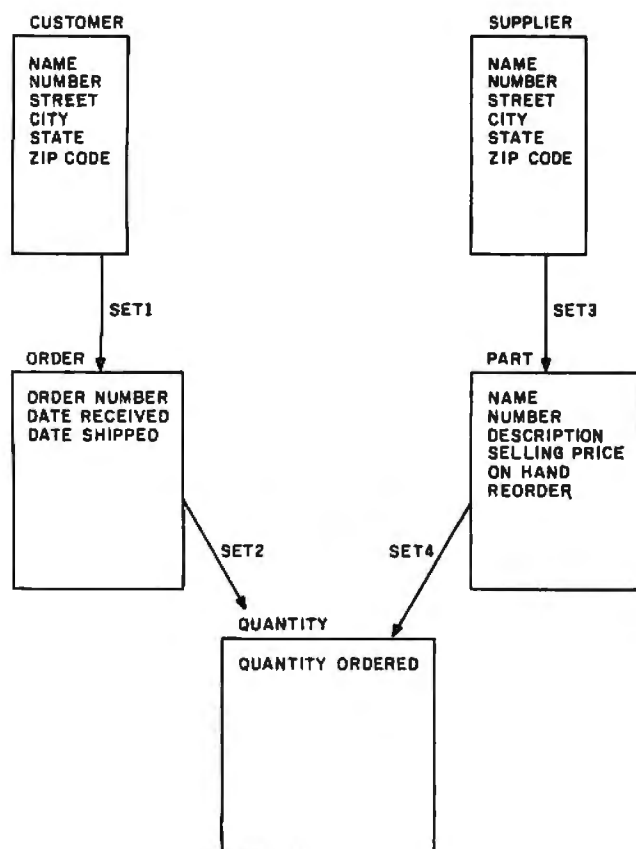


Figure 1: A data structure representing the information needed to handle the data-processing tasks of the Nibble Computer Store. The boxes represent record types. The names within boxes correspond to the data items that make up the records. The lines between boxes represent set-types—ordered groupings of related records. SET3, for example, associates parts with their suppliers.

One more thing about sets: since the members of a set occurrence are accessed one at a time as we traverse the set, we can put an ordering on the set. We can define the set to be ordered on, say, Supplier Name, and the DBMS will automatically maintain the records in the set in sorted order. If we define a different set ordered on Supplier Number, we can access the records in either order simply by choosing the appropriate set. Additional set orderings, such as FIFO (first in, first out) or LIFO (last in, first out), are also supported.

With this background, we can discuss the structure of figure 1. Each customer can have zero, one, or more orders in our system, and SET1 is defined with CUSTOMER as owner and ORDER as member. The relationship between orders and parts is less clear. Each order is made up of one or more parts, but each part can appear in more than one order. Also, the problem arises of where to put the quantity ordered of each part. If we put the quantity in the ORDER record, we don't know which part the quantity refers to (since the order can consist of more than one part). Similarly, an ambiguity exists if the quantity is kept in the PARTS record. The solution is to define a QUANTITY record. By appropriate use of SET2 and SET4, the quantity of each part for each order can be determined.

The data structure of figure 1 as described in MDBS.DDL, a Data Definition Language of Micro Data Base Systems, Inc, is as shown in listing 1 (see page 110). The data definition for our example is relatively straightforward. The sets such as CUSTNAME and CUSTNUM allow us to access the customer records sorted by either name or number.

Several points should be made about the DDL description in listing 1. Five users have been defined, one for each functional area of the company. The first user name, STOCKROOM, is followed by read and write authorization levels and the user's password (317-54-7674). A user may process data that has an access level equal to or less than his own. For example, the stockroom user can read supplier information, but isn't allowed to alter it since the stockroom has a write-access level of 10, while all supplier information has a write-access level of 50. The access levels were defined by:

Level 1: Stockroom/Inventory Control—This department must be able to read part numbers, part descriptions, quantity on hand, and reorder point for inventory control purposes. It must also be able to read supplier information for reorder purposes, determine quantity ordered for each part, and update quantity on hand of each part as it is put into inventory.

Level 2: Shipping—This department must be able to read parts information, customer names and addresses, and order information. It must also be able to update shipping date and quantity on hand for each part shipped.

Level 3: Order Processing—This department must be able to enter new orders.

MDBS, Incorporated

*proudly
announces*

MDBS III

a new generation in data base management technology

not limited
to relational, tabular,
flat-file structures

not limited
to hierarchical structures

not limited
to CODASYL network
structures

The structures above are mere subsets of the capabilities of MDBS III.
Far beyond these, MDBS III provides valuable innovations available in no other system!

Unprecedented **POWER!** **FLEXIBILITY!** **PORTABILITY!**

For serious application development, MDBS III offers major advantages in these seven key areas:

Extraordinary data structuring

Unmatched flexibility for relating records to each other with ease.

Automatic data *compression* where desired.

Up to 255 record types per schema.

High-level query language

Automatically generates desired report or data file with a *single statement*.

Language is *English-like, non-procedural*, and has report writing capabilities.

Extensive performance control

Gives application designer extensive control over record placement... includes automatic *clustering* and *CALC* features.

For highest performance, a streamlined DML... over 20 *host language* interfaces available.

All processing is *data-dictionary driven*.

Data security and integrity

User *passwords* and optional data *encryption*.

Comprehensive *access code facility* for automatic security enforcement.

Automatic *range checking*.

Available for Minis and Micros

Availability for numerous *8* and *16-bit micros*, as well as for *minis*, provides standardized approach to data handling.

Allows extensive portability of application systems... from the *Z-80* to the *PDP-11*.

True multi-user capabilities

Supports multiple *concurrent users* of the same data base.

Supports both active and passive locking.

Automatic transaction logging

Automatically logs all transactions after last back-up.

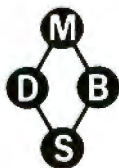
Selective restoration of data base in event of a crash.

Allows surveillance of user activities.

For the full story about the finest application development tool existing in the mini-micro world... call, write, or TWX us today!

Setting standards of excellence for data base software... worldwide.

Micro Data Base Systems, inc.



Box 248
Lafayette, Indiana 47902
317-448-1616/TWX 810-342-1881

Dealer/distributor/OEM inquiries invited.

- Yes, please send me a copy of the MDBS III brochure.
- Please send me the complete MDBS III manual set including manuals for MDBS III, RTL, QRS, and DMU plus tutorial materials. Check for \$75.00 enclosed. (Indiana residents please add \$3.00 for Indiana tax.)

Name _____ Title _____
(Please print)

Company _____

Address _____

City _____ (State) (Zip)

Phone _____

MAIL TO: Micro Data Base Systems, Inc.
P.O. Box 248-B
Lafayette, IN 47902

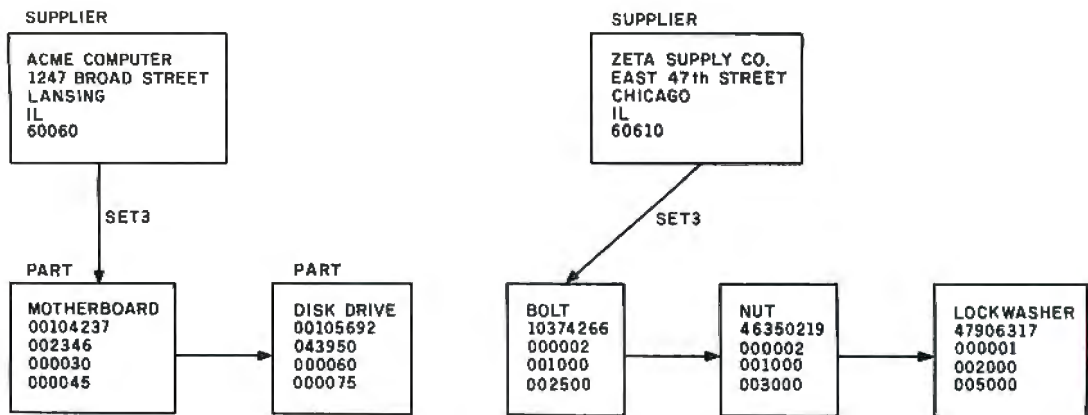


Figure 2: Two of the Nibble Computer Store's suppliers and the parts they supply. This figure gives more detail on SET3 of figure 1.

Level 4: New Accounts—This department must be able to add new customers to the customer list and update customer information.

Level 5: Purchasing—This department must be able to add new supplies to supplier list and update supplier information. It must also be able to define new parts and alter prices of parts and the supplier-parts relationships.

We are now ready to generate the reports listed in table 1. To simplify matters, we will not be concerned with loading data into the data bases or updating information. Out of the repertoire of DML (Data Management Language) commands in MDBS.DMS, we will use:

- FFM: Find First Member—Insures that the first record in a set occurrence is available for processing.
- FNM: Find Next Member—This command actually traverses the set occurrence, moving from one record to the next each time it is called.
- SOM: Set Owner based on Member—Indicates that the record that is the "current" member of one set should be treated as the owner of some other set.
- SMM: Set Member based on Member—Indicates that the "current" member of one set-type is also the current member of some other set.
- GFM: Get Field from Member—Retrieves data from a named field (item) in the "current" member of a set.

In MDBS.DMS, all routines return a value that gives a status indication. Frequently, a nonzero status value represents an error condition. MDBS.DMS can be called from several languages running under CP/M and from disk-based Radio Shack, Apple, and North Star systems. The status value is returned to a user-defined variable. For example, in modified North Star BASIC (see reference 1), a call to FFM looks like:

```
E0 = CALL (addr, "FFM, SET3")
```

Here, *addr* is the address of the MDBS.DMS software. Two entry points to MDBS.DMS are required: one for defining blocks and one for the DMS routines.

The BASIC user of MDBS.DMS can define named data blocks (similar to the sub-schema of the CODASYL committee report). For example, the user may want to define a block called PARTDATA made up of the BASIC variables:


- N for part number
- D\$ for part description
- P for price
- O for on-hand quantity
- R for reorder point

So to insert data into the data base, the user issues the call:

```
E0 = CALL (addr, "CRS, PART, PARTDATA")
```

Text continued on page 120

DISKETTE COPY SERVICE



Allenbach
Industries

LANIER · TRS-80 · ATARI
APPLE · AND OTHERS

For
Information
Outside California Call
(800) 854-1515 or (800) 854-1516
In California Call Collect (714) 436-4351

Allenbach Industries
4322 Manchester Ave. Olivenhain, CA 92024

SYSTEMS KICKER.



...with a performance Motor
...for behind: Real-
...and the DASH
...for an economical system that
...performance. CP/M is included.
...and hard disk subsystems, terminals,
...board-level modules — all part
...for 5-100 product line. A
...product line for the coming
...years for the coming.

DASH is a trademark of Digital
Readers
DASH is a trademark of Data
Systems.



See us at COMDEX Booth 1020

BRAND NAME OUT OF MICROs.

Listing 1: A description in MDB5.DDL (Data Definition Language) of a data structure meeting the needs of the fictitious Nibble Computer Store. This description corresponds to the data structure shown in figure 1.

PASSWORDS

| | | | |
|------------------|----|----|--------------|
| STOCKROOM | 10 | 10 | 317-54-7674 |
| SHIPPING | 20 | 20 | SECRET |
| ORDER PROCESSING | 30 | 30 | MAILROOM |
| NEW ACCOUNTS | 20 | 40 | IGLOO |
| PURCHASING | 30 | 50 | 317-742-7388 |

| | | | | |
|-----------------|------|----|----|----|
| RECORD CUSTOMER | | | 20 | 30 |
| ITEM CNAME | CHAR | 30 | 20 | 40 |
| ITEM CNUMBER | BIN | 2 | 20 | 40 |
| ITEM STREET | CHAR | 20 | 20 | 40 |
| ITEM CITY | CHAR | 20 | 20 | 40 |
| ITEM STATE | CHAR | 2 | 20 | 40 |
| ITEM ZIP | CHAR | 5 | 20 | 40 |

| | | | | |
|-----------------|------|----|----|----|
| RECORD SUPPLIER | | | 10 | 50 |
| ITEM SNAME | CHAR | 30 | 10 | 50 |
| ITEM SNUMBER | BIN | 2 | 10 | 50 |
| ITEM STREET | CHAR | 20 | 10 | 50 |
| ITEM CITY | CHAR | 20 | 10 | 50 |
| ITEM STATE | CHAR | 2 | 10 | 50 |
| ITEM ZIP | CHAR | 5 | 10 | 50 |

| | | | | |
|--------------|------|----|----|----|
| RECORD PART | | | 10 | 10 |
| ITEM PNUMBER | BIN | 2 | 10 | 50 |
| ITEM DESCR | CHAR | 20 | 10 | 50 |
| ITEM PRICE | REAL | 8 | 30 | 50 |
| ITEM ONHAND | BIN | 2 | 10 | 10 |
| ITEM REORDER | BIN | 2 | 10 | 50 |

| | | | | |
|---------------|-----|---|----|----|
| RECORD ORDER | | | 20 | 20 |
| ITEM ONUMBER | BIN | 2 | 20 | 30 |
| ITEM RECEIVED | BIN | 2 | 20 | 30 |
| ITEM SHIPPED | BIN | 2 | 20 | 20 |

| | | | | |
|-----------------|-----|---|----|----|
| RECORD QUANTITY | | | 10 | 30 |
| ITEM QORDERED | BIN | 2 | 10 | 30 |

| | | | | | |
|----------|-----|-----|----|----|----------------|
| SET SET1 | MAN | 1:N | 20 | 30 | |
| | | | | | SORTED ONUMBER |

OWNER CUSTOMER
MEMBER ORDER

| | | | | | |
|----------|-----|-----|----|----|------|
| SET SET2 | MAN | 1:N | 20 | 30 | |
| | | | | | FIFO |

OWNER ORDER
MEMBER QUANTITY

| | | | | | |
|----------|-----|-----|----|----|----------------|
| SET SET3 | MAN | 1:N | 10 | 50 | |
| | | | | | SORTED PNUMBER |

OWNER SUPPLIER
MEMBER PART

Listing 1 continued on page 112



COLOR COMMUNICATES BETTER

For a demonstration, contact one of our Factory Representatives

Pacific

Group III Electronics
CA: San Diego 714/292-0525; Sunnyvale 408/245-4392

Thorson Company Northwest
OR: Beaverton 503/844-5900
WA: Bellevue 206/455-9180

Thorson Company
HI: Honolulu 808/524-8833

Trans Alaska Data Systems
AK: Anchorage 907/276-5616

Mountain

PAR Associates
CO, WY: Denver, CO. 303/371-4140
UT, ID, MT: Centerville, UT 801/292-8145

Southwest

Computer Peripheral Sales
AZ, NV (Clarke Co.): Phoenix, AZ 602/842-4025

BFA Corporation
NM: Albuquerque 505/292-1212
TX (El Paso): 915/542-1762

USDATA Engineering
TX: Dallas 214/661-9633; Austin 512/454-3579; Houston 713/681-0200
AR, OK: Broken Arrow, OK 918/252-9646

Midwest

Dytec North, Inc.
MN, ND, SD: St. Paul, MN 612/645-5816

Resource Data Systems
IL (No.), IN, WI, IA (Scott Co.): Northbrook, IL 312/564-5440

Digital Systems Sales, Inc.
MO, IL (So.), KS, NE, IA (Excl. Scott Co.): Grandview, MO 816/765-3337; St. Louis, MO 314/946-0168; Wichita, KS 316/685-9725; Omaha, NE 402/346-1039

Lowry & Associates, Inc.
MI, KY, OH, PA (W.), WV: Brighton, MI 313/227-7067; Grand Rapids, MI 616/363-9839; Cleveland, OH 216/398-9200; Dayton, OH 513/435-7684; Pittsburgh, PA 412/922-5110

Southeast

W.A. Brown Instruments, Inc.
GA, LA, NC, SC, TN, AL, FL: Atlanta, GA 404/455-1035; Mandeville, LA 504/626-9701; Durham, NC 919/683-1580; Columbia, SC 803/798-8070; Oak Ridge, TN 615/482-5781; Huntsville, AL 205/883-8660; Orlando, FL 305/425-5505; Ft. Lauderdale, FL 305/776-4800; Melbourne, FL 305/723-0766; Ft. Walton Beach, FL 904/243-3189

Intron Corp.
VA, DC, MD: Springfield, VA 703/569-1502

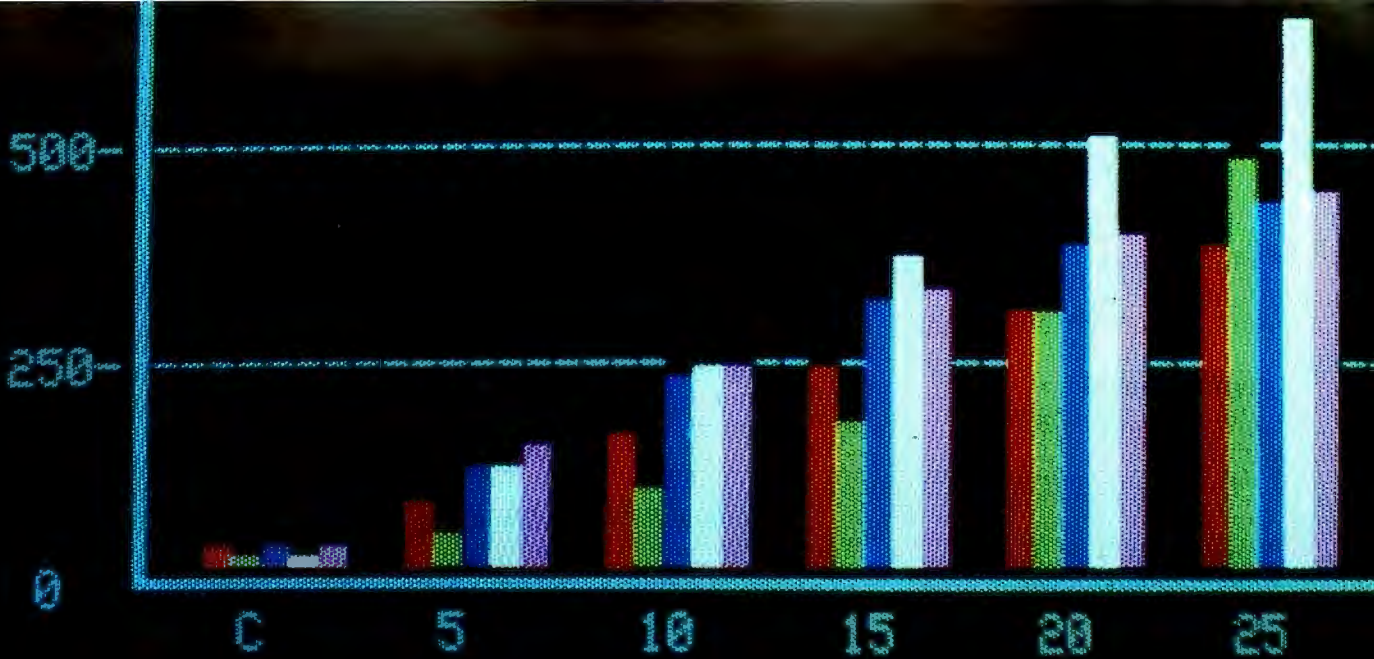
Northeast

J&J Associates, Inc.
MA, ME, NH, VT, RI: Winchester, MA 617/729-5770; Springfield, MA 413/737-6624; Goshen, CT 203/624-7800

NACO Electronics Corp.
NY (Excluding Metro NY/L.I.): North Syracuse, NY 315/899-2651; Cicero, NY 315/672-3751; Fairport, NY 716/223-4490; Utica, NY 315/733-1801

Technical Marketing Associates, Inc.
NJ (No.), NY (Metro/L.I.): Hackensack, NJ 201/646-9222

Miller & Dietz Co.
PA (E.), NJ (So.), DE: Malvern, PA 215/647-7373



Money-back guarantee for computer professionals:

Buy factory-direct from Intelligent Systems.

It took hard work and experience for you to become a leader. Same here. Founded in 1973, we were the first company to ship 20,000 color graphics units. We sell to computer professionals—not through computer stores. So, if you don't need a salesman to tell you what you need, try this unique offer:

A factory-direct, money-back guarantee for our 3650 color graphic desktop computer with 56K of memory for only \$1995—plus your choice of either an internal 5¼" 92K Floppy Mini Disk Drive for \$395, or an external 8" Floppy Disk Drive for \$895! (These prices good only with this offer.) You can buy only one unit before 12/31/81, cash with order. Use it for 30 days; if you're not sold on the merits of your color graphic computer, return it. We will refund the full purchase price



and your only cost would be transportation charges to and from Norcross, Georgia. **Why such a dramatic offer?** Intelligent Systems was built around the needs of computer professionals. We sell primarily through OEM's and want to introduce the dynamics of color graphics to professionals like yourself—so you can help us introduce color graphics in your company.

Features Included for \$1995:

- 56K total memory, 32K user RAM, 4K disk buffer RAM, 4K refresh RAM, 16K ROM (includes extended disk BASIC)
- 13" raster scan color CRT • 8 foreground colors w/blink and 8 background colors • 64 col./32 line • 64 ASCII & 64 graphics characters • 128H x 128V graphics w/point, bar & vector generators • RS232C port • Buffered bus connector

- 72 key professional keyboard • User's Manual & sampler disk • Factory Warranty: 90 days parts & labor

And Your Choice of:

- Internal 5¼" 92K disk drive: \$395 • External 8" 295K disk drive: \$895 (These prices good only with this offer.)

Options Include:

- 101 key keyboard: \$100 • 117 key keyboard: \$250 • blank 8K board for add-on EPROM: \$75 • One-year Factory Service Contract: \$350

Software Available: BASIC is standard; you can add Fortran for \$75. Text editors, assemblers, other utilities available. Also, hundreds of additional programs, including ColorCalc™, ColorGraph™, as well as programs for education, accounting, WP, statistics, etc.

Will your information processing be more comprehensible in color graphics (or color slides) in management meetings? If so, act now. For details, call Marketing Services at 404/449-5295.



Intelligent Systems

COLOR COMMUNICATES BETTER

Intecolor Drive • 225 Technology Park/Atlanta
Norcross, Georgia 30092/Phone 404/449-5295

Unretouched photos of screens.
This offer, not available through computer stores,
expires 12/31/81. U.S. domestic prices.

Listing 1 continued:

```
SET      SET4      MAN  1:N  10  30
                                IMMAT
OWNER    PART
MEMBER   QUANTITY

SET      CUSTNAME  AUTO 1:N  20  40
                                SORTED  CNAME
OWNER    SYSTEM
MEMBER   CUSTOMER

SET      CUSTNUM   AUTO 1:N  20  40
                                SORTED  CNUMBER
OWNER    SYSTEM
MEMBER   CUSTOMER

SET      SUPLNAME  AUTO 1:N  10  50
                                SORTED  SNAME
OWNER    SYSTEM
MEMBER   SUPPLIER

SET      SUPLNUM   AUTO 1:N  10  50
                                SORTED  SNUMBER
OWNER    SYSTEM
MEMBER   SUPPLIER

SET      PARTDESC  AUTO 1:N  10  50
                                SORTED  DESCR
OWNER    SYSTEM
MEMBER   PART

SET      PARTNUM   AUTO 1:N  10  50
                                SORTED  PNUMBER
OWNER    SYSTEM
MEMBER   PART

SET      ORDERS    AUTO 1:N  20  30
                                SORTED  RECEIVED
OWNER    SYSTEM
MEMBER   ORDER
```

Listing 2: A program segment opening a data base using the data-base system MDBS.DMS. Brackets are used to pass addresses of variables; the right bracket has been translated to a parenthesis by North Star BASIC. Lines 1390 through 1470 represent portions of the program not given here.

```
1000 REM *****
1010 REM **
1020 REM ** User's name and password **
1030     DIM N$(16) , P$(12)
1040 REM **
1050 REM ** Input user's name **
1060     INPUT "NAME? " , N$
1070     PRINT
1080 REM **
1090 REM ** Now the password -- but no echo **
```

Listing 2 continued on page 114

MORROW DESIGNS

NOW, 26 Mbytes
\$4,495

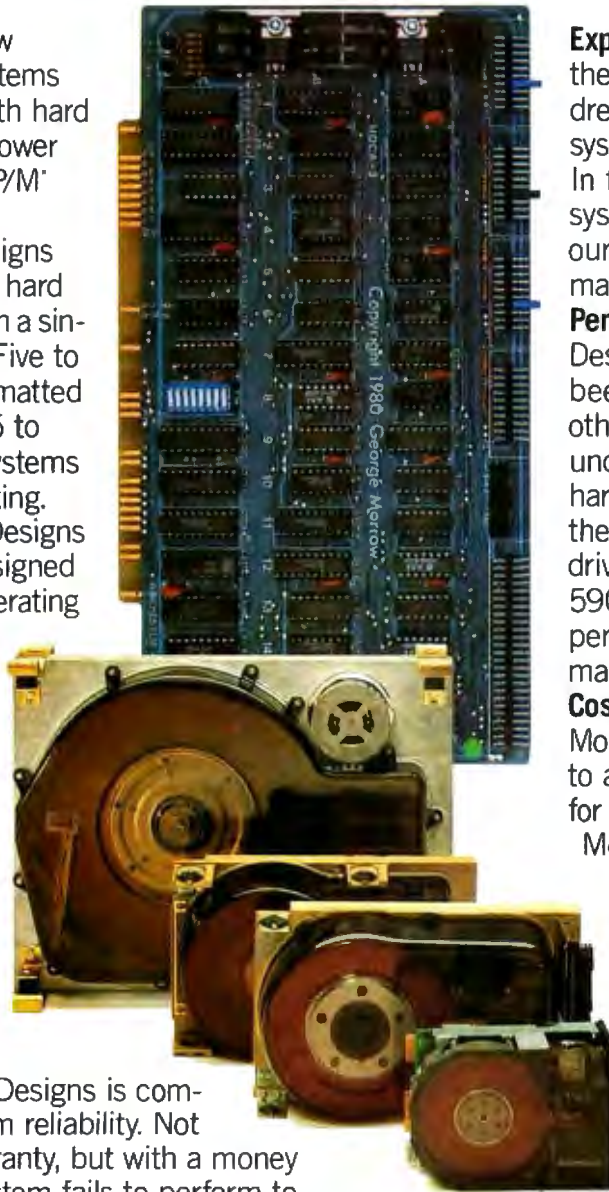
Leading edge technology in hard disk systems.

Complete systems. Morrow Designs hard disk subsystems are delivered complete with hard disk, controller, cabinet, power supply, fan, cables and CP/M^{*} 2.2 operating system.

Widest range. Morrow Designs offers the widest range of hard disk systems available from a single supplier. 5¼", 8", 14". Five to over 100 megabytes of formatted hard disk storage. \$2,995 to \$17,980. Cost effective systems that work. And keep working.

S-100 and more. Morrow Designs hard disk systems are designed for use with the CP/M operating system. Available software packages allow our systems to run on any IEEE696/S-100 Standard system with no hardware modification. Plus, Cromemco^{***}, North Star^{**}, Vector Graphics, Godbout, Dynabyte, Exidy^{****}, IMSAI, Micro-mation, Processor Technology and California Computer Systems.

Reliable systems. Morrow Designs is committed to hard disk system reliability. Not simply with a 90-day warranty, but with a money back guarantee. If our system fails to perform to specification, send it back. We'll send back your money.



Experience. As of April, 1981, there were over fifteen hundred Morrow Designs hard disk systems successfully installed. In fact, over 200 independent systems integrators now use our hard disks to solve their mass storage problems.

Performance answers. Morrow Designs hard disk systems have been benchmarked against all other systems. None is faster under CP/M. Morrow Designs hard disks operate at 10 times the speed of a floppy disk drive. Transfer rates range from 590,000 bytes to 900,000 bytes per second. That kind of performance can become addictive.

Cost effective answers. Compare Morrow prices and performance to anything presently available for S-100 systems. You'll find Morrow's price/megabyte/performance ratio to be unmatched. Leadership in disk systems technology earned us leadership in price/performance. And that may have earned us a call from you. Circle the Reader Service Number for our full line data sheets. Can't wait? Call us at (415)

524-2101. And yes, OEM quantity prices are available. **LOOK TO MORROW FOR ANSWERS.**

MORROW DESIGNS

5221 Central Avenue, Richmond, CA 94804
(415) 524-2101



See Us At ComDEX Booth 575

^{*}CP/M is a trademark of Digital Research.

^{**}Northstar is a trademark of North Star Computers, Inc.

^{***}Cromemco is a trademark of Cromemco, Inc.

^{****}Exidy is a trademark of Exidy Corporation.

Listing 2 continued:

```
1100 PRINT "PASSWORD"
1110 T$ = INCHAR$ (0)
1120 IF ASC ( T$ ) = 13 THEN 1190
1130 P$ (1,1) = T$
1140 FOR J = 1 TO 15
1150 T$ = INCHAR$ (0)
1160 IF ASC ( T$ ) = 13 THEN 1190
1170 P$ = P$ (1,J) + T$
1180 NEXT J
1190 PRINT T$
1200 REM **
1210 REM ** Filename **
1220 F$ = "NIBBLE"
1230 REM **
1240 REM ** Allow the user to modify the data base **
1250 R$ = "MODIFY"
1260 REM **
1270 REM ** MDBS.DMS routines **
1280 A1 = 32768
1290 A2 = A1 + 3
1300 REM **
1310 REM ** Define a data block **
1320 E0 = CALL (A2, "DEFINE,OPENLIST" , [F$], [N$], [P$], [R$], 4)
1330 IF E0 <> 0 THEN 1450
1340 REM **
1350 REM ** Open the data base **
1360 E0 = CALL ( A1 , " OPEN , OPENLIST " )
1370 IF E0 <> 0 THEN 1450
1380 REM **
1390 REM *****
1400 REM **
1410 REM ** ** APPLICATION PROGRAM **
1420 REM **
1430 REM *****
1440 REM **
1450 REM ** ** ERROR PROCESSING **
1460 REM **
1470 REM *****
```

Listing 3: A BASIC program segment generating a list of customers who have placed orders at the Nibble Computer Store in the last sixty days. This listing assumes that an MDBS.DMS data base has been opened and that data blocks have been defined.

```
1000 REM ** The following code assumes that variable D0 **
1010 REM ** has been initialized to the current Julian date **
1020 REM **
1030 REM ** MDBS.DMS addresses **
1040 A0 = 32768
1050 A1 = A0 + 3
1060 REM ** Data Block Definitions **
1070 E0 = CALL (A1, "DEFINE,RECV", [D1], 1)
1080 E0 = CALL (A1, "DEFINE,CNAME", [C$], 1)
1090 REM ** Access each customer in turn **
1100 E0 = CALL (A0, "FFM,CUSTNAME")
1110 IF E0 <> 0 THEN 1350
1120 REM ** Check each of this customer's orders **
1130 E0 = CALL (A0, "SOM,SET1,CUSTNAME")
```

Listing 3 continued on page 116

Phenomenal!



STAR-EDIT

FOR CP/M

From Supersoft, a phenomenon in screen editors/word processors. Star-Edit is a completely tested, "no surprises" screen editor suitable for any text processing task, including program writing and word processing. Its features compare with the highly acclaimed "EMACS" editor. Even though Star-Edit is at least as powerful as any other screen editor, it can be learned easily and quickly by both programmers and non-programmers. Star-Edit includes:

- Multiple file editing capabilities. The user may edit several files simultaneously.
- Split screen option for viewing different files or pieces of the same file.
- The user has free and unrestricted access to all the file at any time, regardless of whether or not the file will fit in RAM. This means that the user may edit the first page, then the last page, then the first, and so on, without rereading. This is accomplished through the use of "virtual memory" residing on disk file.
- Optional "no return mode" (fill between left and right margin) allows text to be entered without the use of carriage returns.
- Complete user manual and tutorial.
- Ability to enter ANY typeable character into the file

- Includes menu driven terminal configurator with simple selection for the 16 or so most popular terminals and video boards. Also allows customization for most other terminals.

Someone familiar with an ordinary typewriter should have no trouble learning and using Star-Edit. The novice need learn only a few commands to make immediate use of the editor; the experienced user will find that Star-Edit has a complete set of text manipulation commands (nearly one hundred).

Requires: 32K CP/M system with
cursor-addressable terminal

Star-Edit: \$225.00
Manual only: \$ 10.00

CP/M formats: 8" soft sectored, 5" Northstar,
5" Micropolis Mod II, Vector MZ, Superbrain
DD/OD, Apple II+

All orders and general information:
SUPERSOFT ASSOCIATES
P.O. BOX 1628
CHAMPAIGN, IL 61820
(217)-359-2112
Technical Hot Line: (217)-359-2691
(answered only when technician is
available)

U.K. and Europe:
DIGITAL DEVICES
134 LONDON ROAD
SOUTHBOROUGH KENT
TUNBRIDGE WELLS
TN4 0PL
ENGLAND
Japan: ASR CORPORATION INTERNATIONAL
1-2-8, SHIBA-DAIMON
TOKYO 105
JAPAN
Tel.: (03)-437-3901 Telex: 242-3296

SuperSoft
First in Software Technology

Listing 3 continued:

```
1140      EO = CALL (A0,"FFM,SET1")
1150      IF EO <> 0 THEN 1310
1160 REM ** Retrieve date order was received **
1170 REM ** Variable D1 receives the date **
1180      EO = CALL (A0,"GFM,SET1,RECVD")
1190 REM ** Following statement assumes that D0 and D1 are
1200 REM ** Julian dates **
1210      IF D0-D1 <= 60 THEN 1280
1220 REM ** Order is over 60 days old -- check next order **
1230      EO = CALL (A0,"FNM,SET1")
1240      GOTO 1150
1250 REM ** Customer has placed order within last 60 days **
1260 REM ** Print customer's name **
1270 REM ** Variable C$ receives the customer name **
1280      EO = CALL (A0,"GFM,CUSTNAME,CNAME")
1290      PRINT C$
1300 REM ** Process next customer **
1310      EO = CALL (A0,"FNM,CUSTNAME")
1320      IF EO = 0 THEN 1130
1330 REM ** All customers processed **
1340      EO = CALL (A0,"CLOSE")
1350      STOP
```

Listing 4: A BASIC program segment that determines which parts the Nibble Computer Store needs to reorder. The listing assumes that an MDDBS.DMS data base has been opened and that data blocks have been defined.

```
1000 REM ** MDDBS.DMS addresses **
1010      A0 = 32768
1020      A1 = A0 + 3
1030 REM ** Data Block Definitions **
1040      EO = CALL (A1,"DEFINE,SHIPPED",[D2],1)
1050      EO = CALL (A1,"DEFINE,QORDERED",[N1],1)
1060      EO = CALL (A1,"DEFINE,ONHAND",[Q1],1)
1070      EO = CALL (A1,"DEFINE,REORDER",[Q2],1)
1080      EO = CALL (A1,"DEFINE,PNUMBER",[P0],1)
1090      EO = CALL (A1,"DEFINE,PNAME",[P$],1)
1100 REM ** Generate the list in part-number order **
1110      EO = CALL (A0,"FFM,PARTNUM")
1120 REM ** Initialize to sum the quantity ordered **
1130      N=0
1140      EO = CALL (A0,"SOM,SET4,PARTNUM")
1150      EO = CALL (A0,"FFM,SET4")
1160 REM ** This part may not have any orders outstanding **
1170 REM ** If this is the case, EO will be set non-zero **
1180      IF EO <> 0 THEN 1400
1190 REM ** Locate the order corresponding to this quantity **
1200 REM ** Ignore the order if it has been filled **
1210      EO = CALL (A0,"SMM,SET2,SET4")
1220 REM ** If a non-zero shipping date is present, the order
1230 REM ** has been filled (Shipping date is returned in D2) **
1240      EO = CALL (A0,"GFO,SET2,SHIPPED")
1250      IF D2 <> 0 THEN 1310
1260 REM ** Order is pending -- Sum the quantity ordered **
1270 REM ** Variable N1 receives the quantity ordered **
1280      EO = CALL (A0,"GFM,SET4,QORDERED")
1290      N = N + N1
```

Listing 4 continued on page 118

SuperSoft's Optimizing



The SuperSoft "C" compiler supports most of version 7 Unix standard "C". Several special and widely desired features are supported, including:

- Macro expansions via the #define statement.
- Include files using the #include statement.
- Inline assembly code is supported with the #asm and #endasm.
- The object code may be ROMed.
- Programs may be ORGed for any location.
- Completely dynamic memory allocation is supported, both by the compiler and in user programs. (That is, the functions 'alloc' and 'free' are provided with the compiler.)

SuperSoft "C" is a two pass compiler. The first pass of the compiler produces an intermediate code (U-code, for Universal code). Pass two contains both the translator and the optimizer. The intermediate code is optimized and assembly code is output to file.

The optimizer typically results in 40% code reduction. This means that compiled object code will run nearly as fast as that which was written in assembler.

An important feature of the compiler is that assembly code is produced. This means that "hand optimization" of critical sections is possible. Also, the inline coder allows easy insertion of assembly language routines.

With the compiler comes the complete source code to the I/O libraries. These libraries are equal to or better than any that exist for the 8080/280 computer system.

Functions included:

| | | | |
|------|-------|-------|--------|
| open | close | read | write |
| seek | tell | fopen | create |
| putc | getc | flush | |

The Seek command supports absolute, relative from front, and relative from end of file. Fopen includes fcreat. Also included with the compiler are numerous sample programs and a complete library of useful functions.

for CP/M

Compile time options include listing file, console output, syntax checking and others.

Requires: 48K CP/M, (more recommended)

"C" compiler: \$200.00

Manual only: \$ 20.00

Z8000 cross-compiler: \$500.00

(CP/M to Z8000 code, requires Z8000 assembler)

Source code for in-house use only: \$5,000.00

CP/M Formats: #1" soft sector, #2" Non Instar, #3" Micropolis Mod II, Vector MZ, Superbrain ODDD, Apple II+

All Orders and General Information:
SUPERSOFT ASSOCIATES
P.O. BOX 1026
CHAMPAIGN, IL 61820

(217) 359-2112
Technical Hot Line: (217) 359-2691

(answered only when technician is available)

*CP/M registered trademark Digital Research
*Unix registered trademark Bell Laboratories



SuperSoft

First in Software Technology

Listing 4 continued:

```
1300 REM ** Process the next order for this part **
1310     E0 = CALL (A0,"FNM,SET4")
1320     IF E0 <> 0 THEN 1210
1330 REM **
1340 REM ** Pending order quantities have been determined **
1350 REM ** Check to see if quantity on hand less quantity
1360 REM ** ordered is less than the reorder point
1370 REM **
1380 REM ** Variable Q1 receives the quantity on hand **
1390 REM ** Variable Q2 receives the reorder point **
1400     E0 = CALL(A0,"GFM,PARTNUM,ONHAND")
1410     E0 = CALL (A0,"GFM,PARTNUM,REORDER")
1420     IF Q1-N > Q2 THEN 1490
1430 REM ** Part needs to be reordered **
1440 REM ** Retrieve part name (P$) and part number (P0) **
1450     E0 = CALL (A0,"GFM,PARTNUM,PNUMBER")
1460     E0 = CALL (A0,"GFM,PARTNUM,PNAME")
1470     PRINT "REORDER PART#",P0,P$
1480 REM ** Process next part **
1490     E0 = CALL (A0,"FNM,PARTNUM")
1500     IF E0 = 0 THEN 1130
1510     E0 = CALL (A0, "CLOSE")
1520     STOP
```

Listing 5: A BASIC program segment that produces a report on overdue orders placed at the Nibble Computer Store. The listing assumes that an MDBS.DMS data base has been opened and that data blocks have been defined.

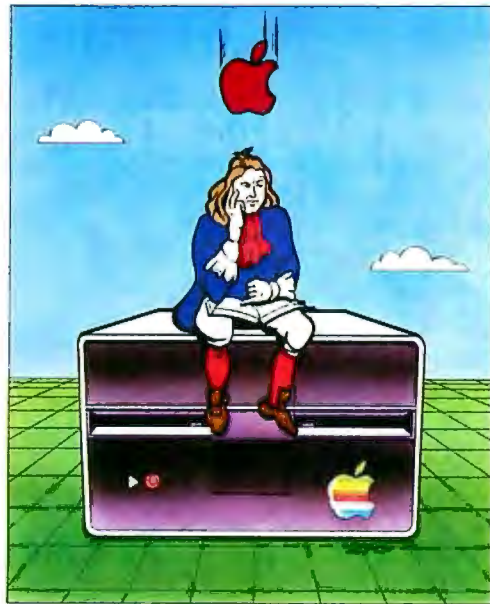
```
1000 REM ** MDBS.DMS addresses **
1010     A0 = 32768
1020     A1 = A0 + 3
1030 REM ** Data Block Definitions **
1040     E0 = CALL (A1,"DEFINE,SHIPPED",[D1],1)
1050     E0 = CALL (A1,"DEFINE,RECVD",[D2],1)
1060     E0 = CALL (A1,"DEFINE,ONUMBER",[O1],1)
1070     E0 = CALL (A1,"DEFINE,CNAME",[C$],1)
1080     E0 = CALL (A1,"DEFINE,CNUMBER",[C0],1)
1090     E0 = CALL (A1,"DEFINE,QORDERED",[Q1],1)
1100     E0 = CALL (A1,"DEFINE,ONHAND",[N1],1)
1110     E0 = CALL (A1,"DEFINE,PNUMBER",[P0],1)
1120     E0 = CALL (A1,"DEFINE,SNAME",[S$],1)
1130 REM ** Find an order which has been outstanding for more
1140 REM ** than two days **
1150     E0 = CALL (A0,"FFM,ORDERS")
1160     IF E0 <> 0 THEN 1560
1170     E0 = CALL (A0,"GFM,ORDERS,SHIPPED")
1180 REM ** Ignore orders which have already been shipped **
1190     IF D2 <> 0 THEN 1530
1200 REM ** Check to see if this order is over two days old **
1210     E0 = CALL (A0,"GFM,ORDERS,RECVD")
1220     IF D0-D1 <= 2 THEN 1530
1230 REM ** An 'old' order has been found **
1240 REM ** Print customer name, customer number and order number
1250 REM ** Variable O1 receives the order number **
1260     E0 = CALL (A0,"GFM,ORDERS,ONUMBER")
1270 REM ** Locate customer data -- number (C0) and name (C$)
1280     E0 = CALL (A0,"SMM,SET1,ORDERS")
```

Listing 5 continued on page 120

our first name is Quality



Our popular space game, *Asteroids in Space*, is now *Meteoroids in Space*, with hyperspace, autobrake, and autofire. This exciting arcade game can be played with or without game paddles. Diskette \$19.95.



Beneath Apple DOS

This best-selling 170 page technical manual tells you everything you want to know about Apple's Disk Operating System. Book \$19.95.



Beginners and experts both enjoy this Othello* playing game that outplays Hayden's *Reversal*. Yet *QS Reversi* has features that *Reversal* doesn't have and costs less. Diskette \$29.95.

LINKER

LINKER

Links and relocates assembled machine language programs. Works with any assembler. Diskette \$49.95.



FASTGAMMON

Known for outstanding graphics and speed of play, this popular program is the standard to which other computer backgammon games are compared. Cassette \$19.95. Diskette \$24.95.

CR

CROSS-REF

Prints out a cross-reference of the variables in your Applesoft program. Options include changing the name of a variable. *Cross-Ref* resides passively in memory with your Applesoft program. Cassette \$22.95. Diskette \$24.95.



FRACAS

A fantastic adventure game like no other. Up to eight players can journey in the land of Faroph at the same time, searching for hidden treasure and fending off monsters. Cassette \$19.95. Diskette \$24.95.



BABBLE

This amazing and amusing program will entertain you by twisting your stories around in a most delightful way. *Babble* also works with music and sound. It's a language all its own! Cassette \$19.95. Diskette \$24.95.



BENEATH APPLE MANOR

The original dungeon game for the Apple computer is still one of the best. Descend into a dangerous maze of underground corridors. See if you can find the Golden Apple. Cassette \$14.95. Diskette \$19.95.



BATTLESHIP COMMANDER

A superb version of the traditional battleship strategy game. Cartoons and sound effects help make this game fun for everyone. Cassette \$14.95. Diskette \$19.95.



ASTROAPPLE

Your computer becomes your astrologer, generating horoscopes and forecasts based on the computed positions of the heavenly bodies. Cassette \$14.95. Diskette \$19.95.

*Othello is a trademark of Gabriel Industries.

l products are for the Apple Computer.

60 Reseda Blvd., Suite 105, Reseda, CA 91335

(3) 344-6599



QUALITY SOFTWARE

ASK FOR QUALITY SOFTWARE products at your favorite computer store. If necessary you may order directly from us. MasterCard and Visa cardholders may place orders by calling us at (213) 344-6599. Or mail your check or bankcard number to the address above. California residents add 6% sales tax. *Shipping Charges:* Within North America orders must include \$1.50 for shipping and handling. Outside North America the charge for airmail shipping and handling is \$5.00. Pay in U.S. currency.

```

1290      E0 = CALL (A0,"GFM,SET1,CNAME")
1300      E0 = CALL (A0,"GFM,SET1,CNUMBER")
1310      PRINT "*****",C0,C$, " ORDER ",O1
1320 REM ** Determine which part(s) are holding up this order **
1330 REM **
1340 REM ** Find parts with order quantity (Q1) which exceeds **
1350 REM ** the inventory quantity (N1) for that part **
1360      E0 = CALL (A0,"SOM,SET2,ORDERS")
1370      E0 = CALL (A0,"FFM,SET2")
1380      IF E0 <> 0 THEN 1530
1390      E0 = CALL (A0,"GFM,SET2,QORDERED")
1400      E0 = CALL (A0,"SMM,SET4,SET2")
1410      E0 = CALL (A0,"GFO,SET4,ONHAND")
1420      IF N1 >= Q1 THEN 1500
1430 REM ** Offending part found **
1440 REM ** Print part number (P0) and supplier name (S$)
1450      E0 = CALL (A0,"GFO,SET4,PNUMBER")
1460      E0 = CALL (A0,"SMO,SET3,SET4")
1470      E0 = CALL (A0,"GFO,SET3,SNAME")
1480      PRINT "      PART#",P0," SUPPLIER ",S$
1490 REM ** Check next part on order (it may be overdue also) **
1500      E0 = CALL (A0,"FNM,SET2")
1510      IF E0 = 0 THEN 1390
1520 REM ** Process next order **
1530      E0 = CALL (A0,"FNM,ORDERS")
1540      IF E0 = 0 THEN 1170
1550      E0 = CALL (A0,"CLOSE")
1560      STOP

```

Text continued from page 108:

where CRS means create a record occurrence and store data into it. This call will take the data located in the variables N, D\$, P, O, and R, and store them in the data base. Retrieving data from the data base is carried out in a similar way. A BASIC variable may be used in several defined data blocks.

To open a data base using MDBS.DMS, the user can give the sequence shown in listing 2. Here, the user's name and password (read in without echoing to the console) are first entered, a call to the OPEN routine of the DMS is issued, and an error check is made. (In listing 2, the brackets are used to pass addresses of variables and

the right bracket has been translated to a right parenthesis by North Star BASIC.)

Listings 3, 4, and 5 are sample programs for producing the reports discussed earlier. Each of the sample program segments assumes that the data base has been opened and that data blocks have been defined.

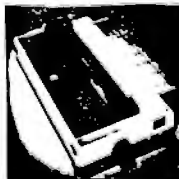
The program in listing 3 generates a list of customers (sorted by name) who have placed an order in the last sixty days. In line 1100, the first member of set CUSTNAME (which corresponds to the customer with the lexicographically first name) is located. The error response E0 is checked for the improbable case of no customers in

ABSOLUTELY THE LOWEST PRICES EPSON PRINTERS & LOBO DRIVES

WE SELL THE ENTIRE
LINE OF EPSON PRINTERS
AND ACCESSORIES; INCLUDING

MX80
MX80FT
MX100

QUALITY AT A PRICE
YOU CAN AFFORD!



LOBO MANUFACTURE A
COMPREHENSIVE RANGE OF
DISK DRIVES AND ACCESSORIES
FOR THE APPLE,TRS-80 AND
S-100 SYSTEMS



5 1/4" MiniFloppy with controller
for Apple Computer. \$459
5 1/4" Add-on Drive for Apple \$389
Dual 8" Double-Sided,
Double Density Drive for
Apple, 212 Megabytes, DOS 3.3. \$2299

CALL US FOR PRICES ON
OTHER UNITS INCLUDING:
5MP 6 10MB HARD DISKS
WITH FLOPPY BACK-UP.

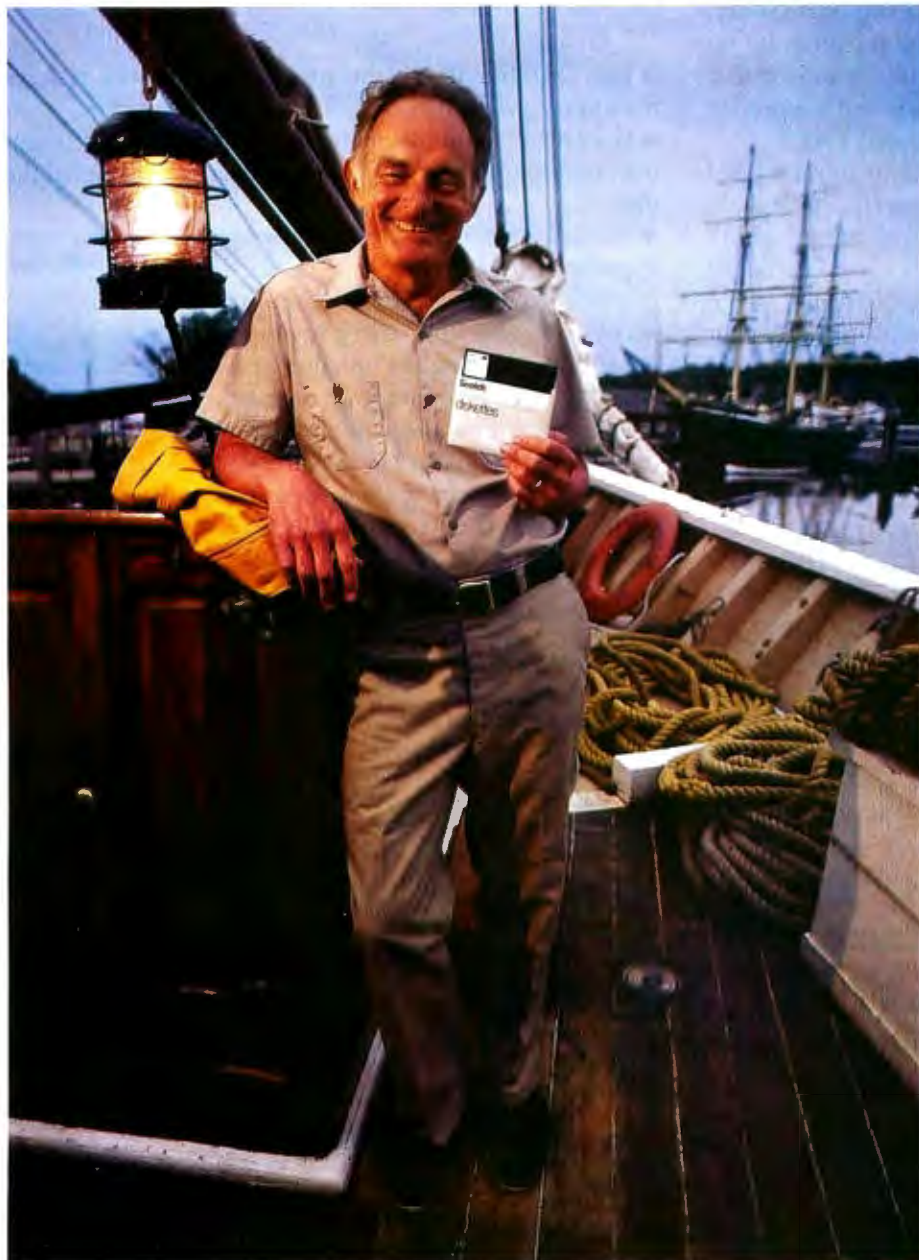
All LOBO DRIVES products have a one
year, 100% parts and labor warranty.



COMPUTERWORLD INTERNATIONAL, INC.
SUITE 133, P.O. BOX 81, WHEATRIDGE,
COLORADO, U.S.A. 80034-0081

CALL US TODAY FOR OUR RIDICULOUSLY
LOW PRICES ON EPSON AND LOBO PRODUCTS
(303)425-4411 MAIL ORDER ONLY

“This year, I’m taking 2,000 people sailing. I wouldn’t trust the travel arrangements to anything less than Scotch® Brand Diskettes.”



Eben Whitcomb, Owner-Operator, Dirigo Cruise Company, Clinton, CT

Eben Whitcomb runs the largest windjammer cruise business using American flag ships. He uses Scotch diskettes to keep track of thousands of names, bookings, sailing times, manifests and general ledger. While his computer saves time and repetition, Scotch diskettes assure him that vital information will be there when he needs it.

Dependable Scotch media can work just as hard for you. Each Scotch diskette is tested before it leaves our factory, and guaranteed error-free. So you can expect it to perform exactly right.

Scotch 8" and 5¼" diskettes are compatible with computer/diskette systems like TRS-80, Apple, PET, Wang and many others. Get them from your local 3M distributor. For the one nearest you, call toll-free: 800/328-1300. (In Minnesota, call collect: 612/736-9625.) Ask for the Data Recording Products Division. In Canada, contact 3M Canada, Inc., Ontario.

If it's worth remembering, it's worth Scotch Data Recording Products.



3M Hears You...

the data base. Statements 1130 and 1140 locate the set of orders on file for the customer. The data is checked and, if the date of an order is within sixty days of the current date, the customer name is printed (statements 1280 and 1290). Statement 1310 accesses the next customer and, if we haven't reached the last customer (E0 is set nonzero when the FNM command detects end of set), the process is repeated.

A program that determines the parts that need to be reordered is shown in listing 4. A part is a candidate for reordering if the quantity in inventory less the quantity required for unfilled orders is less than some reorder point. The reorder point varies from part to part and is stored in the data base (as item REORDER in record PART).

Statement 1110 locates the first part to be processed (parts are processed in part-number order). The logic in statements 1180 through 1320 accesses the quantity ordered of the part (via SET4) for each unfilled order in the system. The inventory quantity (ONHAND) is obtained from the data base and the quantity on order for the part is used to calculate the adjusted inventory level (Q1-N). If this quantity is less than or equal to the reorder point (Q2), the number and name of the part are printed by statements 1450 through 1470. This process is repeated for all parts.

Finally, a program that produces a report on overdue orders is shown in listing 5. All orders in the system are accessed through the set named ORDERS (statements 1150 through 1160). Any order that has been shipped (indicated by a nonzero shipping date) is excluded from the report. In line 1220, the date the order was received (D1) is subtracted from the current date, and if the difference is less than three days, the order is not overdue. If the order is overdue, the customer's name and number and the order number are printed. For each part in the order, the quantity ordered (Q1) is found via set SET2 and the quantity on hand (N1) is obtained via set SET4. If the

quantity ordered is greater than the quantity on hand, the part number and the number of the part's supplier are printed.

Leading data-processing experts think data-base management systems will be the ultimate software tool of the 1980s. The appeal of these systems is certain to grow as software costs become a greater and greater part of total computer costs. Data-base software can significantly reduce the costs of software development in several ways:

- The DBMS relieves the programmer of the task of maintaining data files.
- The DBMS maintains an internal data directory, keeping descriptions of data and relationships among the data.
- The DBMS lets the programmer access data in a form appropriate to each program, rather than forcing the programmer to write a program that fits the data.
- The data-base approach provides great flexibility and economy in altering the initial system to meet new needs. Since the programmer can restructure the data base, creating new files and new links to old files, the DBMS permits major system modifications with little effort and cost. Also, the programmer can generate new reports by simply adding a new program. ■

References

1. Allen Ashley (395 Sierra Madre Villa, Pasadena CA, (213) 793-5748) has developed a patch to North Star BASIC that enables a machine-language call involving multiple parameters. Ashley's patch is available with his HDS (Hybrid Development System) package for North Star BASIC (which is part BASIC and part assembly language) or from Micro Data Base Systems with its North Star BASIC interface to MDBS.DMS.
2. Haseman, W D and A B Whinston. *Introduction to Data Management*. Homewood IL: Richard D Irwin, 1977.
3. Martin, J. *Computer Data-Base Organization*. Englewood Cliffs NJ: Prentice-Hall, 1975.

★★★ CORVUS SYSTEMS

HARD DISK SALE!! 5 MEG ONLY \$2595.00

We are proud to announce great savings on the reliable Corvus Hard Disks for your computer.

| 5 MEG | 10 MEG | 20 MEG |
|---------------------|---------------------|---------------------|
| \$2595 (2 or More) | \$3695 (2 or More) | \$4395 (2 or More) |
| \$2625 (Quantity 1) | \$3745 (Quantity 1) | \$4515 (Quantity 1) |
| \$3750 List | \$5350 List | \$6450 List |

These prices include the complete system; hard disk, power supply, controller, interface card, 5' cable, software to attach the hard disk to your operating system, and manual. In most cases the only tool needed to get up and running is a screwdriver.

Full Factory Warranty (includes shipping one way)

| | | | |
|-----------------------|-------------|--------------|--------------|
| Extended To One Year | \$350/5Meg | \$425/10Meg | \$550/20Meg |
| Extended To Two Years | \$1050/5Meg | \$1325/10Meg | \$1710/20Meg |

Other Corvus Products: 50' CABLE = \$100 • MIRROR BACKUP BOARD (records your data to or from a v.h.s. tape recorder) = \$790 • MULTIPLEXER (allows up to 8 computers to be attached to your corvus disk drive) = \$900 • EXTRA INTERFACE CARDS = \$220 • EPROM (lets a superbrain cold boot to the corvus) = \$150

Available For Most Computers Including: trs80 I&II, apple II, superbrain, alios 1, 2, 3, 4, alpha micro, north star, cromemco, vector graphics, zenith, and other S100's.

Please specify your computer type when ordering.



CREATIVE LOGIC

WHOLESALE DEPT.

2831 N. Catherwood Street • Indianapolis, IN 462191096
(317) 549-2916

Ask about similar values on Superbrain and Superbrain/Corvus Systems. We are the largest stocking Corvus Dealer in the Midwest. cashier's check, bank transfer, or money order please. C.O.D.'s add 5%. Indiana residents add 4%

COMPUTER WAREHOUSE

CALL TOLL FREE **1-800-528-1054**

ATARI

| | |
|---|--------------|
| Special 32K 800 System | |
| 800 w/32K, recorder, star raiders, joysticks..... | \$900 |
| Above w/48K..... | \$960 |
| 800 (16K)..... | \$744 |
| 400..... | Call |
| 810 Disk Drive..... | \$440 |
| 825 Printer..... | \$575 |
| 850 Interface..... | \$155 |
| 410 Recorder..... | \$60 |
| 830 Modem..... | \$140 |
| 16K Memory..... | \$75 |
| 32K Memory..... | \$150 |

DISK DRIVES

| | |
|----------------------|--------------|
| Lobo | |
| Apple 1st Drive..... | \$490 |
| Apple 2nd Drive..... | \$410 |

MODEMS

| | |
|-------------------|--------------|
| Novation | |
| CAT..... | \$140 |
| D-CAT..... | \$155 |
| Apple Cat II..... | \$349 |
| Auto Cat..... | \$235 |

PRINTERS

| | |
|-----------------------|---------------|
| C. Itoh | |
| 25CPS - Serial..... | \$1380 |
| 25CPS - Parallel..... | \$1325 |
| 40CPS - Serial..... | \$1825 |
| 45CPS - Parallel..... | \$1710 |

| | |
|------------------|---------------|
| Datasouth | |
| DS 180..... | \$1275 |

| | |
|-----------------|---------------|
| Diablo | |
| 630 RO | |
| w/Tractors..... | \$2295 |
| 630 RO | |
| w/Tractors..... | \$2100 |
| 1640 RO | |
| w/Tractors..... | \$2485 |
| 1640 KSR | |
| w/Tractors..... | \$2740 |
| 1650 RO | |
| w/Tractors..... | \$2985 |
| 1650 KSR | |
| w/Tractors..... | \$2885 |

| | |
|-----------------|-------------|
| Epson | |
| MX-80..... | Call |
| MX-80 F/T..... | Call |
| MX-100..... | Call |
| Fric. Feed Opt. | |
| for MX-80..... | \$50 |

| | |
|-----------------|---------------|
| NEC | |
| PC-8023A..... | Call |
| 5510 RO | |
| w/Tractors..... | \$2550 |
| 5520 KSR | |
| w/Tractors..... | \$2995 |

| | |
|---------------------|--------------|
| Okidata | |
| Microline 80..... | \$330 |
| Microline 82-A..... | \$475 |
| Microline 83-A..... | \$765 |
| Microline 84..... | Call |

| | |
|--------------------|---------------|
| Paper Tiger | |
| 560G..... | \$1060 |

| | |
|--------------------------|---------------|
| Texas Instruments | |
| 810 Basic..... | \$1250 |
| 810 Loaded..... | \$1450 |

Novation
ZENITH data systems
ATARI®
NorthStar
SOROC TECHNOLOGY, INC.
TeleVideo™
3M
TEXAS INSTRUMENTS
EPSON
 EPSON AMERICA, INC.
OKIDATA
California Computer Systems

VIDEO TERMINALS

| | |
|------------------|--------------|
| Adds | |
| Viewpoint..... | \$545 |
| Soroc | |
| IQ 120..... | Call |
| IQ 130..... | Call |
| IQ 135..... | Call |
| IQ 140..... | Call |
| Televideo | |
| 910 C..... | \$575 |
| 912 C..... | \$694 |
| 920 C..... | \$744 |
| 950 C..... | \$925 |
| Zenith | |
| Z-19..... | \$769 |

DISKETTS

| | |
|---|--------------|
| Scotch | |
| 5 1/4" 0, 10, 16 Sector (Qty 100)..... | \$250 |
| 8" 0, 32 Sector (Qty 100)..... | \$260 |

COMPUTERS

| | |
|------------------------|---------------|
| Altos | |
| ACS 8000-15..... | Call |
| ACS 8000-2 w/CPM..... | Call |
| Northstar | |
| Horizon II 64K DD..... | \$2875 |
| Horizon II 64K QD..... | \$3150 |
| Zenith | |
| Z-89 48K w/CPM..... | \$2100 |

MONITORS

| | |
|------------------|--------------|
| Panasonic | |
| 9" B&W..... | \$150 |
| Sanyo | |
| 9" B&W..... | \$150 |
| 12" Green..... | \$240 |
| Zenith | |
| 12" Green..... | Call |

CALIFORNIA COMPUTER SYSTEMS

| | |
|--------------------------|--------------|
| 64K Dynamic Memory..... | \$500 |
| 16K Static Memory..... | \$255 |
| Floppy Disk Cont..... | \$285 |
| Serial Asynch Board..... | \$110 |

Prices & availability subject to change without notice Personal checks will delay shipping two weeks



2222 E. Indian School Rd. • Phoenix, Arizona 85016
 Order Line: 1-800-528-1054
 Other Information: 602-954-6109



Store Hours: Tues.-Fri. 10-5 MST Saturday 10-3 MST

Prices reflect 3% cash discount. Product shipped in factory cartons with manufacturers warranty. Add 2%, a minimum of \$5, for shipping and handling.

BRAINS-MAINFRAMES

SUPERBRAINS



SUPERBRAIN QD 64K
List \$3995 only \$2949



Z-89 48K
List \$2895 only \$2139

NORTH STARS

MINICOMPUTER
PERFORMANCE
GREEN PHOSPHOR
OPTIONS:
GRAPHICS + CP/M
LIST \$3999
ONLY \$2999

ADVANTAGE



ZENITH MONITOR GREEN PHOSPHOR \$129

TERMINALS Z-19 \$725
INTERTUBE III only \$725



EPSON

| | |
|---------------|-----|
| MX70 GRAPHICS | 394 |
| MX80 FT | 598 |
| MX-80 | 494 |
| MX-100 | 749 |

| | |
|---------------------------|------|
| ANADIX 9501 | 1290 |
| NEC LETTER QUAL FT | CALL |
| DIP-81 | 395 |
| DIP-84 FT GRAPHICS | 595 |
| STARWRITER LETTER QUAL FT | 1824 |
| MALIBU 200 DUAL MODE | 2577 |
| QANTEX W/BUFFER | 1195 |

| | | | |
|---|-----|----------|----------|
|  | 400 | LIST 399 | ONLY 340 |
| | 800 | 1080 | 799 |

WONDERFUL GAMES-EDUCATION
RCA-COSMAC VP-711 199
GAMES-BASIC-PROGRAMS-MUSIC
GUIDED SATELLITE TO SATURN

TARBELL's Empire I, II, & III have two 8" disk drives. The I is single sided, the II is double sided, and the Empire III has one of the floppies replaced by an 8-Megabyte Hard Disk. **FREE BUSINESS SOFTWARE EMP 1 \$4888 ONLY \$3666**

CALIFORNIA COMPUTER 2200A
\$2195 ONLY \$1795 Z80, 64K, I/O, DMA Disk controller + CP/M.

Model 300-1A is the larger system: 2.4 Mb 8", Z80, 64K, and optional OASIS, CP/M, or MP/M operating system. LIST \$5695 ONLY \$4995

MORROW DESIGNS Decision 1 features UNIX plus CP/M. Multi user & Multi processing, 4 to 6 Mhz Z80, and optional Floating Point Processor, or Hard Disk 26Mb. A very powerful system at a saving. LIST \$1725 ONLY \$1380.

GODBOUT COMPUPRO Big 8: 6MHz Z80, DMA Disk Controller, 32K fast static RAM, Interfacer 1 I/O board, + CP/M. LIST \$1995 ONLY \$1595

Super Sixteen 8085/8088 is the fastest combo 8-16 CPU. LIST \$3495 ONLY \$2795

SYSTEMS GROUP System 2812 runs CP/M or OASIS. Supports single user & multi-user & multi task. Up to 5 megabytes with 8" drives optional 10-megabyte hard disk. LIST \$5035 ONLY \$3994

SSM has introduced the Genesys Computer. It features a constant voltage transformer. It comes in several configurations: 12-slot, 22-slot, 5" to 8" floppy to Winchester. It's new, so give us a call.

SEATTLE's 16 bit COMPUTER is here! 8 MHz 8086 CPU the fastest S-100 computer! 128K Static RAM, DD Disk Controller, 22-slot Main Frame, 86-DOS BASIC-86. #2 128K LIST \$4185 ONLY \$3349 #1 As above but 64K LIST \$3190 ONLY \$2649

WE SELL GOOD HARDWARE

square

WE SELL GOOD SOFTWARE

American



Computers

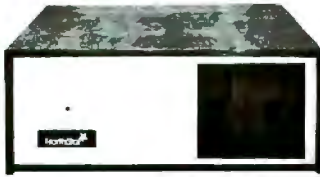
919-889-4577

KIVETT DR. JAMESTOWN N.C. 27282

919-883-1105

LOWEST PRICE - BEST QUALITY

NORTH STAR



North Star Horizon 2

2-5 1/4 Disk Drives
32K Double Den
Factory assem. & tested
Factory guaranteed
List \$3695

only **\$2625**

**POWERFUL NORTH STAR BASIC FREE
SUPERB FOR BUSINESS & SCIENCE**

| FACTORY ASSEMBLED & TESTED | LIST | ONLY |
|------------------------------------|-------------|-------------|
| HORIZON-2-64K-DOUBLE DEN | \$4195 | \$2875 |
| HORIZON-2-32K-QUAD DENSITY | \$3995 | \$2799 |
| HORIZON-2-64K-QUAD | \$4495 | \$3150 |
| HORIZON-1-64K-Q-HD5 | \$6695 | \$4685 |
| HORIZON RAM ASSM | 48K = \$679 | 64K = \$879 |
| HORIZON DISK DRIVE SALE | SAVE | \$445 |
| MORROW HARD DISK 26Mb | \$4495 | \$3395 |
| NORTH STAR HARD DISK 18 Mb | \$5375 | \$3923 |
| NORTH STAR TIME SHARING MULTI-USER | | CALL |
| ZBASIC 2 TO 5 TIMES FASTER! | | \$350 |
| SECRETARY WORD PROCESSOR | | \$99 |
| WORDSTAR WORD PROCESSOR | | \$318 |
| FLOATING POINT BOARD | \$399 | \$319 |
| OASIS MULTI-USER SOFTWARE | SAVE | CALL |
| CP/M FOR N* Extra features | \$230 | \$220 |
| MICRO MIKE SOFTWARE | SAVE | CALL |
| MICRO DISK SYSTEM DD | \$899 | \$799 |
| UCSD PASCAL II.0 | \$199 | \$159 |
| EXTRA PRECISION BASIC | | \$50 |
| NORTHWORD | \$399 | \$299 |
| MAILMANAGER | \$299 | \$224 |
| INFOMANAGER | \$499 | \$374 |
| GENERAL LEDGER | \$999 | \$749 |
| ACCOUNTS RECEIVABLE | \$599 | \$449 |
| ACCOUNTS PAYABLE | \$599 | \$449 |
| INVENTORY | \$999 | \$749 |
| ORDER ENTRY | \$999 | \$749 |

InterSystems

ITHACA INTERSYSTEMS 2A



Z-80A CPU 4 MHz
64K Dynamic RAM
Front panel
V I/O—with Interrupts
FDCII Disk Controller
20 slot motherboard

LIST \$3795 ONLY **\$2839**

PASCAL/Z + THE FASTEST PASCAL \$375

| | LIST | ONLY |
|---------------------------------|--------|------|
| PASCAL SYSTEM 128K 2 DRIVES | \$7295 | SAVE |
| CACHE BIOS SYSTEM 128K 2 DRIVES | \$6995 | CALL |
| CP/M SYSTEM 64K 2 DRIVES | \$6295 | SAVE |
| DPS-1-MAINFRAME WITH Z80A | \$1795 | CALL |
| Z80 MACRO ASSEMBLER | \$125 | SAVE |
| SPELL—PERFECT SPELLING | \$295 | CALL |
| COMPARE—UTILITY SOFTWARE | \$295 | SAVE |
| INTEREDIT—TEXT EDITOR | \$295 | CALL |

MORROW 8" DISK

DISCUS 2D + CP/M* 600K ONLY \$869
DISCUS 2 + 2 + CP/M* 1.2 MEGA B. \$1099
ADD DRIVES 2D = \$599 2 + 2 = \$795
DISCUS 2D-DUAL + CP/M* ONLY \$1450
FREE MICROSOFT BASIC FROM MORROW WITH
DISCUS SYSTEM OR HARD DISK



MORROW HARD DISK
26,000,000 BYTES!!
LIST \$4495 ONLY **\$3395**
CP/M* IS INCLUDED!

2 QUME 2 SIDED DATATRAK 8 DRIVES
IN DUAL CABINET **\$1640**

SAVE ON MEMORY AND PROGRAMS

| | | | | | | | |
|----------------------------|-------|---------------------------|------|-------------------------|------|---------------------------------|------|
| SYSTEMS MEMORY 64K A&T | \$549 | CORVUS HARD DISK | SAVE | ECOSOFT FULL ACCOUNTING | 355 | Which Computers are BEST? | FREE |
| SYSTEMS MEMORY 64K BANK | 684 | SSM VIDEO BRD VB3 4Mhz | 412 | CAT NOVATION MODEM | 169 | INSURED SHIPPING AT LOW RATES | |
| MICROANGELO | 985 | SPECTRUM COLOR UNKIT | 289 | MEMORY MERCHANT 16K | 174 | CALL FOR LATEST PRICES, DETAILS | |
| ITHACA MEMORY 8/16 BIT 64K | 845 | EZ-CODER English to BASIC | 71 | WICAT 68000 16-BIT | CALL | WE BEAT ADVERTISED PRICES | |

FACTORY GUARANTEES

square

EXPERT ADVICE

American Computers

919-889-4577

KIVETT DR. JAMESTOWN N.C. 27282

919-883-1105

The Exatron Stringy Floppy Data-Storage System

Keith Carlson
43 McDill Rd
Bedford MA 01730

More powerful than an 8-inch Winchester? Not likely. Faster than a speeding floppy? Sometimes. Able to read huge data bases in fleeting seconds? Impossible!

Exatron's Stringy Floppy data-storage system may not compare with Superman, but from the minute I plugged my new Stringy Floppy drive into my Radio Shack TRS-80 Model I Level II computer, I was convinced it was super. It appears to be a convenient and economical way to equip a TRS-80 Model I with most of the speed and convenience of a disk drive at less than half the price. There are some problems with it, but they are minor compared to problems of audio-cassette storage.

Why Digital Cassette?

Exatron was the first company to apply the concept of a completely digital cassette-tape data-storage system to microcomputers in a practical way. Audio cassettes are simply not designed for digital recording. They are made to accommodate a limited analog frequency range: those

frequencies audible to the human ear (sometimes less, depending on the quality of the tape). Also, the tape moves comparatively slowly past the write/read (record/playback) head. Finally, you have to rewind the tape to read what has been written or to write something else.

In contrast, the Exatron digital cassettes, or *wafers*, are designed for digital recording. The tape is about $\frac{1}{16}$ inch wide, and it is a closed loop moving in a single direction. It works in a manner similar to that of an eight-track audio tape cartridge. The tape is pulled out of the middle of the single reel and is wound up around the outside. No rewinding is necessary because the tape forms one big loop. The tape runs past the read/write head fast enough to transfer data at 7200 bps (bits per second). The wafers are about the height and width of a business card and about $\frac{3}{8}$ inch thick.

Stringy Floppy Characteristics

The basic control software for the Exatron Stringy Floppy system is stored in ROM (read-only memory) located inside the drive, making the system easy to use. The addressing of the ROM fits cleverly into an otherwise-unused gap in the TRS-80's memory-address space. The control software uses 4 bytes of read/write user memory. All you have to do to activate the control software is type "SYSTEM" to the Level II BASIC interpreter and then type "/12345". There are three ROM-based commands available: @LOAD, @SAVE, and @NEW.

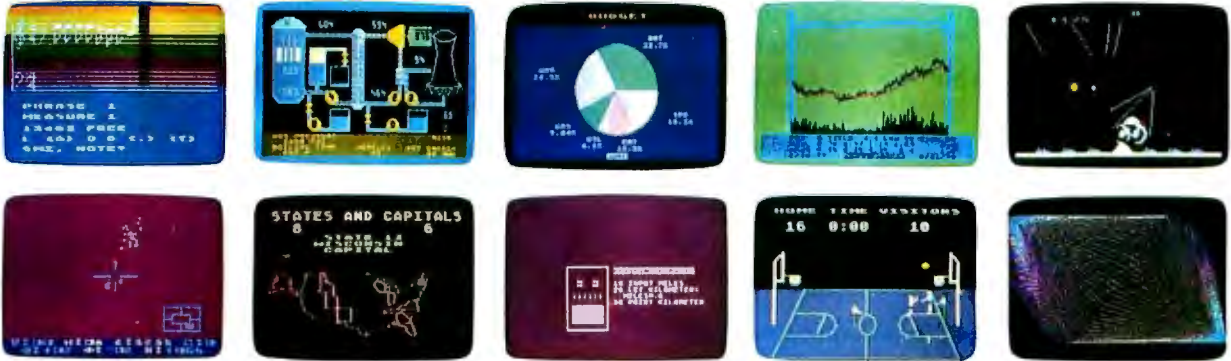
To load a BASIC program from the wafer, you simply type "@LOADn" (where *n* is a file number from 1 to 99), and within a few seconds the program will have been loaded into user memory. To store a BASIC program on the wafer, you type "@SAVEN". The system verifies that the program has been stored correctly, so this takes a little longer. To load and store machine-language programs, you use the same commands, adding arguments (in decimal radix) to specify the load-starting address, the length of the program, and the program's entry point. In



Photo 1: The Exatron Stringy Floppy digital cassette-tape drive.

THE GRAPHIC DIFFERENCE

BETWEEN ATARI® COMPUTERS AND ALL OTHERS.



3.7 million reasons why the ATARI Personal Computer is something to see.

The display screen used with our computers is composed of 192 horizontal lines, each containing 320 dots. Delivering color and luminosity instructions to each dot for a second requires 3.7 million cycles... a lot of work for the normal 6502 processor.

That's why the ATARI computer has equipped its 6502 with its own electronic assistant. It's called ANTIC, and it handles all the display work, leaving the 6502 free to handle the rest. What this means to you is uncompromisingly spectacular display capabilities without loss of computer power needed to carry out the demands of your program.

That's a quality you just don't find in ordinary personal computers. And it's one of the reasons some computer experts say that ATARI computers are so far ahead of their time.

There's more... which is what you'd expect from ATARI.

Language. The ATARI Personal Computer uses several programming languages to give the user maximum control of its extraordinary capabilities. PILOT, Microsoft BASIC,* and ATARI BASIC are understood and spoken by the ATARI computer. You'll also find our Assembler Editor cartridge indispensable for



machine language programming. **Sound.** An ATARI computer has four sound generators, or voices, activated by a separate microchip. This leaves the principal microprocessor chips free to perform other tasks. And you can take full advantage of this capability which is designed for easy programming.

Change. ATARI Personal Computers have been designed to make change and expansion easy. The ATARI computer has a modular operating system* that can be easily replaced as new technology develops. If you need it, memory expansion requires no more than inserting additional RAM modules.* And the ATARI ROM cartridge system also makes it easy to change languages. In short, your ATARI computer won't be obsolete by future developments... *because it already incorporates the future.*

Sharing. To learn more about the amazing capabilities of ATARI computers, visit your local computer store for a demonstration. Or send for our Technical User's Notes, intended for the serious programmer. They are only \$27 and contain a lot more information about our computers' special capabilities than most companies could tell. See your ATARI dealer, or send \$30 (\$27 plus \$3 postage and handling), payable to ATARI, to Technical User's Notes, c/o ATARI Customer Service, 1340 Bordeaux Avenue, Sunnyvale, CA. 94086.

*ATARI 800™ computer only.

ATARI®

Computers for people.™

©1981 Atari, Inc.

A Warner Communications Company

addition, if you use "@LOADn" from inside a BASIC program, it will chain program files while saving variables.

The @NEW command certifies a wafer for use. When you type "@NEW", the system writes a test pattern on the wafer, verifies it, and then displays the amount of storage space available on the wafer.

Storing data is just a little more complicated. A data-I/O (input/output) program that must be loaded into user memory is provided on a wafer. It takes up about 1 K bytes of memory. When loaded, it provides five more commands: @OPEN, @INPUT, @PRINT, @CLOSE, and @CLEAR. The uses of the first four are similar to corresponding commands in disk-based systems, and detailed explanations are included in the manual. The command @CLEAR is used for aborting open files and setting up I/O buffer space when you have more than one drive.

The system is not without some minor problems. First, no matter how well a tape-based system works, it is still a sequential-access system. That is, it may have to read all the files preceding the file you wish to access. (Since the Exatron drives are comparatively fast, this is less irritating than it sounds.)

Furthermore, the method of storage allocation leads to some interesting problems. If you read a program from a wafer, modify the code so it is longer, and then rewrite it onto the same wafer, the longer program will destroy the header of the file behind it. I have made it a policy (after losing several hours' worth of work) always to use a "scratch" wafer until I am absolutely satisfied there are no more changes to be made to a program. Another way to avoid this problem is to write the modified program as the last file on a wafer.

A second problem (one familiar to users of audio cassettes) is that there is no directory on a wafer of the files it contains. I use 3 by 5 file cards cut down to the size

of a wafer to manually record the wafer's contents. I write the file names on the card and always keep that card with the wafer.

The last problem involves those 4 little bytes of user memory that the operating system uses. You won't be able to use every byte of memory in a 16 K-byte system. I was dismayed, at first, to find that I couldn't load some large programs from the Stringy Floppy. (Fortunately for devotees of games like the Scott Adams Adventures, a special loading routine has been developed for use with Adventure International products.) Of course, the 4 bytes are missed less by owners of 32 or 48 K-byte systems.

The 4 bytes will be relocated just below any area at the top of memory reserved for machine-language programs. If you don't reserve memory for machine-language programs, the 4 bytes will reside at the top of memory. If you have a machine-language program that attempts to load over these 4 addresses, either it won't load at all or it won't run correctly.

One way of increasing the data-transfer rate of the TRS-80 version of the Exatron Stringy Floppy system is by speeding up the Z80 microprocessor within the TRS-80. Exatron sells a speed-up kit that roughly doubles the processor's clock rate and the Stringy Floppy's data-transfer rate. Unfortunately, wafers recorded at the higher rate can be read only by a TRS-80 that has been speeded up.

Manufacturer's Support

I am impressed by the documentation and support provided for the Exatron Stringy Floppy. First, enough information about the operating system is provided in the user's manual to make assembly-language programming of wafer-I/O operations simple. Entry points to ROM routines for the various primitive functions (read block, write block, write file header, verify block, etc) and an

DISASTER INSURANCE

PROTECT YOUR HARDWARE FROM THE UNEXPECTED.

Not to mention the unavoidable pollutants in the air. Performance robbing dust, grime, spills and static electricity.

Cover Craft Dust Covers help extend the useful life of your computer equipment at a fraction of the cost. Perhaps that's why more people throughout the world rely on Cover Craft Dust Covers than any other brand.

Visit your local dealer or contact us directly.

Dust Covers for most terminals, disks, printers, modems, etc.

\$8.95-\$15.95
Shipping extra.



COVER CRAFT CORP

PO Box 555, Amherst, NH 03031 • (603) 889-6811





SuperCalc™ and the Answer Key.

Answers. As a decision maker that's what you're after when you use an "electronic worksheet" to analyze problems in management, finance, marketing, sales, and engineering. However, a lot of time and energy can be spent just trying to figure out how your program works. That's why we've invented The SuperCalc[†] Answer Key.

As a new SuperCalc user you want answers on program operation fast...as your questions

arise. As an experienced user you want a complete description of all your options at your fingertips.

From formatting printed reports to merging sheets, the SuperCalc Answer Key gently guides you every step of the way. And included with the SuperCalc Software Package is a comprehensive tutorial and reference guide which introduces you to the full power of the electronic spreadsheet.

The SuperCalc Answer Key. Invented so you can move on to answering the questions that really count.

SuperCalc is available now for your CP/M* computer. Contact us today for the name and address of your local dealer.

SuperCalc™
 **SORCIM**

405 Aldo Avenue Santa Clara, CA 95050
(408) 727-7634

†SuperCalc and The Answer Key are trademarks of Sorcim Corporation

*CP/M is a trademark of Digital Research

At a Glance

Name
Exatron Stringy Floppy

Use
High-speed mass storage on digital cassette

Manufacturer
Exatron Corporation
181 Commercial St
Sunnyvale CA 94086
(800) 538-8559
(408) 737-7111 (in California)

Price
First drive for TRS-80 Model I, \$249.50
First drive with starter kit, \$349.50; Second drive, \$224.50
First drive for Apple II, \$349.50; Second drive, \$189.50

Dimensions
TRS-80 Model I, 6 by 4 1/4 by 2 3/4 inches (15.25 by 10.5 by 6 cm)

Apple II, 6 1/4 by 5 1/4 by 3 1/4 inches; (15.8 by 14.9 by 8.5 cm)

Features
TRS-80 Model I: on-board ROM-based operating system, 7200 bps data-transfer rate, LED indicators, automatic keyboard debounce; Apple II: LED indicators, built-in catalog function, 16,000 bps data-transfer rate

Additional hardware needed
TRS-80 Model I Level II computer and 40-pin ribbon connector; Apple II or Apple II Plus computer and interface card (card supplied with first drive)

Hardware options
TRS-80 Model I Speed-Up Kit (doubles processor clock rate and Stringy Floppy data-transfer rate), \$19.95

explanation of the error-detection system are included.

Second, a starter kit is available that includes some immediately useful software: the data-I/O program, two I/O-demonstration programs, a machine-language monitor called ESF-80, which resembles Radio Shack's T-Bug, and a mini-data-base program. The starter kit also contains documentation, ten blank wafers, and a two-for-one ribbon cable for connecting the Stringy Floppy drive to the expansion port on the TRS-80 keyboard/processor module.

Third, for support after the sale, Exatron Corp has established the Exatron Stringy Floppy Owners' Association, through which a variety of software is available on wafer, including games and utility programs. Membership is automatic when you purchase a Stringy Floppy drive. The association also distributes instructions for modifying popular commercially sold programs to work with the Stringy Floppy drive. Such patches are available for the Electric Pencil word-processing program from Michael Shroyer Software and for the Editor/Assembler Plus from Microsoft Consumer Products. Members of the association are encouraged to contribute to the software collection and to a collection of hardware interface designs, sometimes in exchange for royalties.

Fourth, Exatron maintains a toll-free telephone number you can call if you need more help than you can get locally. The number is (800) 538-8559. California residents can call (408) 737-7111.

PAY LESS. GET MORE.



PRICE EXAMPLES:

| | |
|----------------------------------|--------------|
| ATARI 800 with 16K memory | \$749 |
| ATARI 400 with 16K memory | 329 |
| ATARI 810 DISK | 439 |
| ATARI 410 RECORDER | 65 |
| ATARI 825 PRINTER | 599 |

| | |
|---|-----------------|
| Jawbreaker (16K Disk) | 24.95 |
| Pro Football (Text) (Cass. 16K) | NEW 7.95 |
| Dodge Racer (16K Cass. 24K Disk) | 19.95 |
| Asteroids | 34.95 |
| Missile Command | 34.95 |

Mail Order Customers

- Indicate Unit(s) you want
- Shipping Address • Mass. res. 5% sales tax
- Include check, money order, MC or VISA number

We ship by best means possible freight collect

WARREN'S COMPUTER SYSTEMS

4 Elm St., Braintree, MA 02184 (617) 843-1133
1-800-343-5691 (24 hours)

Send for Catalog of complete Atari products

Other Planned Products

In addition to the version for use with the TRS-80 Model I, Exatron has recently announced a Stringy Floppy drive for use with the Apple II computer. The new system differs from the TRS-80 version in several ways. The operating system for the Apple will not be resident in ROM; it will be loaded into 6 K bytes of the Apple's user memory by a bootstrap routine when the Stringy Floppy system is activated, in much the same manner as popular disk operating systems. The Apple version will provide a catalog on each wafer, residing in the first file, and the standard data-transfer rate will be higher, about 16,000 bps. As the owner of a TRS-80, I envy these features.

Because Exatron is designing Stringy Floppy drives for some Commodore Business Machines computers and for the Radio Shack TRS-80 Color Computer, owners of these machines may look forward to having the Stringy Floppy added to the selection of peripheral devices.

Conclusions

- The Exatron Stringy Floppy system is an excellent low-priced alternative to slow audio-cassette data storage. The system appears to work well despite some minor bugs. Exatron apparently has worked hard to make both the hardware and its operation simple and efficient.
- Both documentation and support appear to be good, and toll-free telephone assistance is a reassuring asset.
- Thanks to the efforts of Exatron and the owners' association, an adequate supply of software converted to run on the system is available. ■

LE SHHHSTICK™

Finally! The ultimate goal in microcomputer hardware, achieved.

A joystick with such remarkable realism and control that even the thought of other joysticks virtually vanish.

Inside Le Stick™ are motion detectors which will maneuver your sights in any direction you want with simple one handed movements. The large red push button on top provides a quick and accurate firing mechanism for better response time.

From Star Raiders to graphic draw programs — Le Stick™ eliminates all the frustrations you experience with the conventional two handed joysticks or keyboards.

The joystick of the future. See and test it at your Datasoft™ dealer today, or contact us for more information.

LE STICK \$39.95

FOR ATARI 400/800, ATARI VIDEO GAME, COMMODORE VIC AND THE TRS-80 COLOR COMPUTER SYSTEMS



Datasoft Inc.™
COMPUTER SOFTWARE

19519 Business Center Dr., Northridge, CA 91324
(213)701-5161

Character Generator for Atari 400/800 Computers

This new program for the Atari Computer enables you to create high resolution graphics in the text mode. Redefines a character set virtually any way you want. Ready for whatever language or graphics set you can devise — from ancient Japanese to Modern Russian. (Diskette) \$19.95 / (Cassette) \$15.95.

Mailing List for Atari 800 Computer

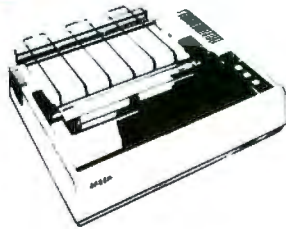
Business application software for the Atari Computer. A versatile disc based system. An efficient micro format equal to those used for many large computers. Sorts by Zip Codes, Names, and stores special data for your personal use. (Diskette) \$24.95.

Order through your local software dealer, or send check or money order plus \$2.00 shipping and handling to Datasoft.

EPSON



**PRINTERS,
MONITORS,
DISKS**



| | |
|--------------------------------------|------|
| Daisy Wheel Printer by C. Itoh | 1750 |
| Paper Tiger 445G | 725 |
| Paper Tiger 460G | 1194 |
| Paper Tiger 560G | 1495 |
| Qume (shipped FREIGHT COLLECT) | 2499 |
| Silentype w/interface | 349 |
| Amdek Color Monitor | 349 |
| Amdek Green Screen | 169 |
| Amdek/Leedex B/W 12" Monitor | 129 |
| NEC 12" Green Screen | 239 |
| Sanyo 9" B/W Monitor | 169 |
| Sanyo 12" B/W Monitor | 255 |
| Sanyo Green Screen | 309 |
| Dysan Disks (pkg. 10) | 50 |
| Memorex Disks (pkg. 10) | 40 |
| Opus Disks (pkg. 10) | 30 |
| Verbatim "Gold" (pkg. 10) | 35 |



ATARI 800
PERSONAL COMPUTER SYSTEM

\$789

IF
ATARI[®]
MAKES
IT, WE
SELL IT

| | |
|----------------------------------|-----|
| Atari 400 8K Computer | 419 |
| Atari 800 16K Computer | 789 |
| Atari 410 Program Recorder | 69 |
| Atari 810 Disk Drive | 499 |
| Atari 820 Printer | 429 |
| Atari 825 Printer | 695 |
| Atari 850 Interface | 169 |
| 16K RAM by Microtek | 99 |
| 32K RAM by Microtek | 189 |
| Assembler/Editor | 45 |
| Atari Joysticks | 18 |
| Atari Paddles | 18 |
| Basketball | 30 |
| Computer Chess | 30 |
| Invitation to Programming | 17 |
| Music Composer | 45 |
| Star Raiders | 39 |
| Super Breakout | 30 |
| 3-D Tic-Tac-Toe | 30 |
| Video Easel | 30 |
| Visicalc | 180 |

SSM AIO \$149

*** MONTHLY SPECIALS ***

VERSA-WRITER DIGITIZER \$239

CALL UNDER \$1200
NEC PC-8000 Series Microcomputer System.

ROM
24K Bytes (expandable to 32K Bytes)

CPU
 μ PD780c-1 (Z-80A compatible), 4MHz

RAM
32K Bytes (expandable to 160K Bytes
with PC-8012A I/O Unit.

The end of the compromise.



TO ORDER: Phone orders invited using Visa, Mastercard or bank wire transfers. Visa and MC service charge of 2%. Mail orders may send charge card number (include expiration date), cashiers check, money order, or personal check (allow 10 business days for personal or company checks to clear). Please add 3% (\$5.00 minimum) for UPS shipping, handling, and insurance. APO and FPO include 5% (\$7.00 minimum) for postage. Calif residents add 6% sales tax. Please include phone number on all orders.

FOREIGN ORDERS include 1% handling — shipped air FREIGHT COLLECT only. Credit cards not accepted on foreign orders. All equipment is in factory cartons with manufacturer warranty. Opened products not returnable. Restocking fee for returned merchandise. Equipment subject to price change and availability. Retail prices differ from mail order prices. WE SHIP THE SAME DAY ON MOST ORDERS!



Circle 95 on Inquiry card.

(714) 579-0330 • MAIL TO: 1251 BROADWAY, EL CAJON, CA. 92021

AUTHORIZED
APPLE
SALES &
SERVICE



COMPUTER SPECIALTIES

DIV OF
COMPUTER
METRICS
INC

EXCITING DISCOUNTS

apple II
16K computer

DISK with CONTROLLER
NEW DOS 3.3 \$529
 without . . . \$445
 Nearly Everything
 for Apple

\$1045



**WE WILL
 MEET OR BEAT
 ANY ADVERTISED PRICES
 ON MOST ITEMS IF MERCHANDISE
 IN STOCK**

APPLE II 48K
\$1095
64K
\$1249

**APPLE COMPUTER
 INTERFACE CARDS**

- Applesoft II Firmware Card 149
- CCS Asynchronous 7710A 129
- CCS Parallel Print Cd. 7720A 155
- Centronics Interface Cd. 179
- Comm. Cd. & DB25 Cable 179
- CPS Multifunction by Mtn. Comp. . . . 199
- Expansion Chassis by Mtn. Comp. . . 555
- HiSpeed Serial Int. Cd. 155
- Integer Basic Firmware Cd. 149
- ROMPLUS 135
- SSm AIO Serial/Parallel I/O
 Assembled & Tested 149

APPLE SOFTWARE

- | | |
|--|--|
| ABM by Muse 19 | Pool 1.5 29 |
| Adventure by Microsoft 27 | Pulsar II 25 |
| Alien Rain by Broderbund 19 | Raster Blaster 24 |
| Apple PIE 119 | Robot War by Muse 31 |
| Apple Pilot 129 | Sabotage 21 |
| Apple-oids 25 | Sargon II Chess Game 29 |
| Appleplot by Apple 59 | Snoggle/Puckman by Broderbund . . 24 |
| Applepost Mailing List System 44 | Space Game Album by Budgeco . . . 39 |
| Applewriter Word Processor 65 | Space Eggs 25 |
| Asteroid Field by Cavalier 19 | Space Invaders/Cosmos Mission . . . 19 |
| CCA Data Mgmt 84 | Space Raiders by USA 25 |
| Data Factory by Microlab 129 | Star Cruiser 24 |
| Desktop Plan II 159 | Sub-Logic FS-1 Flight Simulator . . . 34 |
| DB Master II by Stoneware 199 | Super Single Disk Copy Routine . . . 35 |
| DOS Tool Kit 65 | Super Stellar Trek 33 |
| DOS 3.3 Upgrade 49 | Supertext II by Muse 129 |
| Dow Jones Portfolio Evaluator 45 | Ultima 35 |
| Fortran by Apple 159 | Visicalc II 159 |
| Hi-Res Football 33 | VisiList 24 |
| Head-On 21 | Visitrend/Visiplot 219 |
| Integer Basic Cassette Demos 29 | Wizard and the Princess 32 |
| Orbitron 25 | Zork 34 |
| PASCAL Language System 425 | |
| Peachtree Bus. Pkgs CALL | |
| Personal Filing System 84 | |
| Phantoms Five 29 | |

**LARGE SELECTION OF
 SOFTWARE IN STOCK —
 CALL FOR FREE BROCHURE —**

ACCESSORIES

- A/D D/A Board by Mtn. Comp 319
- Andromeda 16K Ramcard 179
- Apple Game Paddles 25
- Arith. Processor 7811 A or B 339
- COPYROM by Mtn. Comp 51
- Dan Paymar L.C. Kit 1 or 2 55
- Extender Board 27
- GPIO IEEE 488 Card 259
- Graphics Input Tablet 639
- Hayes Micromodem 299
- Introl X-10 Remote Control Sys. . . . 239
- Joystick for the Apple 47
- Keyboard Filter ROM chip 49
- Lazer Lower Case Plus+ 49
- M & R Sup-R-Term 80-col-bd. 319
- Music System by Mtn. Comp 479
- Programmable Timer CCS 7440A . . . 159
- Prototyping Hobby Card 22
- ROMWRITER by Mtn. Comp 149
- SuperTalker Speech Synthesizer . . . 239
- Thunderclock 129
- Versa-Writer Digitizer Drawing Sys . . 239
- Videx Keyboard Enhancer 115
- Videx Videoterm 80-col-cd 319
- Z-80 SOFTCARD by Microsoft 319



CALL 1-800-854-2833
PHONE ORDERS
MON. - SAT. 8 to 6 P.S.T.

Circle 95 on inquiry card.

MEMBER CHAMBER OF COMMERCE

**AUTHORIZED
 APPLE
 SALES &
 SERVICE**



SPECIALTIES

**DIV. OF
 COMPUTER
 METRICS
 INC.**

Reviewing the Microcomputer Revolution

Ed Faber, President
ComputerLand
14400 Catalina St
San Leandro CA 94577

For the past five years, industry leaders have been telling each other about the microcomputer revolution, predicting it may even overshadow the industrial revolution. Of course, the beginnings of the industry go back more than five years, but 1976 marked the first anniversary of BYTE and the creation of ComputerLand, which celebrated its fifth birthday this fall by opening its 200th store.

With so many of the heady predictions of five years ago yet to be fulfilled, it's easy to lose sight of the changes we've already brought about. But one dream still unfulfilled is the emergence of a mass market for home com-

puters. For ComputerLand stores, the home/entertainment market initially accounted for 50 percent of our sales. But by 1979, it represented only 25 percent, except at Christmas time. The home market has not dwindled; it has grown slowly while the business market has exploded. In fact, the events of the past five years might well be called the "office microcomputer revolution."

The three basic reasons for the faster growth of the business market show what's required to develop a mass home market:

1. Business is not afraid of computers; business people are accustomed to them and perceive them as useful.
2. Computers *are* useful to business; programmers have had 30 years to turn hardware into solutions.
3. Channels of distribution and support already exist for business computers.

None of these requirements has been completely satisfied for the home market. The public is afraid of computers. Until recently, most people didn't know where to buy a computer or how to support one, and they didn't see any benefit to owning one.

Making the benefits known is largely the responsibility of manufacturers. The first two requirements can be met by the existence of full-service retail computer stores.

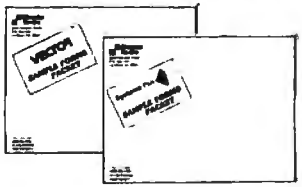
From my viewpoint, the major achievement of the past five years has been the creation of the structures that will carry the microcomputer revolution to its next stages. Those structures have had more to do with merchandising than with technology. In other words, the real revolution springs not from technology but from our making that technology available to a mass market.

Many will read that statement with sorrow, even if they agree. The entry of giant manufacturers, the growth of global retail networks, the emergence of advertising campaigns involving celebrities and network TV—all of these have tended to squeeze out the starry-eyed, blue-jeaned innovators who started the ball rolling.

The start-up phase of our industry has ended. No longer can you trade in a used car to capitalize a company. But the change doesn't explain the extraordinary

And You Thought You Didn't Have A Choice

Now you can have another one of those little extras that makes you feel good about your computer...



...a complete packet of the most attractive stock forms on the market, from the people whose only business is the small computer user. Our experienced customer staff is ready and waiting to answer questions regarding your forms needs.

- OVER 200 STOCK FORMS TO CHOOSE FROM
- 7-WORKING DAY GUARANTEED RUSH SHIPMENT
- PERSONALIZED SERVICE AND QUALITY YOU WILL LEARN TO COUNT ON


DEALER INQUIRIES WELCOME

CALL NOW TOLL FREE

For free packets for the following systems:

- Systems Plus • TCS • Structured Systems Group
- Vector • Paschtree • Radio Shack • Osborne •
- BPI • Alpha Micro • Van Data • Anchor • Insoft •
- Dynabyte • Cado • Durango • Designer • Wark •
- Cantarini • Micro DeSys • DIBS • EDS • IMS •
- Graham Dorian • Continental • & many more •

Call for FREE 1981 Tax Forms Catalog!

NATIONWIDE 800-854-2750  IN CALIFORNIA 800-552-8817

Your Complete Source for Continuous Forms!

MODEMS

All Modems connect to
RS232 Computer or Terminal

1200 Baud and 300 Baud-Bell 212A

Style. Penril 300/1200 \$779
Originate/answer/auto-answer. Full duplex
RS232. Phone line connection via standard
phone jack. 1 yr. warranty
Auto-dial option \$350

300 Baud Phone Link \$179

Originate/answer. Sleek, low profile. 15ozs. Half/
full duplex. Sell test. RS232. Light displays for
On Carrier, Test, Send & Receive Data. 1 yr.
warranty.

300 Baud. USR-330D \$339
Originate/answer/auto-answer. Phone line
connection via standard jack. 1 yr. warranty

300 Baud. USR-330A \$399
Same as USR-330D PLUS Auto-Dial. Call for
quote and technical information on higher
speed modems and multiplexors.



Printing Terminals

The new generation of printing terminals
from General Electric.

30/60 CPS. GE Terminet 2030 \$929

110/300/60/1200 Baud. User selectable lines
per inch and chars. per inch. True descenders
and underlining. Up to 217 cols. per line. Top of
form, vert. and hor tabs. Friction feed std.
tractor lead opt. Answerback. 1 yr. warranty on
parts. Nationwide servicing. Extremely com-
pact. 15 in. paper. Only 22 lbs. Built in text editor
with 16k text editor optional. SUPERIOR TO DEC
LA34AA at lower cost.

120/150 CPS.

GE Terminet 2120 \$1,699
Housed in same compact package as the 2030
with all the features of the 2030 PLUS 150 char
per sec print rate.

Letter Quality. NEC 7720

KSR with keyboard \$2,695
55 CPS. RS232 and Centronics parallel. Inter-
changeable print thimbles for a wide variety of
perfect, letter quality output.

CRT's

Televideo (Lear Seigler, Hazeltine
and ADDS equivalent) \$584
24 x 80. RS232. Numeric keypad. Non-glare
screen. Printer Port. Function keys

Televideo 950 \$959

Green, Non-glare screen. RS232. Detachable
keyboard. Advanced editing with wraparound.
Smooth scrolling. 15 baud rates. Protected
fields. Underlining. Split screen. Fully program-
mable function keys. 15 graphics characters
Sell test. 25th status line. Buffered printer port
14 x 10 high resolution character display. Tilt-
able screen. Nationwide service from General
Electric.

Televideo 912C \$759

Televideo 920C \$792

Visual Technology - Visual 100

(DEC VT100 Emulator) \$1,399
All the features of the DEC VT100 INCLUDING
Advanced Video Features and Non-glare
screen

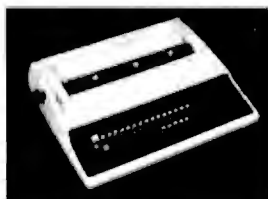
Printers

OKIDATA Microline 82A. 120 CPS.

80/132 Columns per line. \$529
User selectable char. Sizes. Top-of-form bi-dir-
ectional. Short line seeking print techniques for
greater throughput. RS232 & Centronics parallel
interfaces.

Letter Quality, NEC 7710 RO... \$2,395
Same features as the 7720KSR listed above but
without keyboard.

Letter Quality, NEC 3510 RO... \$1,499
Like the 7710 RO but 30 CPS.



BYTE Comment

sense of apprehension that prevails in the headquarters of successful companies. The question of the day seems to be "Who's gaining on me?" Instead of looking for a better and more valuable product, companies are aiming their strategies at the competition. Those who aren't afraid of IBM are afraid of the Japanese, or discounters, or Sears, or something.

Into this turbulent market I'd like to toss an idea, one we've used at ComputerLand and credit with our success: the market is honest. The companies that succeed are the ones that contribute value by building the best possible product and offering it at a fair price. I can think of no bigger mistake than for companies who became successful this way to begin reacting to what others are doing (or might be doing).

The potential market is much greater than anything we're competing for today. Any contribution to expanding the market can't fail to be repaid. The market will always have room for innovation, for products that improve on previous products or help solve new problems.

I believe much of the industry's apprehension grows out of a misperception about consumer marketing. Many manufacturers have not yet learned how to communicate to the general public or how to describe hardware benefits to computer illiterates. That doesn't mean computers should be sold like shampoo, with million-dollar ad campaigns and sex appeal. As shampoo marketers will tell you, ad campaigns are most important for products with few real advantages over their competitors. The market will always make room for a better product.

Innovation is also the answer for those who fear that Japan or some other country will steal the market through price erosion and superior manufacturing capacity. If the battle is fought on the basis of price instead of innovation, Silicon Valley hasn't a chance. If the battle is between cheaper and better, better will prevail wherever it comes from.

The companies to watch during the rest of this decade are the ones that concentrate on providing value to the end user. We happen to believe that value includes offering your products through full-service, full-support retail outlets. Be that as it may, the products with the most value to the end user are the ones that will succeed.

We are still on the threshold of the computer revolution; the greatest opportunities for manufacturers, retailers, and customers still lie ahead. No one now in the market or planning to enter it should fear anything more than the failure to bring value to the market. *That* is the challenge of the 1980s. ■

Occasionally, BYTE invites industry leaders to comment on topics related to the microcomputer industry. The opinions expressed by these authors are their own and do not necessarily represent the opinions of BYTE or its publishers.



VISA/MASTERCARD Accepted. Corporation and
institution purchase orders accepted. Leasing rates
available on request. All equipment is shipped with a
10-day money back guarantee. We offer full service,
on-site maintenance plans on all equipment. All equip-
ment in stock.

U.S. ROBOTICS INC.

203 N. WABASH SALES (312) 346-5650
SUITE 1718 GENERAL OFFICES (312) 346-5651
CHICAGO, ILL 60601 SERVICE (312) 733-0497



The MX-100. Not just better. Bigger.

Epson.

Our MX-80 was a pretty tough act to follow. I mean, how do you top the best-selling printer in the world?

Frankly, it wasn't easy. But the results of all our sleepless nights will knock your socks off.

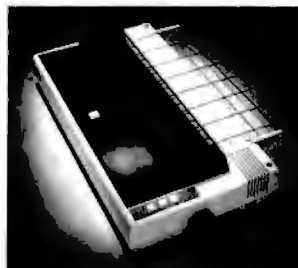
The MX-100 is a printer that must be seen to be believed. For starters, we built in unmatched correspondence quality printing, and an ultra-high resolution bit image graphics capability. Then we added the ability to print up to 233 columns of information on 15" wide paper to give you the most incredible spread sheets you're ever likely to see. Finally, we topped it all off with *both* a satin-smooth friction feed platen *and* fully adjustable, removable tractors. And the list of standard features goes on and on and on.

Needless to say, the specs on this machine — and especially at under \$1000 — are practically unbelievable. But there's something about the MX-100 that goes far

beyond just the specs; something about the way it all comes together, the attention to detail, the fit, the feel. Mere words fail us. But when you see an MX-100, you'll know what we mean.

All in all, the MX-100 is the most remarkable printer we've ever built. Which creates rather a large problem for those of us at Epson.

How are we going to top this?



Your next printer.

EPSON
EPSON AMERICA, INC.

3415 Kashiwa Street • Torrance, California 90505 • (213) 539-9140

Circle 167 on inquiry card. See the whole incredible Epson MX Series of printers at your Authorized Epson Dealer.

MMSFORTH VERSION 2.0: MORE FOR YOUR RADIO SHACK TRS-80 MODEL I OR MODEL III !

- ★ **MORE SPEED**
10-20 times faster than Level II BASIC.
- ★ **MORE ROOM**
Very compact compiled code plus VIRTUAL MEMORY makes your RAM act larger. Variable number of block buffers. 31-char-unique word-names use only 4 bytes in header!
- ★ **MORE INSTRUCTIONS**
Add YOUR commands to its 79-STANDARD-plus instruction set!
Far more complete than most Forths: single & double precision, arrays, string-handling, clock, more.
- ★ **MORE EASE**
Excellent full-screen Editor, structured & modular programming
Word search utility
THE NOTEPAD letter writer
Optimized for your TRS-80 with keyboard repeats, upper/lower case display driver, full ASCII, single & double-width graphics, etc.
- ★ **MORE POWER**
Forth operating system
interpreter AND compiler
5080 Assembler
(Z80 Assembler also available)
Intermix 35- to 80-track disk drives
Model III System can read, write & run Model I diskettes!
VIRTUAL I/O for video and printer, disk and tape
(10-Megabyte hard disk available)

MMSFORTH

THE PROFESSIONAL FORTH FOR TRS-80

(Over 2,000 systems in use)

MMSFORTH Disk System V2.0 (requires 1 disk drive & 16K RAM, 32K for Model III) \$129.95*

AND MMS GIVES IT PROFESSIONAL SUPPORT

Source code provided
MMSFORTH Newsletter
Many demo programs aboard
MMSFORTH User Groups
Inexpensive upgrades to latest version
Programming staff can provide advice, modifications and custom programs, to fit YOUR needs.

MMSFORTH UTILITIES DISKETTE: includes FLOATING POINT MATH (L2 BASIC ROM routines plus Complex numbers, Rectangular-Polar coordinate conversions, Degrees mode, more), plus a full Forth-style Z80 ASSEMBLER, plus a powerful CROSS-REFERENCER to list Forth words by block and line. All on one diskette (requires MMSFORTH V2.0, 1 drive & 32K RAM) \$39.95*

FORTHCOM: communications package provides RS-232 driver, dumb terminal mode, transfer of FORTH blocks, and host mode to operate a remote TRS-80 (requires MMSFORTH V2.0, 1 drive & 32K RAM) \$39.95*

THE DATAHANDLER V1.2: a very sophisticated database management system operable by non-programmers (requires MMSFORTH V2.0, 1 drive & 32K RAM) \$59.95*

MMSFORTH GAMES DISKETTE: real-time graphics & board games w/ source code, includes BREAKFORTH, CRASHFORTH, CRYPTOQUOTE, FREEWAY, OTHELLO & TICTACFORTH (requires MMSFORTH V2.0, 1 drive & 32K RAM) \$39.95*

Other MMSFORTH products under development

FORTH BOOKS AVAILABLE

MMSFORTH USERS MANUAL - without Appendices, for non-owners \$17.50*

STARTING FORTH - best companion to our manual \$15.95*

INVITATION TO FORTH - detailed beginner book on figFORTH \$17.50*

THREADED INTERPRETIVE LANGUAGES - advanced, excellent analysis of MMSFORTH-like language \$18.95*

PROGRAM DESIGN & CONSTRUCTION - intro. to structured programming, good for Forth \$13.95*

FORTH 79 STANDARD MANUAL - official reference to 79-STANDARD word set, etc \$13.95*

FORTH SPECIAL ISSUE, BYTE Magazine (Aug. 1980) - we stock this collector's item for Forth users and beginners \$4.00*

* - ORDERING INFORMATION: Software prices include manuals and require signing of a single system, single-user license. SPECIFY for Model I or Model III! Add \$2.00 SH plus \$3.00 per MMSFORTH and \$1.00 per additional book. Mass. orders add 5% tax. Foreign orders add 20%. UPS COD, VISA & MIC accepted; no unpaid purchase orders, please.

Send SASE for free MMSFORTH information
Good dealers sought.

Get MMSFORTH products from your
computer dealer or

**MILLER MICROCOMPUTER
SERVICES (B11)**

61 Lake Shore Road, Natick, MA 01760
(617) 853-8136

System Review

The Datahandler from Miller Microcomputer Services

Allyn Richardson
POB 254
West Groton MA 01472

There are only two programs in my software library that I use constantly. One is the word processor that is helping me to review and edit *this* text. The other is The Datahandler from Miller Microcomputer Services. Written entirely in MMSFORTH (that company's version of the FORTH language for the Radio Shack TRS-80 Model I), The Datahandler does almost every job you expect of a personal computer except number-crunching—and it even does a little of that, as you will see.

For example, The Datahandler disk includes a checkbook and bank-transaction routine that is the best of its kind. It can generate a summary list of all transactions in a specified interval and provide a running balance for each. Adding a code letter to each entry that designates the source of deposits and the purpose of expenditures allows the output section of The Datahandler to give listings and totals for each class. With these summaries of your financial activities, the annual IRS formalities become a breeze.

There is also a mailing-list routine. Last year, with its help, I got through my entire Christmas-card list before Christmas for the first time in years. Previously, I got a few cards out by Christmas, some by St Valentine's Day, some by Easter/Passover, and many never made it at all. It took less

effort to type all the names and addresses into the TRS-80 than to address one year's Christmas envelopes by hand, and I only had to type them in once. Now that the data is in the computer, I can select and automatically print self-adhesive address labels for the entire list or any desired portion, such as family members, personal friends, business associates, my MMSFORTH users' group, or monthly accounts. The address labels save a lot of work, and the system makes certain that nobody gets overlooked.

The Datahandler is also ideal for creating different catalogs, and it has built-in automatic cross-indexing. For example, I keep a catalog of all my phonograph albums on floppy disk. Each disk entry (called a *record* in computer data-base terminology) in the MASTER LIST data file corresponds to one album in my collection.

Each data record has five fields of information: an accession number, title, description, subfile, and code. The *accession* number tells *where* the phonograph disk can be found. When a file is resorted, this number stays with its file record, even though the records themselves are renumbered in a new sequence. The *title* field includes composer or performer, and the *description* includes the publisher's name, product number, and the number of separate musical pieces on the album.

The *subfile* field points to a separate listing in another file on the same disk containing more detailed

HP • D.C. HAYS MICROCOMPUTERS • PAPER TIGER • GTE • DIABLO • BMC • CENTRONIC • NEC • HAZELTINE • MEMOREX • AMPLEX • PERSONAL SOFTWARE • ADDS • XEROX • DIABLO

MICRO

BUSINESS WORLD INC.
Information Line (213) 996-2252
TOLL FREE MAIL ORDER LINES
(800) 423-5886 Outside Calif.

COMPUTERS

| Apple Computer | 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 3990.00 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 | 257.55 |
| 800 16K Bytes of Ram | 1080.00 | 739.00 | 341.00 |
| 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 | 230.95 |
| 820 Printer (40 col. Impact) | 450.00 | 353.00 | 97.00 |
| 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 | 268.00 |

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 | 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 | 175.00 |
| 9895A 8" Dual Drive | 6850.00 | 5500.00 | 1350.00 |
| Graphics Tablet 9111 | 2050.00 | 1678.00 | 372.00 |
| HP-41 CV New 2.2 bytes mem | 325.00 | 250.00 | 75.00 |
| HP-41-C Calculator Card Reader for 41C/V/C | 250.00 | 185.00 | 65.00 |
| Printer for 41C/V/C | 215.00 | 162.00 | 53.00 |
| Printer for 41C/V/C | 385.00 | 289.00 | 96.00 |
| Optical Wand for 41 C/V/C | 125.00 | 97.00 | 28.00 |
| Quad Ram equals 4 Mem. Mods | 95.00 | 61.00 | 34.00 |
| Memory Modules for 41C | | 25.00 | |
| HP-97 Programmable Printer | 750.00 | 595.00 | 155.00 |
| 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 |

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 SILENTYPE | 645.00 | 299.00 | 346.00 |
| ANADEX 9501 | 1650.00 | 1299.00 | 351.00 |
| NEC | | | |
| 5510 | 3195.00 | 2445.00 | 750.00 |
| 5515 | 3295.00 | 2545.00 | 750.00 |
| 3510 | 2495.00 | 1795.00 | 700.00 |
| 3515 | 2545.00 | 1849.00 | 696.00 |
| OKIDATA | | | |
| MICROLINE 80 | 545.00 | 395.00 | 150.00 |
| MICROLINE 82 | 549.00 | 549.00 | 0.00 |
| MICROLINE 83 | 1050.00 | 769.00 | 281.00 |
| PAPER TIGER | | | |
| 445C with Graphics | 795.00 | 695.00 | 100.00 |
| 460G with Graphics | 1,394.00 | 899.00 | 495.00 |
| 560G New full size | 1,695.00 | 1,139.00 | 556.00 |
| DIABLO (LETTER QUALITY) | | | |
| 630 R102 bidirectional tractor | 2,965.00 | 2,350.00 | 615.00 |
| 1640K109 keyboard tractor | 4,000.00 | 2,899.00 | 1,101.00 |
| 630 RC Receive Only | 2,710.00 | 2,250.00 | 460.00 |
| 1650K 136 keyboard tractor | 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

List \$2430.00

\$1795

MONITORS

| | List | Our Price | SAVE |
|-------------------|----------|-----------|---------|
| NEC Grn. Phs. 12" | \$285.00 | 239.99 | \$45.00 |
| BMC Green Phs 12" | 275.00 | 229.00 | 46.00 |
| Zenith 12" | 159.00 | 119.00 | 40.00 |

SANYO MONITORS

High Resolution, Number 1 seller

| | List | Our Price | SAVE |
|-----------------------------------|---------|-----------|----------|
| 13" Color (new) high quality | 5550.00 | 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 The Best Seller! | 235.00 | 145.00 | 90.00 |

DISKETTES

SOLD IN BOXES OF 10 (Min. Purchase)
BUY \$100 of the Following Diskettes

| | List | Our Price | SAVE |
|-------------------------------------|-------|-----------|------|
| DYSAN | | | |
| 104 1" SOFT SECTOR | 6.00 | 3.99 | 2.01 |
| 104 10" DBL | 6.40 | 4.60 | 1.80 |
| DEN-SOFT SEC | 7.25 | 4.75 | 2.50 |
| 3740 1D 8" DBL | 10.75 | 6.90 | 3.85 |
| DEN-SOFT SECTOR | 5.00 | 4.00 | 1.00 |
| MAXELL | | | |
| MO-2 SOFT SEC. TOR DBL DEN | 5.00 | 4.00 | 1.00 |
| MO-2 " 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 SDF/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 A280006) (16 Sector) | 200.00 | 159.00 | 41.00 |
| Language System with Apple Pascal | 495.00 | 399.00 | 96.00 |
| BPI General Ledger System | 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 |
| Microtab 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 |
| Softpage Magic Window | 99.00 | 72.00 | 27.00 |

TEXAS INSTRUMENTS

| | | | |
|-----------------------------------|--------|--------|----------|
| 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

| | | | |
|--------------------|--------|--------|-------|
| 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-12 | 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 |
| PQ-20 | 29.95 | 23.00 | 6.95 |
| LC-785 | 12.95 | 10.00 | 2.95 |
| FX-3165 | 12.95 | 10.00 | 2.95 |
| FX-68 Scientific | 29.95 | 23.00 | 6.95 |
| FX-81 Scientific | 19.95 | 17.00 | 2.95 |
| FX-3600P Scientific | 39.95 | 29.95 | 10.00 |
| FX-602P "Computer Talk" 88 Memories Programming Upper & Lower Case Dat 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 \$99.00

INQUIRE

MICRO BUSINESS WORLD WAREHOUSE
18720 Oxnard, #108 Tarzana, CA 91356
OUTSIDE CA CALL TOLL FREE 1 (800) 423-5886 IN CA (213) 996-2252

Telex 182872
Answer MR KOTZNA

Name (Please Print) _____
Address _____
City _____ State _____ Zip _____
City _____ State _____ Zip _____
City _____ State _____ Zip _____

7113 41 (PRINT) PLS
"AS IF APPLICABLE"
SUBSCRIBE & MAILING"
TOTAL ENCLOSED \$ _____

*California residents add 8% sales tax.
**Add 3% for Shipping & Handling -
Add 3% surcharge for credit cards.
Orders cannot be shipped unless accompanied by payment, including shipping & handling and tax 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.

information. When all the subfiles have been built, requesting a musical selection will give a list of all versions in the collection, where each may be found (including the side and band of the album), when, where, and by whom each was performed, and a critical comment. You can see how this would be useful for a radio broadcaster handling requests from listeners while on the air.

Another worthwhile application is the ability to organize the contents of journals and periodicals. Finding that particular article in an extensive periodical collection can be quite a job. But if you have a Datahandler file of articles indexed by subject, author, title, when and where published, and a brief abstract, finding the desired article is no problem. An additional benefit is that Datahandler can scan all entries on a particular subject for relevant articles.

Of course, building this kind of data base from scratch takes time. If you are a member of a computer group, each member could build a file on a different publication with The Datahandler and all members could share their files.

The number of data bases is limited only by your imagination and your need to organize and control information. Photographers could catalog their prints, amateur radio buffs could keep their station logs, sports fans could keep individual and team records—the list goes on and on.

Anyone interested in learning about or using the FORTH language will appreciate several of the data files included on The Datahandler disk. A member of the MMSFORTH Users' Group has developed and made available a glossary of standard FORTH words (ie: program-coding commands) in Datahandler file format. This file can be accessed and used by anyone operating in FORTH, or it can be modified, updated, or extended using the Datahandler. Whole new vocabularies, such as the nonstandard FORTH words of which The Datahandler itself has been constructed, can be added. The routine

allows listing by word class, gives a description of what the word does and how it is used, and includes a page reference to MMSFORTH's hard-copy documentation for more information.

Another data file, known as ASSEM, is included for assembly-language users or students. ASSEM contains the 149 commands of the Zilog Z80 microprocessor's instruction set and the associated page number in the TRS-80 Editor/Assembler user's manual from Radio Shack. Both are cross-referenced to the equivalent MMSFORTH Z80-assembler command (the same elements but with arguments and operators in reverse-Polish sequence) and (where applicable) the older MMSFORTH 8080-assembler equivalent. The Editor-Assembler manual provides a detailed description of the operation of each instruction.

The Datahandler's formatted hard-copy output is provided by the REPORT routine. You can print a line listing of all fields in each record of your file, or a selected subset. If the records are longer than one line, subsequent lines are indented and an extra line feed can be inserted between records. REPORT gives the option of generating a custom format, listing your file or selected subset with fields in any order. The format is completely under user control and can be set for your video screen or your printer's line and page length. It automatically truncates field lengths to fit your requirements. Unless you want it to, printer output does not include the various computer-generated prompts and operator responses of the interactive program.

Speed is one of the advantages of this data-base system, a direct result of the nature of the FORTH language (for specific information on this language, see the FORTH theme issue of BYTE, August 1980). The threaded interpretive structure of FORTH makes possible an indexed-sequential file organization. This combines the efficient use of memory space of a sequential file with the speed of random access. The memory efficiency is important because both The Data-

handler program and the entire current data file are resident in the TRS-80 user memory to improve the response time of the system.

In FORTH, source code precompiles as it loads, and thus it occupies a minimum of memory. Once loaded, the compiled FORTH code is very fast. Precompiled code can be saved on floppy disk, reloaded, and reused. While it takes eighty seconds for The Datahandler source code to load and compile, the precompiled code loads

At a Glance

Name

The Datahandler

Type

Data-base-management utility program

Manufacturer

Miller Microcomputer Services
61 Lake Shore Road
Natick MA 01760

Price

\$59.95

Format

5¼-inch floppy disk

Language used

MMSFORTH

Computer needed

Radio Shack TRS-80 Model I with a minimum of 32 K bytes of memory, one floppy-disk drive, and the MMSFORTH system.

Documentation

Reprint of the Scelbi PIMS manual, additional text from MMS, and built-in help functions to guide users through the program.

Audience

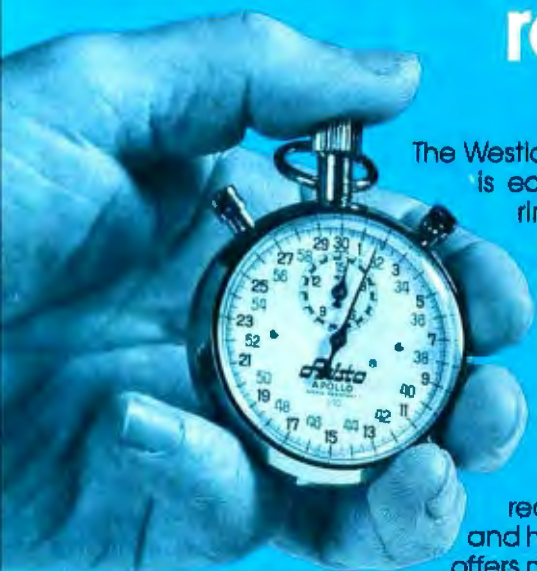
For persons who need a program to help organize and manage information using their TRS-80.

Additional comments

Requires MMSFORTH system, \$129.95, for operation.

Finding the best software on the market can take you weeks.

Reading this ad takes 31.7 seconds and gives you the same results!



The Westico Software Review Committee is easy to recognize. It's their red-rimmed eyes. You get that way checking through an endless parade of software programs. And they do it so that you don't have to. But selecting good software is only part of what makes Westico one of the fastest growing companies in the software industry. Having experts on staff who really understand both software and hardware is another. But Westico offers more than quality products and

support. We offer our unique 24-hour service overnight! Westico. We're working hard to be your software company.

The Westico 24-Hour Computer Hotline (300 baud) (203) 853-0816 for detailed program information and quick access ordering.

—A full range of professional software.

—Support for a wide variety of CP/M® and other computer systems, including: TRS-80 Model II, Apple, Vector Graphic, Cromemco, North Star, Micropolis, Ohio Scientific, Altos, Dynabyte, SuperBrain, Xerox, Zenith and more.

TWO MORE GREAT PROGRAMS FROM WESTICO

LYNX, a friendly overlay linker.

LYNX is an overlay linker for creating executable programs from relocatable files produced by Microsoft's FORTRAN, COBOL, and MACRO-80 languages.

LYNX allows the construction of programs that use all available memory including that used by LYNX itself. Maximum size programs under Microsoft's L80 linker can be increased at least 9K using LYNX without overlays.

The overlay capability of LYNX is vital for programs larger than available memory. With overlays, many large programs on minicomputers or large mainframe computers can be easily moved to a microcomputer.

LYNX offers many features not found in L80. For example, LYNX can be told to get commands from a disk file. The "HELP" feature displays a complete list of LYNX commands. Mapping information can be sent to the screen, printer or disk files. LYNX can decode Microsoft REL files for inspection.

LYNX uses overlays in a tree structure. Any routine is available to any overlay that is higher on the branch than the routine itself.

Complete system with documentation \$250. Documentation alone \$25.

Now it makes sense to MINCE words.

MINCE is a full screen editor based on the "Emacs" text editor, developed after years of research in editor technology and user interface at M.I.T. and other universities. With MINCE you can edit several files simultaneously, allowing the text to be moved between the files. The screen can be divided to display any two files or two parts of the same file at one time. Text can be manipulated by the word, sentence or paragraph, as well as character, line and entire screen with simple, easy-to-remember commands.

MINCE automatically adjusts line length to margins as the text is entered. Commands change words to UPPERcase, lowerCASE or Capitalize. The MINCE unique "query replace" allows global changes to be "tried-out" and then accepted or rejected. Lines can be centered, "white space" removed and text then inserted or overwritten. MINCE is as powerful an editor for programmers as it is for creating documents. MINCE features "type ahead" and a status line which constantly displays: editing mode, the files being edited, the current position in the file, the file modification — if any, the state of the "save" buffer and the command currently being executed. Complete system with documentation — \$175. Documentation alone — \$25.



4 Ways to Order

- Write Westico, Inc., 25 Van Zant Street, Norwalk, CT 06855
- Call (203) 853-6880
- Telex 643-788
- Dial-up our 24-hour computer (300 baud) (203) 853-0816.

COD, MasterCard and VISA accepted.

Prices do not include shipping and are subject to change. In CT add 7% sales tax. All sales final.

Manual price may be credited toward purchase of software.

Dealer Inquiries Invited

Copyright © 1981 Westico, Inc.
WES-36

WESTICO

The Software Express Service

25 Van Zant Street • Norwalk, Connecticut 06855
(203) 853-6880 • Telex 643-788

Send for FREE catalog.

in less than eight seconds. Once loaded, the system disk is not needed for file operations because, as mentioned above, all the program code is in memory. The remaining space on the system disk can be used for file storage, or it can be removed and replaced with a data disk, transferring control to the new disk directory usually located at block zero. On multiple-drive systems, control can be switched at will from one directory to another for access to the files on each; it is even possible to have one directory refer to more than one disk. This can be complicated, however, requiring that such disks always be used as a set, each in its proper drive.

Both the source code and the precompiled version of The Datahandler are useful, and both should be retained. The source code can be easily modified, whereas the precompiled program cannot. Modified source code can be precompiled and saved on the disk; the documentation describes how this is done.

Once the program is loaded, how much space is left for holding a file? If you have a 32 K-byte TRS-80, about 9 K bytes. System overhead (device-control blocks, system stacks, etc) use about 3.5 K bytes while The Datahandler and the portion of the FORTH system it requires compile into about 19.5 K bytes. The remaining 9 K bytes of user memory are used efficiently, with data tightly packed. Each entry is linked to the next by a 2-byte address pointer to eliminate the vacant space at the end of partially filled or empty fields, which are often found in other data-base programs. For many personal applications 9 K bytes is enough; with a 48 K-byte system, the data space is about 25 K bytes, enough for a fairly large file.

If still more space is needed, you can split your data file into two or more parts, usually with no loss of convenience. For example, my phonograph-album file has 245 entries, which exactly fills my 48 K-byte memory space. To make room for

further acquisitions, I split my file into a "classics file" and a "general file" (jazz, folk and humor). A large mailing-list file could be divided alphabetically by addressee, or by zip code for presorted bulk mailings.

Having the entire file resident in memory is much faster than a system which uses frequent time-consuming transfers to and from disk. My memory-filling phono-record file has entries stored in order of accession number; resorting to alphabetic order by title takes 13.2 seconds. Sorting by code designation within the alphabetic sort increases this time to 14.1 seconds. Up to ten successive levels can be sorted. Sorts are the slowest of the file manipulations. Other operations occur as fast as you can punch the keys.

There are also small conveniences that speed up the human end of the operation. For example, when entering a group of checks written on the same day, you need only enter the date for the first entry; entering a semicolon in the date field of the

NOW!

V.I.P.'s Call A.E.I.

V.I.P.'s call A.E.I. because A.E.I. tests before shipping, has expertise on all items offered, and is price competitive.



TELEVIDEO COMPUTER

| | List | Sell |
|--------------------|-------|------|
| System 1 Computer | 3995 | CALL |
| System 2 Computer | 8995 | CALL |
| System 3 Computer | 18995 | CALL |
| TS-80 user station | 1795 | CALL |



TELEVIDEO TERMINALS

| | List | Sell |
|---------------|------|------|
| 910 Terminal | 698 | 585 |
| 918C Terminal | 925 | 675 |
| 990C Terminal | 995 | 730 |
| 990 Terminal | 1195 | 950 |



NEC PRINTERS

| | List | Sell |
|---------------------|------|------|
| 3510-4 30CPS Serial | 2450 | 2050 |
| 7710-1 55CPS SERIAL | CALL | CALL |
| 7720-1 KSR Serial | CALL | CALL |
| 5510-1 55CPS Serial | 3065 | 2495 |
| 5520-1 KSR Serial | 3415 | 2895 |



NORTHSTAR HORIZON COMPUTERS

| | List | Sell |
|------------------|------|------|
| HRZ-2D-32K | 3695 | 2485 |
| HRZ-2D-64K | 4195 | 2995 |
| HRZ-2D-32K | 3995 | 2890 |
| HRZ-2D-64K | 4495 | 3250 |
| HDS-18 Hard Disc | 5374 | 3690 |



NORTHSTAR SOFTWARE

| | List | Sell |
|--------------------|------|------|
| Northstar D/O | 399 | 295 |
| Mailmanager D/O | 299 | 235 |
| Infomanager D/O | 499 | 365 |
| General Ledger D/O | 999 | 785 |
| A/R D/O | 599 | 475 |
| A/P D/O | 500 | 475 |



TEXAS INSTRUMENTS PRINTERS

| | List | Sell |
|--------------------|------|------|
| TI-810 BASIC | 1895 | 1495 |
| TI-810 Fuji ASCII | 1995 | 1580 |
| TI-810 FLO/CP | 2195 | 1780 |
| TI-820 R/O BASIC | 1995 | 1625 |
| TI-820 KSR Package | 2395 | 1850 |



NORTHSTAR ADVANTAGE COMPUTER

| | List | Sell |
|-----------------|------|------|
| ADV-2D-64K | 3995 | CALL |
| BIO Board | 175 | CALL |
| P/O Board | 200 | CALL |
| FRB Board | 399 | CALL |
| Graphics Option | 299 | CALL |



SYSTEMS GROUP

| | List | Sell |
|---------------------|------|------|
| 2800 Computer | 5005 | 3595 |
| DM-8400 Memory | 760 | 585 |
| DMB-5400 Memory | 995 | 725 |
| GPC-2813 CPU I/O | 460 | 365 |
| FOC-2801 Controller | 485 | 370 |



QUME PRINTERS

| | List | Sell |
|---------------------|------|------|
| Sprint 9 35CPS R/O | 1995 | 1700 |
| Sprint 9 45CPS R/O | 2300 | 2000 |
| Sprint 9 55CPS R/O | 2400 | 2050 |
| Full Control Option | 155 | 150 |
| Memory Option | 150 | 150 |



MORROW DECISION COMPUTER

| | List | Sell |
|------------------|------|------|
| Decision 1 BASIC | 1725 | 1350 |
| Decision 2 | CALL | CALL |
| 65K Static Ram | 1000 | 780 |
| Switchboard I/O | 399 | 210 |

Select drives from Morrow disc systems for desired configuration



MORROW DISC SYSTEMS

| | List | Sell |
|--------------------|------|------|
| Discus 2D 1 Drive | 1095 | 850 |
| Discus 2D 2 Drive | 1875 | 1450 |
| Discus 2-2 1 Drive | 1395 | 1150 |
| Discus 2-2 2 Drive | 2495 | 1945 |
| M28 Hard Disc | 4495 | 3325 |
| M20 Hard Disc | 4795 | 3650 |



MODEMS

| | List | Sell |
|--------------------|------|------|
| Cat Modem | 188 | 140 |
| D-Cat | 199 | 150 |
| Auto-Cat | 248 | 190 |
| Apple-Cat | 359 | 310 |
| DC Hayes Micro-100 | 379 | 330 |



ZENITH DATA SYSTEMS

| | List | Sell |
|----------------------|------|------|
| VM-121 Green Monitor | 160 | 125 |
| Z-18 Terminal | 866 | 750 |
| Z-88 Computer | 2888 | 2140 |
| Z-90 Computer | 3198 | 2400 |



MICROPRO SOFTWARE

| | List | Sell |
|----------------|------|------|
| Wordstar | 485 | 300 |
| Apple Wordstar | 375 | 275 |
| Spellstar | 250 | 190 |
| Mailmerge | 150 | 100 |
| Datatar | 350 | 250 |
| Supertool | 250 | 190 |



DISCS-CABLES

| | List | Sell |
|------------------|------|------|
| Memorex 5" 1D | 47 | 27 |
| Memorex 5" 2D | 55 | 36 |
| Memorex 8" 1D | 65 | 40 |
| Memorex 8" 2D | 70 | 45 |
| RS-232 C Cable | 30 | 20 |
| RS-232 10' Cable | 40 | 25 |

—SEE THESE PRODUCTS AND MORE IN OUR SHOWROOM—
PRICES CHANGE DAILY—CALL OR VISIT FOR CURRENT PRICING



AUTOMATED EQUIPMENT, INC.
18430 WARD STREET, FOUNTAIN VALLEY, CALIFORNIA 92708

(714) 963-1414
(800) 854-7635

At Hayes, we don't believe in second best. Or planned obsolescence. We believe in taking the state of the art to the limit. Our new Smartmodem, for example, is the most sophisticated 300-baud originate/answer modem you can buy. And yet, it is perhaps the easiest-to-use modem ever.

RS-232C Compatible. Smartmodem lets any RS-232C compatible computer or terminal communicate by phone with other computers and time-sharing systems located *anywhere in North America*. You get full and half-duplex operation with both Touch-Tone® and pulse dialing.

Auto-Answer/Dial/Repeat. Smartmodem can answer the phone, dial a number, receive and transmit data, and then hang up the phone—automatically! If desired, Smartmodem will even repeat the last command. You can depend on Smartmodem for completely unattended operation.

Completely Programmable. Smartmodem can be controlled using

Hayes Stack™

Microcomputer Component Systems

any programming language. Over 30 different commands can be written into your programs or entered directly from your keyboard.

Smartmodem also includes several switch-selectable features that let you tailor performance to your exact needs. You can "set it and forget it" for the ultimate in convenience.

Built-in Audio Monitor. Thanks to an internal speaker, you can actually listen to your connection being made. You'll know immediately if the line is busy or if you reached a wrong number—

and you don't even need a phone!

Status at a Glance. Seven LED's indicate Smartmodem's current operating mode: auto-answer, carrier detect, off hook, receive data, send data, terminal ready and modem ready. You're never left in the dark!

Direct-Connect Design. Smartmodem is FCC registered for direct connection to any modular phone jack—there's no acoustic coupler to cause signal loss and distortion.

Smartmodem, Smart Buy. Professional quality features. Versatile performance. A full two-year limited warranty. A suggested retail price of only \$279.

What more could you want? Perhaps the matching Hayes Stack Chronograph, an RS-232C compatible calendar/clock system.

Check out the Smartmodem wherever fine computer products are sold. And don't settle for anything less than Hayes.



Smartmodem.
The ultimate concept in modems
is now a reality.

Hayes Microcomputer Products Inc. 5835 Peachtree Corners East, Norcross, Georgia 30092 (404) 449-8741

Hayes Stack is a trademark of Hayes Microcomputer Products, Inc. Sold only in the U.S.A. TM American Telephone and Telegraph ©1981 Hayes Microcomputer Products, Inc.

FLOPPY DISKS & SUPPLIES

BASF FLEXYDISK*

\$26.70*

Certified 100% Error Free



- Cross-linked oxide coating for low head wear and long media life
 - Special self-cleaning jacket liner
 - Double lubrication—special lubricants in formula and on disk surface minimize head friction wear.
- Every BASF flexible disk is tested at thresholds 2-3 times higher than system requirements, to be certified completely error-free.

*5.25" or 8" Single Side, Single Density, Box of 10 Most types in stock. Call for prices. Qty. pricing avail.

BASF Headcleaning FlexyDisk*

BASF's new Headcleaning FlexyDisks* are specially designed to quickly and conveniently clean the read/write heads of your diskette drive without the mess and bother of chemical solvents or liquids.

Box of 3 \$35.00

Note: Use only on single-side diskette drives!

HARDHOLES

Added strength reinforcing rings prevent hole tearing and ripping damage. Made of heavy duty mylar



8" Application Kit \$11.95
Extra Boxes of 50 Holes \$8.00
Applicator Only \$4.00

5.25" Application Kit \$8.95
Extra Boxes of 50 Holes \$6.00
Applicator Only \$3.00

Kas-sette/10" and Mini Kas-sette/10" Library Case



5.25" \$2.25
8" \$2.95

Flip 'N' File™

- * Protective storage system for up to 80 disks
- * Transparent smoke colored acrylic construction with hinged lid



5.25" \$24.95
8" \$29.95

Paper Tractor

The Paper Tractor turns your tractor feed printer into a friction feed printing system. Inexpensively.



- Fits 9 1/2" print frame.
 - Compatible with Matrix, Impact, Daisywheel and Ink Ejection printheads.
 - Fits front, back and dual tractor paper feeds.
 - Positions letter or legal size paper automatically with an edge-protecting guide.
 - Proven with all major manufacturer printers, including Epson, Tiger, GP-80M, and more.
- \$11.95



Mastercard C.O.D. - Visa - Bank Wire Transfer
Personal checks require two weeks to clear. Minimum \$2.00 shipping and handling charge. Add \$1.50 for C.O.D. Prices are subject to change.

CALL OUR ORDER DESK NOW!

(805) 985-9824

MAIL ORDER ONLY

NATIONAL DATA SUPPLIES, INC.

1741 CAPSTAN DRIVE
OXNARD, CA 93033

subsequent entries copies the date information from the previous entry. This semicolon function can be used with any field, whether you're entering a series of articles from the same magazine, friends in the same city, or addresses with the same zip code. When updating a record, a null entry leaves the field unchanged, while entering a couple of spaces erases the previous contents, and any valid entry replaces the old data.

For search-and-match operations, you do not have to enter the exact field desired; The Datahandler will locate close matches if so directed. For example, if you want to find the account of Dr. Neilson but don't know the correct spelling of the name, you type in the name string (the target of the search in each record in this case) as "N7?LS7N", and any alternative spellings will be located (eg: NIELSEN). The wild-card character, ?, indicates that any character in that location is acceptable. Even if you have lowercase capability and have recorded a name with initial-capital letters, instead of using all uppercase, it can still be located on the first try. By changing the program constant ?UL from its default value of 0 to 1 (the command in FORTH to do this is { 1 ?UL C! }), all lowercase characters will be regarded as uppercase for the purposes of string matches. This is very convenient for those with lowercase capability on their TRS-80.

Product Support

One of the most attractive features of The Datahandler is the excellent documentation. The well-known Scelbi PIMS (Personal Information Management System) program, written in BASIC, provided the concept upon which The Datahandler was built. By arrangement with Scelbi Computer Consulting, the very fine PIMS user manual is supplied as the main documentation for The Datahandler. As in the original PIMS, The Datahandler leads you by the hand with the HELP command, which displays all available options, then supplies prompts that tell you what to do next. Additional text takes

you step by step through all the operations, from loading the program to adjusting a custom report format (the most complex operation for a beginner), and using sample practice data files included with The Datahandler disk.

Beginners will find The Datahandler easy to use. Only an extremely experienced user will not require the prompts. Not only do they guide you through all the program options, they provide great flexibility in formatting a custom report. However, the versatility and interactive nature of this program can be a disadvantage. Some options or parameters will not change from day to day, and it can be a nuisance to have to reenter them every time.

This minor nuisance can be overcome if it becomes a problem. For those users familiar with FORTH programming, custom modification of some of The Datahandler routines (such as replacing the #IN routine, which receives keyboard input, with the desired parameter as a literal) is not too difficult. It's easy to eliminate unnecessary inputs while retaining needed flexibility. Even neophytes who know how to use the full-screen FORTH editor will learn a lot in the process.

If, on the other hand, you have a business application and want no part of programming, but do need custom modifications, the group at Miller Microcomputer Services (which includes Tom Dowling, author of both MMSFORTH and The Datahandler) can create a custom version. The typical cost is \$500 to \$1000, depending on the extent of the modifications. This is competitive with many business systems with fewer features, running twenty times slower in BASIC.

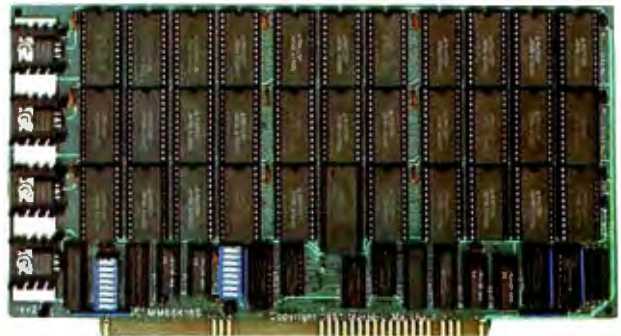
To get new customers started more easily (those who purchase both the MMSFORTH and The Datahandler disk with single-system licenses), MMS will provide a third disk customized for your system configuration and precompiled for eight-second loading. Though the firm does not promote this service, it is available on request for an extra \$10.

S-100 STATIC MEMORY BREAKTHROUGH

MEMORY MERCHANT



16K STATIC RAM \$169



64K STATIC RAM \$795

32K PARTIALLY POPULATED \$479 48K PARTIALLY POPULATED \$659

NO RISK TRIAL

We are so convinced that you will be absolutely delighted with our boards that we extend a no risk trial offer. After purchasing one of our boards, you may return it (intact) for any reason within 15 days after shipment and we will refund the purchase price.

NEW 18 MONTH LIMITED WARRANTY!

The reliability of our boards, through quality controlled production and proven performance, has enabled us to extend our warranty to a full 18 months. This includes a 6 month exchange program for defective units.

HOW TO ORDER

Please send check, money order, VISA or MASTERCARGE (add ICA#) with your order. Sorry, no C.O.D.'s. Specify model number, and quantity desired. Shipping and handling charge is \$5.00 per board. California residents add 6% Sales Tax. Credit card purchases may be telephoned to (415) 483-1008.

OEM and DEALER Inquiries invited.



14666 Doolittle Drive
San Leandro, CA 94577
(415) 483-1008

Prices, terms, specifications subject to change without notice.

Finally, you can buy state-of-the-art S-100 static memory for your computer at unprecedented savings.

Memory Merchant's memory boards provide the advanced features, quality and reliability you need for the kind of operational performance demanded by new high-speed processors.

COMPLETELY ASSEMBLED

These memory boards are not kits, nor skeletons—but top quality, high performance memories that are shipped to you completely assembled, burned-in, socketed, tested and insured with one of the industry's best warranties.

SUPERIOR DESIGN & QUALITY

Memory Merchant's boards are created by a designer, well-known for his proven ability in advanced, cost-efficient memory design. Innovative circuitry provides you with highly desired features and incredible versatility.

Only first quality components are used throughout, and each board is rigorously tested to assure perfect and dependable performance.

SHIPPED DIRECT FROM STOCK

All Memory Merchant's boards are shipped direct from stock, normally within 48 hours of receipt of your order.

64K RAM, Model MM65K16S

Cool running operation to 10 MHz
Ultra low-power consumption
Fully loaded 64K board draws:
Typ. 350 Ma. (Max. current 550 Ma.)

Bank Select Capability

Extended Addressing Capability

One 16K submodule equipped with a 2K window which may be located in any of the 2K segments

2716 (5V) EPROM Compatibility:

Programmed 2716 EPROM's may replace any or all of the RAM

Four independently addressable 16K submodules on one board organized as two pair of independent 32K banks or as one 64K Extended Address Page. Each 32K bank responds independently to phantom.

Bank Select logic is compatible with either Cromemco Cromix* or standard Bank Select software.

*Cromix is a trademark of Cromemco.

New 16K (2K X 8) 150ns Static RAM

Runs on any S-100, 8-bit system

MPM Conversion Option: Write for details.

16K RAM, Model MM16K14

Bank Select Capability

Extended Addressing Capability

One 4K segment equipped with 1K windows

Four independent 4K X 8 byte segments

Uses field proven 2114 (1K X 4)

Low-power consumption (Typ. 1.3 Amps)

Runs on any S-100 8080, 4 MHz Z-80 or 5 MHz 8085 system.

We Wish Apple Computer Inc. and all Apple Users a Happy Holiday!



consumer computers

Mail Order DISCOUNTS

FREE SHIPPING*
on all pre-paid cash orders

NEC

Microcomputer



Call For Our Price

If you're considering a computer, consider this:

- 4 Mhz Z-80A Operation
- 80 or 40 column modes STANDARD
- Built-in Centronics printer port
- Full ASCII keyboard with Shift lock
- Real Time Clock STANDARD
- RGB Color Output
- Mixed text and graphics
- Numerica Keyboard STANDARD
- CP/M Compatibility
- 5 programmable Function keys
- 24K Microsoft NBASIC in ROM with enhanced color graphic commands

The NEC PC-8001A has all these features and much more. Expandibility you want, expandibility you get. Through the use of the PC-8012A I/O unit, total system RAM can be extended to 160K. The PC-8031 Dual Disk Drive puts 286K of floppy disk storage at your command.

The NEC PC-8001A has so many things that are options on other computers built right in that you may never have to buy another accessory! The quality that the NEC name has come to stand for has been built-in, too. Compare the competition, and then call Consumer Computers for the NEC PC-8001.

NEC COMPATIBLE SOFTWARE

- CP/M Operating system with graphics control... CALL
- SUPERCALC Financial & Scientific Modeling (requires CP/M)... CALL
- WORDSTAR Word Processing System (requires CP/M)... CALL
- SYSTEMS PLUS Complete Accounting System (requires CP/M)... CALL
- MICROSOFT BASIC-80 (requires CP/M)... CALL
- MICROSOFT FORTRAN-80 (requires CP/M)... CALL
- MICROSOFT COBOL-80 (requires CP/M)... CALL

VIC20™ PERSONAL COMPUTER



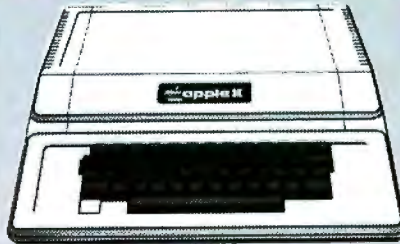
Personal Computer

Color * Sound * Graphics
Call or write for more info.
Disk drives available soon!

\$259

apple computer

Authorized Dealer



APPLE II PLUS

16K NOW **\$1025**

48K NOW **\$1089**

64K* \$1199
*includes 16K Ramboard



APPLE DISK DRIVES

w/cont. & DOS 3.3. \$499
Disk II Drive only \$439

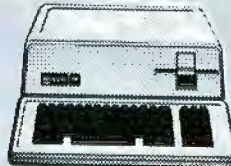
ORDER TOLL FREE 800-854-6654

In California and outside continental U.S.
(714) 698-8088

Telex 695-000 Beta CCMO

APPLE ///

Special Holiday Sale



128K now only **\$3195**

Apple Cards and Hardware

- 16K RamBoard by ConComp Industries... 130
- 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
- Integer Basic or Applesoft II Firmware Card... 145
- Graphics Tablet... 619
- Parallel Printer or Hi-Speed Serial I/F card... 135
- Communications Card w/cable... 185
- Centronics Printer Interface card... 185
- Apple IEEE-488 Interface card... 399
- 16K Language card by Apple Computer... 169
- Thunderclock Plus clock/calendar... 119
- Smarterm 80 column card... 299
- Corvus Winchester Hard Disk Drives... CALL
- ALF 3 Voice Music Card... 239
- ALF 9 Voice Music Card... 169
- Lazer Lower Case Plus +... 55
- Lazer Keyboard Plus +... 99
- 23 Key Numeric Keypad by Keyboard Co... 120
- Joystick II by Keyboard Co... 45
- 6809 CPU Card (The Mill) by Stellation... 319
- AIO Serial & Parallel interface by SSM A&T... 189
- Music System (16 voices)... 479
- A/D + D/A Interface... 289
- Expansion Chassis (8 slots)... 599
- Introl/X-10 Controller card... 169
- Clock/Calendar card... 225
- CPS Multi-function card... 189
- Supertalker SD-200... 239
- Romplus + card... 135
- Romwriter card... 149
- Symtec Hi-Res Light Pen... 210
- Sup-R-Fan ventilation system for Apple II... 45
- Sup-R-Terminal 80 column card by M&R... 329
- SVA ZUX4 Megabyte 8" Disk Controller... 589
- SVA 2+2 Single Den. 8" Disk Controller... 345
- Speechlink 2000 by Heuristics... 249
- Versawriter Digitizer Tablet... 229
- Asynchronous Serial Interface card by CCS... 139
- Centronics Parallel Interface card by CCS... 119

We carry all California Computer System Cards... CALL
We stock many more items for the Apple II.
Please call or write for current price list.

CALL OR WRITE FOR

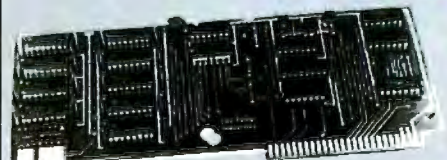
FREE CATALOG

16K RAMBOARD by ConComp for Apple II Computers

FOR ONLY

- 16K Hi-speed Dynamic RAM
- Compatible with all software
- Easy installation & operation
- Read & Write select indicators
- One Year Warranty

\$130



AVAILABLE NOW



consumer computers

Mail Order

DISCOUNTS

ORDER TOLL-FREE

Atari Personal Computers



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

Available Now!!

Asteroids, Missile Command and Star Raiders...35 ea.
 WE STOCK ALL ATARI COMPUTER SOFTWARE AND HARDWARE.
 PLEASE CALL OR WRITE FOR COMPLETE PRICE LIST.

Software for the Apple

- VisiCalc version 3.3.....159
- VisiFile (NEW data base manager).....199
- VisiTrend/VisiPlot.....219
- VisiDex.....159
- VisiTerm.....129
- Desktop/Plan II.....159
- DB Master.....169
- WordStar (Apple 80 col. version).....249
- Dow Jones Portfolio Evaluator.....45
- The Controller (G/L, A/R & A/P).....499
- Apple Post.....45
- Apple Writer.....65
- Apple DOS Toolkit.....65
- DOS 3.3 Upgrade.....49
- Dow Jones News & Quotes Reporter.....85
- Apple Fortran (requires 64K memory).....165
- Apple Plot.....60
- Easywriter word processor (80 column).....225
- Tax Preparer.....99
- Real Estate Analyzer.....129
- Creative Financing.....129
- Personal Filing System (PSF).....85
- Peachtree Accounting Software.....CALL
- BPI Accounting Software.....CALL
- Systems Plus Accounting Software.....CALL

Apple Entertainment Software

- We stock all Apple Special Delivery Software along with HUNDREDS of other games and utilities. Please call or write for a complete price list.
- Haster Blaster.....29
 - Gorgon.....39
 - Pool 1.5.....34
 - Ultima.....39
 - Snuggle.....29
 - Space Eggs.....29
 - Flight Simulator.....33
 - Gobbler.....23
 - Allen Rain.....23
 - Pulsar II.....29
 - Space Warrior.....24
 - Warp Factor.....39
 - Dragon Fire.....45
- We stock HUNDREDS of software games and utilities.

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

ORDER TOLL FREE
800-854-6654
 In California and
 outside continental U.S.
(714) 698-8088
 Telex 695-000 Beta CCMO

PRINTERS



**EPSON
MX-80**

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

**Silentype
w/Apple II
Interface**



\$349

Video Monitors



**SUPER
VALUE**

ZENITH 12" GREEN SCREEN

ONLY \$149



- 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

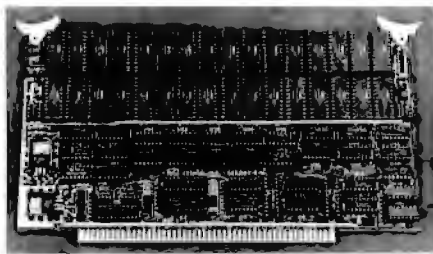
Ordering information: Phone orders using VISA, MASTERCARD, AMERICAN EXPRESS, DINER'S CLUB, CARTE-BLANCHE, bank wire transfer, cashier's or certified check, money order, or personal check (allow ten days to clear). Unless prepaid with cash, please add 5% for shipping, handling and insurance (minimum 5.00). 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.

Send Orders To:
consumer computers Mail Order

**8314 Parkway Drive
La Mesa, Calif. 92041**

The NO Compromise on P³* S-100 Plug-Ins *(Performance, Power, Price)

STATIC RAM BOARD



The 32K x 8 bit/16K x 16 bit STATIC RAM BOARD uses low power and its fast device access time of 200 nsec (max.) allows for operation @ 4 MHz without any wait cycles.

Features: IEEE-696 compatibility with extended addressing Memory address may start and stop on any 4K/2K boundary Special Memory Management and Control Functions (selectable via output port control word(s):
Bank select/deselect 8K/4K
Bank write protect 8K/4K
Bank readdress 8K/4K

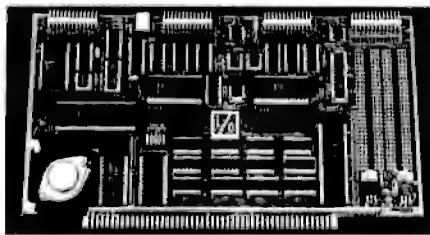
Software page select/override Software wait cycle select (if slower devices utilized by user) External power source back-up capability for Memory Array Low input power requirements (full memory array - 150 MA max. @ 8 VDC IN - support logic-500 ma typ @ 8 VDC IN) Socketed RAMs and support logic IC's for easy maintenance Comprehensive Manual

Assembled and Tested P/N 52748-500-100 \$485
Kit P/N 52748-500 \$395 **Bare Board** P/N 52748-5XX \$95

The multiple on-board functions allow for complete software and hardware I/O task(s) control.

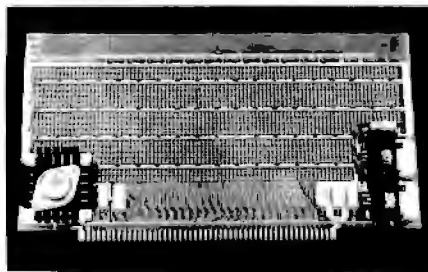
Features: Two independent SYNC/ASYNCR serial ports (Software programmable with status read interface: RS-232-C or current loop - 20 or 60ma - or TTL with handshaking. Dedicated output connectors for each port) One strobed 8-bit parallel port with handshaking (Software status read) Three 8-bit parallel ports undedicated & user configured (Software programmable for input, output, plus input/output/bidirectional with handshaking or combinations thereof. Software status read for handshake logic) Three independent 16-bit timers (Software programmable for 5 operating modes. Indiv. clock source input & gate control - Int. or ext. Uninterrupted read. Two buffered outputs) Eight level priority interrupt controller (Software programmable highest interrupt level. 8080/Z80 auto restart command) Two software programmable baud rate generators with crystal controlled frequencies - .01% tolerance Large prototyping area with access to regulated +5, +12, -12VDC.

MULTI-FUNCTION I/O BOARD



Assembled and Tested P/N 52748-100-101 \$375
Kit P/N 52748-100 \$225 **Bare Board** P/N 52748-1XX \$85

PROTOTYPING BOARD



Provides flexibility and saves hours of power busing layout time.

Features: Bus-bar power distribution Allows wire-wrap or soldering of sockets and discrete components Accepts all std. sockets on .30" & .60" centers 3 regulators (+5V ± 12V) with filter and decoupling capacitors Accepts edge connectors on .10" centers.

Or complete as shown in photo.

Kit includes: 3 regulators w/3 heat-sinks/filter capacitors/2 bus bars and manual P/N 52748-400 \$49.95
Bare Board P/N 52748-4xx \$34.95

I/O TECHNOLOGY

P.O. Box 2119
Canyon Country, CA 91351
(805) 252-7666



CA residents add 6% tax
U.S. Domestic Price, FOB Factory

The Datahandler program is upgraded and improved constantly. New capabilities beyond those already mentioned are often suggested by users. Features are added to the standard version only if their general usefulness is considered worth the extra memory they take away from the available file space. Other more specialized functions are distributed via the *MMSFORTH Newsletter*.

The user's original floppy disk may be returned to MMS for upgrading at any time. The fee for upgrading is \$10, plus \$1 shipping and handling. Fifteen dollars must be sent by the customer with the disk; the extra \$4 is returned with the upgraded disk unless the original arrived damaged and had to be replaced.

The first two issues of the *MMSFORTH Newsletter* are complimentary to new MMSFORTH and Datahandler licensees. A subscription of four more issues costs \$10. Considering the valuable information contained in these newsletters, most users will find them well worth the price.

The September-October 1980 issue, for example, provided information on a new utility disk providing a Z80 assembler, floating-point mathematical operations, a program for looking up source-code definitions of FORTH words, and a routine for converting lowercase text to uppercase. The issue also explained and listed the programming needed to access the interrupt-driven clock in the TRS-80 Expansion Interface and its use in timing operations. Also included was a listing and discussion of the latest addition to MMSFORTH version 1.9, which reports available memory space on the directory-menu screen whenever DIR is entered, and uses no additional memory space itself. There were other suggested improvements a user could make without waiting (and paying) for a full upgrade, news of coming events, short tutorial articles by Tom Dowling, and a listing of user-group contacts scattered throughout the nation.

The Datahandler is a personal data-base management and utilities

SAVE A FEW THOUSAND DOLLARS WITH GE'S FREE LIGHTING ENERGY AUDIT.

General Electric Watt-Miser® II fluorescents and other GE energy-efficient lamps saved a bank in Maryland \$2,000 a year, saved JCPenney \$19,000 a year in just one store, and Eaton \$665,000 a year in 18 plants.

Many other GE customers are saving thousands of dollars just by replacing the standard lighting products in their existing fixtures. That's why lighting energy savings offer one of the *quickest paybacks* of

any energy saving you can make, with no capital investment.

Maybe GE can save you lots of money too. All you have to do is cut out the form below, fill it out and mail it to us.

When you do, you'll receive a *personalized* computer-generated analysis of potential savings and other benefits when using GE energy-efficient lamps.

**WE BRING
GOOD THINGS
TO LIFE.**








GENERAL  ELECTRIC

C-150

SEE WHAT YOU CAN SAVE WITH GE'S FREE LIGHTING ENERGY AUDIT.

Fill out this form and mail to General Electric Company,
Lighting Energy Audit, Department PMN-1, Nela Park, Cleveland, Ohio 44112.

| | Now in use | Total Number | Lighting hours per week | Now in use | Total Number |
|--------------------------------------|---|-----------------|---|--|-----------------|
| Standard Fluorescents | | | Ballast | | |
| 12 | 4' F40/RS | _____ | _____ | 4' F40/RS | _____ 100 |
| 20 | 8' F96 | _____ | _____ | 8' F96 | _____ 105 |
| 28 | 8' F96HO | _____ | _____ | 8' F96HO  | _____ 110 |
| 36 | 8' F961500MA | _____ | _____ | 8' F961500MA | _____ 115 |
| Recessed Downlight Floods | | | My energy rate is \$ _____ per kilowatt hour 120 (Divide total dollars from your last bill by total kilowatt hours used.) | | |
| 44 | 75R30/FL | _____ | _____ | Please send the savings analysis to: | |
| 52 | 150R/FL  | _____ | _____ | Name _____ | 124 |
| Incandescent Bulbs | | | Company _____ | | |
| 60 | 60 Watt | _____ | _____ | Address _____ | 159 |
| 68 | 100 Watt  | _____ | _____ | City _____ State _____ | 194 |
| PAR-Lamps | | | Zip Code _____ | | |
| 76 | 150PAR/FL | _____ | _____ | Phone _____ | 229 |
| 84 | 150PAR/SP  | _____ | _____ | _____ | 264 |
| Mercury | | | Phone _____ | | |
| 92 | 400 Watt  | _____ | _____ | <input type="checkbox"/> Please have someone come out and help me fill out this form. | 269 |
| _____ 295 | | | | | |

**If you're looking for
the best prices
in the U.S.A. on**



**TRS-80
MICROCOMPUTERS**

We have consistently offered the TRS-80 line at savings up to 20%. You can save up to \$1500 by buying from Computer Discount of America.

| | | |
|-----------------------|------------------------------|-----------|
| Model II | | |
| 26-4002 | 64K, 1 disc | \$3385.00 |
| Model III | | |
| 26-1051 | 4K, Level I | \$ 610.00 |
| 26-1062 | 16K, Level III | \$ 845.00 |
| 26-1066 | 48K, Level II 2-drive/RS-232 | \$2115.00 |
| Color Computer | | |
| 26-3001 | 4K | \$ 325.00 |
| 26-3002 | 16K w/Ext. Basic | \$ 489.00 |
| EPSON | | |
| MX70 | Printer | \$ 375.00 |
| MX80 | Printer | \$ 485.00 |
| MX80FT | Printer | \$ 585.00 |

**ATARI[®]
MICROCOMPUTERS**



We have the full line of ATARI personal computers and systems.

Our savings are as big on expansion interfaces, printers, diskettes, Apple Computers, OKIDATA Microline, C-ITOH Starwriter, Lexicon Modems — everything for your computer.

We have the largest inventory in the Northeast, and most models are in stock, for immediate delivery. Our full price catalog or a price quote is as near as your phone.

**CALL TOLL FREE:
800-526-5313**

**Computer
Discount
of America**

COMPUTER DISCOUNT OF AMERICA, INC.
15 Marshall Hill Road, West Milford Mall
West Milford, New Jersey 07480-2198
In New Jersey Call 201-728-8080

package of impressive capability, well documented and easy to use. If you want to make the most of your TRS-80, this program provides the best way I know to put it to work organizing and managing information. If you have or can upgrade to a 32 K-byte system with one or more floppy-disk drives, it is well worth the price to acquire MMSFORTH, if only to use The Datahandler. With 48 K bytes of user memory and a printer, many small-business tasks can be managed very capably. For the FORTH programmer, The Datahandler can be used as a starting point for a wide variety of custom applications, since source code is provided and FORTH programs are characterized by ease of modification and extension. Programs run about twenty times faster than equivalent operations in BASIC and compile into relatively little memory space.

The Datahandler, with complete documentation and a single-system license, sells for \$59.95. MMSFORTH with license and equally good documentation is \$129.95, giving the TRS-80 user an additional powerful computer language and operating system.

I have the first Datahandler sold by MMS and have been an active member of the users' group since it was formed. In this time I have heard of no user who is less than enthusiastic about the program's features and many uses. Most users of a suitably configured TRS-80 should find many constructive ways to put The Datahandler to work.

Conclusions

- The Datahandler is a data-base management utility for TRS-80 Model I microcomputers, ideal for personal use and for many business applications.

- It requires at least 32 K bytes of programmable memory and one floppy-disk drive. A memory size of 48 K bytes with two drives and a printer complete an ideal system for most uses.

- MMSFORTH is required as the operating system and also gives you a powerful new language with many

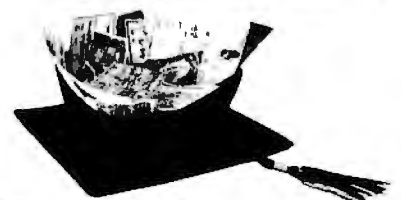
advantages. No knowledge of FORTH is needed to use The Datahandler.

- Advantages include excellent documentation and interactive programming for easy use by anyone, many convenient features to speed keyboard operations, and very fast computer operations, including fast sorting. Routines are included for maintaining a mailing list, printing address labels, checkbook balancing, and custom reporting. The Datahandler is completely flexible in number and size of fields and field titles. Custom report formats for special needs can be tailored to order by MMS and by many other competent programmers. A wealth of powerful routines in source code are provided from which the professional can rapidly assemble custom software.

- Disadvantages are limited to the fact that very large files which cannot fit within the computer's user memory must be divided into sections that do fit. For the applications for which this utility was primarily intended, dividing files is seldom necessary and causes little inconvenience when it is; the speed of operation achieved by having the entire file in user memory is of more value. I know of no other major disadvantages.

- The cost of the entire Datahandler/MMSFORTH package (with single-system licenses and documentation) is, in my opinion, very reasonable and would not be out of line for The Datahandler alone.

- For the programmer, source code is provided and custom modification is not difficult. In fact, this one utility program can be used as the starting point for a wide range of special application programs. ■



**Make America smarter.
Give to the college
of your choice.**

Stop the Floppy Shuffle



Announcing The David Hard Disk Subsystem

Compared to cassettes, floppies were the greatest thing since the integrated chip. But with increased applications, data bases, and speed requirements, a lot of business people are spending more time doing the "Floppy Shuffle" and less time doing work.



Now with Konan's David Hard Disk Subsystem you can have 32 times the storage of a mini-floppy in about the same amount of space. At a cost per megabyte that really makes sense, the David Subsystem is available for a variety of micro-computers.

So if you own a personal computer, check into the David Hard Disk Subsystem at

your local dealer and stop doing the Floppy Shuffle. And if you want real timesharing capabilities, a networking card is available.

The David Subsystem is available immediately.

Toll-free Information Line
800-528-4563

KONAN
KONAN™

KONAN CORPORATION
1448 NORTH 27TH AVE, PHOENIX, AZ 85009
(602) 269-2649, TWX/TELEX 9109511552

Microsoft Softcard

Mark Pelczarski
1206 Kings Circle
West Chicago IL 60185

The Microsoft Softcard offers Apple owners increased flexibility and a strong alternative or complement to the Language System from Apple. At a suggested retail price of \$399 Softcard comes with version 2.2 of the CP/M operating system and Microsoft's BASIC-80, version 5.0.

In addition, a number of other Softcard support products are available, including Microsoft's FORTRAN and COBOL, an assembly-language development system, a BASIC compiler, muMath and muLisp, and 16 K-byte memory expansion cards. None of these are inexpensive; for example, the COBOL language system retails for \$750 (making FORTRAN seem like a comparative bargain at \$195), but the point is that you can now have these languages, plus a variety of software

already written for CP/M, on your Apple.

Overview

The Softcard package comes with the card, 13- and 16-sector disks, and two thick manuals. The card is manufactured for Microsoft by California Computer Systems of Sunnyvale, California, and was designed by Don Burtis of Burtronix in Huntington Beach, California. With the exception of slot 0, it works in any of the Apple peripheral slots and the Softcard package will work alongside the Apple Language System. The Language System actually extends the ability of the Softcard system by providing an extra 12 K bytes of programmable memory. The Softcard is not compatible with the Apple III. It does work with all of the 80-column

boards now available for the Apple II.

The software supplied is the CP/M operating system and two versions of BASIC. The 13-sector disk contains MBASIC, which is Microsoft's ANSI (American National Standards Institute) compatible BASIC-80, with a few additions to accommodate Apple's low-resolution graphics features. The 16-sector disk also contains GBASIC, which includes high-resolution graphics commands. CP/M, the operating system, is an abbreviation for Control Program/Microcomputer, and is licensed by Microsoft from Digital Research, Inc. This version of CP/M includes a variety of disk and transfer utilities, plus an 8080 editor/assembler/debugging utility. The software was produced by Neil Konzen, a name that will be familiar to anyone fortunate enough to own Synergistic Software's Program Line Editor, another of Neil's Apple creations.

Using the Softcard

The two system manuals are very thorough and provide simple to very technical information. One is for CP/M, the other tells how to use BASIC 5.0 and the included software utilities. The first subject covered is how to back up the master disk. The beginner will probably want to go from there to more familiar ground and play with some of the BASIC

About the Author

Mark Pelczarski is a software consultant and Director of Micro Co-op, a consumer buying cooperative. He previously was Editor of Soft-Side magazine, and a computer science instructor at Northern Illinois University.

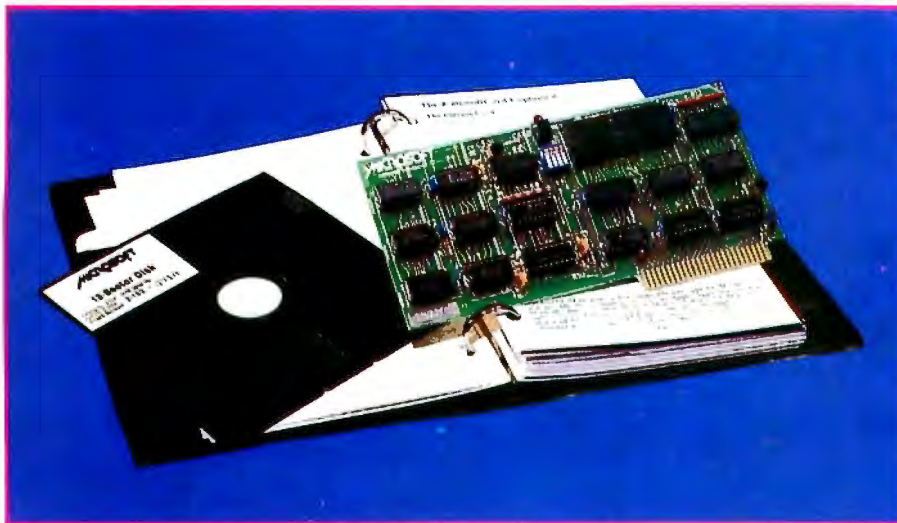


Photo 1: Microsoft's Softcard package. Included are the card itself, software for the Apple II, and a two-volume set of manuals (with installation instructions, information on using CP/M, hardware details, Microsoft BASIC reference, and documentation on other utilities).

Most small system users think all microcomputers are created equal. And they're not. If you want performance, convenience, styling, high technology and reliability (and it doesn't?) your micro usually has a price tag that looks more like a mini. It seems big performance always means big bucks. But not so with the SuperBrain!

Standard SuperBrain features include: twin double-density 5¼" drives which boast nearly 10,000 bytes of disk storage — expandable to 10 megabytes. A full 64K of dynamic RAM. A CP/M* Disk Operating System to insure compatibility to literally hundreds of application packages presently available. And, a 12" non-glare, 24 line by 80 column screen.

*Registered trademark of Digital Research, Inc.

You'll also get a full ASCII keyboard with an 18 key numeric pad and individual cursor control keys. Twin RS232C serial ports for fast and easy connection to a modem or printer. Dual Z80 processors which operate at 4 MHz to insure lightning-fast program execution. And the list goes on! Feature after feature after feature.

Better yet, the SuperBrain boasts modular design to make servicing a snap. A common screwdriver is about the only service tool you'll ever need. And with the money you'll save on purchasing and maintaining the SuperBrain, you could almost buy another one. For under \$3,500, it is truly one of the most remarkable microcomputers available anywhere.

Whether your application is small business, scientific, educational or just word processing, the SuperBrain is certainly an exciting solution to the small computer problem. And since you can easily expand it, you'll probably never outgrow it.

Call or write us today for a complimentary copy of our "SuperBrain Buyer's Guide." We'll show you how you can get big system performance without having to spend big bucks.

**INTERTEC
DATA
SYSTEMS.**

2300 Broad River Rd. Columbia, SC 29210
(803) 798-9100 TWX: 810-666-2115

Circle 205 on inquiry card.

SUPERBRAIN™



commands, learning how to use the operating system as the need arises.

BASIC 5.0 is a nice way to convert to a structured language. If you're already familiar with BASIC, AppleSoft or another version, you won't be trying to learn a new language from scratch. The advantages of BASIC 5.0 include several new commands that support structured programming. (See table 1 for a list of enhancements and their descriptions.)

The most convenient additions are the inclusion of the ELSE clause in the IF-THEN statement, the PRINT USING statement for explicit formatting of output, the inclusion of real disk commands, replacing the ungodly PRINT Control-D commands of Apple's DOS, and BASIC's version of a DO WHILE loop: WHILE/WEND. An example of the latter, paraphrased, would be: WHILE this condition is true, keep repeating all the commands before the WEND statement. This version of BASIC is also compatible with current ANSI standards, so the use of BASIC programs written

Text continued on page 158

At a Glance

Name
Microsoft Softcard

Manufacturer
Microsoft Consumer Products
400 108th Ave NE
Bellevue WA 98004
(206) 454-1315

Price
\$399

Computer needed
Apple II, 48 K-byte minimum storage, and a disk drive

Hardware
Peripheral card that fits in any of the Apple expansion slots (except 0). The microprocessor is a Z80A

Software
CP/M, version 2.2, from Digital

Research, and Microsoft BASIC 5.0, 13-and 16-sector versions with Apple enhancements

Documentation
Two manuals, approximately 400 pages, one primarily about CP/M, the other about BASIC 5.0

Options
Microsoft's FORTRAN, COBOL, muMath, muLisp, assembly-language development system, and BASIC compiler; 16 K-byte memory expansion card (or the Apple Language System)

Audience
Those seeking to increase the software flexibility of their Apple II computers

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes —

FIELD PROVEN!!

10 MEGABYTES and MORE for the TRS-80* Model II plus SHARED ACCESS to HARD DISK DRIVE

Hard/Soft Disk System (HSDS) Software allows access as single drive. You can have that 10 Megabyte continuous file - that 50,000 name maillist or inventory! Or a directory with 1000 entries! All completely compatible with TRSDOS 2.0 BASIC. You can mix floppy and hard disk drives. Includes special utilities including HPURGE, DCS Directory Catalog System, HZAP Hard Disk Superzap, and many special formatting options. Three to eight times faster than floppy! RACET quality.

HARD DISK DRIVE & CONTROLLER \$5995. Second User \$595. HSDS Software \$400. (Note: HSDS now also available for CORVUS drives!!)

INFINITE BASIC (Mod I & III Tape or Disk) Mod I \$50.00, Mod III \$60.00
Extends Level II BASIC with complete MATRIX functions and 50 more string functions. Includes RACET machine language sorts! Sort 1000 elements in 9 seconds!! Select only functions you want to optimize memory usage.

INFINITE BUSINESS (Requires Infinite BASIC) Mod I & III \$30.00
Complete printer pagination controls — auto headers, footers, page numbers. Packed decimal arithmetic — 127 digit accuracy +, -, *, /. Binary search of sorted and unsorted arrays. Hash codes.

BASIC CROSS REFERENCE UTILITY (Mod II 64K) \$50.00
SEEK and FIND functions for Variables, Line Numbers, Strings, Keywords. 'All' options available for line numbers and variables. Load from BASIC — Call with 'CTRL'R. Output to screen or printer!

DSM Mod I \$75.00, Mod II \$150.00, Mod III \$90.00
Disk Sort/Merge for RANDOM files. All machine language stand-alone package for sorting speed. Establish sort specification in simple BASIC command File. Execute from DOS. Only operator action to sort is to change diskettes when requested! Handles multiple diskette files! Super fast sort times — Improved disk I/O times make this the fastest! Disk Sort/Merge available on your TRS.
(Mod I Min 32K 2-drive system. Mod II 64K 1-drive Mod III 32K 1-drive)

GSF (Mod I & III Tape or Disk - Specify Memory Size) Mod I \$25; Mod II \$50; Mod III \$30
Generalized Subroutine Facilities. The STANDARD against which all other sorts are compared! And then compare prices! Machine language — fast and powerful! Multi-key multi-variable and multi-key character string. Zero and move arrays. Mod II Includes USR PEEKS and POKES. Includes sample programs.

DISCAT (32K 1-drive Min)

This comprehensive Diskette Cataloging/Indexing utility allows the user to keep track of thousands of programs in a categorized library. Machine language program works with all TRSDOS and NEWDOS versions. Files include program names and extensions, program length, diskette numbers, front and back, and diskette free space.

KFS-80 (1-drive 32K Min — Mod II 64K) Mod I, III \$100.00; Mod II \$175.00
The keyed file system provides keyed and sequential access to multiple files. Provides the programmer with a powerful disk handling facility for development of data base applications. Binary tree index system provides rapid access to file records.

MAILLIST (1-drive 32K Min - Mod II 64K) Mod I, III \$75.00; Mod II \$150.00
This ISAM-based maillist minimizes disk access times. Four keys, no separate sorting. Supports 9-digit zip code and 3-digit state code. Up to 30 attributes. Mask and query selection. Record access times under 4 seconds!

COMPROC (Mod I & Mod III — Disk only) Mod I \$20; Mod III \$30
Command Processor. Auto your disk to perform any sequence of instructions that you can give from the keyboard. DIR, FREE, pause, wait for user input, BASIC, No. of FILES and MEM SIZE, RUN program, respond to input statements, BREAK, return to DOS, etc. Includes lowercase driver software, debounce and screenprint!

UTILITY PACKAGE (Mod II 64K) \$150.00
Important enhancements to the Mod II. The file recovery capabilities alone will pay for the package in even one application! Fully documented in 124 page manual! XHIT, XGAT, XCOPY and SUPERZAP are used to reconstruct or recover data from bad diskettes! XCOPY provides multi-file copies. 'Wild card' mask select, absolute sector mode and other features. SUPERZAP allows examine/change any sector on diskette include track 0, and absolute disk backup/copy with I/O recovery. DCS builds consolidated directories from multiple diskettes into a single display or listing sorted by disk name or file name plus more. Change Disk ID with DISKID. XCREATE preallocates files and sets 'LOF' to end to speed disk accesses. DEBUGII adds single step, trace, subroutine calling, program looping, dynamic disassembly and more!!

DEVELOPMENT PACKAGE (Mod II 64K) \$125.00
Includes RACET machine language SUPERZAP, Apparatus Disassembler, and Model II interface to the Microsoft 'Editor Assembler Plus' software package including uploading services and patches for Disk I/O.

CHECK, VISA, M/C, C.O.D., PURCHASE ORDER
TELEPHONE ORDERS ACCEPTED (714) 997-4950
*TRS-80 IS A REGISTERED TRADEMARK OF TANDY CORPORATION

RACET COMPUTES
1330 N. GLASSSELL, SUITE M,
ORANGE, CA 92667

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes —

OTHERS MAY SEE THE ERRORS OF YOUR WAYZ. ONLY MICROSPELL CORRECTS THOSE WAYS.

Lifeboat Associates, the world's foremost source for microcomputer software, proudly presents MicroSpell,TM the first program that not only isolates spelling errors in your text, but actually corrects them.

MicroSpell works with your word processor. And if you have the best word processing system, why settle for anything less than the best spelling corrector?

Goes Beyond The Competition

Other spelling programs function primarily as spelling checkers, merely pointing out words with suspect spelling. It's left up to you to determine the correct spelling and then type it in.

MicroSpell, the only spelling program that knows how to "spell," corrects the error automatically. Here's how it works: MicroSpell will read your text, carefully looking for words that might be spelled incorrectly. When it comes across a word that it's not absolutely sure of, it stops and shows you that word, along with its context. Then it searches through its own built-in dictionary and presents a list of guesses which it "thinks" might be correct. All you have to do is press a key and the misspelled word is corrected. There is no

need to bother with your own dictionary, or even to type in the change. MicroSpell will do it all for you!

The Most Complete Built-In Dictionary

MicroSpell uses word stems and suffix stripping routines, so its dictionary of 25,000 word-parts can deliver over 150,000 words to you. And if that's not enough, MicroSpell will let you add thousands of additional words, so you can create and store specialized dictionaries of technical terms, unusual expressions, even acronyms. And you can let MicroSpell know just when any of these special dictionaries are wanted.

MicroSpell is highly interactive and designed to complement word processing systems that create ASCII text using a CPM[®] compatible operating system. It requires minimum disk storage capacity of 70K per drive.

So why settle for a program that merely finds your *misspellings* when you can get the one that corrects your *misspellings*? MicroSpell. It corrects the errors of your ways.

MicroSpell is brought to you exclusively and supported completely by Lifeboat Associates. Call or send us the coupon below.

LIFEBOAT WORLDWIDE offers you the world's largest library of software. Contact your nearest dealer or Lifeboat:

Lifeboat Associates
1651 Third Ave
New York, NY 10028
Tel (212) 860-0300
Telex 640693 (LBSOFT NYK)
TWX 710-581-2524

Lifeboat Inc.
DK Bldg, 5F
1-2-8, Shiba-Daimon
Minato-ku, Tokyo 105, Japan
Tel: 03-437-3901
Telex: 2423296 (LBJIYO)

Lifeboat Associates, Ltd
PO Box 125
London WC2H 9LU, England
Tel: 01-836-9028
Telex: 893709 (LBSOFTG)

Lifeboat Associates GmbH
Hinterbergstrasse
Postfach 251
6330 Cham, Switzerland
Tel: 042-36-8685
Telex: 865265 (IMCO CH)

Intersoft GmbH
Schlossgartenweg 5
D-8045 Ismaning, W. Germany
Tel: 089-965-444
Telex: 5213643 (ISOFD)

Lifeboat Associates, SARL
10, Grande Rue Charles de Gaulle
92600 Asnieres, France
Tel: 1-733-08-04
Telex: 250303 (PUBLIC X PARIS)

Mail coupon to: Lifeboat Associates,
1651 Third Avenue, New York, New York 10028
or call (212) 860-0300.

- Please send me more information on MicroSpell.
 Please send me a free Lifeboat catalog.

Name _____ Title _____

Company _____

Street _____

City _____ State _____ Zip _____

MicroSpell is a trademark of Bob Lucas.
CP/M is a registered trademark of Digital Research.
Copyright © 1981, by Lifeboat Associates

2014

Lifeboat Associates
World's foremost software source

#

SOFTWARE
WITH
FOOL
PROOFING

SPECTACULAR OFFERS

BASF "FLEXYDISK"...
Superior Quality data storage medium. Certified and guaranteed 100% error free.



SINGLE SIDED-SINGLE DENSITY

5 1/4" or 8" Diskettes 10/\$24
5 1/4" or 8" Vinyl Storage Pages 10/\$5

MAXELL-DISKETTES
The best quality diskette money can buy. Approved by Shugart and IBM.



Sold only in boxes of 10

5", 1 side\$3.30
8", 1-side\$3.90
5", 2-side\$4.25
8", 2-side\$5.60

ALL MAXELL DISKETTES ARE DOUBLE DENSITY

LIBRARY CASE...
3-ring binder album. Protects your valuable programs on disks Fully enclosed and protected on all sides. Similar to Kas-sette storage box.



Library 3-Ring Binder\$6.50
5 1/4" Mini Kas - sette/10\$2.49
8" Kas-sette/10\$2.99

DISKETTE DRIVE HEAD CLEANING KITS
Prevent head crashes and insure efficient, error-free operation.



5 1/4" or 8"\$19.50

SFD CASSETTES

C-10 Cassettes 10/\$7
(All cassettes include box & labels)
Get 8 cassettes, C-10 sonic and Cassette/8 library album for only\$8.00
(As illustrated)



HARDHOLE
Reinforcing ring of tough mylar protects disk from damage



5 1/4" Applicator \$3 5 1/4" Hardholes \$6
8" Applicator \$4 50/8" Hardholes \$8

VISA • MASTERCHARGE • MONEY ORDERS
CERTIFIED CHECK • FOR PERSONAL CHECKS
ALLOW TWO WEEKS • C.O.D. REQUIRES A 10%
DEPOSIT • CAL. RES. ADD 6% SALES TAX
MIN \$2 SHIPPING & HANDLING • MINIMUM
ORDER \$10 • SATISFACTION GUARANTEED
OR FULL REFUND
Write for our free catalog

ABM PRODUCTS

8868 Clairemont Mesa Blvd.
San Diego, CA 92123

Toll Free
1-800-854-1555
For Orders Only

For information or California orders
(714) 268-3537

Some new features of BASIC 5.0:

AUTO—Automatic line numbering when entering programs.

BEEP—Sounds the "Bell," instead of using an invisible Control-G.

Boolean operators—In addition to AND, NOT, and OR, BASIC 5.0 has XOR (exclusive OR), IMP (implication), and EQV (equivalence).

BUTTON—Instead of PEEKing at locations to find if a paddle button is pressed.

CALL—Can be used to call Z80 and 6502 subroutines, and pass parameters to them.

CHAIN—Runs another BASIC program, allowing variables to be passed.

COMMON—In conjunction with CHAIN, passes variables to another program.

Disk I/O—OPEN instead of PRINT "D OPEN"; likewise CLOSE, GET#, INPUT#, WRITE#, and so on.

EDIT—An in-line program editor.

ELSE—As in: IF X = 0 THEN PRINT "ZERO" ELSE PRINT "NOT ZERO"

Functions—New string functions INSTR, which searches for a substring, and STRING\$, which allows repetitive string definition.

HSCRN—Tells whether a point on the high-resolution screen is on or off.

LPRINT—Outputs a line to the printer, instead of using: PR#1 : PRINT.

MERGE—Allows two program files to be merged.

MOD—Finds the remainder of a division. This was available in Integer BASIC, but it's not included in Applesoft.

PRINT USING—Allows formatting of output, and is much more flexible than HTABs and VTABs.

RENUM—Allows you to renumber your program lines.

SWAP—Interchanges the values of two variables without using an intermediate variable.

User Functions—Can be defined with multiple arguments, instead of Applesoft's single-argument functions.

Variable types—Includes integer, single, and double precision; up to 16-digit accuracy.

VPOS—Finds the vertical position of the cursor.

WHILE/WEND—A loop structure similar to FOR-NEXT, except it checks for a condition each time instead of counting.

Applesoft commands not supported:

Cassette LOAD and SAVE, STORE and RECALL—Cassette functions are not included at all.

ESC editing—Replaced with the EDIT function for line editing.

FLASH—No flashing characters.

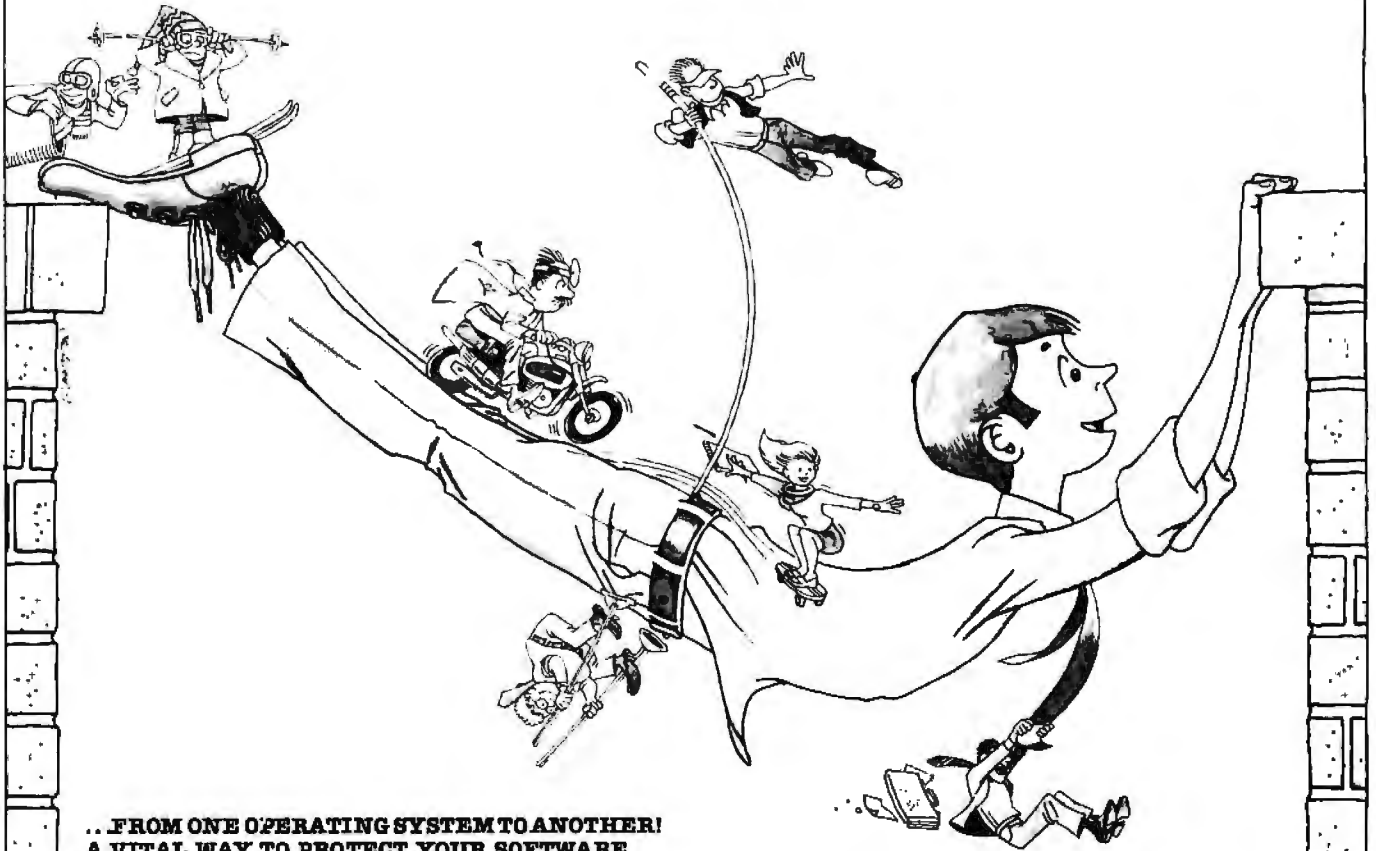
HIMEM, LOMEM

Shape Tables—None of the shape functions, DRAW, XDRAW, ROT, or SCALE, are supported.

IN#, Pr#—Commands are already device oriented.

Table 1: Comparison of the features available in Microsoft MBASIC 5.0 as supplied with the Microsoft Softcard and Applesoft BASIC.

RAM/COBOL™ MAKES IT ACROSS!



.. FROM ONE OPERATING SYSTEM TO ANOTHER! A VITAL WAY TO PROTECT YOUR SOFTWARE INVESTMENT FOR THE FUTURE!!

The **RAM/COBOL** language runs on more different Operating Systems and more different-sized computers than any other similar language. For starters, it runs on NCR and TI minicomputers and, in the micro field, on the CP/M[®], MP/M[®], TRSDOS[®], OASIS[®], MOASIS[®], and UNIX (ONYX version) Operating Systems...to mention only a few.

Until now, serious business software of the scope and flexibility seen in the minicomputer world has not been available on micros. **RAM/COBOL** now allows transfer of such software with a minimum of fuss.

We have participated in such a mini-to-micro transfer of a major set of general business software...using **RAM/COBOL**, as the transfer mechanism, of course. Running on literally thousands of minicomputers, these refined, enhanced, and proven software packages cover A/R, A/P, G/L, P/R, Order Entry (with Invoicing and Inventory Control) as well as Sales Analysis. The packages define a new level of achievement for features and flexibility in micro applications software and offer top quality at a reasonable price.

For immediate information, call 714-848-1922 for your complete product descriptions.

.. **PLUS ALL THE OLD, FAMILIAR FAVORITES** that we continue to offer, such as:

General Business—Client Accounting (CPA Write-up)
FMS[®] (Financial Modeling System)
NAD⁷ (Name and Address System)

Real Estate—REAP (Real Estate Acquisition Programs)
PMS (Property Management System)
MLS[®] (Multiple Listing System)

Health Care—APH[®] (Automated Patient History)

Word Processing and System Software—Magic Wand[®]
QSORT[®]
CBASIC¹⁰

and Cybernetics' unique TRS-80[®], Model II CP/M offering high performance, hard disk support, and CP/M compatibility.

Trademarks of:

1—Ryan McFarland Corp.; 2—Digital Research, Inc.; 3—Tandy Corp.; 4—Phase One Systems, Inc.; 5—Bell Telephone Laboratories, Inc.; 6—American Business Systems, Inc.; 7—Structured Systems Group, Inc.; 8—Cybernetics, Inc.; 9—Peachtree Software, Inc.; 10—Compiler Systems, Inc.

MR. SMITH, THIS SOFTWARE WILL DEFINITELY
ENHANCE YOUR CURRENT DATA PROCESSING
FINANCIAL INDEXING RE TRIEVABILITY.

THOSE ARE
NICE WORDS

CYBERNETICS
INC.

TEL. 714-848-1922

8041 NEWMAN AVE., SUITE 208
HUNTINGTON BEACH, CA 92647

Text continued from page 154:

for other machines using ANSI BASIC is possible.

After the language is loaded, about 14 K bytes of working storage are left on a 48 K-byte system. Hence, there are advantages to having the Language System or the optional 16 K-byte memory board. Either choice gives an added 12 K bytes of working storage. A 4 K-byte slice of that memory range is inaccessible: those are hexadecimal memory locations C000 thru CFFF, which are

allotted for peripheral card I/O by the Apple. Another 4 K bytes, for the 6502 microprocessor's stack, the text screen, and other miscellany, are not available to the Z80, so Microsoft refers to 44 K- and 56 K-byte systems, rather than 48 K- and 64 K-byte systems.

CP/M for the Softcard is a complete version of the operating system. The command files provided with CP/M are shown in table 2. The standard CP/M 8080 assembler is included, along with a line-oriented text

editor and DDT (Dynamic Debugging Tool) for machine-language programmers. Utilities are also available for transferring files from one device to another PIP (Peripheral Interchange Program), simulating batch jobs with disk input files (SUBMIT), dumping the hexadecimal contents of any file (DUMP), and transferring text and binary files from Apple DOS disks (APDOS).

Using Other CP/M Software

A language or operating system is of little value if it is nonstandard or can't be used with existing software. Softcard provides a DOWNLOAD program, a listing, and programming details for an UPLOAD program, that when loaded into respective systems (DOWNLOAD for the Apple, UPLOAD for another CP/M machine) allow the transfer of CP/M files from another CP/M system to the Apple through a serial RS-232C port. This does, of course, assume that you have the appropriate serial interfaces and another CP/M system available. A working knowledge of 8080 assembly language is also necessary for implementation of the UPLOAD program.

Another possible solution is to transfer CP/M files to an Apple DOS disk as a text file and convert that file to a CP/M file using APDOS. However, the text file created with the Apple DOS will use only a carriage return as a delimiter, while CP/M requires a carriage return and a line feed. Depending on the language, at this point, more tinkering is needed for the Softcard to understand your program. The saving grace to all non-tinkerers is the fact that companies such as Lifeboat, Peachtree Software, Microapt and Structured Systems offer their CP/M software already on Apple-format disks. Also, the Computer Shack in Pueblo, Colorado, will, for \$10, download any CP/M program you send them for use with the Softcard.

Using the 6502 from CP/M

It is possible for programs written for the Softcard to call routines writ-

Text continued on page 162

The simplest way to manage your Apple.



If you're interested in managing all your business and personal information exactly like you want, we have a simple solution. It's File-Fax.™ The fastest and easiest-to-learn Data Base Management System that allows you to design your own formats.

With File-Fax, you can store and retrieve information without guessing how your printouts will look. And there's no disk

swapping or waiting for your programs to translate. That's because it's written in the language most easily understood by your Apple.* So you need only one disk drive. And each key retains the same meaning.

To simplify matters even more, File-Fax comes with complete instructions including a tutorial. And help screens can be called up throughout your programs. We've even made it easy to get File-Fax. Just give our Industrial Sales Department a call. That shouldn't be too hard to manage.

DANA INDUSTRIES
2612 Croddy Way
Santa Ana, CA 92704
(714) 641-1332

*Apple is a registered trademark of Apple Computer, San Jose, California.

DANA INDUSTRIES

**Imagine, a true business alternative to VisiCalc™ and dBASE II
It's Here!**

LOGICALC and QUEST

Written in UCSD Pascal™



In addition to the basic features found in other financial modeling systems LOGICALC provides the following:

- Conditional expressions allowing "what if" processing together with relational operators (e.g. <, <=, >, >=, =) and logical operators (AND, OR) with parenthesis
- Complete interface to QUEST (SPI's relational data base), ASSET (SPI's Accounting system) and word processor
- Built in financial functions like linear regression, present value, depreciation, consolidation and more
- Column format feature for individual column width, column precision or individual entry precision
- Dump utility to obtain a hard copy of the model to facilitate audit trails
- Merge command to combine two or more reports
- Print command to print entire or partial reports according to parameters you specify including titles, page width and length. If the report to be printed exceeds the width of the printer LOGICALC automatically splits the report into two or more pages which when laid side by side form the complete report.

Only \$290.00

QUEST is a relational data base providing single, multi-user and distributed processing capabilities. Concurrent access to QUEST is handled through a built-in record locking mechanism. QUEST uses a subset of the SQL query language (IBM's recently announced relational query language).

- Interface to application software via high level calls
- User definable screen mask (up to 8 pages per record)
- Arithmetic expression evaluator to combine fields in formulas
- Conditional expression handling ("what if" processing on selected fields)
- Data entry range checking and password protection on selected fields
- Scan for records with partial information.
- Find records qualifying on any number of search criteria using relational and logical operators
- Sort records by as many as 15 key fields (ascending or descending)
- Join, select and project implementation to facilitate relational query processing
- Create, restructuring and recover utilities of files
- Complete interface to LOGICALC AND ASSET (SPI's accounting system)
- Report Generator lets user define report formats, headings, page footing, subtotals, level breaks. Built in arithmetic and logic processor enables the user to design very complex reports.

Only \$490.00

Other Programs which interface to Quest and Logicalc are available now:

- ASSET, SPI's Accounting System
- Medical Billing
- Boutique Management System
- School Management System

Software Products International



5482 COMPLEX STREET, SUITE 115
SAN DIEGO, CA 92123
PHONE (714) 268-4346

- Visa and MasterCard orders accepted.
- Dealer inquiries invited.

Visicalc is a registered trademark of Personal Software, UCSD Pascal is a registered trademark of the Regents, University of California.

**SEE US AT COMDEX
BOOTH 685**



Get a \$20 rebate on the TI-59 Programmable.

Even without the \$20 rebate, the TI-59 is special—it's our most powerful programmable, and we've never offered it at a lower price.

The TI-59 gives you up to 960 program steps, or up to 100 memories, plus magnetic card read/write capability. You can also slip in one of TI's Solid

State Software™ modules and successfully attack complex engineering, business, statistical and scientific problems. And by adding the optional PC-100C printer, you can record your calculations. But if that's not enough, any TI-59 owner can

join our Professional Program Exchange for access to over 2500 additional programs.

So if you like the idea of having real programmable power, take us up on the rebate offer. Buy a TI-59 now, and fill out the coupon below. The offer ends December 31, 1981.

TEXAS INSTRUMENTS
INCORPORATED



©1981 Texas Instruments Incorporated

I bought my TI-59 Programmable at (store name): _____ and have attached the dated sales receipt and completed customer information card (packed in box). My TI-59 Serial No. is _____ (from back of calculator). Please send my \$20 rebate check to:

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Send to: Texas Instruments TI-59 Rebate Offer, P.O. Box 725 Dept. 59, Lubbock, Texas 79491.

NOTE: Proof of purchase must be dated between August 1, 1981 and December 31, 1981. Offer void where prohibited. Offer good only in U.S.A. Rebate applies to purchases of TI-59 Programmable only. Items must be postmarked by January 15, 1982. Allow 30 days for delivery. Limit one per person/address.



Built-in CP/M Commands:

DIR—Lists the disk directory.

ERA—Erases a file or files from disk.

REN—Renames a disk file.

SAVE—Saves a file to disk.

TYPE—Displays the ASCII contents of a disk file.

USER—Used to divide the disk into up to 16 separate user areas. **USER** specifies access to one of those 16 areas.

Transient Commands:

ASM—Loads the 8080 assembler and assembles a program from disk.

DDT—Dynamic Debugging Tool, an interactive machine-language debugging aid, allows program traces and editing.

DUMP—Displays the hexadecimal contents of a file.

ED—CP/M's editor utility.

LOAD—Creates a transient command file from a machine-language file on disk.

PIP—Peripheral Interchange Program, allows you to copy, merge, print, and load disk files.

STAT—Provides statistical information about disk space and device assignments.

SUBMIT—Executes the CP/M commands put in a special file with the editor program. Allows programs and commands to be

batched together as Apple's **EXEC** command does.

CP/M Software:

APDOS—Allows transfer of ASCII and binary files from Apple-formatted disks to CP/M disks. This program requires two or more drives and cannot write CP/M files to Apple DOS disks.

CONFIGIO—Allows you to configure CP/M to your system, such as upper/lower case, 80 columns, and redefinition of keyboard characters for external terminals.

COPY—Disk copy utility.

DOWNLOAD—In conjunction with the **UPLOAD** program on another system, allows transfer of CP/M files to the Apple CP/M system.

FORMAT—Formats new disks.

GBASIC—BASIC 5.0 with high-resolution graphics enhancements, provided on the 16-sector disk only.

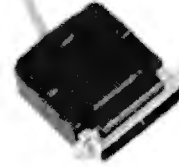
MBASIC—BASIC 5.0, with some additional commands for use with the Apple.

RW13—Allows the 16-sector CP/M to read and write on a 13-sector CP/M disk.

UPLOAD—A listing of a program to be used on another CP/M system in conjunction with **DOWNLOAD** for transferring of CP/M files. A working knowledge of assembly language will be necessary to implement this program on another system.

Table 2: List of the features and utilities of the CP/M operating system included with the purchase of a Softcard.

The Converter that transforms your electronic typewriter into a computer printer.



- No modifications to the typewriter
- Does not affect normal typewriter functions
- All typewriter functions accessible by computer
- RS232C, IEEE and parallel interfaces available
- KSR version turns typewriter into a computer terminal
- Fully assembled, tested and burned in

NEW! NOW AVAILABLE

**OLIVETTI PRAXIS 35
TYPEWRITER
+
CONVERTER TP35 =
DAISY WHEEL PRINTER
FOR LESS THAN \$1000.**

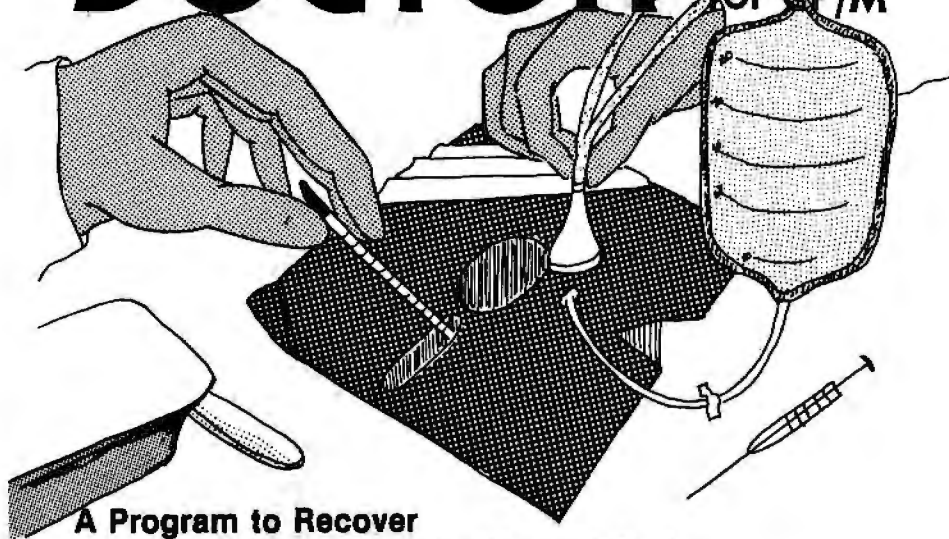
Prices start as low as \$275.
CONTACT YOUR LOCAL
OFFICE EQUIPMENT DEALER
OR
VERTICAL DATA SYSTEMS INC.
FOR FURTHER DETAILS.



Vertical Data Systems Inc.
1215 Meyerside Dr., Unit 2A,
Mississauga, Ontario,
Canada L5T 1H3
(416) 671-1752

Dealer inquiries invited

DISK DOCTOR



A Program to Recover "Crashed" Discettes AUTOMATICALLY!

Maybe it was a lightning storm, static from the rug, or just too late at night to be working. Whatever the cause, when a discette "crashes" and valuable data or programs are destroyed, the loss is enormous, both in time and money.

DISK DOCTOR is a program which automatically recovers bad discettes. Best of all DISK DOCTOR does not require any knowledge of CP/M file structure! If you can operate CP/M, then you can use DISK DOCTOR. The entire system is menu driven with key information displayed.

DISK DOCTOR is comprised of five "wards", each capable of performing a specific discette recovery operation.

- **Ward A:** Verifies discettes and locks out bad sectors without touching the good files that remain.
 - **Ward B:** Copies whatever can be read from a "crashed" file and places it into a good file under user control.
 - **Ward C:** Copies discettes without stopping for bad sectors. Bad sectors are replaced by spaces.
 - **Ward D:** "Un-erases" files. That is, Ward D will recover accidentally erased disk files.
 - **Ward E:** Displays directory of recoverable erased files.
- DISK DOCTOR will pay for itself the first time it is used.

Best of all, DISK DOCTOR operates almost complete automatically. The small amount of user interaction is explained in the manual as well as prompted by DISK DOCTOR.

Requires: 48K CP/M, two drives needed for complete operation.

DISK DOCTOR: \$100.00
Manual Alone: \$ 10.00

CP/M Formats: 8" soft sectored, 5" Northstar, 5" Micropolis Mod II, Vector MZ, Superbrain DD/QD, Apple II +

SuperSoft

First in Software Technology



All Orders and General Information:
SUPERSOFT ASSOCIATES
P.O. BOX 1628
CHAMPAIGN, IL 61820
(217) 359-2112

Technical Hot Line: (217) 359-2691
(answered only when technician is available)

CP/M REGISTERED TRADEMARK DIGITAL RESEARCH

Text continued from page 158:

ten for the 6052 processor. The Z80 is enabled with a memory write to a specific location. This *soft switch* can be toggled back to the 6502 with a similar write performed by the Z80. 6502 subroutines may be called by putting the subroutine address in a predesignated location, then toggling the soft switch. Values can also be passed to the 6502's A, X, Y, and status registers through another set of specified memory locations. The only confusion may come from the fact that the Softcard re-maps the Apple's memory to conform to CP/M standards. This means that the same location will have different addresses under the 6502 and Z80 modes. Apple's zero page has been moved to the top of the Z80's memory, so the Z80's location zero is actually hexadecimal 1000 to the 6502. This may sound confusing, but the adjustment is not difficult.

Conclusions

Because of the flexibility it offers Apple users, I consider the Softcard an excellent buy. Despite the introduction of many new and often better languages, three of the first popular computer languages (FORTRAN, COBOL, and BASIC) continue to enjoy the widest use. Although I'd like to jump on the Pascal bandwagon, I don't think that it and other languages will replace any of the above three. New languages will be used, but the trend is that existing languages continue to evolve to keep pace with the times. Look at BASIC. It's hardly recognizable from its original version or the version of FORTRAN of which it was supposedly a subset. The cost of rewriting software and retraining programmers is just too high to allow drastic changes or entirely new languages. The Softcard lets you choose among the many standards of the industry as it now exists. It has the most current version of BASIC, is capable of handling COBOL and FORTRAN, and uses CP/M, the closest there is to a standard operating system for microcomputers. The price is reasonable, and it works. ■

EXCITING NEWS FOR TRS-80™ MODEL III USERS!

Standard & Poor's unique software and data system—STOCKPAK—can help you manage your investments like a Wall Street Professional! Now for TRS-80 Model I and Model III users too!

STOCKPAK not only delivers a "stand-alone" Portfolio Management System but also gives you the software for Standard & Poor's monthly Common Stock Data Service (available to TRS-80 owners on a subscription basis). With STOCKPAK and the Data Service you command one of the most powerful and versatile investment tools available.

Here's How STOCKPAK Will Help You:

A 900 COMPANY DATA BASE SERVICE

Monthly Data Service subscribers receive a diskette containing 30 vital financial items on 900 of the most widely traded stocks (S&P "500" and 400 NYSE, ASE and OTC issues). Accompanying this monthly diskette is an Investor's Newsletter highlighting important financial news and investment strategies, with suggestions for maximizing the usefulness of the system.

STOCKPAK SELECTION SYSTEM

The heart of STOCKPAK is a powerful, analytical stock selection tool which enables investors to choose stocks which meet their investment criteria. For example, you may wish to select only those oil and gas stocks with price/earnings ratios of less than 7 and yields of 6% or more. Once a group of stocks has been selected, you can store it as a separate data file for continuing use.

REPORT WRITER

You can define the report formats you would like to see on those stocks meeting your investment objectives. Hundreds of calculations and ratios that you define can be sorted, averaged or totalled, and displayed on video screen or optional printer.



PORTFOLIO MANAGEMENT SYSTEM

Now you can effectively evaluate and manage your own stock portfolio of up to 100 securities with as many as 30 transactions for each. You can record "buy" and "sell" transactions, price and dividend information and stock splits for instant retrieval, for record keeping and tax purposes. You can measure actual performance or create hypothetical situations to help you make "buy" or "sell" decisions.

HOW TO ORDER STOCKPAK

STOCKPAK is designed exclusively for TRS-80 users with 32K business systems with two mini-disk drives. You can obtain the basic software and sample Data Base, plus a comprehensive User's Manual from your local Radio Shack Store for only \$49.95. The STOCKPAK Monthly Data Updating Service can be ordered directly from Standard & Poor's for \$200 annually, or from the order form provided in the basic package you purchase from Radio Shack.



Standard & Poor's Corporation

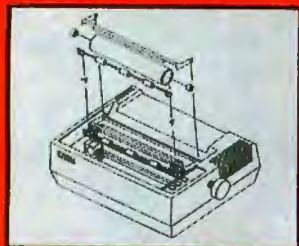
25 BROADWAY, NEW YORK, NY 10004 (212) 248-3993/3374

Buy your printer.....

Orange Micro.

EPSON PRODUCTS

MX 80/70 FRICTION FEED KIT by Orange Micro



HERE AT LAST! A friction feed kit for your EPSON MX 80/70. The kit allows the user to convert his Epson printer to a friction feed and pin feed mechanism.

The friction feed will accept single sheets of your letterhead, or multiple copy forms such as invoices

with up to 4-part carbon copies.

The pin feed replaces the adjustable sprocket mechanism. It allows use of 9 1/4" wide continuous fanfold paper which is an industry standard size.

No drilling required. Installation takes about 30 minutes. All parts are included with easy to follow instructions. \$75.00. DEALER INQUIRIES INVITED.

EPSON MX 80/MX 80 FT

9 x 9 dot matrix - Lower case descenders - 80 CPS - Bi-directional, logic seeking - 40, 66, 80, 132 columns per line - 64 special graphic characters - TRS-80 Compatible - Form handling - Multi-page printing - Adjustable tractors
MX 80 (List \$645) \$ Call
Graftrax-80 Dot Graphics Upgrade (List \$95) \$ Call
MX 80 FT includes Friction Feed



(List \$745) \$ Call

EPSON MX 70



Super low-priced dot resolution graphics - 5 x 7 dot matrix - User replaceable printhead & Top of Form
MX 70 (List \$450) \$ Call

EPSON MX 100

Same basic features as the MX 80 - PLUS friction feed for single sheets - PLUS 15" wide carriage
MX 100 (List \$995) \$ Call



LETTER QUALITY PRINTERS

VISTA—C. ITOH

Daisy Wheel Letter Quality 25 CPS (Optional 45 CPS) - Typewriter quality - Centronics parallel - RS 232 Serial (Optional) - Proportional spacing - Bi-directional - Programmable VFU

Self test - Diablo compatible - Friction feed (Optional tractor) - 136 printable columns - Manufactured by TEC
VISTA V300 (C. ITOH) Starwriter (List \$1895) \$ Call



NEC SPINWRITER

High Speed Letter Quality - 55 CPS - Typewriter quality - Bi-directional - Plotting & Proportional spacing
77XX RO. Serial/Parallel (List \$3055) \$2575

QUME 9/45 typewriter quality

DIABLO 630 Typewriter quality

\$ Call
\$ Call



NEW! NEC 8023 DOT MATRIX

Dot graphics - 100 CPS - Bi-directional, logic-seeking - Tractors & friction feed - 5-Alphabet fonts - 8 character sizes - Proportional spacing
NEC 8023 DOT MATRIX (List \$795) \$ Call

TELEVIDEO CRT'S

TV1910, TV1912C, TV1920C, TV1950 - Please call toll free. Prices are too low to advertise \$ Call

NEW! CENTRONICS 739 (Radio Shack Line Printer IV)



With graphics and word processing Print Quality - 18 x 9 dot matrix; suitable for word processing - Underlining - proportional spacing - right margin justification - serif typeface - 80/100 CPS - 9 1/4" Pin Feed/Friction feed - Reverse Platen - 80/132 columns - Top of Form

CENTRONICS 739-1 (Parallel)
CENTRONICS 739-3 (Serial)

(List \$955) \$725
(List \$1045) \$815

.with our expertise.

The printer specialists.

ANADEX

Dot Graphics, Wide Carriage - 11 x 9 dot matrix; lower case descenders - Dot resolution graphics - Bi-directional, logic seeking - Up to 200 CPS - RS 232 Serial & Parallel - Forms control - X-ON/X-OFF - Up to 8 part copy
ANADEX 8501



(List \$1650) \$1350

IDS PAPER TIGERS



Dot Resolution Graphics, quality print, speed 9 wire staggered printhead with lower case descenders - Over 150 CPS - Bi-directional, logic seeking - 8 character sizes, 80-132 columns - Adjustable tractors - High-resolution dot graphics - Proportional spacing & text justification

IDS 460G

(List \$1094) \$ Call

IDS 560G

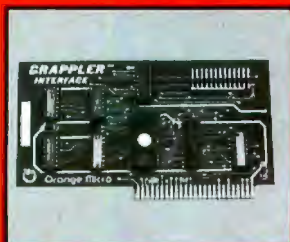
(List \$1394) \$ Call

INTERFACE EQUIPMENT

| | |
|--|---------|
| CCS APPLE PARALLEL Interface & Cable | \$150 |
| ORANGE INTERFACE for Apple II parallel interface board & cable | \$110 |
| MICROTRONICS Atari parallel interface | \$69 |
| TRS-80 CABLES to keyboard or Exp. Interface | \$ Call |
| NOVATION D-CAT direct connect modem | \$ Call |

THE GRAPPLER™

APPLE INTERFACE AND CABLE by Orange Micro



The Grappler™ interface card is the first to provide on-board firmware for Apple high resolution dot graphics. No longer does the user need to load clumsy software routines to dump screen graphics—it's all in a chip. Actually, it's our E-PROM, and it is replace-

able to accommodate the Anadex, Epson MX 70, 80* and 100, IDS Paper Tigers, Centronics 739, NEC Prowriter and future graphic printers. The Grappler™ accepts 18 software commands including Hi-Res inverse, 90° rotation, double size and much more. Invented by, and available from Orange Micro and Orange Micro dealers only. \$ Call for price

*Requires GRAFTRAX 80

VISIT OUR PRINTER PRO SHOPS

If you live in California, or are visiting, don't miss our two Printer Pro Shops, devoted to and filled with all the printers you want. Expert consultation and know-how to assist you in getting the best printer for the application.



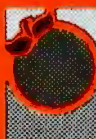
SHERMAN OAKS, 13604 Ventura Blvd., (213) 501-3486
ANAHEIM, 3150 E. La Palma, Suite 1, (714) 630-3622
Store Hours: M-F 10-6, Sat 10-4

At Orange Micro our printer specialists fit the right printer to your application. Call us today for free consultation (and don't forget to ask for your free catalog).

Phone orders are WELCOME, same day shipment. Free use of VISA and MASTERCARD. COD's accepted. Personal checks require 2 weeks to clear. Manufacturers warranty included on all equipment. Prices subject to revision.

CALL TOLL FREE (800) 854-8275

CA, AK, HI (714) 630-3322



Orange Micro inc.

3150 E. La Palma, Suite G, Anaheim, CA 92806

Circle 324 on inquiry card.

CourseWare Magazine

Elaine Holden
Reading and Language Arts Coordinator
Merrimack School District
Merrimack NH 03054

One of the problems limiting the use of microcomputers in the classroom is the lack of good educational software. This comes as no surprise, since hardware developments have always outpaced software developments. The problems of generating educational software, however, are compounded by the fact that most educators do not have the technical skills to write good programs and, conversely, most good programmers do not have the educational background to design useful programs.

CourseWare magazine was started to fill this gap. Its philosophy, as stated in the introduction:

"Each issue of *CourseWare* magazine will include a C-10 cassette containing at least two programs selected from the ten pre-college curriculum areas of business, consumer economics, English, fine arts, foreign language, industrial arts, mathematics, physical education, science, and social studies, or from the area of teacher-assistance programs. Each student program will be accompanied by a teacher guide, a student guide, worksheets (if appli-

cable), suggestions on how to adapt programs for individual lessons, a description of variables used in the program, and a listing of the program. Teacher programs (computer-managed instruction, computer-supported instruction) will be accompanied by a user guide."

In using the materials given in the Apple II version of



Photo 1: September 1980 issue of *CourseWare* magazine. Each issue includes a cassette tape of the programs in that issue; separate versions are available for use with the Apple II or II Plus, Commodore PET, or Radio Shack TRS-80 Model I.

At a Glance

Name
CourseWare magazine
(September 1980)

Type
Software and documentation
for classroom use

Publisher
CourseWare
4919 N Millbrook #222
Fresno CA 93726

Price
\$12.95 (or 5-issue subscrip-
tion, \$50)

Format
Cassette

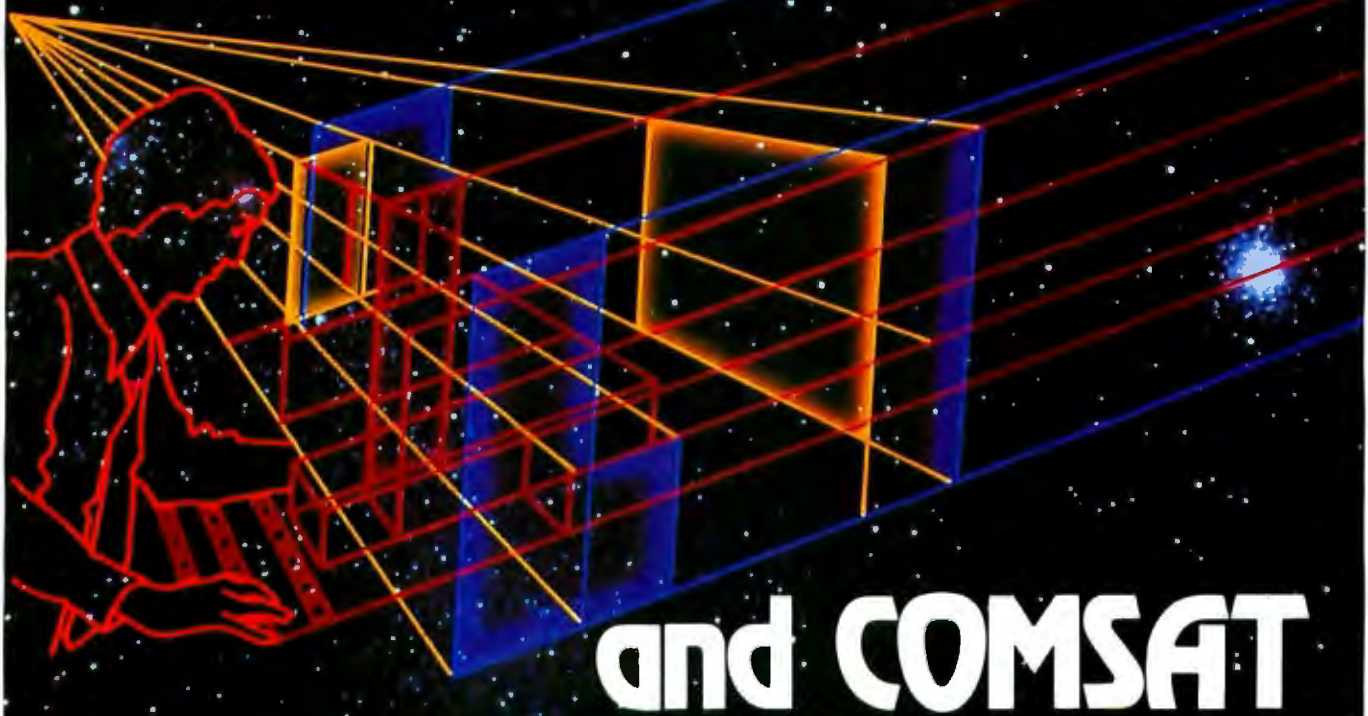
Language used
BASIC

Computer needed
Apple II or II Plus, Com-
modore PET, or Radio
Shack TRS-80 Model I

Documentation
28 pages, in a 3-ring binder

Audience
School teachers with access
to one of the computers
listed above

Tomorrow and You...



For COMSAT . . . what many view as futuristic is already part of our everyday business and plans. We offer:

- **ORGANIZATION OF THE FUTURE**— a private corporation working directly with governments, at home and worldwide.
- **GLOBAL COMMUNICATIONS OF THE FUTURE**— satellite communications systems serving over 100 countries and some 700 ships at sea.
- **OFFICE OF THE FUTURE**— a partnership venture brings video conferencing, electronic intra-company mail transfer, information and more, via satellite to business and government.
- **FACTORY OF THE FUTURE**— computer-aided design and manufacturing services and systems.
- **HOME OF THE FUTURE**— planned home entertainment through direct satellite relay.
- **NATURAL RESOURCES MANAGEMENT OF THE FUTURE**— advanced satellite technology to provide

natural resource management through practical conservation and environmental programs.

- **RESEARCH OF THE FUTURE**— advanced R&D facilities offering the latest in communications product technology.

Our rapid expansion has created career openings in such diversified engineering disciplines as spacecraft design, signal processing, power systems, scientific software development and RF systems.

We offer excellent salaries and benefits, as well as the challenge of being in the forefront of high technology.

If you are interested in working with us, send your resume to:

Senior Employment Representative, Department 81-6RC, COMSAT, 950 L'Enfant Plaza, S.W., Washington, D.C. 20024.



COMSAT

AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.

Zilog's System 8000™

If you want to establish a low-cost UNIX[®]-based system, or need additional UNIX productivity on your current system,

Zilog's System 8000 is the perfect choice. System 8000 is a modular, free-standing unit built for multi-user office and labora-

tory application. Based on Zilog's reliable, high performance Z8000™ microprocessors, System 8000 delivers supermicro power at prices far below those of comparable minicomputers. (See Mini Micro Systems, Sept. '81; benchmarks article.)

The Price

The quiet (48 decibel), compact (33 inches tall), System 8000 rolls easily into your work area

Zilog

```
ZEUS login: nabil  
Password:
```

```
The following are news items of current interest:
```

```
zeus Information on your new ZEUS operating system  
news Information on how to use this 'news' package
```

```
You have mail.
```

```
%mail  
from doug Thurs Aug 27 11:07:35 1981  
Please reschedule our 3:30 meeting to 8 am tomorrow  
thanks, doug
```

```
?q
```

```
%ls
```

```
bin      lpr      mch.o    newobj   mail.c  
bench    uucp     plz      test.c   memo.report
```

```
%pr test.c | lpr  
%
```

LOCK



HL

POWER
USER

the Supermicro.

and requires no special environment. Zilog provides a complete eight user system, including system software, 256 KB of main memory, a 24 MB Winchester disk and 17 MB tape cartridge back up, along with expansion capabilities, all for only \$29,950. (U. S. list.)

The Performance

The System 8000 runs the ZEUS operating system, which is a faithful enhancement of the seventh edition of UNIX, perfected through Zilog's extensive UNIX experience. Because ZEUS is a high performance implementation of UNIX, any program that runs under UNIX, written in C, COBOL, or Pascal, can be easily ported to System 8000. Programs comprising the utilities and development tools provide user access, command processing, file management status informa-

tion, and communication with other devices or systems. ZEUS also includes text processing software, libraries, a symbolic debugger, programming languages (standard C, PLZ/SYS, PLZ/Assembler, plus optional COBOL and Pascal), and more than 100 other utilities.

The Future

System 8000 plans include hardware and software expansion as well as compatibility with future generations of microprocessors. Soon the System 8000 will become integrated with Zilog's Z-NET™ Local Area Network (LAN) for commercial distributed data processing. No other manufacturer offers a UNIX-based system with the price and performance of the System 8000. So, if you're seeking the right UNIX solution, System 8000 is the perfect choice.

For more information, write Zilog, Inc. General Systems Division, 10460 Bubb Road, Cupertino, CA 95014. Or call the office nearest you.

Los Angeles (714) 549-2891

Chicago (312) 885-8080

New York (212) 398-4497

Dallas (214) 243-6550

Atlanta (404) 451-8425

Boston (617) 273-4222

Paris 778-14-33

London (0628) 36131

Munich 01806 4035

Tokyo 03-587-0578

System 8000, Z8000, and Z-NET are trademarks of Zilog, Inc.

Zilog
EXXON COMPUTER
SYSTEMS

*UNIX is a trademark of Bell Laboratories.

Zilog

the first issue, September 1980, I found that these objectives were met.

SPELL 'N' TIME

I loaded the first program, SPELL 'N' TIME, without any problems. SPELL 'N' TIME is an electronic version of the traditional spelling bee, in game format. The drill can be used at all grade levels and for any subject. It is especially useful in subjects where specific vocabulary recognition is important.

SPELL 'N' TIME works like this: a student starts up the program and the computer prints "watch carefully." A box with an arrow pointing to it appears on the screen. The program displays and erases a word in the box, and the student spells the word in a box below. If the answer is correct, the computer prints "Good job!," and another word is presented. If the answer is incorrect, the program gives a short, nonthreatening sympathy message, "Sorry, try again." After one misspelling, the word is displayed syllable by syllable, and the student tries to spell the word again. If he/she does not spell the word correctly the second time, the word is continuously displayed while the student types in the word correctly.

This process continues for each word in the list. The number of correctly and incorrectly spelled words is displayed at the bottom of the screen. When the last word is finished, the computer gives a list of the incorrectly spelled words, which the student is to copy onto his/her worksheet (a master copy is provided in the documentation).

To the student, the program is a game, since the objective is to finish the word sequence as quickly as possible. All students can experience success:

- the presentation time of words depends on the individual's word recognition and spelling accuracy
- the word selection can be matched to the student's ability level

- there's immediate positive feedback for a correct response

An introduction states what the program does, what computers it runs on, its objectives, and why it is useful in a classroom. Explicit instructions tell how to change the number of words to be used (one program line must be changed), and how the teacher can change the actual words to be used (by typing the words, hyphenated with dashes, into one or several DATA statements). With only minimal computer experience, I was able to make both kinds of changes and save the changed program under a new program name.

By using the program, the teacher may leave the quizzing to the computer and give special attention to each student's needs by monitoring the student's response and revising the word list.

Studies show that the best way to evaluate spelling is with a written test. Improvement in spelling often comes from regularly administered tests based on misspelled words found in the student's work and later corrected and practiced. SPELL 'N' TIME reinforces this basic concept. Students can practice on teacher-selected words and later take a written test. This testing method closely approximates methods recommended by current studies and, as such, the teaching matches the testing. Consistent teaching and testing eliminates confusion on the part of the student.

QUIZSTAT

QUIZSTAT, the second program in the September 1980 issue of *CourseWare*, is a management program. It gives the teacher statistics on classroom performance on a given quiz. Only the memory capacity of the computer limits the number of students this program can handle.

For a given test, QUIZSTAT tabulates the number of students who missed each question, the percentage of students who made the incorrect response, the overall

PRICE IS OUR MOST IMPORTANT PRODUCT!

CROMEMCO

Reg. Price Our Price

System I \$3995. **\$2999.**

System Z2H 9995. **7399.**

System III 7995. **5999.**

*Registered trademark of North Atlantic Industries, Corp.

TERMINALS

HAZELTINE Esprit **\$569.95**
 1421 **689.95**
 1500 **849.95**

Executive 80 Model 20 **CALL**
 Model 30

SOROC
 Model IQ120 **699.95**
 Model IQ140 **1099.95**

TELEVIDEO
 Model 912 **779.95**
 Model 920 **829.95**
 Model 950 **1099.95**

PRINTERS

QANTEX*
 Model 6000 Parallel **\$1149.00**
 Model 6000 Serial **1195.00**
 EPSON Model 80 **499.95**
 Model 100 **759.95**

TEXAS INSTRUMENTS
 Model 810 **1399.00**

INTERTEC
 Superbrain 64KDD **2699.00**
 Superbrain 64KQD **3299.00**

NORTHSTAR
 Horizon II 64K **3299.00**
 Horizon IIQD 64K **3599.00**

DATA DISCOUNT CENTER, INC.
 P.O. Box 233, Greenvale, N.Y. 11548

Phone Orders Call
516-869-8537

Most items in stock for immediate delivery. Factory sealed cartons. Full manufacturer's guarantee. All products subject to availability. All prices subject to change. N.Y.S. residents add Sales Tax. Shipping F.O.B. N.Y.

IF YOU CAN RECOGNIZE VALUE, YOU CAN SAVE;

\$500⁰⁰

M.T.I. MOD III PLUS

Now You Can Save
\$500 over comparable model.

\$1998

We have taken the basic 16K Model III expanded the memory to 48K and added our MII Double Density, Dual Disk Drive system. System is fully compatible with Radio Shack DOS and peripherals.



MOD III/EXPANDED

Same as above but has double storage capacity (708 storage). Your choice of 2 dual headed 40 track drives or 2 single headed 80 track disk drives

\$2499

MOD III/280

Our largest MOD III, approximately 1.5 mega bytes of storage, utilizes 2 dual headed 80 track, double density disk drives. Complete with manuals and professional operating system. Microsystems DOS plus 3.3.

\$2799

MTI MOD III, SALES, PARTS & SERVICE CENTERS-INDEPENDENT DEALERS

| | | | | | |
|------------------------|----------------|----------------------|----------------|----------------------------|----------------|
| PHOENIX, AZ | (602) 244-9739 | WALNUT, CA..... | (714) 594-8311 | MANHASSET, NY | (516) 869-8335 |
| SIERRA VISTA, AZ | (602) 458-2479 | FORT COLLINS, CO ... | (303) 221-1776 | NEW ROCHELLE, NY .. | (914) 235-4444 |
| TEMPE, AZ | (602) 839-0546 | GROTON, CT | (203) 445-5166 | TROY, NY | (518) 273-8411 |
| TUCSON, AZ | (602) 323-9391 | HOLLYWOOD, FL | (305) 981-1011 | N & S DAKOTA | (701) 594-5674 |
| ANAHEIM, CA..... | (714) 773-0240 | GEORGIA | (404) 449-8982 | CLEVELAND, OH..... | (216) 779-6040 |
| COVINA, CA..... | (213) 332-4088 | KAILUA, HI | (808) 261-6596 | MAUMEE, OH..... | (419) 893-4288 |
| HOLTVILLE, CA | (714) 356-5185 | IDAHO | (208) 785-1497 | DALLAS, TX | (214) 247-6679 |
| INGLEWOOD, CA..... | (213) 673-3295 | SHREVEPORT, LA | (318) 865-7189 | CHEYENNE, WY..... | (307) 632-9132 |
| LANCASTER, CA..... | (805) 942-5747 | JOPLIN, MO | (417) 781-1748 | MEXICALI, BC | (714) 357-4717 |
| OXNARD, CA | (805) 486-5837 | MIDWEST..... | (618) 345-5068 | OVERSEAS | |
| SAN DIEGO, CA..... | (714) 275-4243 | MISSOULA, MT | (406) 549-9715 | AUSTRALIA | 3877-6946 |
| SAN JOSE, CA | (408) 946-1265 | RALEIGH, N.C..... | (919) 755-1175 | BELGIUM | 1663-2452 |
| SANTA CRUZ, CA..... | (408) 427-0836 | JERICHO, NY | (516) 997-8668 | REP. OF SOUTH AFRICA | 2145-1047 |



MICROCOMPUTER TECHNOLOGY INC.

3304 W. MACARTHUR, SANTA ANA, CA 92704

• (714) 979-9923 • TELEX 6780401 TABIRIN •



U.S. PRICES
F.O.B. SANTA ANA,
CALIFORNIA

MICROSTAT™ Release 2.0

**NEW
RELEASE!**

Just some of the new features of Microstat Rel. 2.0 include: new programs for moments about the mean, skewness, kurtosis and stepwise multiple regression, longer file names, faster sort routine, the ability to declare each data file's numeric precision and drive location plus an expanded user's manual with new appendices for the equations and file structures used in Microstat. Also included is a Data Management Subsystem for file maintenance (edit, list, destroy, augment, sort, rank-order, move and merge) plus transformations (add, subtract, multiply, divide, reciprocal, log, natural log and antilog, exponentiation and linear) that allow you to create new variables from existing variables.

After file creation with DMS, programs for analysis include: Descriptive statistics, Hypothesis testing (mean and proportion), ANOVA (one-way, two-way, and random blocks), Scatterplots, Frequency distributions, Correlation analysis, Simple, Multiple and Stepwise Multiple Regression (including files larger than available memory), Time series, 11 Nonparametric tests, 8 Probability distributions, Crosstabs and Chi-square, Combinations, Permutations and Factorials (up to one million factorial). All program output is neatly formatted for easy use.

The price for Microstat Rel. 2.0 is \$295.00 and the user's manual is available for \$25.00 (credited towards purchase) and includes sample printouts with file labels that reference standard statistical texts and journals so you can compare the results from Microstat to those produced on much larger systems. Compare Microstat to any other package on the market and we think you'll agree that Microstat is the best at any price.

I(nterchange)

I(nterchange) is a general purpose file maintenance program for use with the CP/M™ operating system. Since it is a single program written in optimized Z-80™ code, it is much faster and easier to use than other file maintenance programs. Features include: DIR as usual plus listing all files excluding those with a specified character(s), ERA as usual plus exclusive erases. Also, a "Q" switch can be used to query each erase, a "W" allows erases of R/O files without query (normally you are queried), and an "R" switch if system files are to be included, LIST permits listings and uses TAB, WIDTH, LINES and WRAP for control, COPY as usual plus exclusive copies and supports the "Q", "W" and "R" switches plus an "E" switch for query on existing files, STAT with ambiguous, unambiguous and exclusive listings and produces an alphabetized listing with file length, total directory entries and space used and unused, START-END allows for copying contiguous data files, and RENAME as usual plus ambiguous renames. Other commands include: QT, DATE, TIME and SETIT (for the QT clock board) plus CLEAR, RESET, HELP and TYPE. Disk copies can even be continued after a disk full condition by simply inserting a new disk. All of this in one program without ever having to leave I(nterchange) and wait until you see the speed improvement . . .

The price for I(nterchange) is \$59.95 and the manual is available for \$10.00 (credited towards purchase). I(nterchange) is recommended for 32K or larger systems using CP/M™ 2.0 or later. It will not run on an 8080 CPU and only User 0 is supported.

All programs are available on 8" SD or North Star 5 1/4" disk. Microstat is available for North Star Basic, Microsoft's Basic-80 (Rel. 5.0 or later) or compiler Systems CBasic2. Please specify when ordering.

CP/M is a registered trademark of Digital Research.

ECOSOFT, INC.

P.O. BOX 68602
INDIANAPOLIS, IN 46268-0602
(317) 283-8883



class average, and a grade-percent scale. The information is entered and displayed in several frames. The first frame asks for the class size, the number of questions in the test, and other identifying information. In the second frame, the teacher types in the number of each question that was answered incorrectly (once for every time it was answered incorrectly). When this process is finished, the third frame shows a summary of each question, including the number and percentage of students who missed it. If 50% or more missed any given question, an asterisk appears beside the question number. A record sheet is provided in the program documentation for the teacher to copy the information from this frame. Finally, the fourth and fifth frames give the class average and a grade-percent scale. The program allows the teacher to correct transcription errors during data entry.

In its simplest use, the program helps the teacher determine which classes and which subject areas need work. When used in a pre-test/post-test system, the analysis of the pre-test data shows the teacher which material needs to be emphasized, and the analysis of the post-test data shows which areas were most effectively taught.

Conclusion

One criticism I have is that I would like to see documentation of certain statements made in the magazine. For example, in the introduction, passing reference is made to "four surveys made during the past five years." How comprehensive were these surveys? What were the actual results? That is not stated. Educators might want to see the research so an address should be given.

In a second example, questions answered correctly less than 50% of the time were flagged by the QUIZSTAT program. My question to the program designers is "what research supports this seemingly arbitrary figure?" I feel that at least 85% of all students, a standard figure for many educators, must pass a given test question. I hope these problems with documentation will disappear in future issues.

The two programs in the issue I reviewed are useful and complete. The importance of supporting the programs with worksheets and documentation cannot be overstated. One of the most exciting aspects of using this software is that program improvements and new ideas come to mind immediately, causing me (and, I hope, other teachers) to see new uses for the classroom computer.

The editor of *CourseWare*, Dr Dan Isaacson, is on the faculty of the School of Business and Administrative Sciences at California State University in Fresno, California. The material in the first issue reflects a knowledge of teachers' needs as well as a proficiency in computer science. [Editor's note: *At the time at which this review went to press, three issues of CourseWare had been published. ...GW*] Efficient and creative use of the computer in the classroom will depend on programming efforts such as this. ■

PRIME SOURCE DISTRIBUTING



COMPUTER SYSTEMS

The Computer with the MmmOST® — TeleVideo's Multi-User, Multi-Tasking, Multi-Processor Operating System Technology makes TeleVideo the leader in multiple-user, distributed data processing systems. TeleVideo is incredibly faster than ordinary multiple-user systems, and it is also less expensive!

- Each user has his own Z80 processor
- Individual Programs run under CP/M®
- File and record lock-out, and Fata Embraces are handled
- TeleVideo-RM/COBOL supports shared files

TERMINALS

Outstanding Performance, Reliability, Price and Delivery have made TeleVideo the terminal chosen by the majority of new micro computer users.

The newest member of the TeleVideo family, the Model 910, emulates three other terminals, knows 3 foreign languages, has a large set of screen attributes, 19.2K Baud, and a Selectric style Keyboard with numeric pad; but lists for only \$699. Value for the dollar makes the TeleVideo 910 a best buy.

Watch for more new products in the near future that will put TeleVideo further out front.

DEALERS AND OEMs WHO CALL EARLY WILL BE FIRST IN THE SUPPLY LINE.

RIGHT NOW!

BECAUSE:

PRIME SOURCE Delivers computer systems that work. We carry a complete line of microcomputers and peripherals backed by in-house technical expertise. Pretested and Preconfigured systems available.

PRIME SOURCE is a stocking distributor with product ready to ship.

PRIME SOURCE Supports the dealer with extras such as flooring plans, demonstration software packages, sales leads from national advertising, and advertising funds for local advertising.

PRIME SOURCE sells to Dealers, Manufacturers, Systems Houses, and Independent Software Vendors. We do not sell to end users.

CP/M® is a licensed product supplied by Digital Research, Inc.
MmmOST® is a registered trademark of TeleVideo Systems, Inc.

Circle 349 on Inquiry card.

PRIME SOURCE DISTRIBUTING

18380 Enterprise Lane
Huntington Beach, CA 92648
714/842-2208 213/592-4201
Outside California 800/854-6451

DIF: A Format for Data Exchange between Applications Programs

Candace E Kalish & Malinda F Mayer
DIF Clearinghouse
POB 527
Cambridge MA 02139

One of the most frustrating problems facing users of applications software is the inability to use the same data with more than one program. Users often know that one program has stored data with which a second program could work wonders, but incompatible storage formats make the data inaccessible to the second program. If you own an applications program, you ought to have control over the data in that program. But rarely do you enjoy full possession of this data.

Generating graphics from stored data provides a good example of this problem. Suppose you are using a data-analysis program to project your company's profits for the years 1980 to 1982. You enter data and run calculations, and the program produces table 1. You have a plotting program that can produce striking

graphics to illustrate data, but the plotting program won't accept data in the format of the data-analysis program.

The need for a standard format for data exchange has long been recognized.

In the absence of a recognized standard format for data exchange between programs, you have only three choices for making the data from the first program useful with the second. You can retype all the data, write a program to reformat all the data, or modify one of the programs to accept data in a different format.

Each of these three data-transfer processes is inefficient and tedious. In a business environment, programs for billing, invoicing, inventory, ordering, and projections may all need the same data. Transferring data among all these different programs can take a great deal of time. Clearly, if all the programs used the same data format,

the problems and inefficiencies would be greatly reduced.

Although many people see the need for a standard format for data exchange, we still lack such a standard. From time to time, individual users and commercial software houses have tried to establish a standard (particularly for use with VisiCalc, the electronic worksheet program written by Software Arts Inc and distributed by Personal Software Inc), but their efforts have failed to win wide acceptance.

Software Arts is now trying to provide a standard by offering DIF, a specific format for data interchange. The DIF file format stores tables of data and provides easy access to the data by any program using DIF. Many commercially available programs already use DIF, and more are coming soon. Some of the programs now available (in addition to VisiCalc) are VisiPlot, VisiTrend/VisiPlot, and CCA Data Management System, all from Personal Software Inc; TREND-SPOTTER, from Friend Information Systems, published by Software Resources Inc; and DB

About the Authors

Candace E Kalish is a freelance writer. Malinda F Mayer is a technical writer at Software Arts Inc. Contributing writers include Dena B Feldstein, publications manager, and Patrick J Slaney, programmer, both of Software Arts Inc.



**Don't make your
computer old
before its time**

TM

Now there's Palantir™ — Word Processing and Accounting Software for Today's Computers

You've just gotten a brand new computer. Don't tie it down with old software. Two-year-old software will make it run like a two-year-old computer.

The microcomputer industry is the fastest growing, most exciting industry in the world. Today's printers, terminals and disk drives can do things no one even dreamed of two years ago.

But a computer is just a dumb piece of metal until software gives it life, and, unfortunately, microcomputer software has not kept up with the hardware.

Until now.

There's a commonly held belief that you should not buy new software because it hasn't been tested. We say, "Hogwash!"

At one time those complaints might have been valid, but the software industry has come of age. We do our testing *before* we release a product, not afterwards.

More importantly, we've learned that quality cannot be

tested into a product; it must be *built* in from the beginning by people who know what they are doing.

And we do.

We formed Designer Software because we believed that the quality hardware of today demanded software of equal quality. It took a lot of time, sweat, money, care, experience and talent to make that belief a reality.

We set high standards, but our team of CPA's, systems analysts, programmers, writers, artists and marketers that created *Palantir*™ Word Processing and Accounting have exceeded all of our expectations.

Palantir™ is the most professional packaged software ever to be offered to the CP/M® market.

We don't expect to convince you of that with just one ad, and we won't try. But if you're in the market for business software, we hope we've convinced you to find out more about *Palantir*™ — today's software for today's computers.

Designer Software

HOUSTON

For more information and the name of a dealer near you, please write, call, telex or use The Source. Dealer, distributor and OEM inquiries invited.

**3400 Montrose Blvd. • Suite 718 • Houston, Texas 77006
(713) 520-8221 • Telex 790510 • Source TCU671**

CP/M is a registered trademark of Digital Research

Designer Software and Palantir are trademarks of Palantir, Inc.

Circle 134 on Inquiry card.

Master, from Stoneware Microcomputer Products. All versions of VisiCalc support DIF except VisiCalc 1.37 on the Apple II and VisiCalc PLUS on the HP-83/85.

The DIF Approach

DIF is easy for both beginners and advanced programmers to use and understand, yet it has sufficient power and versatility for most applications. Programs using DIF may be written in any language from BASIC to Pascal to assembly language. Furthermore, DIF is not dependent on the features of any particular computer. Because DIF avoids unusual features, data formatted in DIF can be transferred between programs regardless of the computers on which they are run.

Here are a few examples of DIF applications:

- Report generators and graphics programs can take data saved in DIF and produce easily grasped reports and vivid illustrations of what the data

means.

- Programs that accept data from laboratory instruments can use DIF as a data-storage format, making the data easily accessible for later analysis by other programs.

- Periodic data stored in DIF can be consolidated later into a master report.

- If data is stored in DIF, two different types of computers can exchange the data over communications lines (such as an RS-232 connection).

The DIF Format

DIF represents data in tables and provides for optional accompanying

information that describes the data. Descriptive information can be associated with all of the data in the table or with a specific column. In table 1, for instance, the title "Profit Report" clearly refers to the whole table. The labels "Year," "Sales," "Cost," and "Profit," however, each refer to only one column of data. Programs can use the data values and ignore the title and labels if desired.

Because tables can be structured in many different ways, DIF uses the terms "vector" and "tuple" instead of "column" and "row." Each tuple in table 2 contains one data value from each vector. This example has three

| PROFIT REPORT | | | |
|---------------|-------|------|--------|
| Year | Sales | Cost | Profit |
| 1980 | 100 | 90 | 10 |
| 1981 | 110 | 101 | 9 |
| 1982 | 121 | 110 | 11 |

Table 1: A simple table projecting profits for the years 1980, 1981, and 1982.

DATAMAC'S MICROCOMPUTER SYSTEM

The Best Features of a Large Computer
for Under \$5,000.

A Unique System

The Datamac System 1200 Series of Microcomputers is a new and exciting contribution to the small business, education and scientific markets with *high performance features previously available only in large mainframes.*

Highly Reliable

The portable, self contained computer system is "user friendly" and utilizes a single card design that has been conservatively designed and extensively tested to keep you in top operational condition virtually every time.

Easily Serviceable

A unique self diagnostic capability is built into the system for both hardware and software and is easily checked through the keyboard and on the System Activity Monitor (SAM). The experienced or inexperienced



programmer can display or alter memory and registers, set breakpoints or single step through program debugging as a standard function. MTTR is only 20 minutes.

Exceptionally Flexible

The industry standard *CP/M operating system provides for a wealth of accessible application software. Datamac's system permits simultaneous use of 5 1/4" or 8" floppies and Winchester disk drives for system expansion from 3/4 megabyte of processed data up to 80 megabytes utilizing various formats. And, input/output ports are compatible for interfacing with almost any peripheral.

Contact your Datamac representatives for product details about "Tomorrows Microcomputer System... Available Today!"

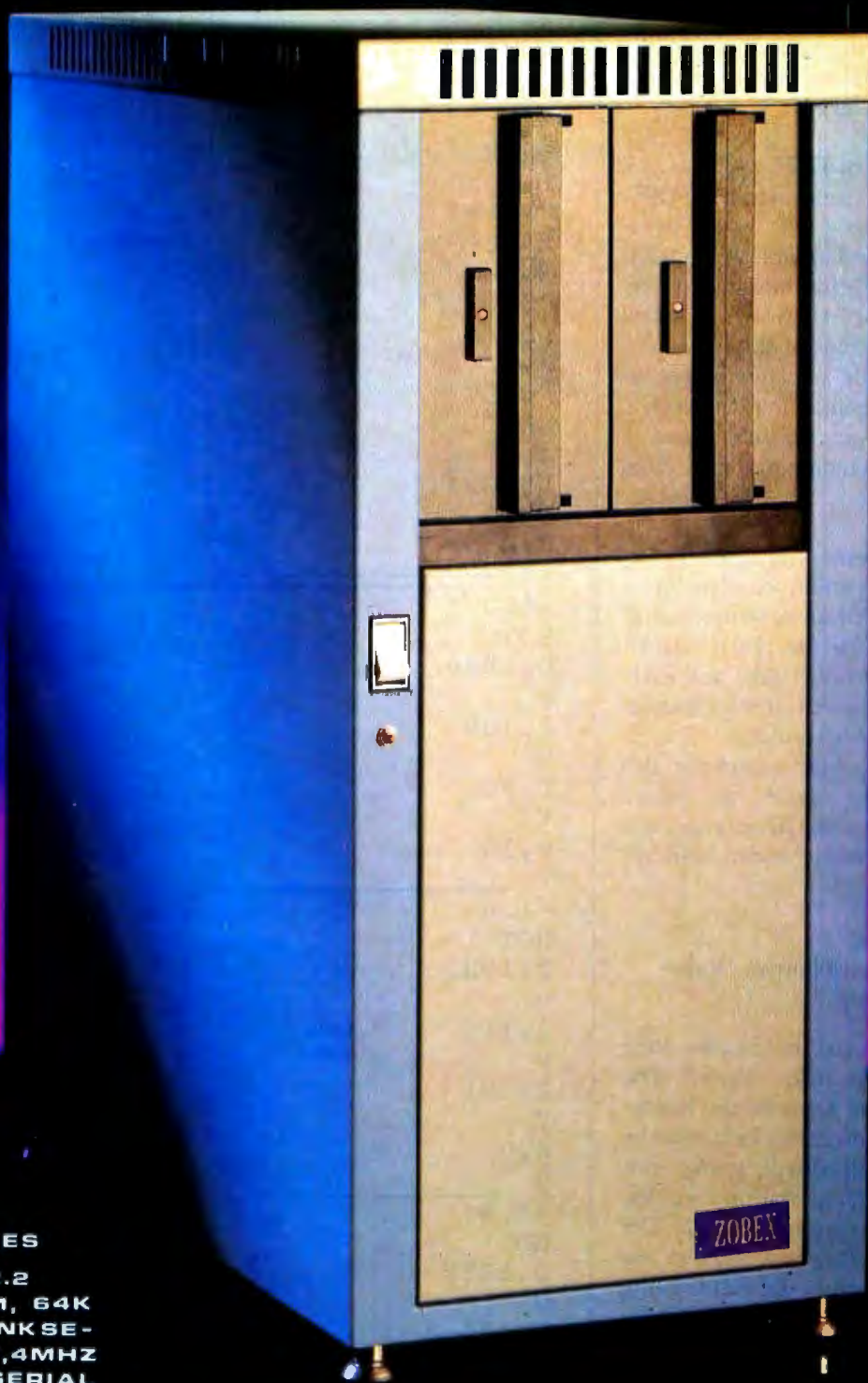
datamac

DATAMAC COMPUTER SYSTEMS
680 Almanor Avenue, Sunnyvale CA 94086 408/735-0323

 **COMDEX '81**

Visit us at Booth 579
for Distributor Opportunities.

MULTIUSER



COMPUTER
ON S-100 BUS
DESIGNED TO
SATISFY A WIDE
VARIETY OF
APPLICATIONS.

STANDARD FEATURES
INCLUDE: CP M 2.2
OPERATING SYSTEM, 64K
EXPANDABLE, BANKSE-
LECTABLE MEMORY, 4MHZ
Z80A CPU WITH 4 SERIAL
AND 3 PARALLEL PORTS,
RELIABLE 8" FLOPPY DISK
DRIVES IN A STURDY ALL
METAL CABINET.

\$ 4900

MP M OPTIONAL.

CP M AND MP M REGISTERED TRADE MARKS OF DIGITAL RESEARCH

ZOBEX™

P.O. BOX 1847 SAN DIEGO, CA. 92112
7343-J RONSON RD, SAN DIEGO, CA. 92111
(714) 571-6871

tuples of four data values each:

```
1980,100,90,10
1981,110,101,9
1982,121,110,11
```

To keep the format simple, DIF requires that all the tuples in a table have equal length and that all the vectors have equal length.

The Structure of DIF

To illustrate the structure of DIF, we will show how DIF would store the data presented in table 1. Figure 1 shows the DIF file for the data in table 1, with large braces drawn to label various subdivisions of the file.

Every DIF file has two parts: a header section containing descriptive information about the table, and a data section containing the data values.

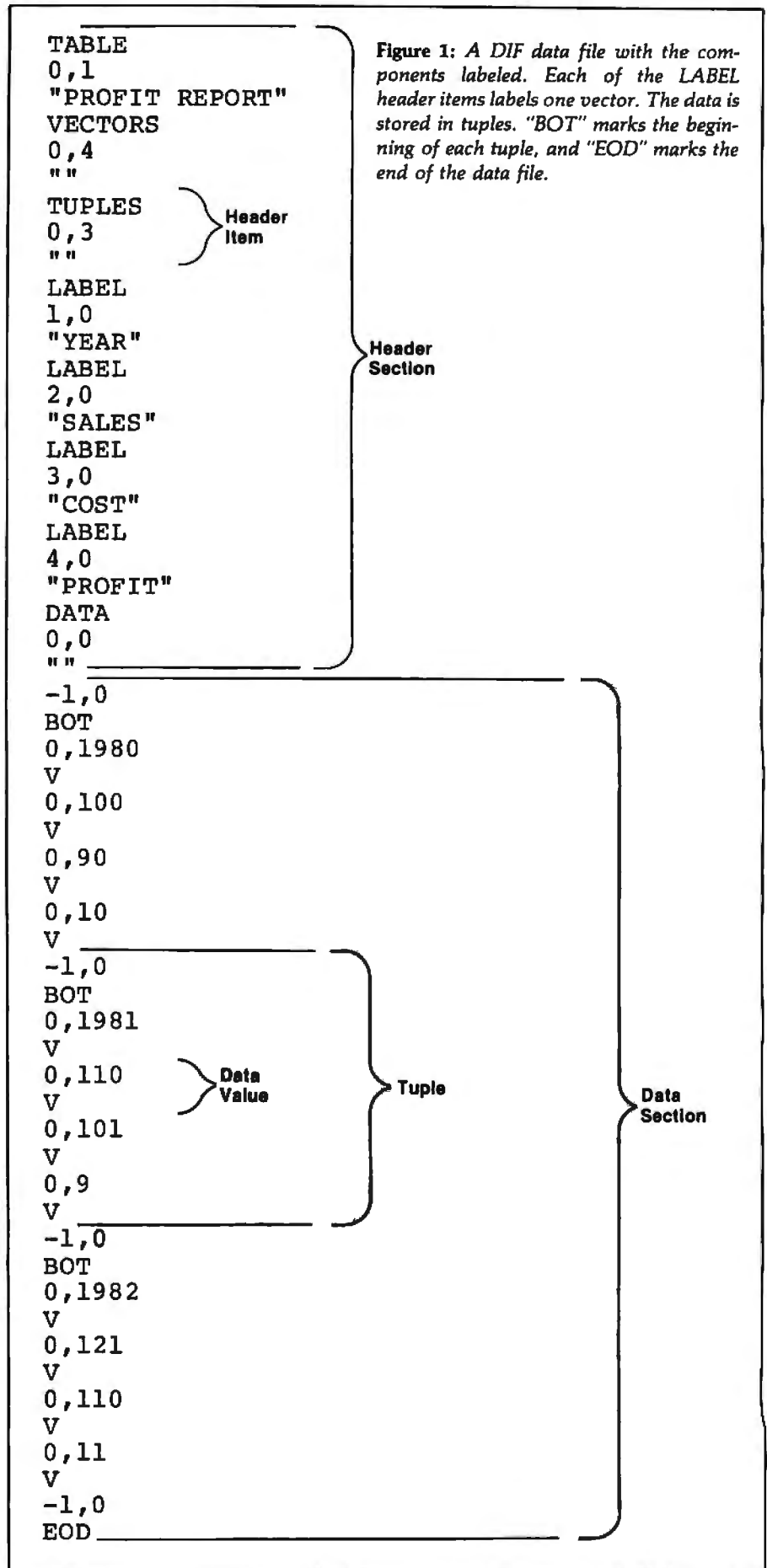
DIF Header Items

The header section consists of a series of header items, each describing one aspect of the file. Each header item consists of four fields, and each field contains a piece of information about the data-file format.

The fields in a header item are the topic, the vector number, the value, and the string value. DIF arranges the four fields of each header item on three lines:

```
Line 1 Topic
Line 2 Vector Number, Value
Line 3 "String"
```

Figure 2 shows the header item TABLE with the fields labeled. The topic field is the name of the header item; information in this field must be an uppercase alphabetic string with no spaces or quotation marks. TABLE is the topic in figure 2. The vector number, the first field on the second line, specifies the vector being referenced. Note, however, that if the header item does not belong to a single, specific vector, then the vector number used is 0. Since the header item TABLE refers to the entire file rather than to any single vector, TABLE's vector number is 0. The data value for the header item TABLE is the version number, and must be 1. On the third line, the string value for



A DataStar™ is born.



Meet Melanie. She was a data-handling novice until she met DataStar.* Now, she's a star. Her revolutionary new system has taken her into a new dimension — and left all her old file cabinets, folders and paper forms behind.

Melanie's learning fast. She lets her DataStar do it all, up on the screen, from creating forms to fast accurate entry and retrieval. And when Melanie uses DataStar with MicroPro's other programs,

WordStar™ and SuperSort™ she's a whiz at a lot more than data. Melanie can enter her data... merge, select and rearrange it... and then produce "personalized" mailings.

Discover what Melanie has. DataStar: the microworld's most comprehensive data entry, updating and retrieval system. Send for a free copy of our DataStar demonstration booklet by calling (415) 457-8990. Or

visit your nearby authorized dealer. Remember, when you're the star, we're the star.

MicroPro™
INTERNATIONAL CORPORATION

MicroPro International Corporation
1299 4th Street, San Rafael, CA 94901
(415) 457-8990 TELEX 340388
Sold through authorized dealers and
distributors only. OEM inquiries invited.



The Star Maker

Runs on most Z80/8080/8085 microcomputers with CP/M (TM of Digital Research), 48K and terminal with addressable cursor

Circle 262 on Inquiry card.

Micro-SEED™

The Powerful Mainframe Database Management System for Professionals Who Use Microcomputers

Power: Micro-SEED was derived from the CODASYL SEED database system. It has both hierarchial and network structures with power to handle any application regardless of its data complexities.

Compatibility: Fully compatible with SEED for creating microcomputer databases tied to a large host computer.

Productivity: Faster and easier to develop and maintain applications since data relationships are automatically and consistently maintained. Shared database allows integration of various application programs, each having selective authorization to access data. Consistent data naming allows programs to evolve independently of one another.

Performance: Since only Micro-SEED gives you full CODASYL access methods (plus additional ones), your database can be tuned for maximum performance. Critical portions of Micro-SEED are written in assembly language for fast, efficient operation, while the remainder is in standard FORTRAN to permit rapid evolution of Micro-SEED. Your data is secure since the database is never damaged in a system failure. Only the last transaction is lost.

Proven: Micro-SEED has been in use since 1977 and is continually enhanced.

Ease of Use: Documentation consists of a Reference Manual (over 100 pages) and a CP/M Operating Guide. Also, three example databases are illustrated in detail. Concise Data Definition and Data Manipulation Languages permit easy structuring and updating of your database.

When Your Application Requires BIG Computer Power at little Computer Prices, Get Micro-SEED.

Requirements are CP/M operating system, FORTRAN or PL/I-80, 48K bytes available to user program, and Zilog Z-80 or Intel 8080/8085 processor. Format is 8" single-density, others on special order. Single copy license is \$1,195. Demonstration Package with Documentation is \$75. Documentation only is \$40. VISA, MC, and AE accepted. Dealer and OEM inquiries invited.



Micro Decisionware

4890 Riverbend Road
Boulder, CO 80301
Phone (303) 443-2706

SEED trademark of International Data Base Systems (IDBS). Micro-SEED trademark of IDBS and Micro Decisionware. CP/M and PL/I-80 trademark of Digital Research.

the header item TABLE is "PROFIT REPORT," the title of the table. In summary, the header item TABLE is organized as follows:

```
TABLE
0,version#
"title"
```

The header section in figure 1 contains other items. The header items TABLE, VECTORS, TUPLES, and DATA are required. The order of the items does not matter, as long as TABLE is first, DATA is last, and VECTORS comes before any use of vector numbers.

The next two header items specify the number of vectors and tuples in the table. The topic VECTORS refers to the entire table rather than to a single vector, so the vector number is 0. The value of the header item VECTORS is the count of vectors in the file. Since the table has four columns, the data value of item VECTORS is 4. The item VECTORS has no string value, as shown by the empty pair of quotation marks. Thus, the header item VECTORS has the following form:

```
VECTORS
0,count
""
```

Similarly, the header item TUPLES for our sample table has a vector of 0,

a data value of 3, and no string value. The form of the header item TUPLES is:

```
TUPLES
0,count
""
```

Data values of the topic VECTORS and the topic TUPLES must always be integers.

Before the last required header item, DATA, DIF permits standard optional header items. Among these are LABEL (described below), COMMENT, and SIZE. DIF also permits defining new header items to meet special needs. The DIF Technical Specification (available from the DIF Clearinghouse) describes in detail all the standard header items.

Looking again at figure 1, you can see that the header items whose topic is LABEL refer to specific vectors. Each item whose topic is LABEL has a vector number and may have a data value as well. The data value of a LABEL item is the number of lines required by the label. This is how DIF provides for labels that require more than one line. Systems that allow only single-line labels can ignore the line number. Note that under DIF, the values 0 and 1 are equivalent line numbers. Each of the LABEL header items has a string value, and that string value is the label of the vector.

| | | |
|------------------|-----------------|----------|
| | TABLE | - Topic |
| Vector Number -- | 0,1 | - Value |
| | "Profit Report" | - String |

Figure 2: The organization of a DIF header item. The first line shows the topic. The second line shows the vector number and the value. Line 3 is the character string that is the header item's title.

| | Vector 1 | Vector 2 | Vector 3 | Vector 4 |
|---------|----------|----------|----------|----------|
| Tuple 1 | 1980 | 100 | 90 | 10 |
| Tuple 2 | 1981 | 110 | 101 | 9 |
| Tuple 3 | 1981 | 121 | 110 | 11 |

Table 2: A recasting of table 1 into DIF format, with tuples in place of rows, and vectors in place of columns.

If you don't know a baud from a floppy ... **YOU NEED TO KNOW THE QDP-100 MICROCOMPUTER**

Most people who need computers don't have the time, or desire, to become full-time computer "wizards."

With the budget-priced QDP-100 you get all the time-saving precision information you want from a computer, now and in the future, without all the unnecessary complexity associated with less considerate computers.

QDP-100 IS A FULL-SCALE 8-bit computer, readily upgradeable to 16 bits as your business or professional information-processing needs grow. It uses the IEEE S-100 bus, compatible with CP/M and MP/M disk operating systems.

QDP-100 HANDLES BOTH floppy disks and hard disks to give you total software versatility.

QDP-100 CONNECTS INSTANTLY to any standard terminal and printer. Both serial and parallel ports are available. Features most micro-computers can't match.

CP/M and MP/M are registered trademarks of Digital Research Corp.

It does more, does it easier, and costs a lot less.

QDP-100 HAS SINGLE BOARD SIMPLICITY. Eliminates the hassle of complex multi-chip, multi-board computers.

QDP-100 IS EASY to learn and to operate. Most owners use their QDP-100 with professional skill and results in short order. Our instruction manual doesn't need an interpreter.

If you'd rather be a wizard with computer results, than with computers, choose the QDP-100. Call or write for literature and full details.

QDP NEEDS A FEW MORE GOOD DEALERS. Attractive, profitable, protected dealerships are still available in several high-potential computer market areas.



Quasar Data Products

10330 Brecksville Road
Cleveland, Ohio 44141
216/526-0838 Telex: 241596



Thus, the form of the header item LABEL may be represented as:

```
LABEL
vector#,line#
"label"
```

In figure 1, vector 1 is the column labeled "YEAR," vector 2 is the column labeled "SALES," vector 3 is the column labeled "COST," and vector 4 is the column labeled "PROFIT." Each label requires only one line, and so the data value is given as 0 (it could also be 1).

The last DIF header item must be DATA. It signals to the program that all items following are data values. A program can be structured to ignore all header items until it finds the DATA header item, which has the form:

```
DATA
0,0
""
```

DIF Data Items

The form of data items differs from

that of header items. DIF organizes data by tuples. Within the tuples, values are arranged according to the order of the vectors.

Each data entry consists of three fields on two lines. The first line contains two numeric values, which are respectively the type indicator and the number value. The second line contains only one value, the string value. Together the type indicator, the number value, and the string value represent one DIF data value, in the following form:

```
type indicator, number value
string value
```

The type indicator, which must be an integer, can have one of three possible values. A type-indicator value of 0 means the data is numeric and is stored in the field immediately following the type indicator. A type-indicator value of 1 means the data is a string. For string data, the number-value field is ignored and the string value is stored on the second line of

the data item. Finally, a type-indicator value of -1 indicates a special data value. The number-value field is 0, and the string-value field may have one of two special values: BOT (beginning of tuple) or EOD (end of data). These are discussed further in the section on string-field values.

The Number Value. The number value may be signed (+ or -) and may contain a decimal point. One or more blanks may precede or follow the number value. If the data value contains an exponent of a power of ten, the value is followed by the letter "E" and the signed or unsigned exponent. The number value is the only place that DIF allows a noninteger value.

When the data value is numeric, the string-value field contains one of the values described in the following section.

The String Value. When the type-indicator is 1, the data is a string and contains no control characters and no quotation marks. If the string is a sim-

CALL TOLL FREE:
1-800-547-2492



apple 16k+ \$999
New RFI Version

48k+ \$1059
New RFI Version with Apple Memory

ATARI 400 (16k) \$329

800 (16k) \$719

Toll free number for order desk only. In Oregon and for service or warranties call (503) 479-4150. Bank wires, cashiers checks and bankcards accepted immediately. Allow 20 days for personal checks. MasterCard and VISA add 2%, sorry no C.O.D.'s. Add 3% (minimum \$4.00) for all U.P.S. shipments to cover freight, handling and insurance. \$100.00 minimum order (no sales tax). Prices subject to change without notice. NOTE: We are registered with the State of Oregon, have been in electronic sales and service for 5 years and are fully qualified for repair of any micro computer system. Three full-time certified technicians insure one-day turnaround on most Apple repairs. Hours: 9:00 to 5:00 Monday through Saturday.

"A Unique Combination of Quality Products, Competitive Prices, and Service"

APPLE HARDWARE

| | |
|-------------------------------|-------|
| DISK DRIVE w/3.5 CONTROLLER | \$489 |
| DISK DRIVE ONLY | \$419 |
| SILENTYPE PRINTER | |
| w/INTERFACE | \$309 |
| GRAPHICS TABLET | \$599 |
| APPLE SOFT OR INTEGER CARD | \$139 |
| PASCAL LANGUAGE CARD | \$349 |
| PARALLEL PRINTER CARD | \$129 |
| SERIAL PRINTER CARD | \$159 |
| CENTRONICS PRINTER CARD | \$139 |
| LOWER CASE ADAPTOR | \$39 |
| 16K RAM CARD (MICROSOFT) | \$159 |
| 2-80 CARD (MICROSOFT) | \$249 |
| MICROMODEM (HAYES) | \$269 |
| SMART MODEM (HAYES) | \$229 |
| MOUNTAIN CLOCK | \$249 |
| MOUNTAIN MUSIC SYSTEM | \$479 |
| MOUNTAIN A/D CONVERTER | \$299 |
| MOUNTAIN INTROL/X-18 CONTROL | \$179 |
| MOUNTAIN C.P.S. MULTIFUNCTION | \$199 |
| 18 KEYPAD (A.B.T.) | \$99 |
| SUP-R-TERM (80 COLO BY M&R) | \$269 |
| SUP-R-MOD (MODULATOR BY M&R) | \$19 |
| 16K MEMORY EXPANSION | \$29 |
| JOYSTICK (T.G. OR PROGRAMMA) | \$39 |
| 9" B&W MONITOR (SANYO) | \$145 |
| 9" B&W MONITOR (N.E.C.) | \$139 |
| 12" B&W MONITOR (SANYO) | \$189 |
| 12" GREEN MONITOR (SANYO) | \$229 |
| 12" B&W (N.E.C.) SPECIAL | \$169 |
| 13" COLOR MONITOR (SANYO) | \$385 |
| L.D.S. 445G PRINTER | \$689 |
| L.D.S. 466G PRINTER | \$799 |
| L.D.S. 566G PRINTER | \$999 |
| EPSON MX-70 | \$359 |
| EPSON MX-80 | \$459 |
| EPSON MX-80FT | \$559 |
| EPSON MX-100 | \$699 |
| EPSON CABLE & INTERFACE | \$69 |
| EPSON GRAFTRAX | \$59 |

ATARI HARDWARE

| | |
|--------------------------|-------|
| CX-2600 VIDEO GAME | \$149 |
| 418 PROGRAM RECORDER | \$64 |
| 818 DISK DRIVE | \$419 |
| 820 PRINTER | \$249 |
| 822 PRINTER | \$359 |
| 825 PRINTER | \$569 |
| 830 MODEM | \$149 |
| 858 INTERFACE MODULE | \$139 |
| 853 16K MEMORY EXPANSION | \$79 |

SOFTWARE

| | |
|-----------------------------|-------|
| VISICALC (ATARI) | \$139 |
| BASIC (ATARI) | \$49 |
| VISICALC | \$139 |
| VISIDEX | \$129 |
| VISIPLOT | \$119 |
| VISITERM | \$99 |
| VISITREND | \$169 |
| D.O.S. TOOL KIT | \$55 |
| D.O.S. 3.3 UPDATE | \$45 |
| MICROLAB DATA FACTORY | \$129 |
| D 8 MASTER (STONEWARE) | \$169 |
| APPLE WRITER | \$43 |
| SUP-R-TEXT II | \$99 |
| WORDSTAR | \$269 |
| B.P.I. FOSTWARE (each) | \$319 |
| GENERAL BUSINESS CONTROLLER | \$479 |
| SOFT-TECH PAYROLL | \$179 |
| STOCKPILE INVENTORY | \$299 |
| ADVENTURE | \$29 |
| ZORK | \$29 |
| SARGON CHESS | \$29 |
| GALAXIAN | \$22 |

CALL FOR OTHER HARDWARE AND SOFTWARE

WE WILL UNDERSELL



530 N.E. 'E' Street • Grants Pass, Ore. 97526

See us at Comdex '81 in Las Vegas, Booth #774.

The BOS M System: The Universal Donor

Type "O" Positive

The BOS M Card is the heart of the M System. It is designed to be IEEE S-100 bus compatible for universal system use. Virtually all elements of a computer mainframe now reside on one S-100 card — Z-80A CPU, 64k of 200ns RAM (no wait states), 4k 250ns EPROM, Winchester Disk I/O port, two RS-232 serial ports, system port, floating point processor, and parallel I/O. The same M Card can be used in single-user, multi-user, or even multi-processor systems.

Second Generation Multi-Processor. With the BOS M Card, multi-processing is finally free of the Master/Slave and hand-shaking parameters so prevalent in first generation multiprocessors. Inter-system communications are FIFO buffered; the old "Master" is now a slave to the user, and the system functions without "S-100 bus overrun" or system generated wait states.

The Universal Processor is now a reality! As a single-user system, the BOS M is unmatched in performance (up to ten times the speed of other microcomputers). As a multi-user system, this power can be translated into a low cost multi-terminal capability. As a multi-processor, the system leaves the realm of "microcomputer" and competes in performance with a minicomputer! You can start with a single-user computer and expand to a multi-user/multi-processor computer system when needed.



The Universal Product. BOS has what you need — anything from a single M Card to a complete turnkey computer system. Diskette, rigid disk, tape and telecommunications sub-systems are all available. Compatible software includes CP/M, MP/M*, CP/NET*, BOS/TURBODOS, complete monitor, languages, application packages, and more!*

Dealer and OEM Inquiries Welcome

BOS

Business Operating Systems, Inc.
2835 East Platte Avenue
Colorado Springs, Colorado 80909
In Colorado Call: (303) 634-1541
Toll Free Number: 1-800-525-3898

The BOS M System does what a Universal Donor must do — it provides high performance for all system types; single-user, multi-user, and multi-processor. M Systems start at less than \$5,000.00 for a single-user computer with dual 8" double density diskette drives.

ALTOS BUSINESS C



**Now—A four station,
hard disk business computer
with letter quality printer,
terminals and get-rolling
software for less
than \$15 a day.***

Introducing the Altos Business Computer Special. The most powerful, reliable, easy-to-use system in its price range. And Altos now offers on-site, nationwide service.

The hardworking engine of our system is the Altos ACS8000-10 computer. It can cost-effectively hook-up with from one to four stations, as your needs demand. Its rapid access, 10 MByte Winchester hard disk is capable of storing a 3,000 page load.

*Price approximate and may vary in your area. Daily lease based on: \$17,000 principal, 20% annual interest, 5-year term. Includes: Altos ACS8000-10 computer, letter quality printer, four precision terminals and get-rolling software. Does not include tax, installation, training and maintenance.

COMPUTER SPECIAL



Our get rolling business software package includes multi-user systems software, Wordstar™ for word processing and Microplan™ for business analysis. And when you need more, your local Altos representative can route you through to hundreds of other business and accounting programs, to meet virtually any requirement. Plus Altos also lets you communicate with other computers, mainframes, and even allows networking.

Get on the right track! Join thousands of professionals, institutions and businesses who rely on Altos computer systems. Call our toll free number or write today for the Altos sales and service depot nearest you.
All aboard!

Wordstar is a trademark of MicroPro International Corp.
Microplan is a trademark of Chang Laboratories, Inc.
© 1981 Altos Computer Systems

**Packed with
fresh ideas
for business**

ALTOS
COMPUTER SYSTEMS

2360 Bering Drive
San Jose, California 95131

800-538-7872
(In Calif. 800-662-6265)

See Us At ComDEX Booth 204

ple word, it may be entered directly on the line. If the string contains blanks or special characters, then the string must be enclosed in quotation marks. If the string is null, the string-value field contains quotation marks with no space between them.

When data is numeric, the string value is one of the following uppercase, unquoted words:

- V: indicates a numeric value.
- NA: not available. Indicates that the value marked is not available; the number value is 0.
- ERROR: the result of an invalid calculation; the number value is 0.
- TRUE: the logical value; the number value is 1.
- FALSE: the logical value; the number value is 0.

Special Data Values. If the type-indicator field is -1, then the data is one of two special data values, BOT or EOD. BOT flags the beginning of a tuple, and EOD flags the end of the last tuple in the file.

Sample Programs Using DIF

Listings 1 and 2 are BASIC programs that illustrate the use of DIF. Listing 3 is a Pascal program that shows a Pascal procedure to use a DIF file.

A teacher has written the program in listing 1 to create a DIF file that contains the names and tests scores of students. Because it is heavily commented, the program should not be difficult to follow. It prompts the teacher to enter a file name, the number of students, and the number

of test scores for the students. The program organizes the data into one tuple for each student; a tuple consists of one string value for the student name and one numeric value for each test score. The number of vectors is one more than the number of test scores per student; the extra vector is for the student's name.

For example, if three test scores are entered for a student, there are four vectors, and a typical tuple might contain the following information:

```
Stephenson
75
82
60
```

This program enters student records into a file by prompting the

Text continued on page 206

Listing 1: A BASIC program that uses DIF. This program prompts the user for a student's name and test scores and then copies the information into a DIF file.

```
100 REM - THIS PROGRAM CREATES A DIF FILE CONTAINING THE
110 REM - NAME AND TEST SCORES OF A GIVEN NUMBER OF STUDENTS.
120 REM - IT PROMPTS FOR A FILE NAME, THE TOTAL NUMBER OF
130 REM - STUDENTS, AND THE NUMBER OF TEST SCORES FOR
140 REM - EACH STUDENT. IT THEN PROMPTS FOR A STUDENT'S
150 REM - NAME AND TEST SCORES, AND WRITES THEM TO THE
160 REM - FILE AS A TUPLE.

1000 PRINT "OUTPUT FILE NAME:"; :REM - GET FILE NAME.
1010 INPUT F$
1020 OPEN "O",1,F$ :REM - OPEN FILE FOR OUTPUT.
1030 PRINT "NUMBER OF STUDENTS:";
1035 :REM - PROMPT FOR NUMBER OF
1040 INPUT NT :REM - TUPLES.
1050 PRINT "NUMBER OF TEST SCORES PER STUDENT:";
1060 INPUT NV :REM - NUMBER OF VECTORS IS
1070 NV = NV + 1 :REM - NUMBER OF SCORES + 1.
1080 GOSUB 3000 :REM - USE SUBROUTINE TO
1090 :REM - OUTPUT DIF HEADER.
2000 FOR I = 1 TO NT :REM - OUTPUT A TUPLE FOR
```

Listing 1 continued on page 188



Remember the \$500 pocket calculator?

The same thing just happened to computer software.

Everyone remembers when pocket calculators first came out. They were so impressive and futuristic, people were happy to pay \$500 for one. But it didn't take the electronics industry long to offer a smaller, more fully-featured calculator for only \$25.

Demand and Supply.

As more and more individuals and businesses turn to small computers for their various needs, the small computer industry will turn out more and more computer software. This increased volume naturally lowers the cost per unit. And the rapid growth of the CP/M[®] compatible computers has meant even greater sales volume for these popular and valuable software packages.

Here is what All Systems offers:

Wordstar 3.0[®] \$199

Quite simply, the best word processing program for the small computer. Price shown is for the Apple system, \$249 for all others.

SuperCalc[™] \$199

The state of the art in electronic worksheet programs, with features and enhancements that previous programs just did not have.

*VisAccount[™] \$199

The greatest software buy in the country. It is a fully-integrated accounting package with a General Ledger, Accounts Receivable/Order Entry, Accounts Payable/Purchase Order, Payroll, Inventory, Fixed Assets, and even a Mailing List program—all for one price.

*Data Manager \$199

A powerful and professional data base management program that's wonderfully simple to operate. Features include: data base building, lists, comparative analysis (by generating history & performance reports), various file maintenance, fast assembly language (sort/merge), fast data retrieval, record selection, report writing and forms handling.

*Both VisAccount and Data Manager come with a 45-day conditional money back guarantee. We know of no other software company with the confidence to provide a similar guarantee.

All Systems offers these programs for the following computers:

| | |
|--------------------------------|--------------|
| Apple II | Heath/Zenith |
| Radio Shack Models I, II & III | Superbrain |
| Osborne I | North Star |
| Hewlett Packard 125 | IBM |

Most CP/M Compatible Computers

How To Order

To find the dealer nearest you, or to order, call toll free

800-221-2486[†]

In New York or for further information, call 212-685-0090. You may use your **Visa, MasterCard, American Express**, or (for an additional charge) order C.O.D. Or you may send a check or money order to:



All Systems

332 East 30th St., New York, N.Y. 10016

SuperCalc is a trademark of Sorcim. Inc
*24 hours, 7 days a week.

CP/M is a registered trademark of Digital Research. Wordstar is a registered trademark of Micro Pro International.
VisAccount is a trademark of CSCA. All Systems is a division of Computer Services Corporation of America.

Listing 1 continued:

```
2010                                :REM -   EACH STUDENT.
2020  T = -1: V = 0: S$ = "BOT"
2025                                :REM - OUTPUT BOT SPECIAL
2030  GOSUB 4000                    :REM -   DATA VALUE.
2040  PRINT "NAME OF STUDENT #";I;
2050  INPUT S$                      :REM - GET NAME OF THIS STUDENT.
2060  T = 1: V = 0                  :REM - OUTPUT AS STRING DATA
2070  GOSUB 4000                    :REM -   VALUE.
2080  FOR J = 1 TO NV-1             :REM - PROCESS EACH SCORE.
2090      PRINT "SCORE #";J;
2100      INPUT V                   :REM - GET SCORE.
2110      T = 0: S$ = "V"          :REM - OUTPUT SCORE AS A DATA
2120      GOSUB 4000                :REM -   VALUE.
2130  NEXT J
2140 NEXT I
2150 T = -1: V = 0: S$ = "EOD"     :REM - OUTPUT EOD SPECIAL DATA
2160 GOSUB 4000                    :REM -   VALUE.
2170 CLOSE 1                       :REM - CLOSE THE OUTPUT FILE.
2180 STOP                           :REM - DONE.

3000                                :REM - ROUTINE TO OUTPUT HEADER.
3010 PRINT#1,"TABLE":PRINT#1,"0,1":GOSUB 3500
3020 PRINT#1,"TUPLES":PRINT#1,"0,";NT:GOSUB 3500
3030 PRINT#1,"VECTORS":PRINT#1,"0,";NV:GOSUB 3500
3040 PRINT#1,"DATA":PRINT#1,"0,0":GOSUB 3500

3050 RETURN
3500                                :REM - ROUTINE TO OUTPUT A
3510                                :REM -   NULL STRING ("").
3520 PRINT#1,CHR$(34);CHR$(34)     :REM - PRINT 2 QUOTATION MARKS.
3530 RETURN

4000                                :REM - ROUTINE TO OUTPUT A DATA
4010                                :REM -   VALUE.  T IS THE TYPE
4020                                :REM -   INDICATOR, V IS THE
```

Listing 1 continued on page 190

Small, Dark and Handsome

RHINO XR-1

HIGH-TECH ROBOT ■ FOR EDUCATION, RESEARCH & INDUSTRY

The Rhino[®] XR-1 high tech robot, though small in size, is built with the same operating technology as large industrial robots. And it features an RS232C interface (using 3 wires) making it compatible with the programming capabilities of any computer from the small PET[®], Apple II[®], or TRS-80[®] to the big IBM's. The Rhino[®] XR-1 is available for immediate delivery. Write for more information on your company letterhead to the address below.

Features:

- Digital Choppers on All Axes
- Powerful DC Servo Gear Motors
- Controller Card with Intel 8748 CPU
- Eight Motor Control Capability (Rhino[®] XR-1 has 6 motors)
- Operators Manual and Tool Kit
- Rigid 1/4" Aluminum Space Frame Construction
- "Built-In" Functional Self-Test Program

Options:

- Custom Hand
- Computer Controlled Carousel, Conveyor, or Lateral Slide Base

Specs:

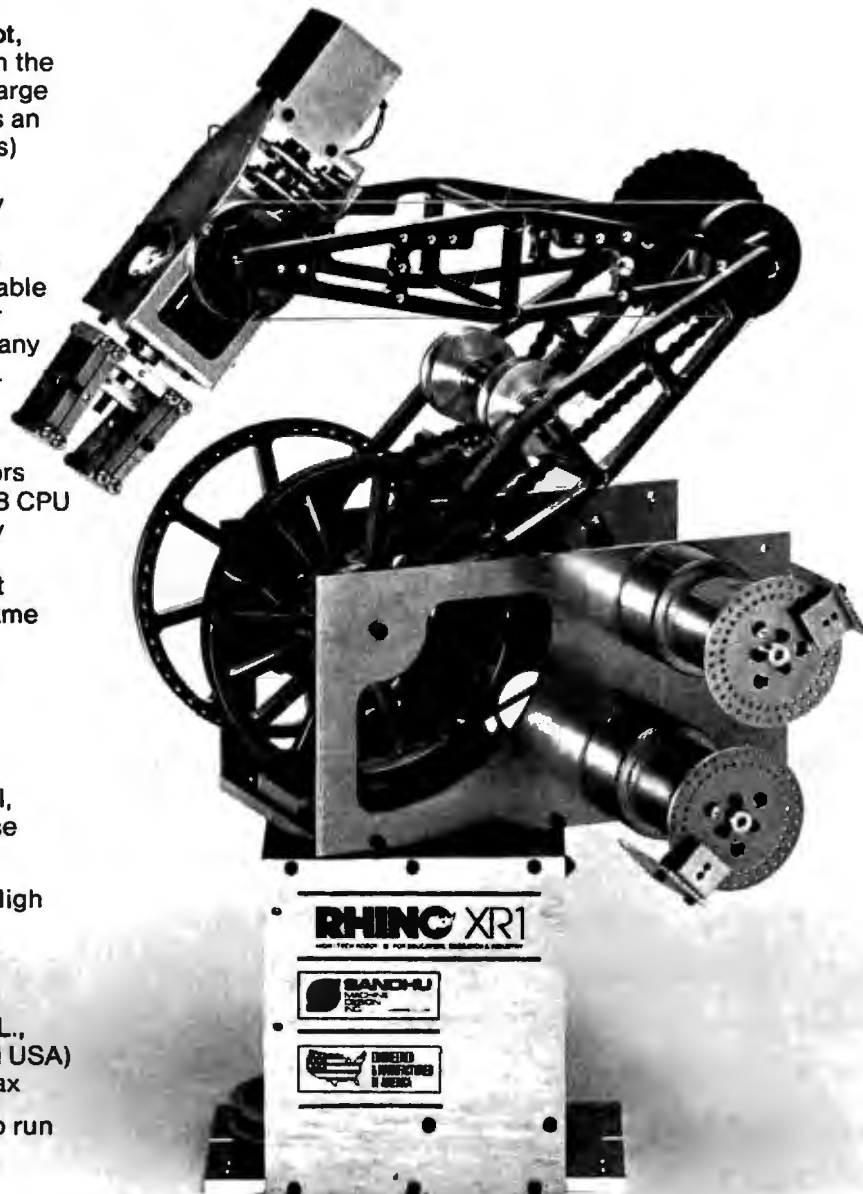
- Reach: 22.5" Maximum, 32" High
- Grasp: 2 lbs. — open 3"
- Lift: 2 lbs. at extension

Price:

- \$2,400.00 (F.O.B. Champaign, IL., delivered via UPS in Continental USA)
- Illinois residents add 5% sales tax

Includes everything you need to run your Rhino[®] XR-1 (Except your computer)

We reserve the right to alter price and specifications without notice.



Sandhu Machine Design, Inc. Sales Dept.
308 S. State, Champaign, IL. 61820
(217) 352-8485

Listing 1 continued:

```
4030             :REM -   NUMBER VALUE, AND S$
4040             :REM -   IS THE STRING VALUE.
4050 PRINT#1,T;" ";V
4060 PRINT#1,S$
4070 RETURN
5000 END
```

Listing 2: A BASIC program whose input is the DIF file created by the program in listing 1. This program calculates an average test score and a letter grade for each student.

```
100  :REM - THIS PROGRAM READS A DIF FILE CONTAINING THE
110  :REM - TEST SCORES OF A GROUP OF STUDENTS, CALCULATES
120  :REM - AN AVERAGE SCORE FOR EACH STUDENT, MATCHES THE
130  :REM - AVERAGE TO A LETTER GRADE, AND PRINTS THE
140  :REM - STUDENT'S NAME, AVERAGE, AND LETTER GRADE.

500 DIM T(100)      :REM - MAXIMUM OF 100 VECTORS.
510 DIM V(100)      :REM - T IS THE TYPE INDICATOR, V IS
520 DIM V$ (100)    :REM -   THE NUMBER VALUE, AND V$ IS
530                 :REM -   THE STRING VALUE OF EACH DATA
535                 :REM -   VALUE.
540 GOSUB 5000      :REM - INITIALIZATION SUBROUTINE.
550 GOSUB 6000      :REM - SUBROUTINE TO READ HEADER.
560 FOR I = 1 TO NT :REM - FOR EACH TUPLE,
570   GOSUB 7000     :REM -   GET ALL VECTOR ELEMENTS IN
575                 :REM -   TUPLE.
580   M=0           :REM -   M IS THE SUM OF THE SCORES.
590   FOR J = 1 TO NV :REM -   FOR EACH VECTOR VALUE,
600     IF T(J)=1 THEN PRINT V$(J) :REM - PRINT NAME.
610     IF T(J)=0 THEN M = M+V(J)  :REM - ADD SCORES.
620   NEXT J
630   M = M/(NV-1) : PRINT M :REM - PRINT STUDENT'S AVERAGE
640   IF M<=50 THEN PRINT "THIS STUDENT'S FINAL GRADE IS F"
650   IF M<=70 AND M>50 THEN PRINT "THIS STUDENT'S FINAL GRADE IS D"
660   IF M<=85 AND M>70 THEN PRINT "THIS STUDENT'S FINAL GRADE IS C"
670   IF M<=94 AND M>85 THEN PRINT "THIS STUDENT'S FINAL GRADE IS B"
```

Listing 2 continued on page 192

Cameo Makes Your Micro Big Enough for Big Business



When you want a data base for your micro that will grow as fast as you do — look to Cameo. Whether your business is commercial, educational or institutional — for large inventories, massive mail lists, extensive accounts receivable and effective cash management — Cameo has the system to meet your needs.

Cameo's Cartridge Disk Subsystem provides reliable mass storage for most popular micros*. The Cameo subsystem gives you up to 100 times the storage capacity of floppies, while retaining the same flexibility that floppy media provide. With Cameo's system you can remove, copy and back-up massive amounts of data quickly and easily. And, byte-for-byte, cartridge disk mass storage is more economical than floppy disks. Even today's new technologies cannot give you the reliability, flexibility and back-up capability that Cameo provides.

Installation and start-up is simple. Cameo's subsystem is compatible with most operating systems, eliminating the need for additional complex programming. Make Cameo your micro mass storage connection. Call today for the location of the dealer nearest you.

*Apple, TRS-80 Model I & II, Heath H89 and most S-100's

Cameo Electronics, Inc.
1626 Clementine Street
Anaheim, CA 92802
(714) 535-1682

European Distributor
Cameo Electronic Vertriebs-GmbH
Escherstrasse 3, D-8121 Eberfing
West Germany
Tel: 8802-8363 TELEX: 59903



CAMEO
Sculptured Brilliance
in Mass Storage

Listing 2 continued:

```
680 IF M>94 THEN PRINT "THIS STUDENT'S FINAL GRADE IS A"
690 NEXT I
700 CLOSE 2
710 PRINT "FINISHED CALCULATING GRADES"
720 STOP

5000 :REM - INITIALIZATION CODE.
5010 PRINT "FILE NAME";
5020 INPUT F$
5030 OPEN "I",2,F$ :REM - OPEN FILE FOR INPUT.
5040 NV = 0 :REM - INITIAL VECTOR COUNT.
5050 NT = 0 :REM - INITIAL TUPLE COUNT.
5060 RETURN

6000 :REM - READ HEADER. GET NUMBER OF VECTORS AND TUPLES.
6010 INPUT#2,T$ :REM - GET TOPIC.
6020 INPUT#2,S,N :REM - GET VECTOR NUMBER AND VALUE.
6030 INPUT#2,S$ :REM - GET STRING VALUE.
6040 IF T$="VECTORS" THEN 6500:REM - CHECK FOR KNOWN HEADER
6050 IF T$="TUPLES" THEN 6600 :REM - ITEMS.
6060 IF T$="DATA" THEN RETURN
6065 :REM - "DATA" ENDS HEADER.
6070 GOTO 6010 :REM - IGNORE UNKNOWN ITEMS.
6500 NV = N :REM - NUMBER OF VECTORS.
6510 IF NV<=100 THEN 6010 :REM - CHECK FOR 100 OR LESS VECTORS.
6520 PRINT "TOO MANY VECTORS. PROGRAM CAPACITY 100 VECTORS."
6530 CLOSE 2
6540 STOP

6600 NT = N :REM - NUMBER OF TUPLES.
6610 GOTO 6010 :REM - GET NEXT HEADER ITEM.

7000 :REM - SUBROUTINE TO GET ALL VECTOR ELEMENTS IN A TUPLE.
7010 GOSUB 8000 :REM - GET NEXT DATA VALUE.
7020 IF T1<>-1 THEN 9000 :REM - MUST BE BOT, ELSE ERROR
7030 IF S$<>"BOT" THEN 9000
```

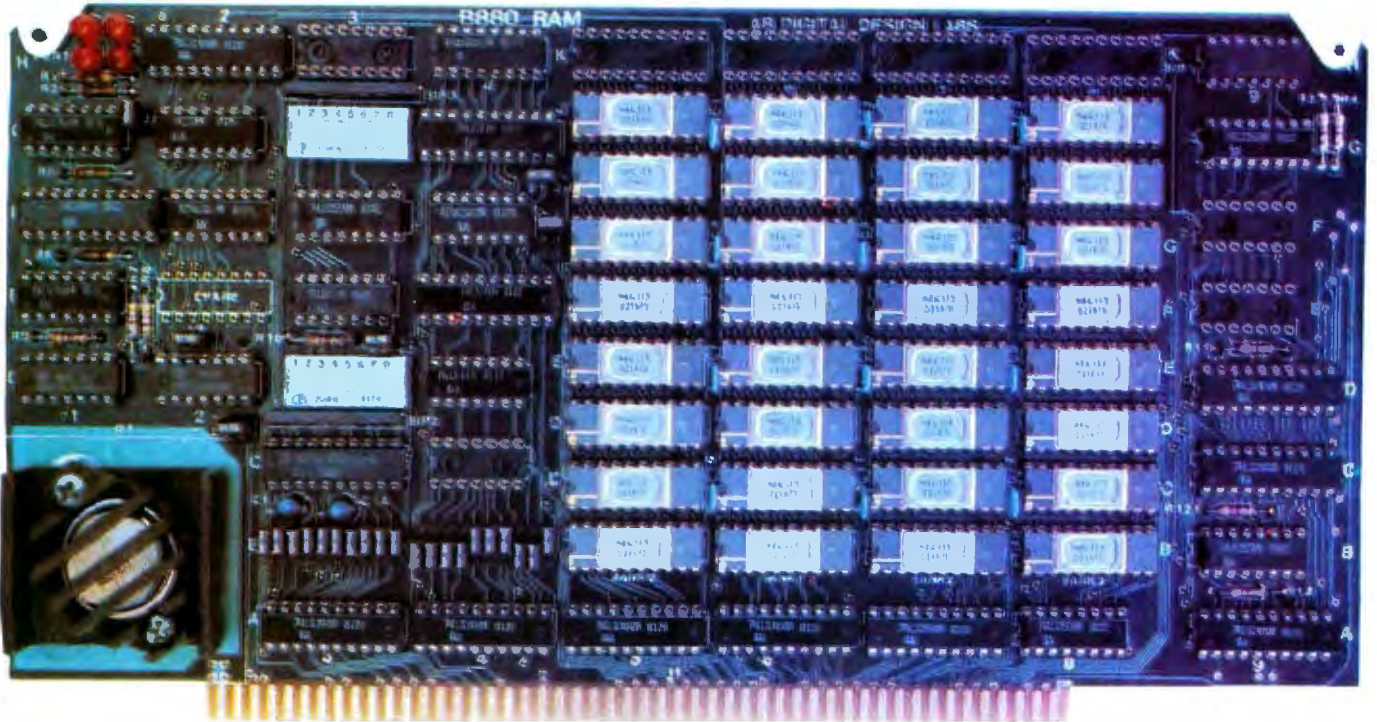
Listing 2 continued on page 194

NEW

THE B880 RAM

engineered for excellence

64K Byte/32K Word Fast Static Memory



FEATURES • Byte or Word Width Operation • Extended Addressing or Port Select • 100 ns Access and Cycle Time (Maximum) • Low Power Consumption • IEEE 696 Standard • Four Layer Board • Byte Parity Option

\$995. **Introductory Price valid for Purchase Orders placed on or before Nov. 30, 1981. Assembled and Tested with 1 Year Warranty. (For Byte Parity Option, add \$100.)**

The B880 RAM represents one of the best solutions for applications requiring a very high speed static memory card of compact design and remarkably low cost. Suitable for a wide range of commercial applications, the B880 RAM is form, fit and functionally compatible with the IEEE 696 (S-100) bus standard. It automatically provides byte or word width access using the *sXTRQ signal. An exclusive ultra high speed bipolar memory mapping PROM allows the B880 RAM to be used with any current or future bank select scheme. The B880 RAM works with all S100 processors, and features a four layer board with full ground and power planes for noiseless operation. Use of the new JEDEC-standard 20 pin slimline 16K Static RAM chips has given us enough board real estate to offer a very wide variety of options, making the B880 RAM a truly universal S-100 memory card.

Available through California Digital (for orders only, call toll-free 800-421-5041) and other fine distributors, or direct. Specification sheets on request. Manuals may be purchased separately for \$25.00 refundable on order.

AB DIGITAL DESIGN LABS designs and manufactures computer products that provide technological leadership and industrial-grade quality combined with unexcelled performance. AB DIGITAL was first in the industry to offer a 256K Dynamic Memory (the B810 A and B810 B RAM cards). Our B880 RAM is far superior to any other 64K Static Memory available. All AB DIGITAL products are manufactured to higher quality standards than any other computer product on the industry. No "surplus" components will ever be used on an AB DIGITAL card. All AB DIGITAL boards feature full interior ground and power planes in a multilayer board to eliminate noise and radiation. OEMs and distributors wishing to handle our line are invited to phone J. Hill, Sales.



DIGITAL DESIGN LABS

109 Cuyama Road Shell Beach, CA 93449

(805) 773-1731

Listing 2 continued:

```
7040 FOR K = 1 TO NV :REM - GET EACH DATA VALUE.
7050     GOSUB 8000
7060     IF T1>1 THEN 9000
7070     T(K) = T1     :REM - SAVE TYPE INDICATOR.
7080     V(K) = V1     :REM - SAVE NUMBER VALUE.
7090     V$(K) = S$    :REM - SAVE STRING VALUE.
7100     NEXT K
7110 RETURN

8000     :REM - SUBROUTINE TO GET NEXT DATA VALUE.
8010 INPUT#2,T1,V1     :REM - GET TYPE INDICATOR, NUMERIC
8020 INPUT#2,S$        :REM - VALUE, AND STRING VALUE.
8030 RETURN

9000     :REM - ERROR ROUTINE
9010 PRINT "ERROR IN FILE FORMAT"
9020 CLOSE 2          :REM - END PROGRAM
9030 STOP
9040 END
```

Listing 3: A Pascal program that reads data from a DIF file into an array and then displays the data on the terminal. The variant of Pascal used is Apple Pascal 1.1.

```
{ This is a simple program which reads DIF file data into an array and
  displays the results on the terminal. It makes use of a procedure
  called "get_dif_array" which handles only numeric data. It is written
  for Apple Pascal 1.1 and may require modification to run on other systems. }
```

```
program dif_read;
```

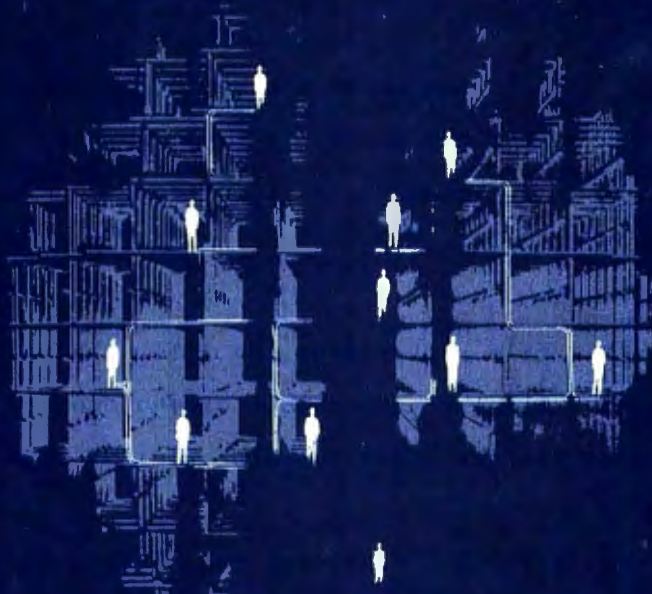
```
const
```

```
    max_vector = 10;           { maximum number of vectors }
    max_tuple  = 10;           { maximum number of tuples }
```

```
type
```

```
    vector_index = 0..max_vector;
```

Listing 3 continued on page 196



NESTAR

Linking People & Information Through Personal Computers

Nestar Systems combines the technology of local networking with the sophistication of our system software to bring you a personal computer system which delivers maximum benefits at minimum cost. Word processing. Financial planning. Data entry. Distributed data processing. All this is possible with Nestar's Cluster/One personal computer systems and it is all available

today. When you're ready taking a package off the

Call or write us today
Cluster/One personal computer
2585 East Bayshore Road
(415) 493-2223 TELEEX: 1

Electronic mail, it's as easy as

Information about Nestar's
services. Nestar Systems, Inc.
Irvine, California 92714
1-800-333-3266
NESTAR PLANS

See us at COMDEX 81 in Las Vegas Booth 1568

Listing 3 continued:

```
tuple_index = 0..max_tuple;
dif_array   = array[1..max_vector, 1..max_tuple] of real;

var
  in_file      : text;           num_vectors : vector_index;
  fname       : string[15];     num_tuples  : tuple_index;
  matrix      : dif_array;      code, i, j  : integer;

{ "Get_dif_array" reads a DIF file and returns the file data (currently
  only numeric) in an array. Also returns number of vectors and tuples
  -- these must be specified in file header -- and an error code. }

procedure get_dif_array (var dif_file: text; var real_array: dif_array;
                        var nvectors: vector_index; var ntuples: tuple_index;
                        var return_code: integer);

const
                                { currently defined data types }
  special = -1; numeric = 0; char_string = 1; other = 2;

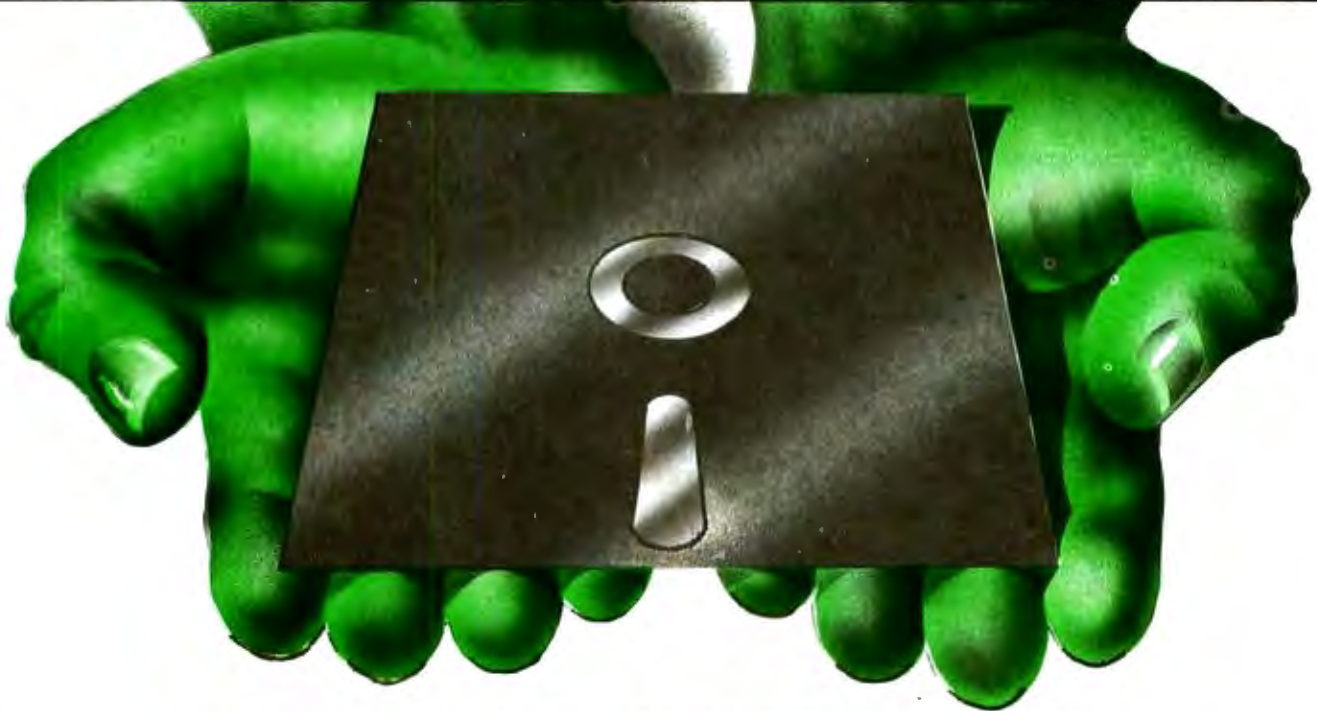
type
  header_item = record
    topic      : string;
    vector_num : vector_index;
    value      : integer;
    string_value : string
  end;

  data_value = record
    kind      : -1..2; { currently defined data types }
    number_value : real;
    string_value : string
  end;

var
  hdr_item      : header_item;
```

Listing 3 continued on page 198

You may be holding the most important **Software** you could ever own... in the Palm of Your Hands



TITLE: "THE PROGRAM WRITER/REPORTER"™

Enables ANYONE to write complete, running, debugged BASIC LANGUAGE Programs in 35 to 40 minutes with NO PRIOR PROGRAMMING KNOWLEDGE OR ABILITY.

IF you are one of the many who bought a microcomputer in the belief that with just a little studying you could write your own programs, you now know that you can't.

IF you, as a businessman, thought you could have stock software modified at a reasonable cost with reasonable results, you know that's not possible either.

IF you are a hobbyist getting tired of the untold hours it takes to write a program, only to find it takes more hours to debug than to write.

IF you are a skilled programmer you don't have to be reminded of the repetitious time spent on each new application.

IF you have left your micro-computer sitting somewhere gathering dust... meet THE PROGRAM WRITER/REPORTER'.

THE PROGRAM WRITER/REPORTER' is not just another data base generator. THE PROGRAM WRITER/REPORTER', at your direction, makes complete running programs that are thoroughly documented, easy to modify at any time by YOU!

THE PROGRAM WRITER/REPORTER' cuts programming time up to 90% for a skilled programmer.

THE PROGRAM WRITER/REPORTER' will make anyone a skilled programmer in 30 to 35 minutes!

THE PROGRAM WRITER/REPORTER' does the work! You can answer the simple direct questions and THE PROGRAM WRITER/REPORTER' CREATES... AND ALL IN BASIC LANGUAGE.

Q. After THE PROGRAM WRITER/REPORTER' has produced a program, can it be modified?

A. Yes, the resulting program is modular, fully documented and readily accessible for alterations or deletions.

Q. Does the program created use so much disc space that there is very little space left for the record storage?

A. No, the code produced is extremely compact despite complete documentation. If requested THE PROGRAM WRITER/REPORTER' will even "pack" or compress information. You may even delete the "remarks" making it even more space efficient.

Q. Must I be expert or even conversant with Basic Language?

A. No, all questions to and answers from the operator require no computer language knowledge, simple every day English will do.

Q. What about math ability?

A. If you can count your fingers and toes, you'll have no problems.

Q. Will the programs which I produce with THE PROGRAM WRITER/REPORTER' be bulky, slow or amateurish?

A. No, the resulting programs will be sophisticated and extremely fast operating. For example, should you create a mailing list or inventory program, the time for any record to be retrieved and displayed from a full disc would take a maximum of 1 second.

Q. Must the programs produced conform to a pre-determined format and file length?

A. No, you determine format and file size to fit your requirements. You may have as many as 22 fields or as few as 1.

Q. Can I develop my own business programs?

A. For the most part, yes.

Q. What are the limitations? What programs can I produce with THE PROGRAM WRITER/REPORTER'?

A. Your own ingenuity and hardware limitations. 100's of different programs.

TECHNICAL ASPECTS

The Reporter Package - makes reports your way.

Record access by a hashing algorithm guaranteeing fast record retrieval.

Duplicate keys permitted.

Record deletion automatically supported.

Record access and file maintenance is user transparent.

Minimal disc overhead since there is no special assembly language routine called. No "Basic" overhead.

Programs produced can be transported between 6800, 6502, 8080, Z80, 8085, 8086 and Z8000 based systems.

Can be used with Micro-Soft Basic and CP/M systems.

Complete file maintenance including up-date of any record in any field, delete and add new records even with duplicate key.



VANLOVES

800-255-5119

Vital
Information Inc. 7899 Mastin Dr. Overland Park KS 66204

Listing 3 continued:

```
data_val      : data_value;
tuple, vector : integer;
```

{ "Read_integer" reads an integer terminated with a comma. The routine is required because this Pascal dialect's "read" procedure recognizes only <space>, eoln and eof as delimiters of integer values. }

```
procedure read_integer (var number: integer);
```

```
var
```

```
    sign, magnitude : integer;
```

```
    ch : char;
```

```
begin
```

```
    sign := 1; magnitude := 0;           { initialize }
```

```
    read (difile, ch);                   { get 1st character }
```

```
    while ch <> ',' do                     { comma is delimiter }
```

```
        begin
```

```
            case ch of
```

```
                '-' : sign := -1;
```

```
                '0', '1', '2', '3', '4', '5', '6', '7', '8', '9'
```

```
                : magnitude := magnitude * 10 + ord(ch) - ord('0')
```

```
            end; { case }
```

```
            read (difile, ch)             { get next character }
```

```
        end;
```

```
        number := sign * magnitude       { return result }
```

```
end; { read_integer }
```

{ "Read_string" deletes leading and trailing blanks and strips the quotes from quoted strings. }

```
procedure read_string (var str: string);
```

```
begin
```

```
    readln (difile, str);
```

```
    while str[1] = ' ' do                  { leading blanks }
```

```
        delete (str, 1, 1);
```

```
    if str[1] = '"'                        { strip quotes }
```


No business is too **NORTH STAR** small for a



The economical business computer that does it all.

Bookkeeping. Mailing Lists. Word processing. Running your business is a lot more complex than running a lemonade stand. But it doesn't have to be. Sure, you may already know you could use a computer. But did you know that the North Star HORIZON® can do the job better than many bigger computers? For much less money?

The North Star HORIZON is easy to install and operate. As you grow, add programs, work stations, and memory. Today, more than 22,000 HORIZONS are in operation worldwide.

HORIZON is a registered trademark of North Star Computers, Inc.

And our sales and service support is there to help you.

So look at the HORIZON before you buy a computer. You owe it to yourself. And to your business.

For the dealer in your area, call toll-free (800) 447-4700.

In Illinois (800) 322-4400.

In Alaska and Hawaii (800) 447-0890. Or write

North Star Computers, Inc.,
14440 Catalina Street,
San Leandro, CA 94577.

Phone (415) 357-8500.

TWX/Telex (910) 366-7001.



FOLLOW THE STAR

NorthStar 

Circle 307 on inquiry card.

Listing 3 continued:

```
        then begin
            delete (str, 1, 1);
            delete (str, pos("^", str), length(str) - pos("^", str) + 1)
        end
    else if pos(" ", str) > 0 { trailing blanks }
        then delete (str, pos(" ", str), length(str) - pos(" ", str) + 1)
    end; { read_string }

procedure read_header_item (var item: header_item);
begin
    read_string (item.topic); { get topic }
    read_integer (item.vector_num); { get vector number }
    readln (difile, item.value); { get value }
    read_string (item.string_value) { get string value }
end; { read_header_item }

procedure read_data_value (var value: data_value);
begin
    read_integer (value.kind); { get data type }
    readln (difile, value.number_value); { get number value }
    read_string (value.string_value) { get string value }
end; { read_data_value }

begin { get_dif_array }
    return_code := 0; { assume no problems }
    nvectors := 0; ntuples := 0; { initialize }
    repeat { read header }
        read_header_item (hdr_item);
        if hdr_item.topic = 'VECTORS'
            then nvectors := hdr_item.value { vector count }
        else if hdr_item.topic = 'TUPLES'
            then ntuples := hdr_item.value { tuple count }
    until hdr_item.topic = 'DATA';

    if (nvectors = 0) or (ntuples = 0) { check counts }
```

Osborne Welcomes You to the World of Microcomputers

INTRODUCTORY BOOKS

Business System Buyer's Guide
by Adam Osborne and Steven Cook
Purchasing a computer for any business is a complex process, but this book will help. Before you buy any computer, read this book. You'll never make a better investment.
#47-0, \$7.95 □

Introduction to Microcomputers
Volume 0: The Beginner's Book
by Adam Osborne
Here's the book to start with if you know nothing about microcomputers but wish to learn. Provides the concepts you'll need to understand this technology.
#26-8, \$7.95 □

An Introduction to Microcomputers
Volume I: Basic Concepts
by Adam Osborne
The world's best selling textbook on microcomputers uses concepts that are common to all microprocessor systems. Shows what a microcomputer can do, and how it does what it does. This edition is the most comprehensive and up-to-date introduction to microprocessor systems available anywhere.
#34-9, \$12.99 □

Running Wild-
The Next Industrial Revolution
by Adam Osborne
An insider's look at the microelectronics revolution. Will the coming years prove to be a dream or a nightmare? Running Wild tells the story.
#28-4, \$3.95 □

GUIDES

Apple II™ User's Guide
by Lon Poole, Martin McNiff and Steven Cook
Complements your Apple II owners manual. Our guide will tell you more about your Apple II or Apple II plus computer than any other single source. It covers all the special features of the Apple computer.
#46-2, \$15.00 □

PET/CBM™ Personal Computer Guide
by Adam Osborne and Carroll Donahue
A step-by-step guide which takes you from the "on" switch to assembly language subroutines for your Commodore system. It's a BASIC tutorial and covers many recent CBM products.
#55-1, \$15.00 □

PROGRAMMING BOOKS

Science and Engineering BASIC Programs
ed. by John Heilborn
An important collection of the most valuable programs for scientists and engineers. Easily used on most popular microcomputers #63-2, \$15.99 □

Some Common BASIC Programs
by Lon Poole and Mary Borchers
76 well designed and brilliantly documented programs that solve a variety of problems in statistics, finance, and math.

Generalized BASIC Edition
#06-3, \$14.99 □

PET/CBM™ Edition #40-3, \$14.99 □

TRS-80™ Level II Edition #54-3, \$14.99 □

Atari™ Edition #53-5, \$14.99 □

All 76 programs ready to run on:
PET/CBM™ floppy disk #33-0, \$22.50 □

PET/CBM™ cassette #25-X, \$15.00 □

TRS-80™ Level II cassette #32-2, \$15.00 □

Practical BASIC Programs
Here are 40 useful and fully documented programs designed to run on most microcomputers. Especially useful in small business and household applications. (Generalized BASIC).
#38-1, \$15.99 □

NEW

Osborne CP/M™ User Guide
by Thom Hogan
The most complete and up-to-date CP/M book you can find. It will make your first use of CP/M easy. If you already own CP/M, it will help you modify your system. #44-6, \$12.99 □

NEW

CBASIC™ User's Guide
by Adam Osborne, Gordon Eubanks and Martin McNiff
Co-authored by Gordon Eubanks, the creator of CBASIC, this is more than a self-teaching textbook, it is the definitive reference of the CBASIC language.
#61-6, \$15.00 □

BUSINESS BOOKS

by Lon Poole and co-authors
Osborne's three business systems are renowned for excellence in design and documentation. Our books explain in detail how to use the programs. They contain complete programs listings, supporting technical documentation, and specific information on changing and installing the programs.

Payroll with Cost Accounting #22-5, \$20.00 □

Accounts Payable and Accounts Receivable #23-3, \$20.00 □

General Ledger #24-1, \$20.00 □

ASSEMBLY LANGUAGE PROGRAMMING SERIES

by Lance Leventhal and co-authors
You needn't know anything about assembly language to use these books. Each one is a straightforward, self-teaching textbook that is both precise and easy to understand.

ASSEMBLY LANGUAGE PROGRAM SERIES

- 68000** #62-4, \$16.99 □
6809 #35-7, \$16.99 □
6502 #27-6, \$16.99 □
Z80 #21-7, \$16.99 □
Z8000 #36-5, \$19.99 □
6800 #12-8, \$15.99 □
8080A/8085 #10-1, \$15.99 □

The 8086 Book
by Russell Rector and George Alexy
Part assembly language text and part hardware reference, this book covers all of the 8086's most important features.
#29-2, \$16.99 □

Osborne McGraw-Hill Dept. B21
630 Bancroft Way, Berkeley, CA 94710
Call Toll Free: 800-227-2895
in California (415) 548-2805

Name _____

Address _____

City/State/Zip _____

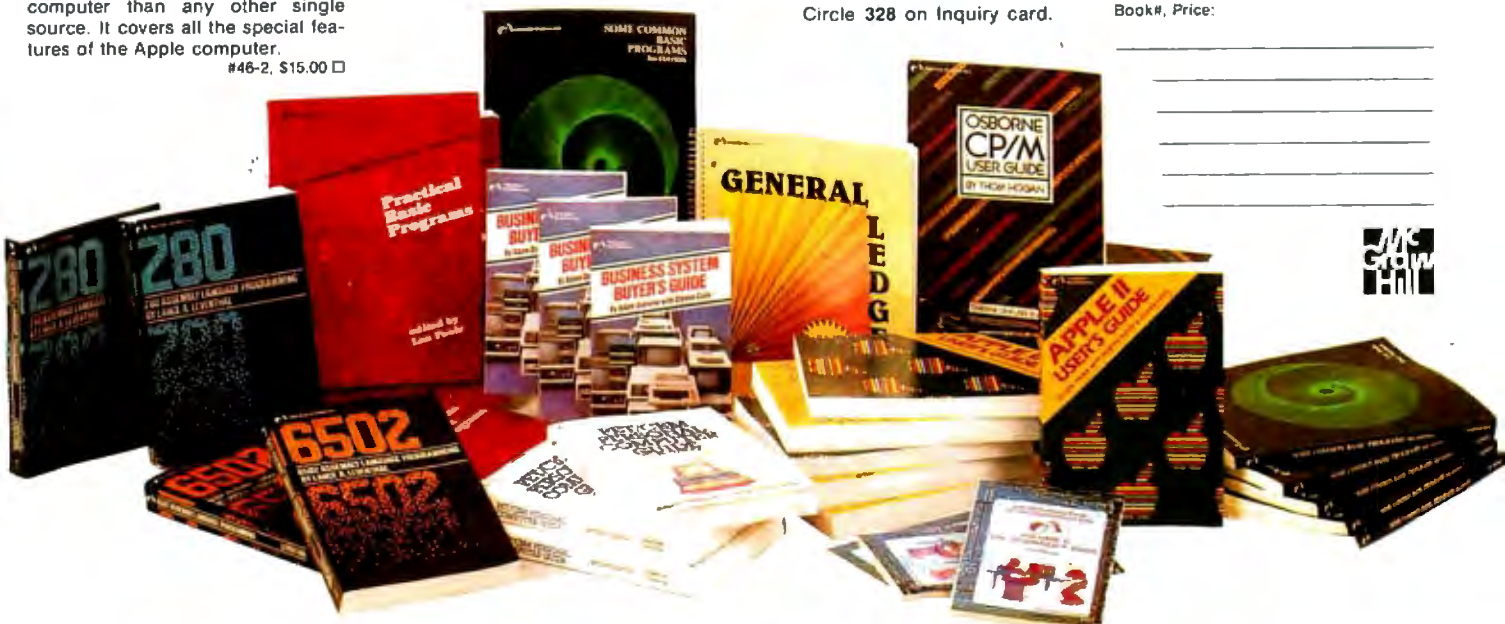
Plus: 75/item 4th class \$1.50/item UPS
 \$2.50/item Air Mail \$10.00/item Overseas
(California residents add applicable tax.)

Total amount enclosed \$ _____
or charge my Visa Mastercard

Card# _____ Exp. Dt. _____

Book#, Price: _____

Circle 328 on Inquiry card.



Listing 3 continued:

```
then return_code := 1

else begin

  for tuple := 1 to ntuples do                { read data }

    begin

      read_data_value (data_val);              { BOT }

      for vector := 1 to nvectors do

        begin

          read_data_value (data_val);

          if data_val.kind = numeric

            then real_array[vector, tuple] := data_val.number_value

        end

      end;

    read_data_value (data_val);                { EOD }

    if (data_val.kind <> special) or

      (data_val.string_value <> ^EOD^ )

      then return_code := 2

    end

end
```

Listing 3 continued on page 204

MARYMAC INDUSTRIES, INC.

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

21969 Katy Freeway
Katy (Houston) Texas 77450

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

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

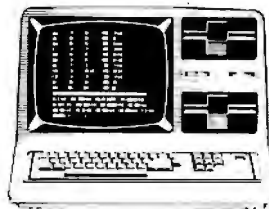
TRS-80[®] BY RADIO SHACK. Brand new in cartons delivered. Save state sales tax. Texas residents add only 5% sales tax. Open Mon.-Sat. 9-6. We pay freight and insurance. Come by and see us. Call us for a reference in or near your city. Ref: Farmers State Bank, Brookshire, Texas.

WE OFFER ON REQUEST

- Federal Express (Overnight Delivery)
- Houston Intercontinental Airport Delivery (Same Day)
- U.P.S. BLUE (Every Day)
- References from people who have bought computers from us probably in your city
- Telex 77-4132 (Fleks Hou)

* TRS 80 is a Registered Trademark of Tandy Corp

ED McMANUS



In stock TRS-80 Model II and III

No Tax on Out of Texas Shipments!

**Save
10% 15%
OR MORE**

We Specialize In Overseas Shipments
Telex 77-4132 (Fleks Hou)

WE ALWAYS OFFER

- NO extra charge for Master Card or Visa
- We use Direct Freight Lines. No long waits.
- We always pay the freight and insurance
- Toll free order number
- Our capability to go to the giant TRS-80[®] Computer warehouse 5 hours away, in Ft. Worth, Texas, to keep you in stock.

JOE McMANUS

VISA

Qume® Data Trak™ Floppy Disk Drives

Distributed
by: **asap**
computer
products, inc.

The Data Trak™ 5 double-sided double-density drive uses state-of-the-art technology to give you superior data integrity through improved disk life, data reliability, and drive serviceability using 5¼" media.

Qume's independent head load yields wear characteristics far superior to competitive drives. This superior wear performance produces savings on both diskette usage and drive maintenance.

Improved data reliability, resulting from superior amplitude and bit shaft characteristics, optimizes operator efficiency and reduces processing time for end-users.

And Data Trak's unique modular design means simplified field servicing for you and your customers.

Design Features

Expanded storage capacity • Two-sided, double-density

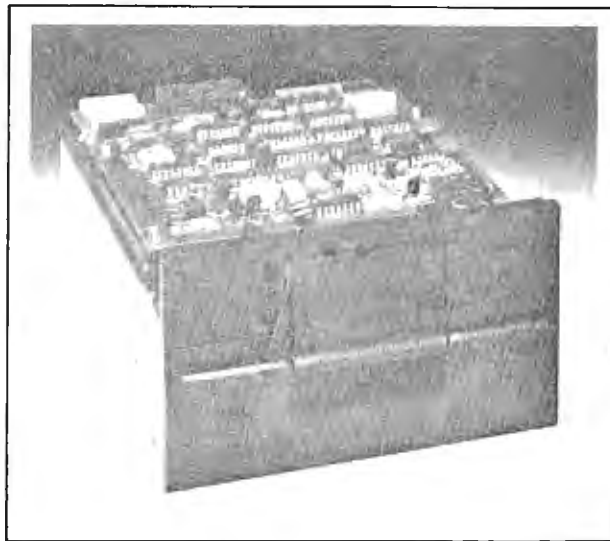
Proven head carriage assembly • Ceramic head with tunnel erase • Dual-head flex mounting arrangement • Superior head load dynamics

Precise lead screw actuator • Fast access time — 12 ms track-to-track • Low friction and minimum wear • Low power dissipation

Additional features • Industry standard 5¼" media format • ISO standard write protect • Door lock out for media protection • Requires DC voltage only • Daisy Chain up to 4 drives • Heads load on command independent of loading media

Product Specifications

Performance Specifications • Capacity: Unformatted: 437.5K or 500K bytes; Qume Formatted: 286.7K or 327.7K bytes • Recording Density: 5456 BPI • Track Den-



sity: 48 TPI • Cylinders: 35 or 40 • Tracks: 70 or 80 • Recording Method: FM or MFM • Rotational Speed: 300 RPM • Transfer Rate: 250K bits/second • Latency (avg.): 100 ms • Access Time: Track-to-track 12 ms; Settling 15 ms • Head Load Time: 50 ms

The Data Trak™ 8 double-sided double-density drive uses state-of-the-art technology to give you superior data integrity through improved disk life, data reliability, and drive serviceability.

Qume's innovative approach to controlling head load dynamics yields wear characteristics far superior to competitive drives. In independent evaluation, Data Trak 8 is setting industry standards for tap test performance. This superior wear performance produces savings on both diskette usage and drive maintenance.

Improved data reliability, resulting from superior amplitude and bit shift characteristics, optimizes operator efficiency and reduces processing time for end-users.

And Data Trak's unique modular design means simplified field servicing for you and your customers.

Design Features

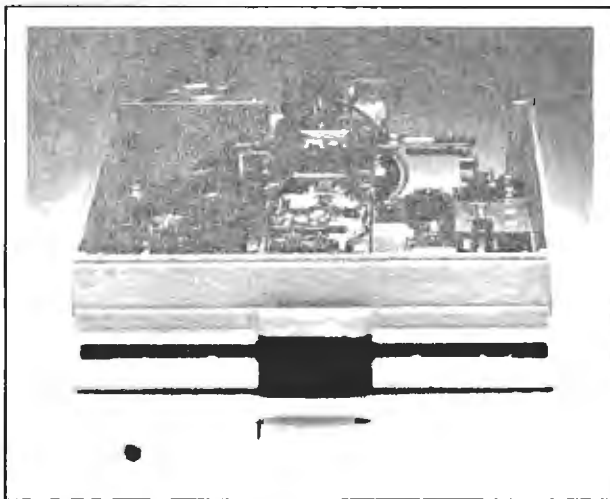
Expanded storage capacity • Two-sided, double-density

Fully IBM compatible • IBM 3740 and System 32 drives • IBM 3600 and 4964 drives • IBM System 34 drives

Proven head carriage assembly • Ceramic head with tunnel erase • Dual-head flex mounting arrangement • Superior head load dynamics

Fast, precise steel belt drive • Fast access time — 3 ms track-to-track • Low friction and minimum wear • Low power dissipation

Additional features • ISO standard write protect • Programmable door lock • Negative DC voltage not required • Daisy Chain up to 4 drives • Side-by-side mounting in standard 19" RETMA rack • Compatible with Shugart SA850/SA851



Product Specifications

Performance Specifications • Capacity: Unformatted: 1.6 Mbytes/disk; IBM Format: 1.2 Mbytes/disk • Recording Density: 6816 BPI • Track Density: 48 TPI • Cylinders: 77 • Tracks: 154 • Recording Method: MFM • Rotational Speed: 360 RPM • Transfer Rate: 500Kbits/second • Latency (avg.): 83 ms • Access Time: Track-to-track 3 ms; Settling 15 ms; Average 91 ms • Head Load Time: 35 ms • Disk: Diskette 2D or equivalent

asap
computer
products, inc.

1198 E. Willow, Signal Hill, CA 90806

Call Toll Free (800) 421-7701

AUTHORIZED DISTRIBUTOR FOR QUME
CALL FOR PRICE AND DELIVERY

(213) 595-6431 or (714) 891-2663 In California

Listing 3 continued:

```
end; { get_dif_array }

begin { dif_read }

writeln; { get DIF file name }
write (^DIF file name: ^);
readln (fname);
reset (in_file, fname); { open and point to BOF }

get_dif_array (in_file, matrix, num_vectors, num_tuples, code);

close (in_file); { close DIF file }
case code of { display results }
  0: begin
    writeln;
```

Listing 3 continued on page 206

At Last... The S-100 Revolution

At last, a full S-100 system has been put together on a single board with the introduction of the Super Net/I and the Super Net/II... the space and money savers. The Super Net/I has eliminated the need for four boards in existing S-100 systems. Additionally, Super Net/I and Super Net/II run with CP/M™, MP/M™ and CP/Net™. A most revolutionary innovation for all OEMs, distributors, and system houses.

ADVANCED MICRO DIGITAL CORPORATION

FEATURES:

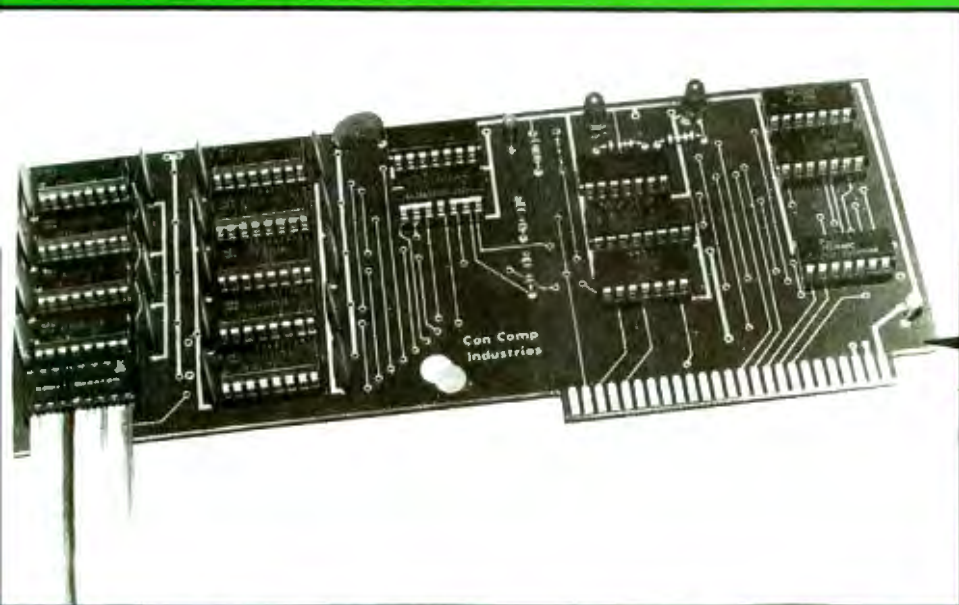
- S-100 IEEE
- 64K of bank select memory (16K banks)
- 2-80 CPU at 4 MHz (no wait)
- Floppy disk controller for 8-inch or 5 1/4-inch drives
 - Two serial (RS-232C) and two parallel I/O ports
- Asynchronous (Super Net/I) or synchronous (Super Net/II) operations... A feature that is used in network systems
- One year warranty (Includes parts and labor)

For further information call or write:

ADVANCED MICRO DIGITAL CORPORATION
14221 Edwards St., Suite 72,
Westminster, CA 92683
(714) 891-9953
Telex: 678-401 TAB IRIN

™Registered trademark of Digital Research Corporation.

IMPOSSIBLE! NO, JUST INCREDIBLE 16K RamBoard



**FOR APPLE II
COMPUTERS**

**INTRODUCTORY
OFFER**

\$129.95

**OFFER EXPIRES 12-30-81
REG. \$149.95**

Dealer Inquiries Invited

INCREDIBLE IS RIGHT!

If you've considered upgrading your Apple II to 64K you probably have also considered the price. Almost all of our competitors boards are selling for around \$200. We are announcing incredible news for Apple owners by offering our 16K RamBoard for only \$129.95.

SOFTWARE COMPATIBILITY... NO PROBLEM.

Let's face it... all RAM boards give you one thing; 16K more of Random Access Memory. They're all alike in how they install, what they are compatible with and how they operate. The RamBoard is compatible with all Apple II languages and software. The RamBoard enhances the Apple II by allowing larger languages, data bases, and programs. It greatly improves the capabilities of CP/M, PASCAL, FORTRAN, COBOL, and programs like VisiCalc, VisiFile, and any large business or scientific program applications.

COMPARE THE COMPETITION.

The RamBoard offers all that you need to enjoy 64K of user ram in your Apple II at an affordable price. The ConComp RamBoard is constructed with high quality components and utilizes hi-speed dynamic RAM, (200ns). It comes complete with installation and operation instructions, and to make good news better is covered by a One Year Warranty.

NOW IS THE TIME TO BUY.

They won't be available from your local dealer at this introductory price (suggested retail \$149.95). So before it's impossible order your RamBoard today. To order or form more information please call or write.

**ConComp Industries
8338 Center Dr.
La Mesa, Calif. 92041
(714) 464-8715**

CONCOMP

industries

Apple II is a trademark of Apple Computer Inc.
VisiCalc is a trademark of Personal Software.
Pascal is a trademark of U.C.S.D. Regents.
CP/M is a trademark of Digital Research

Listing 3 continued:

```
writeln ("", fname:l5, "", " contains ", num_vectors:3,
        " vectors and ", num_tuples:3, " tuples.");
writeln ("The data values follow in tuple order:");
writeln;
for i := 1 to num_tuples do
    begin
        for j := 1 to num_vectors do
            write (matrix[j, i]:l0:2);
        writeln
    end;
    writeln
end;

1: writeln ("Error. Tuple or vector count not found.");
2: writeln ("Error. Data not properly terminated.");
end { case }

end. { dif_read }
```

Text continued from page 186:

user for a student's name and test scores, and then copying the information into a DIF file.

Listing 2 takes the output DIF file from listing 1 and calculates an average score for each student and a letter grade for each student. Then the program prints the name, average, and letter grade for each student.

Listing 3, in Pascal, reads data from a DIF file into an array and displays the data on a terminal.

A close look at these listings will convince you that using DIF can simplify many programming tasks. Whatever your favorite programming language, try using the DIF format when you write your next program. You'll find the format conve-

nient and clear, and you may make your program attractive to a large body of software users who have already stored much of their essential data in the DIF format. The accompanying text box tells you how to obtain additional information about joining the community of programmers who use DIF. ■

For Further Information about DIF

The DIF Clearinghouse coordinates and distributes information about DIF and commercially available programs that use DIF. For information, send a request to the DIF Clearinghouse, POB 527, Cambridge MA 02139. Include \$6.00 along with your name, address, and ZIP code.

The DIF Clearinghouse will send you the DIF Technical Specification, providing a more detailed description of the DIF format, as well as current information about programs that support DIF. The clearinghouse will also

send you any updates published during the following year.

The clearinghouse would like to add to its growing list of programs that support DIF. No royalties or fees are charged for using DIF, but the clearinghouse does make three requests of authors of commercially available programs that use DIF.

First, please send a one-page description of your program to the DIF Clearinghouse. Describe what the program does, what computers it runs on, how it uses DIF, and how it can be purchased.

Second, because DIF is a trademark of Software Arts Inc, the "tm" designation must be used if DIF is mentioned in any material you publish about your program. The material also should include the statement "DIF is a trademark of Software Arts Inc."

Finally, if you are unable to test your program with the VisiCalc program, please write the DIF Clearinghouse before advertising your product as supporting DIF. Any program employing DIF should be capable of transferring data to and from the VisiCalc program.

The Multi-User Computer With The MmmOST®*

The TeleVideo family of multi-user business computer systems brings you the highest job throughput . . . every user controls a private computer while sharing a common data base!!! The CP/M®† operating system

†CP/M® is a Registered Trademark of Digital Research, Inc.
*MmmOST® is a Registered Trademark of TeleVideo Systems, Inc.

*Multi-user, Multi-task, Multi-processor Operating System Technology opens the window to the largest array of business applications available for microcomputers.

TeleVideo Systems provides the computing solution!

Nationwide service by General Electric Company's Instrumentation and Communication Equipment Service Centers.



 **TeleVideo® Systems**

TeleVideo Systems, Inc., 1170 Morse Avenue, Sunnyvale, CA 94086
408/745-7760; 800/538-8725 (toll-free outside California)

A Survey of Data-Base Management Systems for Microcomputers

Kathryn S Barley
DataWise
POB 426
Windermere FL 32786

James R Driscoll
Department of Computer Science
University of Central Florida
Orlando FL 32816

Advertisements for data-base management systems (DBMSs) seem more numerous all the time. At first glance, you would expect the advertised systems to perform similar functions. Yet, their prices range from \$15 to \$1500. What justifies such a price range? What functions do each of these systems actually perform? Some of them claim to solve almost every problem facing businesses and individuals today. Which problems *will* the available DBMSs solve? Most of the DBMSs available for large computers have principal goals of providing data integrity, data security, and data independence. Do the DBMSs available for microcomputers meet these same goals?

To answer these questions, we requested information from forty-eight companies that had advertised a DBMS for microcomputers. Our goal was not to judge systems against any preconceived DBMS standard, but rather to develop an overview of each system based on its user manual and compare all the systems feature by feature.

Eighteen companies sent us a user manual, and several included a disk of software as well. The text box on this page lists the names and addresses of these companies with the names of the products.

General Features

Table 1 lists some important gen-

eral features of the twenty DBMSs, including hardware requirements, prices, available extension packages,

type of data organization, method by which the user enters commands, and language in which the software is

| Company | Product | Company | Product |
|--|--------------------------------------|--|---|
| Apple Orchard 131 Highland Ave Vacaville CA 95688 | The Informer | Micro AP 9827 Davona Dr San Ramon CA 94583 | Selector IV |
| Business Computer Services Co 9020 EBY Overland Park KS 66212 | Data Handler | Micro Architect 96 Dothan St Arlington MA 02174 | Interactive Data Manager—IDM-IV, IDM-M2 |
| Condor POB 8310 Ann Arbor MI 48104 | Condor Series 20/DBMS | Microcomputer Technology Inc 3304 W MacArthur Santa Ana CA 92704 | The Microconductor |
| Cromemco 280 Bernardo Ave Mountain View CA 94040 | Cromemco Data Base Management System | Micro Data Base Systems, Inc POB 248 Lafayette IN 47902 | MDBS |
| Des Moines Computer 4456 Parklawn Dr Des Moines IA 50321 | Micro Manager | Muse 330 N Charles St Baltimore MD 21201 | Micro Information System |
| High Technology POB 14665 Oklahoma City OK 73113 | Information Master | Personal Software Inc 1330 Bordeaux Dr Sunnyvale CA 94086 | CCA Data Management System |
| Innovative Software 9805 Holly Kansas City MO 64114 | Total Information Management—TIM | Radio Shack 700 One Tandy Ctr Ft Worth TX 76102 | Profile Profile II |
| Jini Micro-Systems Inc POB 274-K Bronx NY 10463 | Jinsam 2.0 | Systems Plus 1921 Rock St Suite 2 Mountain View CA 94043 | The File Management System—FMS-80 |
| Ken Knecht 6 South St, Box 68 Milford NH 03055 | Dynamic Data Base | The Bottom Shelf POB 49104 Atlanta GA 30359 | Data Manager |

MULTIPROCESSOR PASCAL



ibs petasystem II

- SIMULTANEOUS Timeshared & Multiprocessor Operation
- FULL UCSD™ PASCAL II Compatibility with IBS™PASCAL, SEMAPHORES, CONCURRENCY, CHAINING, TRUE WORD PROCESSING
- 5, 10, 20, Mbyte FIXED DISK SYSTEMS, 5", 8" FLOPPY DISC SYSTEMS
- TWO Timeshared Users on EACH Slave Processor, plus 128K RAM plus PARITY, 2K EPROM, Full Interrupts, Hardware Floating Point, IEEE S-100, Software Bank Boundary, 2 Serial Ports for Synchronous or Asynchronous Protocol
- VIDEO TAPE ARCHIVING
- CP/M™ Compatibility with MuDOS™
- LARGE DEALER MARGINS and GOOD DEALER SUPPORT

ibs

(415) 443-3131

INDEPENDENT BUSINESS SYSTEMS, Inc.
1328 Concannon Blvd., Livermore, CA 94550

Interested?

OUR DEALERS: FOREIGN • Philip Baksh, London England, Tel: 44 1 7413707 • EEI, Sharjah, UAR, Tel: 354688 • Elif, Inc., Montreal, Quebec, Tel: (514) 337-3214 • FDM, Madrid, Spain, Tel: 402 2497 • JH Systems, Etobicoke, Ontario, Canada, Tel: (416) 621-0538 • S.A. Micro Service, Paris, France, Tel: 205 38 71 • Servonic, Munich, West Germany, Tel: 089 483253 • GBK, The Netherlands, Tel: 20-733376 • Terrace Computer Svcs., LTD, Terrace, BC, Tel: (604) 635-7606 • DOMESTIC - CEB3, San Jose, CA, Tel: (408) 267-3547 • Donald Coffman, Cupertino, CA, Tel: (408) 253-2327 • ERS, Brea, CA, Tel: (714) 524-2470 • Innovative Interfaces, Berkeley, CA, Tel: (415) 524-8416 • ICE Services, Gaithersburg, Maryland, Tel: (301) 869-2896 • Khalsa Consultants, Cambridge, MA, Tel: (617) 864-3638 • Link Systems, Santa Monica, CA, Tel: (213) 453-1851 • EDS, Frazer, PA, Tel: (215) 296-7300 • Quali-Type, Inc., Livermore, CA, Tel: (415) 447-6121 • SPI, San Diego, CA Tel: (714) 268-4346 • Khalsa International, Herndon, VA, Tel: (703) 437-0404

UCSD PASCAL is a trademark of Regents of U. of C

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

MuDOS is a trademark of MuSYS Corp.

IBS is a trademark of IBS, Inc.

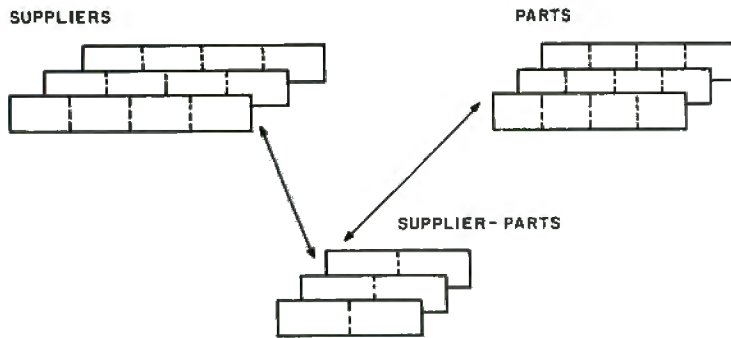
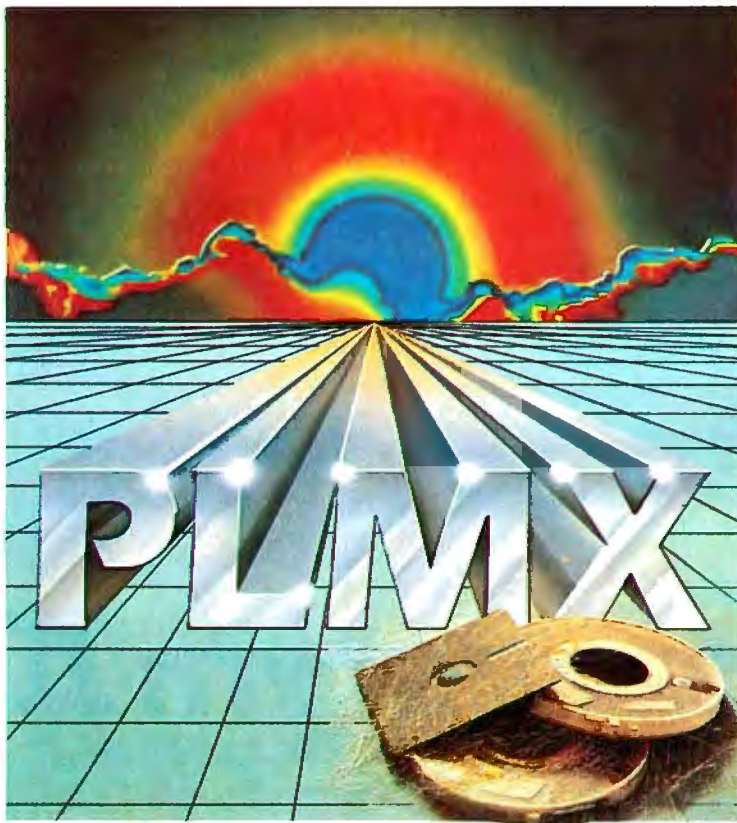


Figure 1: A visual representation of files in a network data-base management system. The user can move through the network of files. For example, a user positioned at part number 124 in the Parts file can find out all the suppliers of that part by moving through the Supplier-Parts file to the Suppliers file.



PL/M SOFTWARE PORTABILITY FOR ONLY \$500

This Versatile Software Package Features

- PL/M Optimizing Compiler
- Relocating Cross-Assembler and Linker
- Intel® Compatible PL/M Syntax
- ROM-able Object Code
- Library Manager

| COMPILES UNDER | PRODUCES CODE FOR |
|---|---|
| CP/M, CDOS, IMDOS TEKTRONIX DDB/SO (8550) TEKDOS (8002) | 8080, 8085, Z80, 6800, 6802, 1802, 9900 |



Product Development Group
4018 Hancock Street, San Diego, CA
92110. Or Call (714) 292-PLMX
TWX 910-335-1660

written. The table groups the systems by the kinds of computers on which they run, with the group that runs on the greatest number of computers listed first. With the exception of Condor and Microconductor, all the systems that cost more than \$250 will in principle run on any popular small computer. However, requirements for specific hardware (for example, an 8-inch disk drive) or a specific operating system (such as CP/M) may in some cases prevent these DBMSs from running on the smallest model of some personal computers.

Most of the items in table 1 are easy to interpret, but a few require comment.

The extension packages listed in column 8 fall into three categories:

- word processors
- utility programs; for example, programs that rearrange a user's data to conform to a new definition
- statistical packages

We found no extension packages available for applications such as general ledger, inventory, or appointment scheduling, whether in the form of separate programs that use the DBMS's files or batch-command files for use within the system.

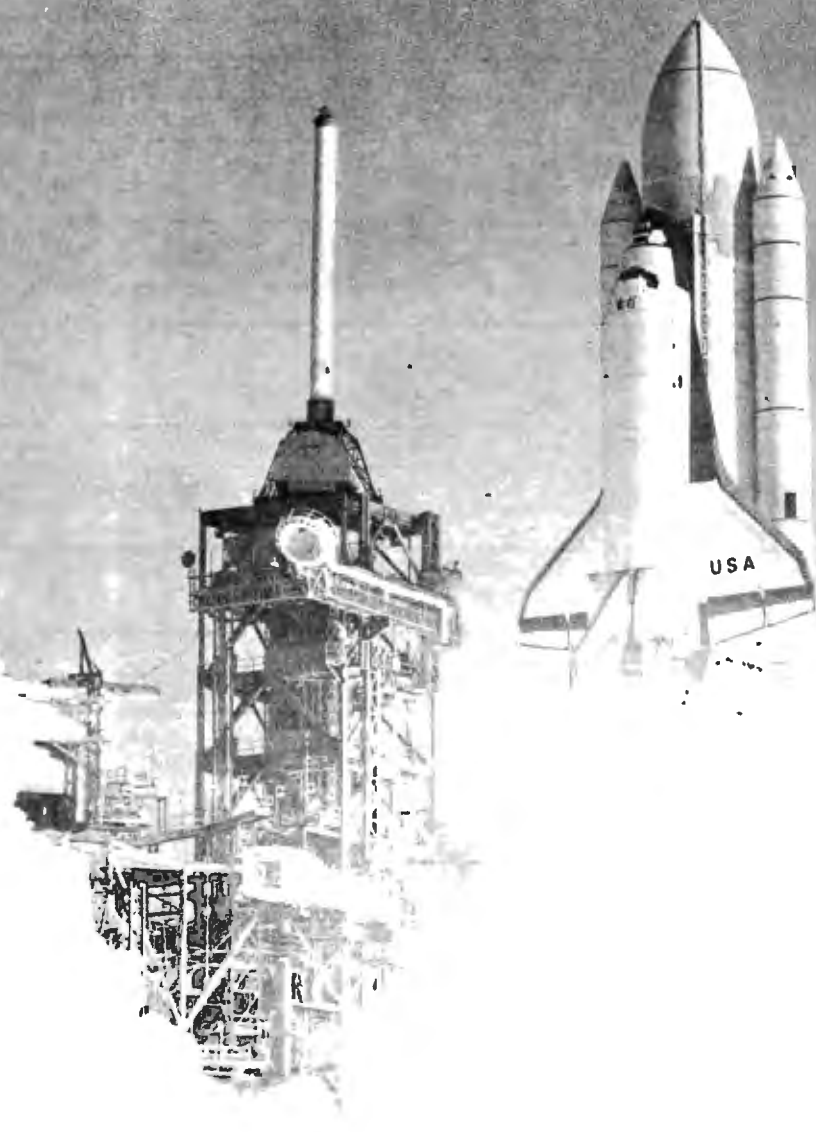
In the ninth column, headed Type, the systems that are simplest to understand are the type "file." All the records that can be used at the same time will belong to just one file, and that file constitutes the data base. For example, you might have one file that contains many records, and each of these records could consist of a supplier number, supplier name, address, and phone number.

Type "multifile" systems allow the use of more than one file. A data base of this type could include a file on suppliers, and a second file of records on parts. Each part record could contain a part number, part name, quantity on hand, and quantity on order. To indicate where each part comes from, a third file could be used as a cross-reference. Each record in this third file would contain a supplier number and part number.

A system of the type "relational"

JINSAM™ 8.0

Officially approved by Commodore for their 8000 Series Desk-Top Computers.



space

age

micro

ware

Selected by NASA,
Kennedy Space Center
With Multiple Applications Related
to the Columbia Space Shuttle Project

SEE YOUR NEAREST COMMODORE DEALER
FOR A DEMONSTRATION. OUR IBM EX-
ECUTIVE VERSION WILL SOON BE
AVAILABLE.

JINI MICRO-SYSTEMS, Inc.

DATABASE MANAGEMENT SYSTEM DESIGN

BOX 274 KINGSBRIDGE STN., RIVERDALE, N.Y. 10463 (212) 796-6200

| | Runs On | 5-inch Disks | 8-inch Disks | Hard Disk | Maximum # Disks | Minimum Memory | Price | Extension Packages/Price | Type | Command Entry Method | Language |
|------------------|---------|--------------|--------------|-----------|-----------------|----------------|-------|---|------------|----------------------|--|
| MDBS | 1 | Y | Y | Y | 8 | ? | \$900 | RTL QRS/\$600 DRS | Network | Type Out | Machine language |
| FMS-80 | 2 | - | Y | - | 16 | 48 K | \$750 | - | Multifile | Menu and Type Out | Machine language |
| Selector IV | 2 | - | Y | Y | Comb | 48 K | \$550 | - | Multifile | Menu and Type Out | CBASIC |
| TIM | 2 | Y | Y | Y | Comb | 48 K | \$400 | WordStar | File | Menu | Microsoft BASIC |
| Condor | 3 | Y | Y | - | 4 | 64 K | \$695 | - | Relational | Type Out | Z80 Machine language |
| Data Handler | 4 | Y | - | - | 2 | 32 K | \$ 25 | - | File | Menu | Applesoft BASIC Commodore BASIC |
| CCA | 5 | Y | - | - | ? | 32 K | \$100 | - | File | Menu | Machine language |
| Microconductor | 5 | Y | - | - | ? | 32 K | \$400 | - | File | Menu and Type Out | - |
| Information Mstr | 6 | Y | - | - | 2 | 48 K | \$150 | Data Master/\$100 | File | Menu | Applesoft BASIC |
| The Informer | 6 | Y | - | - | 2 | 16 K | \$ 50 | - | File | Menu | - |
| Micro Info Sys | 6 | Y | - | - | 2 | 48 K | \$100 | - | File | Menu | Applesoft BASIC |
| Jinsam 2.0 | 7 | Y | - | - | ? | 24 K | \$195 | Mathpack/\$40 Statpack/\$50 Wordpack/\$50 Label Gen/\$50 | File | Menu | Commodore BASIC; sorts and inputting in machine language |
| Cromemco | 8 | Y | Y | - | 4 | 64 K | \$ 95 | - | File | Menu | Cromemco BASIC |
| Micro Manager | 9 | - | Y | Y | Comb | 48 K | \$249 | - | File | Menu | - |
| Data Manager | 10 | Y | - | - | 4 | 32 K | \$ 49 | - | File | Menu | - |
| Dynamic DB | 10 | Y | - | - | 1 | 32 K | \$ 25 | - | File | Menu | - |
| IDM-IV | 10 | Y | - | - | 4 | 32 K | \$ 69 | - | File | Menu | Radio Shack BASIC; sorts in machine language |
| IDM-M2 | 10 | - | Y | - | 4 | 64 K | \$199 | - | File | Menu | Radio Shack BASIC; sorts in machine language |
| Profile | 10 | Y | - | - | 4 | 16 K | \$ 80 | - | File | Menu | Machine language |
| Profile II | 10 | - | Y | - | 4 | 32 K | \$179 | Scriptit/\$300 | File | Menu | Machine language |

"Comb" in column 5 means support for 5-inch, 8-inch, or hard disks in combination.

- 1 Any with machine's DOS*
- 2 Any with CP/M*
- 3 Z80
- 4 Apple, PET, TRS-80
- 5 Apple, TRS-80

- 6 Apple
- 7 Commodore PET
- 8 Cromemco
- 9 Ohio Scientific
- 10 TRS-80

- *Where any means any one of the following:
- Cromemco
 - Apple
 - TRS-80
 - 8080
 - 8085
 - Z80
 - 6502
 - 8086
 - North Star
 - Zilog

Table 1: Some general features of the twenty data-base management systems participating in the survey.

POWER-ONE D.C. POWER SUPPLIES

Our customers select their favorite models




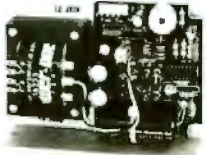
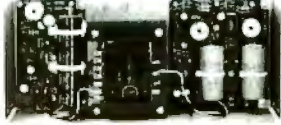



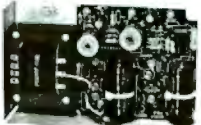
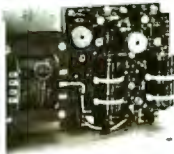
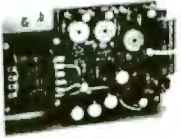

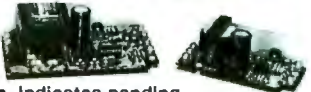
The choice wasn't easy. Not with 105 open frame linears and a full switcher line to choose from. Still, the top models of the past year — proudly pictured below — have been named.

Actually, this is a statement of Power-One's most popular D.C. power supplies — as determined by our customers. Obviously, applications vary widely, from

small floppies and micro-computers to large main-frame systems.

But one thing they all have in common. They're built by Power-One. Which means the most reliable power supplies available, at the lowest cost possible.

So take a look at our entire line. Send for our new 1981 Catalog and Facilities Brochure for details.

| | | | |
|---|--|--|---|
| <p>Switchers</p> <ul style="list-style-type: none"> • Hi-Tech Design • High Efficiency - 75% min. • Compact/Light Weight • 115/230 VAC Input • 20 msec Hold-up • Totally Enclosed Packaging • Two Year Warrantee • 24 Hour Burn-in | <p>SINGLE OUTPUT</p>  <p>5V to 24V Models</p> <p>SD, 60W : \$115.00 SF, 100W : \$170.00 SK, 200W : \$250.00</p> | <p>MULTIPLE OUTPUT 150 Watts</p>  <p>5V @ 20A -12V @ 3A 12V @ 5A 5V to 24V @ 3.5A User Selectable</p> <p>SHQ-150W : \$295.00</p> | <p>QUME PRINTER SUPPLY</p>  <p>5V @ 10A ± 15V @ 4.5A/16A Peak</p> <p>SP305 : \$345.00</p> |
| <p>Disk-Drive</p> <ul style="list-style-type: none"> • Powers Most Popular Drives • 7 "Off the Shelf" Models • Powers Drives & Controller • UL & CSA Recognized • 115/230 VAC Input | <p>5 1/4" FLOPPY SUPPLIES</p>  <p>CP340, 1 Drive : \$44.95 CP233, Up to 4 Drivers : \$74.95</p> | <p>8.0" FLOPPY SUPPLIES</p>  <p>CP205, 1 Drive : \$69.95 CP206, 2 Drives : \$91.95 CP162, Up to 4 Drives : \$120.00</p> | <p>WINCHESTER SUPPLIES 2 Models to Power any Manufacturer's Drive</p>  <p>CP379, CP384 : \$120.00</p> |
| <p>Open-Frame Linear</p> <ul style="list-style-type: none"> • Industry Standard Packages • 115/230 VAC Input • ± .05% Regulation • Two Year Warrantee • UL & CSA Recognized • Industry's Best Power/Cost Ratio | <p>SINGLE OUTPUT</p>  <p>5V @ 3A 24V @ 1.2A 12V @ 1.7A 28V @ 1.0A 15V @ 1.5A 250V @ 0.1A</p> <p>HB Series : \$24.95</p> | <p>SINGLE OUTPUT</p>  <p>5V @ 6A 24V @ 2.4A 12V @ 3.4A 28V @ 2.0A 15V @ 3.0A 48V @ 1.0A</p> <p>HC Series : \$44.95 to \$49.95</p> | <p>DUAL OUTPUT</p>  <p>± 12V @ 1.0A or ± 15V @ 0.8A</p> <p>HAA15-0.8 : \$39.95</p> |
| <p>DUAL OUTPUT</p>  <p>± 12V @ 1.7A or ± 15V @ 1.5A</p> <p>HBB15-1.5 : \$49.95</p> | <p>TRIPLE OUTPUT</p>  <p>5V @ 2A ± 9V to ± 15V @ 0.4A</p> <p>HTAA-16W : \$49.95</p> | <p>TRIPLE OUTPUT</p>  <p>5V @ 3A ± 12V @ 1A or ± 15V @ 0.8A</p> <p>HBAA-40W : \$69.95</p> | <p>POWER FAIL MONITORS</p>  <ul style="list-style-type: none"> • Indicates pending system power loss. • Monitors AC line and DC outputs. • Allows for orderly data-save procedures <p>PFM-1 : \$24.95 PFM-2 : \$39.95</p> |

NEW '81 CATALOG & FACILITIES BROCHURE

Get your free copies now!

Phone or write us direct, or circle the reader service number



Power-One
D.C. POWER SUPPLIES



permits a user to look at information as tables, regardless of how it is actually stored on the disk. For the suppliers and parts information, a relational DBMS could produce tables that look like the files of a multifile system. But in a relational system, these tables might be stored on disk in ways other than one file for each table. Condor, for example, keeps several files for each table. Condor is a limited relational system, but the company plans to release a version that can perform all the commands necessary to qualify as a fully relational system. The names of Condor's commands suit a business environment; for example, the command "POST" will update one table with another.

Systems of the type "network," on the other hand, let the user view the data as a network of files. The suppliers and parts information could be envisioned as shown in figure 1.

The network system allows the user to navigate through the records contained in the Suppliers file or

Parts file with commands such as FIND NEXT RECORD or FIND PREVIOUS RECORD. In addition, a user positioned at a record in the Parts file where the part number is 124 could find the addresses of suppliers of that part by linking through the Supplier-Parts file to the Suppliers file. MDDBS qualifies as a full network system. Its extension package, QRS, enables a user with no knowledge of the network navigational paths to query the data base with English-like commands.

The systems in the first three computer groups, types network, relational, and multifile, are the only systems that can access more than one data file at a time. This is important for tasks of the following types:

- Posting from one file to another.
- Printing a report that is made up of fields from more than one file.
- Creating one large list from several smaller ones.
- Producing a list that consists of records that meet certain criteria

when those criteria are based on requirements from more than one file. For example, producing a list of the names and telephone numbers of suppliers from whom you can purchase a specific part.

According to the "Command Entry Method" column of table 1, some of the systems give the user a menu from which to choose a command, others require the user to type out commands, and a few systems let the user enter commands either way.

Features Related to Ease of Use

Software packages capable of performing amazing feats are worthless if using the software is more difficult than solving the original problem. Table 2 provides information about features that make DBMSs easier to use.

When reading the table, however, keep in mind that a few of the features are unnecessary on some of the DBMSs. One such feature is the ability to customize the DBMS for a specific terminal (column 1). If a DBMS runs only on a TRS-80 Model I, there is no need to customize the software for other terminals. In effect, the DBMS is already customized.

Most features in table 2, however, would benefit users of any system. An example is column 3, "Error Recovery." Error-trapping can prevent a system from crashing when the user tries to enter data of the wrong type. The cause of most crashes is an error the system failed to trap. The user manuals of six systems warn that certain errors in data entry will cause a system crash; six other manuals (question marks in the table) leave the issue in doubt.

But there are also six DBMSs that do provide error-trapping. Some systems provide error-recovery functions to deal with hardware failures, such as loss of power. Some systems allow the user to recapture data entered earlier. MDDBS offers extensive error-trapping facilities. The manual devotes 75 pages to explaining the system's error messages.

Should the user of a particular system be a programmer? A "Y" in col-



ARBA REGISTER

YOUR AFFORDABLE COMPUTER CONNECTION

THIS IS THE ELECTRONIC CASH REGISTER THAT INTERFACES WITH VIRTUALLY ANY COMPUTER ON THE MARKET AND IT DOESN'T COST MORE THAN YOUR SYSTEM.

- DO REAL TIME ON LINE POINT OF SALE INVENTORY CONTROL
- A RETAILER'S CASH REGISTER WITH MANY FINE BUSINESS AIDS
- RS232C INTERFACE AT 300 BAUD
- STANDARD ASYNCHRONOUS ASCII CODE
- EMPLOYS TIME TESTED RELIABLE LSI CIRCUITRY
- \$1295 SUGGESTED RETAIL - DEALER PRICING AVAILABLE

ARBA

FINE BUSINESS COMPUTING
6340C AMERICANA DRIVE 315C
WILLOWBROOK, ILL 60514
312-749-7444



State-of-the-art hardware demands state-of-the-art software

Operating Systems & Support Software from Technical Systems Consultants

To perform to its fullest capabilities, your hardware demands software designed to meet the specialized requirements of today's microprocessors. State-of-the-art software from Technical Systems Consultants keeps pace with the rapid advancements in computer technology so your hardware can live up to its full potential. Our complete line of state-of-the-art software includes:

The UnifLEX™ Operating System

UnifLEX, a true multi-user, multi-tasking system for the 6809 and 68000 microprocessors, supports such features as:

- hierarchical file systems
- device independent I/O
- four Gigabyte disk capacities
- full file protection
- inter-task communication via pipes
- I/O redirection
- task swapping
- full random-access files
- comprehensive shell command language

UnifLEX, structured for large-scale microprocessor systems, will not run with minimal systems and thus has avoided design compromise. (Off-the-shelf versions and OEM licenses are available.)

The FLEX™ Operating System

FLEX, a powerful, easy-to-use operating system designed for the 6800 and 6809 microprocessors, includes:

- dynamic filespace allocation
- random files
- batch job entry
- automatic space compression
- English error messages
- user environment control
- disk resident commands
- flexible device I/O
- printer spooling

Plus, FLEX can accommodate hard disks as well as floppies. The System is available off-the-shelf for a variety of systems and in a field-adaptable version. (OEM licenses available.)

FLEX and UnifLEX are trademarks of Technical Systems Consultants, Inc.

Support Software

Technical Systems Consultants offers a full line of state-of-the-art support software compatible to FLEX and UnifLEX, some of which are:

- native C and Pascal compilers for advanced programming
- extended BASIC for business and educational applications
- text editing and processing software
- sort/merge package for business applications
- variety of absolute and relocatable assemblers
- debug and diagnostic packages

... and more. Write or call today for our brochures describing our complete product line.



technical systems
consultants, inc.
Box 2570, 1208 Kent Avenue
West Lafayette, Indiana 47906
(317) 463-2502 Telex: 27-6143

Sculpture by Joann Chaney



Introducing 4 new programs from the

These new programs are going to do for you just what our VisiCalc™ program has done: make your computer work harder, so you can work smarter!

They'll enable a personal computer to take over more of those tasks eating up so much of your time. That'll give you more time to concentrate on the tasks where your skills, experience and intuition can do the most good. Things like thinking, planning and managing.

A personal computer can help you do all these things better. And Personal Software™ programs will help you do them best!

VisiDex. The VisiDex™ program makes it a snap for you to remember anything, and everything, you don't want to forget.

It's a free-form personal filing program with nearly unlimited cross referencing.

VisiDex "thinks" and "remembers" just the way you ask it to—so you can access it anyway you want, and find exactly what you want— instantly!

VisiPlot. The VisiPlot™ program makes it easy to see what your numbers really say.

It adds real meaning to financial analysis, forecasting, budgeting and business planning. Because VisiPlot takes hard-to-grasp numbers and automatically turns them into easy-to-comprehend charts and graphs, right before your eyes!

All kinds of charts and graphs, with all kinds of flexibility in titling, shading, and color—all at the touch of a few buttons!

HOW TO WORK SMARTER NOT HARDER



people who brought you VisiCalc!

VisiTrend/VisiPlot. If you want sophisticated trend forecasting and statistical analysis—and you know how hard it is to create them by hand—you'll want to get your hands on the VisiTrend/VisiPlot™ program!

This program will enable you to rapidly perform regressions and time series analysis, plus providing you with comprehensive charting and graphing capabilities.

VisiTerm. The VisiTerm™ program enables you to reach out to the world.

With VisiTerm, you'll be able to use your personal computer to communicate with larger computers, to tap into data networks, to communicate with other personal computers.

VisiTerm gives you all the benefits of a personal computer, plus all the advantages of an intelligent terminal, all in one package.

All of these programs are currently available for the Apple II and II Plus. Besides their many individual benefits, these new programs deliver an even greater total benefit. That's because many of them interact with each other and with our new, enhanced version of VisiCalc.

Together, they give you an unprecedented family of personal computing capabilities; making the computer work harder, so you can work smarter!

PERSONAL SOFTWARE INC.

Or call us at (408) 745-7841 for the name of the Personal Software dealer nearest you. Or write us at 1330 Bordeaux Drive, Sunnyvale, CA 94086.

Circle 449 on inquiry card.

umn 13 of table 2 shows that the system belongs to one of the following three categories:

- Designed to be used by a programmer. Some systems assume the programmer will modify the system to suit the user's needs. Some of the smallest, least expensive systems (such as Data Handler) are of this

type. Dynamic Data Base, for example, instructs the user to modify the system in order to sort.

- Does not require any knowledge of a programming language but is too difficult for a novice to understand. Microconductor and IDM-M2 fall in this category. Their user manuals contain computer jargon that would baffle anyone but a programmer.

- Designed in such a way that only a programmer can benefit from everything the system offers. FMS-80's user manual, for example, has explanations for three different levels: novice, experienced FMS-80 user, and programmer.

A "Y" in column 4, "Programming Language Interface," indicates that

| | Can Customize System to Terminal | Can Customize System to Printer | Error Recovery | Programming Language Interface | Storage Transparent to User | User-Designed Screens for Data Entry | Help Command | Levels of Data Security | Sort Maintained | Ascending and Descending Order | Derived Data | Alternate Views | User Should Be Programmer | Batch Commands Available |
|------------------|----------------------------------|---------------------------------|----------------|--------------------------------|-----------------------------|--------------------------------------|--------------|-------------------------|-----------------|--------------------------------|--------------|-----------------|---------------------------|--------------------------|
| MDBS | Y | Y | Y | Y | Y | N | N | 512 | Y | Y | Y | Y | Y | Y |
| FMS-80 | Y | Y | Y | N | N | Y | Y | N | Y | Y | Y | Y | Y | Y |
| Selector IV | Y | Y | Y | N | Y | N | N | N | Y | Y | Y | N | Y | Y |
| TIM | Y | Y | Y | Y | N | N | Y | 1 | Y | Y | Y | N | Y | N |
| Condor | Y | N | Y | N | Y | Y | Y | N | N | Y | Y | Y | Y | Y |
| Data Handler | N | N | N | N | N | N | N | N | N | Y | N | N | Y | N |
| CCA | N | N | Crashes | Y | N | N | N | N | Y | Y | Y | N | Y | N |
| Microconductor | N | N | ? | N | Y | N | Y | N | N | Y | Y | Y | Y | Y |
| Information Mstr | N | Y | Y | Y | Y | N | N | N | Y | Y | Y | N | N | N |
| The Informer | N | N | ? | N | N | Y | N | N | N | N | N | N | N | N |
| Micro Info Sys | N | N | ? | N | Y | N | N | N | N | Y | Y | N | Y | N |
| Jinsam 2.0 | N | Y | Y | Pkg Avail | Y | N | Y | 3 | Y | Y | Y | N | N | N |
| Cromemco | N | N | Crashes | N | Y | N | N | N | Y | N | N | N | N | N |
| Micro Manager | N | N | ? | N | Y | N | N | 1 | N | Y | N | N | Y | N |
| Data Manager | N | Y | Crashes | N | N | N | N | 1 | N | N | N | N | N | N |
| Dynamic DB | N | N | Crashes | N | Y | N | N | N | N | N | Y | N | Y | N |
| IDM-IV | N | N | Crashes | N | N | Y | N | N | Y | N | N | N | Y | N |
| IDM-M2 | N | N | Crashes | N | N | Y | N | 2 | Y | N | Y | N | Y | N |
| Profile | N | N | ? | Y | N | Y | N | 1 | N | Y | Y | N | N | N |
| Profile II | N | Y | ? | N | Y | Y | N | 4 | Y | N | Y | Y | N | N |

Table 2: Features of data-base management systems that affect ease of use. In the "Error Recovery" column, "CRASHES" indicates that the user manual said certain errors in data entry would cause the system to "hang" or "crash."

the system allows a programming language to access the data-base files either directly or through the DBMS. For example, Profile's user manual contains several lines of code to be embedded in a BASIC program, while Jinsam offers an interface package on disk. MDBS can also be embedded in a host language such as BASIC, Pascal, or FORTRAN. This allows a program to access the DBMS with subroutine calls.

By definition, a DBMS hides its method of physical storage from the user. The storage method is said to be "transparent to the user." Some of the manuals, however, have explained how their files are set up. These sys-

tems are indicated in column 5.

A user-designed screen (column 6) makes a system both more versatile and more pleasant to use. Normally, the fields of a record are placed one below the other on the screen. But a file may contain too many fields to fit on the screen at one time, preventing the user from simultaneously viewing them all. A screen designed by the user can position fields at any location desired. Several screens can be designed for viewing a record with many fields. Profile II allows characters or lines to divide or highlight portions of the screen, and also supports reversed lettering.

A help command, shown in col-

umn 7 of table 2, is often provided by systems that require the user to enter commands, rather than choose from the choices on a menu. In response to the help command, the system produces a list of commands the user might need. Condor allows users to design the help responses. The responses can then include the names of the tables or files the user has specified.

Data security (column 8) is important if more than one person will be using the system, and if only certain persons are allowed to see some parts of the data. Security provisions range from one level of protection, which permits a data disk to be read only

The perfect marriage of Superbrain™ and Winchester.™

**700K or 350K
floppy storage**

**5 Megabyte
hard disk storage**

**Finally, a price-performance
breakthrough for mass storage
in a one-piece, handsomely
styled desk-top computer.**

- 5 1/4" Micro-Winchester™ 5 Mbyte (formatted) hard disk.
- 700K or 350K floppy disk back up.
- Dual Z-80 processors with 64K RAM.
- Dual RS232 ports.
- Complete and ready to run with CP/M™ 2.2.

**DEALER & OEM
INQUIRIES INVITED**

**TELEPHONE (206) 453-9777
TOLL FREE 1-800-426-2963**



- Largest Intertec distributor in the United States.
- Distributor for C. Itoh, MPI, Epson.
- Seagate, Tandem drives.
- Corvus hard disks, multiplexers.
- Superbrain S-100 bus, graphics, and parallel port.
- Software: MicroPro, Accounting Plus, Peachtree, Condor, Benchmark.

SuperFive ALSO DISTRIBUTED BY:

Compu Data
1 Bala Cynwyd Plaza
Bala Cynwyd, Pennsylvania 19004
Telephone (215) 667-6843

Diversified Data
8043 W. 82nd
Indianapolis, Indiana 46278
Telephone (517) 299-0115

CMC International
A Division of Computer Marketing Corporation
11058 Main, Suite 125, Bellevue, WA 98004
(206) 453-9777

with the proper password, to the 512 possible levels of protection offered by MDBS.

Some systems allow alternate views of the same data. For example, a user-designed screen can suppress specific fields from view. This is useful if a clerk's job is to update personnel files, but the employer does not want the clerk to see sensitive figures such as the salaries of other employees.

MDBS assigns each user a password and also a read-access level and write-access level from 0 to 255. A record with a read-access level of 0 can be read by everyone. A read-access level of 5 prevents viewing by all but those with an access level of 5 or above.

To ensure data integrity, a system must offer protection against accidental or malicious data entry. Profile II provides protected fields in which data, even though it can be seen, cannot be changed. Profile II also offers a limited menu that allows the user to query, print, or update, but prevents creation of files or formats. Condor is

the only system that can accept a range of values for the purpose of validating data entry.

All twenty systems provide a routine to sort or order the data, but column 9 of table 2 shows that only half the systems *maintain* the data in sorted order. A maintained sort assures that further entries will be inserted in their proper order.

Derived data (column 11) are data produced by operations on other data. Examples of derived data are the sum of a column, the number of records counted, etc. (Table 8c, discussed later, shows the specific derived-data functions each system provides.)

The term "batch" in the last column of table 2 may be unfamiliar to some readers, but the concept is easy to understand. Batch commands are usually offered by systems that require the use of commands rather than providing a menu of choices. Simply stated, a user can write several instructions on the screen and then have them all carried out at once—in a batch. For example, the user can write com-

mands on the screen telling the system to read a particular file, select all records in that file in which the state is Florida, list on the printer the names and addresses found in those records, place that same list in a new file, and name the new file FLORIDA. After entering this sequence of commands, the user can take a coffee break while the computer executes the entire sequence.

Defining Data

Table 3 presents information on available methods for defining the data a file is to contain. Most of the systems, as shown in column 2, allow the user to specify the data type of a specific field. Examples of data types are numeric, date, and character. The table abbreviates data types and lists the spelled-out names at the bottom. The calculated-field type means data in the field will be automatically calculated, as specified by the user, from the contents of other fields whenever data are entered or modified in those fields. Only two systems, CCA and TIM, offer this feature. Only one sys-

| | | |
|---|---|--|
|  |  |  |
| MX80 — \$469 | APPLE II — \$1179 | M83A — \$749 |
| APPLE GRAPHICS PARALLEL INTERFACE Full Hi Res Graphics for Epson, Okidata, etc. | \$89 | TRS80 BIDIRECTIONAL I/O PORT Cascadable with Selectable Addressing |
| \$39 | | |
| ADDS Viewpoint — \$565 | INTERFACES SSM-AIO — \$180 CPS-CARD — \$199 | SOROC 120 — \$729 135 — \$799 |
| ALTOS ACS 8000-15 — \$4750 | NORTHSTAR HR64DD — \$2895 HR64QD — \$3280 | SOFTWARE All Major Brands — \$CALL |
| ANADIX 9500 — \$1225 9501 — \$1275 | LOBO Apple Drive/Card — \$390/\$90 TRS80 Drive/Interface — \$260/\$90 Apple DD Drive — \$2740 | TELEVIDEO 912 — \$669 950 — \$949 |
| ATARI 400 16K — \$349 800 32K — \$740 | MODEMS HAYS-MICROMODEM — \$295 Novation-Cat — \$155 Penril - 300/1200 (212A) — \$795 | TI 810 — \$1375 820 — \$1795 |
| CENTRONICS 730 — \$800 737 — \$750 | MONITORS APF — \$125 SANYO-BW — \$159 Sanyo-Green — \$249 Color — \$425 Amdek-Green — \$159 Color — \$350 | OKIDATA M80 — \$369 SL125 — \$3150 M82A — \$499 SL250 — \$4200 M83A — \$749 M84 — \$1175 |
| DATASOUTH DS120 — \$595 DS180 — \$1275 | MPI 88G — \$595 99G — \$895 | XTRAS Memory-16K 200ns — \$19.95 Game Paddle Extension — \$14.95 Game Paddles — \$19.95 |
| DIABLO 630 — \$2150 1640 — \$2575 | NEC 5510 — \$2540 5520 — \$2900 | C IO TH 25CPS-P — \$1379 45CPS-P — \$1699 |
| DISKETTES Scotch — \$2.50 Dysan — \$3.50 | | ZENITH Z19 — \$775 Z89 — \$2195 |
| EPSON MX80FT — \$629 MX100 — \$749 | | |
| HAZELTINE 1500 — \$995 Esprit — \$675 | | |
| DISCOUNT LINE 1-800-528-8960 | EXPOTEK CORPORATION INTERNATIONAL 2231 West Shangri La Road, Phoenix AZ 85029 | ARIZONA 1-602-861-3181 EXPORT TWX - 910-950-1194 |



OUR MONITORS ARE STATE-OF-THE-ART... OUR PRICES ARE NOT.

**12" P31 GREEN
PHOSPHOR
1200 LINES
RESOLUTION**

\$179⁰⁰

**12" B&W
15 MHz**

\$139⁰⁰

Visit your local dealer and ask about our monitors with the quality you expect and at prices you didn't expect. If these units are not available from your local dealer, . . . fill out the coupon below or call toll free. . . 1-800-258-6370.



18 BRIDGE ST.
SALEM, N.H. 03079
TEL. 603-893-2047

PLEASE SEND ME:

.....TM-12PC-GX @ \$179.00 (plus \$2.75 shipping)
.....TM-12PC @ \$139.00 (plus \$2.75 shipping)

NAME.....

ADDRESS.....

CITY.....STATE.....ZIP.....

Check Enclosed C.O.D. VISA MasterCard

Card Number.....Bank Number.....

Expiration Date.....Signature.....



tem, FMS-80, allows data fields to vary in length.

Many of the systems require that a

field be defined as a key field, and several systems allow more than one field to be used as a key field. Other

systems allow sorting or searching of any field. Data Handler allows no field definition; an entire record is entered as a stream of characters. Then, to access any particular part of the record as a field, the user must give the beginning column number and a length.

Most of the systems specify a maximum number of fields allowed. This number differs significantly from MDBS's 255 to Data Manager's 10. Though the maximum allowed by IDM-IV is 20, there is also a maximum of 10 alphabetic fields and 10 numeric fields. IDM-IV would not allow, for example, 15 numeric fields. Microconductor limits its fields to 20, but then allows 20 subfields for each of the 20 fields. Many systems restrict the number of fields by the number of characters allowed per record, so the maximum number of fields in any specific file depends on the field length chosen. At the other extreme, Micro Information System always uses 22 fields.

Not surprisingly, the number of records or files allowed depends on the number of disk drives used, the size of the disks, etc.

"Definition Revision," the last column of table 3, refers to revision of field definitions such as length and type. A "Y" in this column indicates that revision is possible after data have been entered and will not cause loss of the previously entered data.

More Than One File at a Time

Systems that can access more than one file at a time usually provide the features included in table 4. With the subfile feature, the user can create a new file from an old one. An example is dividing a long mailing list into shorter lists by state. The user can also combine files or create a new file consisting of selected records from more than one old file. For example, a user might select from two files the names and addresses of widget manufacturers and place the names and addresses in a new file.

Updating Data

Table 5 shows the variations found in facilities for updating data. Some systems bar entry of some specific

| | Field Name | Field Types Defined | 1 Key Field | Multi Key Fields | Maximum # Fields Allowed | Revision Allowed |
|------------------|------------|--------------------------|-------------|------------------|--------------------------|------------------|
| MDBS | Y | Int Char Bin Real Log | Y | Y | 255 | Y |
| FMS-80 | Y | A N V | Y | Y | 255 | Y |
| Selector IV | Y | A N J G K U | Y | Y | 80 | Y |
| TIM | Y | N C D \$ I S | N | N | 24 | Y |
| Condor | Y | A N \$ J An | N | N | 127 | N |
| Data Handler | N | - | N | N | 0 | N |
| CCA | Y | A N C | Y | Y | 24 | Y |
| Microconductor | Y | A \$ % ! # | N | N | 20 | N |
| Information Mstr | Y | A N \$ | N | N | 20 | N |
| The Informer | Y | - | Y | Y | ? | N |
| Micro Info Sys | Y | - | Y | N | 22 | ? |
| Jinsam 2.0 | Y | - | Y | Y | 255 | Y |
| Cromemco | Y | A N | N | N | 25 | ? |
| Micro Manager | Y | - | Y | N | 75 | N |
| Data Manager | Y | A N | Y | Y | 10 | ? |
| Dynamic DB | Y | A N | N | N | ? | N |
| IDM-IV | Y | A N | Y | Y | 20 | N |
| IDM-M2 | Y | A N | Y | N | 40 | N |
| Profile | Y | - | N | N | - | N |
| Profile II | Y | A N Dec | Y | Y | - | N |

| | |
|--------------|----------------------------|
| A Alpha | G Date |
| N Number | U or K Key |
| C Calculated | I Inverted |
| J or D Date | An Alphanumeric |
| \$ Dollar | % ! # Basic lang extension |
| V Variable | Dec Decimal |

Table 3: Facilities for defining data fields. Systems vary widely in their provisions for defining key fields (to be used for sorting) and in the number of fields allowed. Only six systems permit revising the characteristics of a field without losing previously entered data.

MicroMed™ and MicroDent™ make your practice perfect.™

Simply the best!

They're the real solution to the problems confronting every physician's and dentist's office. Each is a unique package, developed through years of work in close conjunction with doctors and dentists. They'll help you treat your patients more efficiently and accurately, while saving you time and money in the process.

Versatility.

Whether you are in private practice or a member of a busy group, there's sufficient capacity to handle your needs. Thousands of patients can be accommodated on floppies, and even more on hard disk. MicroMed and MicroDent can easily handle everything in your practice from billing to patient records to complex insurance forms. With millions of hours of actual use in medical and dental offices throughout the country, they stand alone at the top, in a class by themselves.

Solutions, not more problems.

We know you're after solutions, not more problems. Our menus are simplicity itself, and are designed for your convenience (not our programmers'). The computer displays your options at every step. What could be simpler? Your own office staff can easily take care of the routine so that you can devote your valuable time to your patients.

You are the boss.

Forget about problems with outside billing services or manual record-keeping. You exercise absolute control over your billing procedures. Finger-tip patient recall lets you know instantly whose accounts are due and what services were performed. Account aging is automatic, and past-due notices or statements are printed and addressed, ready for mailing. All types of reports may be requested to help you better understand your finances and cash flow. Daily backups are created automatically.

Multiple Insurance Forms.

Many patients have several different types of insurance coverage. With MicroMed and MicroDent you can enter almost any form, keep track of which patients it applies to, and get it processed and ready for mailing. When new forms come out (as we all know they will) you don't have to pay for custom programming, you can modify the form print format yourself. With our exclusive Formulator™ system it takes just minutes.

Economic Sense.

The biggest surprise of all is that MicroMed and MicroDent are just \$1500 each. Plus, having your own office computer provides you with great tax advantages. If you like what you see, contact your nearest computer store. They can provide you with MicroMed or MicroDent on any CP/M® based computer for an amazingly economical price. Or, if you already have a computer, a demo disk and manual set is available for just \$75, and allows you to run the entire program. The manual separately is \$50. Send for one today, and make your practice perfect!

Features:

- Automatic billing for any patient load
- Handles practices with up to 20 doctors
- Accepts all insurance forms
- Exclusive "Formulator" form system
- Multiple insurance coverage
- Insurance preauthorization
- Automatic statements with aging
- Instant access to patient records
- Full transaction and treatment details
- Cumulative totals by doctor
- Profitability analysis reports
- Mailing list maintenance
- Can be linked to word-processing
- Appointment recall with reminders
- Maintains hospital and lab codes
- Keeps track of referring doctor codes

Demo disk and manual set \$75!

Dealerships are available to established computer vendors on a territorial basis.

See Us At



COMDEX '81 Booth A-86
November 19-22, 1981
Las Vegas Convention Center, Las Vegas, NV

™MicroMed, MicroDent, and Formulator are trademarks of SoftwareHowz
®CP/M is a registered trademark of Digital Research
Copyright ©1981, SoftwareHowz

SOFTWARE HOWZ

P.O. Box 36275, Los Angeles; CA 90036

(213) 731-0876 • TWX: 910-321-2378

characters as data; those characters are listed in column 1.

All systems let the user update one record at a time, but column 2 shows that only seven systems provide a method for simultaneously updating all records that meet specified criteria. Adding \$5 to all records with a balance less than zero is a task that would require this multirecord capability. Data Handler has a process called "Mass Update." First, a column and length are specified as a field. Then, for each sequential record in turn, the user can enter a replacement

value for that field. This is not an automatic multirecord update, however, because the user must change each record one at a time.

To speed data update and entry, TIM, Jinsam, Selector IV, Information Master, and FMS-80 permit one-key copying of data from a previous record's field.

Criteria for Selecting Records

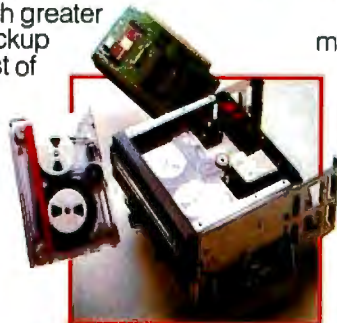
A selection criterion is a rule against which a record can be tested to see if it qualifies for selection. The selection criterion can be simple and

straightforward, such as "Part# > 124." On the other hand, the selection criterion can be complex: "Part# > 124 AND Part# < 130 OR Part-name = widget." Relational systems usually permit the user to specify that the value in a field of one file match the value in a field of another file. Multifile systems pro-

THE BACKUP SYSTEM WITH MORE BYTE.



More byte than any other system on the market, in fact. **MCSave (Magnetic Cartridge Save)** is not just another backup system—but a true file-oriented archive system. It gives you a full 67 megabytes of on-line archive/backup storage. So you can easily access, store, delete or transfer files with greater speed, and backup even the largest of most hard disks. **MCSave** combines the cost effective 3M HCD-75 Tape Drive with CP/M* to give you the kind of



performance you can really sink your teeth into. **MCSave** can handle 13,000 files per drive. You can transfer file-by-file from disk to tape, tape to disk, or tape to tape. MCSave runs on any S-100 Z-80 48K CP/M,* CDOS,* or CROMIX* system. Ask your dealer about **MCSave**... the backup system with more byte!

MCS
Microcomputer
Consulting
Services

8308 Juniper
Ft. Worth, Texas 76180
(817) 498-6390

Dealer & OEM
inquiries invited

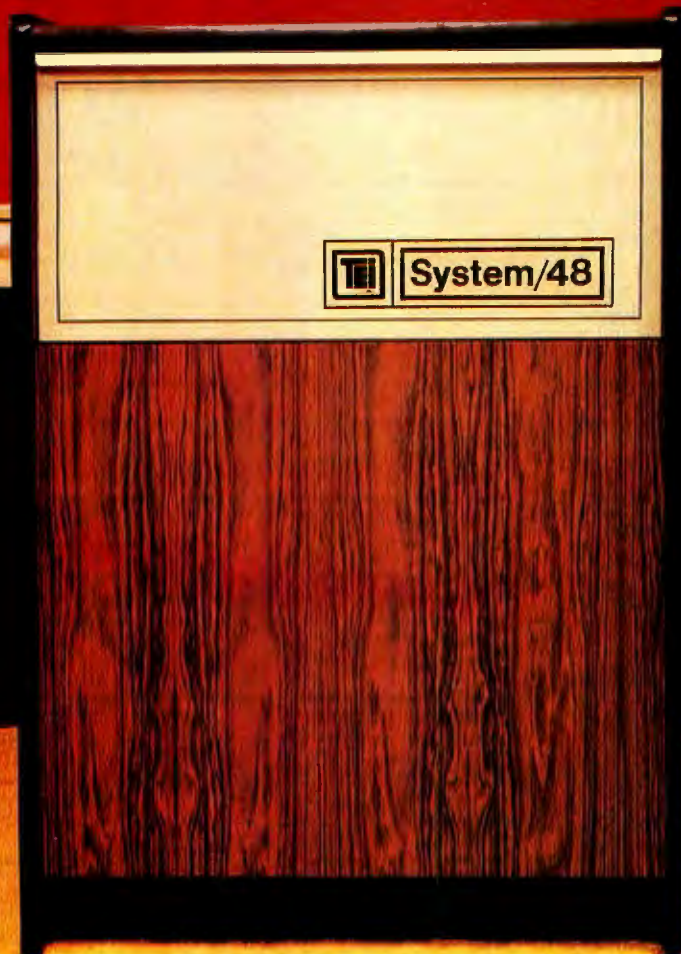
*CPM is a trademark of Digital Research *CDOS and CROMIX are trademarks of Cromemco, Inc.

| | Subfile | Combination of Files |
|------------------|---------|----------------------|
| MDBS | Y | Y |
| FMS-80 | Y | Y |
| Selector IV | Y | Y |
| TIM | Y | N |
| Condor | Y | Y |
| Data Handler | N | Y |
| CCA | N | N |
| Microconductor | N | N |
| Information Mstr | N | N |
| The Informer | N | N |
| Micro Info Sys | N | N |
| Jinsam 2.0 | N | N |
| Cromemco | N | N |
| Micro Manager | N | N |
| Data Manager | N | N |
| Dynamic DB | N | N |
| IDM-IV | N | N |
| IDM-M2 | N | N |
| Profile | N | N |
| Profile II | N | N |

Table 4: Facilities for accessing more than one file at a time. Only five systems can make a new file from part of an old file, and only five can combine old files or parts of old files to make a new file.

NEW

The World's First MacroComputer[®]



SEE US AT COMDEX
BOOTH 536

The **Parallel Processing[®] System/48[®]** is the world's first **MacroComputer[®]**, an elegantly powerful and modular multi-user computer for business and industry. It was designed from the start to out-perform other computer systems at three or more times its price. The operating system software is so friendly, versatile and fast that it's called **MAGIC[®]**.

In addition to outstanding new capabilities, **MAGIC'S** interface translator allows instant access to a large number of standard languages and applications for GL, AR, AP, PR, Inventory, Financial Planning, Fixed Assets, Property Management, Prospect Management, Order Entry, Word Processing and a host of others. **DataMagic II[®]** is provided with the **System/48**, for comprehensive database management . . . and it makes new application programming a simple joy.

Whether it's 2 or 3 users, or 128, **MAGIC** exhibits exceptional performance with transactional disk back-up to cartridge or 9-track tape; full access security; logical partitioning of tasks and users; fast Multi-Key ISAM access to multiple disks in each node (10-250 Mbytes); 1-16 Workstations and Task Processors in each node; up to 16 nodes; local and central printers for both word and data processing; remote Workstations and nodes; communications; real-time calendar and clock; and exceptional reliability because of its modularity and redundancy of software and hardware. Circle 405 on inquiry card.

And that's the whole point! You can get exactly the performance and configuration needed now and it can expand easily to meet future needs, taking advantage of the technology revolution. Large or small, real-time, batch or mixed, there's a **System/48** that's just right for the job.

If you haven't seen our **Parallel Processing System/48 MacroComputer** in ACTION, then seeing is believing! See your local dealer today for the full story. Or call Jim Knepton now at (713) 738-2300 and he'll explain how you can have your own private showing . . . and how easy and profitable it can be for you and your business.

TEI has 14 years of experience in manufacturing it RIGHT!
OEM and Dealer inquiries invited — come GROW WITH US!



System/48[®]

5075 S. LOOP EAST, HOUSTON, TX. 77033
(713) 738-2300 TWX. 910-881-3639

© COPYRIGHT TEI, INC. 1981
® REG TM OF TEI, INC. 1981

Introducing Pascal Sourcebooks™

from the NATI Pascal Software Library

- 84 **PROCEDURE** wand input.
 - 85 **BEGIN** {wand inn
 - 86 read cod
 - 87 **IF** Complete
 - 88 **Program Listings**
 - 89 **Cross References and**
 - 90 **Block Summaries**
- Block Indices by Page**

This new library of UCSD Pascal* compatible programs provides practical applications and system augmentations available nowhere else. Each Pascal Sourcebook™ is a treasure trove of ideas and proven program techniques. These Pascal programs will run on every major personal computer system currently manufactured which has the UCSD p-System* installed.

Pascal Sourcebooks™ contain completely commented and annotated source listings and machine readable bar code texts**** of well designed, clearly written UCSD Pascal* programs. Use the programs "as is", or modify and customize them to your own personal tastes. Either way, you gain a practical working library available nowhere else.

File System: Interrogate directories from application programs in order to select existing files or create new files interactively...

FS.01 Pascal Sourcebook™ alone**** \$69.95

FS.02 Pascal Sourcebook™ and Apple Pascal** media \$99.95

Incremental Backup System: Use these daily rituals to save recently used files to prevent loss of floppy or hard disk data.

IBS.01 Pascal Sourcebook™ alone**** \$69.95

IBS.02 Pascal Sourcebook™ and Apple Pascal** media \$99.95

Report Generator: Use this report formatting program to create professional word processing quality documentation with the UCSD Pascal* system's Screen Editor. Uses Diablo, NEC, Ricoh, Ahearn&Soper, etc. printers with Diablo 1620 compatible serial interface.

RGI.01 Pascal Sourcebook™ alone**** \$79.95

RGI.02 Pascal Sourcebook™ & Apple Pascal** media \$109.95

Telephone Utilities: Use these Hayes Smartmodem*** programs to dial originate or answer mode data calls. Save session images on disk. Transfer files to the line. Use the autodialer for voice calls.

TU.01 Pascal Sourcebook™ alone**** \$59.95

TU.02 Pascal Sourcebook™ and Apple Pascal** media \$89.95

Graphic Applications-I: Practical examples of Pascal programs driving application oriented graphics: examples of hydro power profiles, spherical lens ray tracing, sun-earth-moon orbital model, numerical integration, etc.

GAI.01 Pascal Sourcebook™ alone**** \$19.95

GAI.02 Pascal Sourcebook™ and Apple Pascal** media \$49.95

Typewriter Simulators: Use a word processing quality printer with your terminal as an eclectic electric typewriter. Automatic address accumulation, envelope addressing, line by line correction. Uses Diablo, NEC, Ricoh, Ahearn&Soper, etc. printers with Diablo 1620 compatible serial interface.

TSI.01 Pascal Sourcebook™ alone**** \$49.95

TSI.02 Pascal Sourcebook™ and Apple Pascal** media \$79.95

* UCSD Pascal and UCSD p-System are trademarks of the Regents of the State of California

** Apple Pascal is a trademark of the Apple Computer Company

*** Smartmodem is a trademark of Hayes Microcomputer Products

**** All Pascal Sourcebooks™ include NATI Text Format™ bar code images of compressed machine readable Pascal language source texts. Bar code readers and bootstrap software are available for Apple Pascal machines.

Dealer Inquiries Invited

FREE BONUS! With each order, we'll send customers a personal copy of the booklet "Alternative Software Delivery Media" describing our NATI Text Format™ printed bar code technology



NORTH AMERICAN TECHNOLOGY, INC.

Strand Building
174 Concord St.
Peterborough, NH 03458
(603) 924-7138

Order your Pascal Sourcebooks™ and media copies now. Call our 24 hour credit card phone order service with your Master Card, or Visa billing information:

800-854-0561 operator 860

(or in California, 800-432-7257 operator 860)

vide the latter capability with the use of batch commands.

Table 6 shows that all systems but one use selection criteria to specify conditions on at least one field. All but four systems allow a user to request that more than one field meet given criteria. Most of the systems

permit a user to search for a record falling within a specified range. Most systems also allow the user to enter only a substring of the desired field value. For example, "Smi" would return "Smith" as well as "Smiley." But only six systems allow you to ask if a field contains nothing at all. This

| | Characters Not Allowed in Field Data System Limitation | Updates One Record at a Time | Automatically Updates Multirecords at One Time | System Triggered Updates | Predefined Updates | Update Produces Audit Trail | Selection Criteria Used for Global Updates |
|------------------|--|------------------------------|--|--------------------------|--------------------|-----------------------------|--|
| MDBS | | Y | Y | N | Y | Y | Y |
| FMS-80 | | Y | Y | Y | Y | Y | Y |
| Selector IV | | Y | Y | N | Y | N | Y |
| TIM | | Y | N | Y | N | N | N |
| Condor | | Y | Y | N | Y | Y | Y |
| Data Handler | , ; | Y | N | N | N | N | N |
| CCA | , | Y | N | Y | N | N | N |
| Microconductor | | Y | N | Y | Y | N | N |
| Information Mstr | | Y | Y | N | N | N | Y |
| The Informer | , : " " | Y | N | N | N | N | N |
| Micro Info Sys | , | Y | Y | N | N | N | Y |
| Jinsam 2.0 | , : " " * shift | Y | N | N | N | N | N |
| Cromemco | | Y | N | N | N | N | N |
| Micro Manager | | Y | Y | N | N | N | N |
| Data Manager | | Y | N | N | N | N | Y |
| Dynamic DB | | Y | N | N | N | N | N |
| IDM-IV | | Y | N | N | N | Y | N |
| IDM-M2 | | Y | N | N | N | Y | N |
| Profile | | Y | N | N | N | N | N |
| Profile II | | Y | N | N | N | N | N |

Table 5: Facilities for updating data. Seven systems provide a method for simultaneously updating all records that meet specified criteria (column 3).

Software prices for hardnosed shoppers:

MICRO PRO

APPLE CP/M®

| | |
|--------------|--------|
| WORD STAR* | 259.00 |
| SUPER SORT* | 145.00 |
| MAIL MERGER* | 90.00 |
| DATA STAR* | 215.00 |
| SPELL STAR* | 195.00 |

S-100 CP/M®

| | |
|-------------|--------|
| WORD STAR | 310.00 |
| SUPER SORT | 195.00 |
| MAIL MERGER | 110.00 |
| DATA STAR | 245.00 |
| SPELL STAR | 195.00 |

BRODERBUND

| | |
|---------------------------|-------|
| TAWALA'S LAST REDOUBT | 24.95 |
| GALAXY WARS | 20.95 |
| ALIEN RAIN (AKA GALAXIAN) | 20.95 |
| SNOGGLE (REQ. JOYSTICK) | 27.95 |
| ALIEN TYPHOON | 20.95 |
| APPLE PANIC | 24.95 |
| SPACE WARRIOR | 20.95 |

AUTOMATED SIMULATIONS

| | |
|---------------------------|-------|
| INVASION ORION | 20.95 |
| STAR WARRIOR | 32.95 |
| TUES. MORNING QUARTERBACK | 25.95 |
| CRUSH, CRUMBLE AND CHOMP | 24.95 |
| THE DRAGON'S EYE | 20.95 |

MUSE SOFTWARE

| | |
|--------------------|--------|
| ROBOT WARS | 32.95 |
| THREE MILE ISLAND | 32.95 |
| A. B. M. | 20.95 |
| GLOBAL WAR | 20.95 |
| CASTLE WOLFENSTIEN | 24.95 |
| SUPER TEXT II | 129.00 |

ON-LINE SYSTEMS

| | |
|---------------------|-------|
| MYSTERY HOUSE | 20.95 |
| WIZZARD AND PRINCES | 29.95 |
| H/R FOOTBALL | 32.95 |
| H/R CRIBBAGE | 20.95 |
| MISSILE DEFENSE | 25.95 |
| CRANSTON MANOR | 29.95 |
| SABOTAGE | 20.95 |
| GOBBLERS | 20.95 |
| SOFT PORN ADVENTURE | 24.95 |
| PEGASUS II | 25.95 |
| EXPEDITER | 73.95 |

PERSONAL SOFTWARE

| | |
|----------------------|--------|
| DESKTOP PLAN II | 159.00 |
| CCA DATA MGT. SYSTEM | 89.00 |
| VISIPILOT | 159.00 |
| VISITREND/VISIPILOT | 199.00 |
| VISIDEX | 159.00 |
| VISITERM | 129.00 |
| VISICALC 3.3 | 159.00 |
| CHECKER KING | 21.95 |
| GAMMON GAMBLER | 21.95 |
| BRIDGE PARTNER | 21.95 |
| MONTY PLAYS MONOPOLY | 29.95 |
| ZORK | 32.95 |
| MONTY PLAYS SCRABBLE | 34.95 |

SIRIUS SOFTWARE

| | |
|------------------|-------|
| PHANTOMS FIVE | 24.95 |
| SPACE EGGS | 24.95 |
| AUTOBAHN | 24.95 |
| PULSAR II | 24.95 |
| GAMMA GOBLINS | 24.95 |
| GORGON | 32.95 |
| SNEAKERS | 24.95 |
| EPOCH | 29.95 |
| COPS AND ROBBERS | 29.95 |

MORE GREAT APPLE GAMES

| | |
|--------------------------|-------|
| COMPUTER QUARTERBACK | 32.95 |
| THE WARP FACTOR | 32.95 |
| CARTELS AND CUTTHROATS | 32.95 |
| TORPEDO FIRE | 49.95 |
| THE SHATTERED ALLIANCE | 49.95 |
| COMPUTER BASEBALL | 32.95 |
| POOL 1.5 | 29.95 |
| ULTIMA | 33.95 |
| RASTER BLASTER | 24.95 |
| FLIGHT SIMULATOR | 27.95 |
| INTERNATIONAL GRAND PRIX | 25.95 |
| COSMO MISSION | 24.95 |
| SARGON II | 28.95 |
| SHUFFLE BOARD | 29.95 |

MICROSOFT APPLE

| | |
|---------------------|--------|
| FORTRAN* | 165.00 |
| BASIC COMPILER* | 315.00 |
| COBOL* | 595.00 |
| APPLE SOFT COMPILER | 159.00 |
| Z-80 SOFTCARD | 299.00 |
| RAMCARD | 159.00 |
| TYPING TUTOR | 17.95 |
| OLYMPIC DECATHLON | 24.95 |

S-100 CP/M®

| | |
|----------------|--------|
| BASIC 80 | 299.00 |
| BASIC COMPILER | 319.00 |
| FORTRAN 80 | 399.00 |
| COBOL 80 | 599.00 |

PEACHTREE APPLE CP/M®

| | |
|------------------|--------|
| GENERAL LEDGER | 219.00 |
| ACCT. RECEIVABLE | 219.00 |
| ACCT. PAYABLE | 219.00 |
| PAYROLL | 219.00 |
| INVENTORY | 219.00 |

S-100 CP/M®

| | |
|---------------------|--------|
| GENERAL LEDGER | 595.00 |
| ACCT. RECEIVABLE | 595.00 |
| ACCT. PAYABLE | 595.00 |
| PAYROLL | 595.00 |
| INVENTORY | 595.00 |
| PROPERTY MGMT. | 799.00 |
| CPA CLIENT WRITE-UP | 799.00 |

APPLE BUSINESS SOFTWARE

| | |
|---------------------------|--------|
| MAGIC WINDOW | 79.00 |
| DB MASTER (NEW) | 179.00 |
| PFS: PERSONAL FILING SYS. | 84.00 |
| PFS: REPORT | 84.00 |
| Z-TERM* | 79.95 |
| ASCII EXPRESS | 63.95 |
| HAYDEN APPLESOFT COMPILER | 149.00 |
| EASY WRITER-PRO | 199.00 |

S-100 SOFTWARE

| | |
|--|--------|
| dBASE II | 599.00 |
| SUPER CALC | 249.00 |
| MAGIC WAND | 279.00 |
| SPELLGUARD | 239.00 |
| PICKLES AND TROUT CP/M® MOD. II TRS-80 | 175.00 |

EDU-WARE

| | |
|---------------------------------|-------|
| PERCEPTION PKG. | 19.95 |
| COMPU-READ | 24.95 |
| STORY TELLER | 18.95 |
| COMPU-MATH: ARITHMETIC | 39.95 |
| COMPU-MATH: FRACTIONS | 34.95 |
| COMPU-MATH: DECIMALS | 34.95 |
| COMPU-SPELL (REQ. DATA DISK) | 24.95 |
| COMPU SPELL DATA DISKS 1-4, ea. | 17.95 |

TRS-80 GAMES

| | |
|--------------------------|-------|
| TEMPLE OF APSHAI | 34.95 |
| HELLFIRE WARRIOR | 34.95 |
| STAR WARRIOR | 34.95 |
| RESCUE AT RIGEL | 24.95 |
| CRUSH, CRUMBLE AND CHOMP | 24.95 |
| INVADERS FROM SPACE | 17.95 |
| PINBALL | 17.95 |
| STAR TREK 3.5 | 17.95 |
| MISSILE ATTACK | 18.95 |
| STAR FIGHTER | 24.95 |

*REQUIRES Z-80 SOFTCARD

**IF YOU DON'T SEE IT,
CALL US. WE HAVE ALL
THE LATEST SOFTWARE.**

We built a reputation on our prices and your satisfaction.

We guarantee everything we sell for 30 days. If anything is wrong, just return the item and we'll make it right. And, of course, we'll pay the shipping charges.

We accept Visa and Master Card on all orders. COD accepted up to \$300.00

Please add \$2.00 for standard UPS shipping and handling on orders under 50 pounds, delivered in the continental U.S. Call us for shipping charges on items that weigh more than 50 pounds. Foreign, FPO and APO orders please add 15% for shipping. California residents add 6% sales tax.

**Alpha
Byte
STORES**

(213) 706-0333

31245 La Baya Drive, Westlake Village, California 91362

The prices quoted are only valid for stock on hand and all prices are subject to change without notice.

CP/M® is a registered trademark of Digital Research.

Circle 15 on inquiry card.

NEW

for
the

NEC

PC-8000 Series

from Ren Tec

The Wedge

- Fully emulates all features of the NEC PC-8012A module
- NEC PC-8001A S/I/O (terminal mode) channel is brought out to a DB 25 connector
- Additional ports for 40 bits of digital I/O and analog input including 2 Atari-type joystick ports; built-in 3 voice synthesizer with amplifier
- 32K RAM card included; also capable of handling another 32K RAM = 96K of RAM
- 16 levels of interrupt capability
- NEC PC-8012A bus structure is implemented.
- Attaches easily to the bottom of the NEC PC-8001A.

Ren Tec Wedge \$595.00

RS-232-C Interface Card
for NEC PC-8012A or
Ren Tec Wedge 179.00

32K Memory Board
for NEC PC-8012A or
Ren Tec Wedge 199.00

RGB to Composite Video
for NEC PC-8001A
(40 column only) 79.00

and

NEC Dot Matrix Printer 795.00

- 100 CPS
- Bidirectional printing
- Friction and tractor feed
- Parallel interface
- Single-ribbon cartridge

NEC Monitors

- 12" Green Screen 285.00
- 12" RGB Color 1095.00
- 12" Composite Video 430.00

* more *

ATARI 10-Key Accounting Pad . . . 124.95

ES100 Letter-Quality Printer/
Typewriter for Apple, Atari,
Commodore, H.P., NEC, Northstar,
Osborne 1, TRS-80

Ren Tec Interface 295.00

Olympia ES100 and Ren Tec
Interface 1495.00

DEALER INQUIRES WELCOME

**RENAISSANCE
TECHNOLOGY
CORPORATION**



3347 VINCENT ROAD
PLEASANT HILL, CA 94523
(415) 930-7707

facility could be used to determine which records have not been updated, to find errors, or to print only records that contain data in a particular field.

Predefined Queries

Some systems let you define a query, name it, and use it repeatedly by calling its name; table 7 shows which systems provide this facility. A

| | Conditions on 1 Field | Conditions on 1 + Fields | Complex Nested Conditions | Maximum # Conditions Allowed | Multifile/Set Conditions | Range | Substring | Null Value |
|------------------|-----------------------|--------------------------|---------------------------|------------------------------|--------------------------|-------|-----------|------------|
| MDBS | Y | Y | Y | No limit | Y | Y | Y | N |
| FMS-80 | Y | Y | Y | No limit | Y | Y | Y | Y |
| Selector IV | Y | Y | Y | 10 | Y | Y | Y | Y |
| TIM | Y | Y | Y | ? | N | Y | Y | Y |
| Condor | Y | Y | N | 32 | Y | Y | Y | ? |
| Data Handler | N | N | N | - | N | N | N | N |
| CCA | Y | Y | Y | - | N | Y | Y | N |
| Microconductor | Y | Y | N | - | N | N | Y | N |
| Information Mstr | Y | Y | Y | 6 | N | Y | Y | Y |
| The Informer | Y | Y | N | - | N | ? | Y | N |
| Micro Info Sys | Y | Y | N | - | N | N | Y | Y |
| Jinsam 2.0 | Y | Y | Y | # of fields | N | Y | Y | N |
| Cromemco | Y | Y | N | - | N | Y | N | N |
| Micro Manager | Y | N | N | - | N | N | Y | N |
| Data Manager | Y | N | N | - | N | Y | N | N |
| Dynamic DB | Y | Y | N | - | N | N | Y | N |
| IDM-IV | Y | Y | N | - | N | Y | N | N |
| IDM-M2 | Y | Y | Y | 4 | N | Y | Y | N |
| Profile | Y | N | N | - | N | N | Y | N |
| Profile II | Y | Y | N | - | N | Y | Y | N |

Table 6: The kinds of criteria by which data-base management systems can select records. Most systems allow the user to search for a record that falls within a certain numerical or alphabetical range. Only four systems allow you to select from multiple files all the records that meet a set of conditions ("Multifile/Set Conditions").



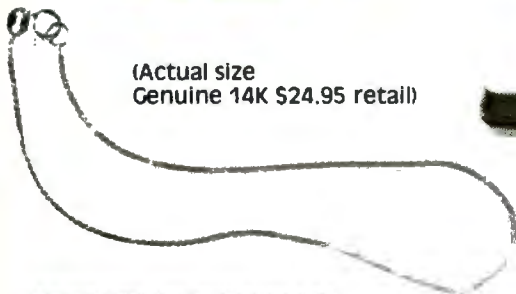
ATARI

Ω CHRISTMAS SPECIALS!

**SAVE
now on ATARI
especially
these products!!**

We carry the complete line of
ATARI Hardware, Software
Peripherals, and accessories.

FREE GOLD!



(Actual size
Genuine 14K \$24.95 retail)



**Buy an ATARI 800 16K
and receive a 14K Gold
Bracelet FREE!!**

ATARI SPECIALS

ATARI 400 16K Personal Computer \$39

ATARI PERIPHERALS

410 Program Recorder \$ 60

810 Disk Drive \$449

820 40 Column Printer \$299

822 40 Column Thermal Printer \$349

825 80 Column Printer \$599

830 Acoustic Modem \$159

850 Interface Module \$139

ATARI ACCESSORIES

CX852 8K RAM Memory Module \$39.95

CX853 853 16K RAM Memory Module \$89.95

CX30-04 Paddle Controller (pair) \$15.00

CX40-04 Joystick Controller (pair) \$15.00

**With any purchase of ATARI Hardware or
Software over \$500 you can buy the bracelet
for only \$9.95.**

PRICES ARE SUBJECT TO CHANGE W/O NOTICE.

WE CARRY THE COMPLETE LINE OF ATARI SOFTWARE.

CALL FOR THE SUPER CHRISTMAS SAVINGS!!!

**WEST COAST
1-800-235-3581**

3533 Old Conejo Rd. #102
Newbury Park, CA 91320
1-805-499-3678
CA. TOLL FREE 1-800-322-1873

Ω OMEGA SALES CO.



**EAST COAST
1-800-556-7586**

12 Meeting Street
Cumberland, RI 02864
1-401-722-1027

query is usually, though not necessarily, displayed on the terminal screen, while a report is usually printed on paper with titles, etc. A predefined query thus permits periodic viewing of a list of records meeting a specific requirement, such as past due accounts, by entering all

the information only the first time the query is used. A few systems limit the number of predefined queries a user can keep.

Column 3 of table 7 shows which systems allow a predefined query for which the user can enter a value at the time the query is used. That value

might be the date that identifies an account as past due. Such a query could be used through the year, but with a different date each month.

Producing Reports

Reporting capabilities vary widely from system to system. In order to

| | Possible | Maximum # Allowed | Modifiable When Used |
|------------------|----------|-------------------|----------------------|
| MDBS | Y | - | N |
| FMS-80 | Y | - | Y |
| Selector IV | Y | - | Y |
| TIM | Y | - | Y |
| Condor | Y | - | Y |
| Data Handler | N | - | N |
| CCA | N | - | N |
| Microconductor | N | - | N |
| Information Mstr | Y | 15 | N |
| The Informer | Y | - | N |
| Micro Info Sys | N | - | N |
| Jinsam 2.0 | Y | - | N |
| Cromemco | N | - | N |
| Micro Manager | N | - | N |
| Data Manager | N | - | N |
| Dynamic DB | N | - | N |
| IDM-IV | N | - | N |
| IDM-M2 | N | - | N |
| Profile | N | - | N |
| Profile II | Y | 5 | N |

Table 7: Facilities for predefined queries. It is a real convenience to be able to define and name a query, and then repeat the query without reentering its parameters.

| | Can Be Written to File | Format Predefined | Maximum # Predefined Formats | Uses Multiple Data Files |
|------------------|------------------------|-------------------|------------------------------|--------------------------|
| MDBS | Y | Y | ? | Y |
| FMS-80 | Y | Y | 255 | Y |
| Selector IV | N | Y | ? | Y |
| TIM | N | Y | ? | N |
| Condor | Y | Y | ? | Y |
| Data Handler | Y | N | 0 | N |
| CCA | N | Y | 20 | N |
| Microconductor | Y | Y | ? | N |
| Information Mstr | N | Y | 15 | N |
| The Informer | Y | Y | ? | N |
| Micro Info Sys | N | Y | 3 | N |
| Jinsam 2.0 | N | Y | Unlimited | N |
| Cromemco | N | N | 0 | N |
| Micro Manager | N | N | 0 | N |
| Data Manager | N | Y | ? | N |
| Dynamic DB | Y | N | 0 | N |
| IDM-IV | Y | Y | 10 | N |
| IDM-M2 | N | Y | 10 | N |
| Profile | N | Y | 1 | N |
| Profile II | N | Y | 5 | N |

Table 8a: General facilities for generating reports. Few systems can generate reports from multiple files. The ability to use predefined formats to generate reports from multiple files permits rapid production of complex reports.

Chief Relief

For years many small business system buyers thought that in order to get "real" performance and enough storage to be a "real" business system they would have to sacrifice the family jewels.

But with the introduction of the Smoke Signal Chieftain series office computers a lot of people's minds have been changed.

Because we designed the highly reliable Chieftain small business system with the most innovative combination of performance and efficiency around.

At your fingertips there are 64,000 characters of random access memory and you can address anywhere from 740,000 characters to 2 million characters with Smoke Signal's new double density controller. For larger concerns, there's a 20M byte hard disk available.

At a time when other small computer manufacturers tell you "you're on your own", Smoke Signal offers an abundance of easy-to-use software programs such as order entry, inventory control,

accounts receivable, invoice entry, payroll, word processing and much, much more. There's BASIC, COBOL and FORTRAN — even a multi-user BOS (Business Operating System) that allows for numerous users simultaneously.

Chieftain systems starting at under \$200.00 per month display performance on par with systems costing twice to three times as much.

So call (213) 889-9340 for your nearest authorized Smoke Signal dealer — he'll be glad to demonstrate the Chieftain's high reliability and ease of operation.



For dealers only, circle 382
All other inquiries, circle 474

SMOKE SIGNAL



BROADCASTING

31336 Via Colinas, Westlake Village, California 91361. (213) 889-9340



discuss the features listed in tables 8a through 8c, consider a hypothetical system having all those features. Such a system would allow a user to define a report format. The user could give the report a title, column headings, insert a paragraph of text, specify that some fields should print in ascending order, and that, within that ordering, other fields should print in

descending order.

The user could set the column widths, justify the margins, print a sample record to help line up the form on a printer, specify the number of lines to skip between each record, specify a break when a certain field changes value, and then print sub-totals or perform any of several statistical or mathematical functions.

Anadex Printer Distributors

NORTHWEST (Oregon, Washington, W. Idaho)
Sigma Distributing
Bellevue, WA (206) 454-6307

NORTHERN CALIFORNIA
Basic Electronic Distributors
Santa Clara, CA (408) 727-1800
Terminal Rentals
San Jose, CA (408) 292-9915
Byte Industries
Hayward, CA (415) 783-8272
Computerland
San Leandro, CA (415) 895-9363

SOUTHERN CALIFORNIA
Basic Electronic Distributors
Inglewood, CA (213) 673-4300;
San Diego, CA (714) 268-8000
Terminal Rentals
Tustin, CA (714) 832-2414

SOUTHWEST
(Texas, Oklahoma, Arkansas, W. Louisiana)
Barnhill Associates, Inc.
Richardson, TX (214) 231-2573;
Houston, TX (713) 688-9971; Austin, TX (512) 451-0217

ROCKY MOUNTAIN STATES (Colorado, Wyoming, Montana, Utah, E. Idaho, Arizona, New Mexico)
Barnhill Associates, Inc.
Englewood, CO (303) 779-3600;
Scottsdale, AZ (602) 947-7841;
Albuquerque, NM (505) 299-7658;
Murray, UT (801) 262-3000

MIDWEST (Illinois, Missouri, Kansas, Nebraska, N. Dakota, S. Dakota, Minnesota, Indiana, W. Kentucky, Iowa, Wisconsin)
Tek-Aids, Inc.
Arlington Heights, IL (312) 870-7400
Comtel Corporation
Chicago, IL (312) 539-4838; St. Louis, MO (314) 428-5508
Shawnee Mission, KS (913) 722-1030; Minneapolis, MN (612) 835-3060; Indianapolis, IN (317) 253-1681;
Cedar Rapids, IA (319) 377-9434;
Brookfield, WI (414) 786-1940

NORTHEAST (Connecticut, Vermont, Massachusetts, Maine, Rhode Island, New Hampshire)
Pat Jenks Associates
North Haven, CT (203) 239-6201;
Woburn, MA (617) 938-0488
Microamerica Distributors
Needham, MA (617) 449-4310

NEW YORK METROPOLITAN AREA
Logon, Inc.
Fort Lee, NJ (201) 224-6911 / (212) 594-8202

MID-ATLANTIC STATES (Maryland, Washington, DC, Virginia, W. Virginia, E. Pennsylvania, S. New Jersey)
Micro Distributors, Inc.
Rockville, MD (301) 468-6450
Plymouth Meeting, PA (215) 265-1600

SOUTHEAST STATES (Louisiana, Florida, Alabama, Mississippi, Georgia, N. Carolina, S. Carolina)
Currie, Peak & Frazier, Inc.
Huntsville, AL (205) 536-1506;
Orlando, FL (305) 855-0843;
Greensboro, NC (919) 273-3040

CANADA
Nelma Electronics Ltd.
Mississauga, Ont. (416) 624-0334



| | Title | Heading | Footing | Column Widths | Text Inserts | Margin Justification | Margin | Sample | # Lines Skipped Between Records | # Characters Between Records | # Records Across Page | # Lines/Record | Summary Breakpoints |
|------------------|-------|---------|---------|---------------|--------------|----------------------|--------|--------|---------------------------------|------------------------------|-----------------------|----------------|---------------------|
| MDBS | Y | Y | N | Y | N | N | Y | N | N | Y | N | N | Y |
| FMS-80 | Y | Y | Y | Y | N | Y | Y | Y | Y | Y | Y | Y | Y |
| Selector IV | Y | Y | ? | ? | ? | ? | ? | ? | ? | ? | ? | Y | Y |
| TIM | Y | Y | N | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Condor | Y | Y | N | Y | N | N | Y | N | N | N | N | Y | Y |
| Data Handler | N | N | N | N | N | N | N | N | N | N | N | N | N |
| CCA | Y | N | N | Y | N | Y | N | Y | N | N | Y | Y | Y |
| Microconductor | Y | Y | N | N | N | N | Y | N | N | N | N | N | Y |
| Information Mstr | Y | Y | N | Y | Y | N | Y | N | Y | N | N | Y | Y |
| The Informer | Y | Y | N | N | N | N | N | N | Y | Y | N | N | N |
| Micro Info Sys | N | Y | N | N | N | N | Y | Y | Y | Y | Y | Y | N |
| Jinsam 2.0 | Y | Y | N | Y | N | N | Y | Y | Y | Y | Y | N | N |
| Cromemco | N | N | N | N | N | N | N | N | N | N | N | Y | N |
| Micro Manager | Y | Y | N | Y | N | N | Y | N | Y | Y | N | Y | N |
| Data Manager | N | Y | N | N | N | N | Y | N | N | N | N | N | N |
| Dynamic DB | N | N | N | N | N | N | N | N | N | N | N | N | N |
| IDM-IV | Y | N | N | N | N | N | N | N | N | N | N | N | N |
| IDM-M2 | Y | N | N | N | N | N | N | N | N | N | N | N | N |
| Profile | Y | Y | N | Y | N | Y | N | Y | N | N | N | N | N |
| Profile II | Y | Y | N | N | N | N | Y | N | N | N | Y | Y | Y |

Table 8b: Facilities for formatting reports.

The important plus in matrix printers:

grafixPLUS.™



Since their introduction in mid-1980, the Anadex high-resolution DP-9500 Series matrix printers have set new standards for printer quality and performance. All models feature the rugged Anadex 9-wire print head that combines long life with resolutions of 72 dots/inch vertical and up to 75 dots/inch horizontal. With this kind of resolution, fineline graphics (under data source control) and razor sharp characters are pluses built into every printer.

Performance Plus

The full standard ASCII 96 character set, with descenders and underlining of all upper and lower case letters, is printed bi-directionally, with up to 5 crisp copies, at speeds up to 200 CPS. Models DP-9500 and DP-9501 offer 132/158/176 and 132/165/198/220 columns respectively. Print densities are switch- or data-source selectable from 10 to 16.7 characters/inch. All characters can be printed double-width under communications command.

Interface Plus

Standard in all models are the three ASCII compatible interfaces (Parallel, RS-232-C, and Current Loop). Also standard is a sophisticated communications interface to control Vertical Spacing, Form Length and Width, Skip-Over Perforation, Auto Line Feed, X-On/Off, and full point-to-point communications.

Features Plus

As standard, each model features forms width adjustment from 1.75 to 15.6 inches, shortest-distance sensing, full self-test, 700 character FIFO buffer (with an additional 2048 characters, optional), and a quick-change, 6 million character life ribbon.

Quality Plus

Beyond the built-in performance of the grafixPLUS series printers, the engineered-in quality and support are equally important. The result? Approval of both UL and FCC, Class A; operating noise levels under 65dbA; and a nationwide service organization second to none.

To see for yourself why the grafixPLUS printers offer more pluses for your printing dollar, contact us today.

 **Anadex**
the plus in printers

Made in
U.S.A.
for the World

A user could even print a column for which there is no data stored. For example, the system might allow, for each record, that the second column be multiplied by the third and the result put in a new fourth column.

The system might then print grand totals in yet another column.

The user could specify record numbering, choose to have footings printed on each page, and use information from several files. A user

could save all these specifications in a predefined report format and use the format every month without reentering the specifications.

Tables 8a through 8c show that several systems offer many of these features, but some systems offer only a few.

Some of the less expensive systems have excellent report generators. Note in the tables all the features Information Master offers. More expensive systems provide multifile report capabilities. Selector IV, for example, can report on up to 80 fields from as many as six files. TIM has its own built-in text editor that allows you to prepare form letters, checks, invoices, and the like. Profile II and Jinsam encourage the use of their word-processing packages in conjunction with their DBMSs. This combination enables the user to personalize form letters.

Conclusion

We caution the reader against basing a buying decision solely upon the information in this article. Though we have attempted to show where these DBMSs differ and what functions they perform, a report as compact as this can present only a limited amount of information.

Of course, these twenty systems do not include all software packages advertised as DBMSs. Several new packages are currently being marketed, as are upgraded versions of some of these twenty. We believe that a potential buyer, by studying these tables, can determine which features he or she considers most important and then seek a system that offers those features.

Attempts are being made to provide integrity, security, and data independence in data-base management systems for microcomputers. Even the smaller systems have provided a feature here and there that works toward these three goals. MDDBS appears to have come close to achieving all three. For software as young as data-base management systems, and hardware as young as microcomputers, the achievement of Micro Data Base Systems, Inc, is impressive. ■

| | Sums | Means | Minimums | Maximums | Roots | Weights | Count | Statistics | Average | User Defined | Column Resulting from Operation on 2 Columns | Record Numbering |
|------------------|------|-------|----------|----------|-------|---------|-------|------------|---------|--------------|--|------------------|
| MDBS | Y | Y | Y | Y | Y | N | Y | Y | Y | Y | Y | N |
| FMS-80 | Y | Y | Y | Y | N | Y | Y | N | Y | Y | Y | Y |
| Selector IV | Y | N | N | N | N | N | N | N | N | Y | Y | ? |
| TIM | Y | Y | Y | Y | N | N | Y | Y | Y | Y | Y | ? |
| Condor | Y | N | Y | Y | N | N | N | N | Y | N | Y | N |
| Data Handler | N | N | N | N | N | N | N | N | N | N | N | N |
| CCA | Y | N | N | N | N | N | N | N | N | N | N | Y |
| Microconductor | Y | N | Y | Y | N | N | N | N | N | N | N | N |
| Information Mstr | Y | N | N | N | Y | N | N | N | N | Y | Y | Y |
| The Informer | N | N | N | N | N | N | N | N | N | N | N | N |
| Micro Info Sys | D | N | N | N | N | D | D | N | D | N | N | Y |
| Jinsam 2.0 | (2) | (2) | (2) | (2) | (2) | (2) | Y | (2) | (2) | N | (2) | Y |
| Cromemco | N | N | N | N | N | N | N | N | N | N | N | N |
| Micro Manager | N | N | N | N | N | N | N | N | N | N | N | N |
| Data Manager | N | N | N | N | N | N | N | N | N | N | N | N |
| Dynamic DB (1) | D | D | N | N | N | N | N | N | D | N | Y | N |
| IDM-IV | Y | Y | N | N | N | N | Y | N | Y | Y | N | Y |
| IDM-M2 | Y | N | N | N | N | N | Y | N | Y | Y | Y | Y |
| Profile | N | N | N | N | N | N | N | N | N | N | N | N |
| Profile II | Y | N | N | N | N | N | N | N | N | N | N | Y |

- (1) Not printed; displays on screen for 15 seconds
- (2) Stat and Mathpack Available
- D Display only (not printed)

Table 8c: Facilities for deriving new data from existing records to create a report. Only MDDBS and TIM can derive statistics, although Jinsam offers an extension package for statistics.

PL/I-80™: Not for beginners*

**Why
Microcomputer
Consultants Co.
Chose
PL/I-80™
For
Business Applications**

A Case History
By
Paul Franson
Franson/Brough Associates



 **DIGITAL RESEARCH**

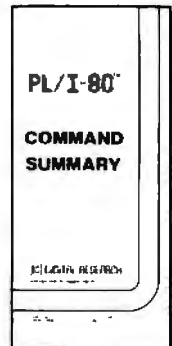
- **For internal savings**, product capabilities, code speed and upward compatibility – How PL/I-80 meets these criteria is making software news.
 - **MC is a successful company** selling business applications to first time users.
 - **MC switched** from a popular but less efficient language. MC benefits from these PL/I-80 (ANSI Subset G) features. • *Fast design* with picture specifications for output. • *Easy data retrieval* with BT-80™ file manager. • *Improved performance* with LINK-80™ loading of disk resident overlays. • *Small, fast programs* with optimized object code and no interpreter.
 - **Specific examples** of PL/I-80's speed, memory conservation, error checking, and control in the business environment are cited.
 - **In a candid interview**, Mr. Charles Russell, MC's president, discusses his professional programming needs.
- * *Mr. Russell distinguishes, "PL/I-80 isn't a panacea. It's a programmer's language. Ideal for the experienced programmer. Just as PASCAL and BASIC are good for beginners."*

● **Worldwide market exposure** of your products and company through your listing in our CP/M® Compatible Software Catalog; news affecting your business in a free subscription to ISV FORUM; plus comprehensive seminars comprise our ISV Support Plan for those who write applications under CP/M.

Yours free. See why MC switched. Then compare your language.

Limited quantity. Respond now and receive a bonus book, *PL/I-80 Command Summary*, a quick reference to 343 PL/I-80 commands and error messages.

I'd like to analyze PL/I-80 features. Send your Brochure & Bonus Book to:



Name: _____

Title: _____

Company: _____

Address: _____

 **DIGITAL RESEARCH®**
P.O. Box 579D, Pacific Grove, CA 93950

Europe: Vector, Intl., Leuven, Belgium, 32(16)202496
Far East: Microsoftware Assoc., Tokyo, Japan, 03-403-2120

CP/M is a registered trademark of Digital Research, Inc. PL/I-80, BT-80 and LINK-80 are trademarks of Digital Research, Inc.
Copyright 1981, Digital Research, Inc.

PDQ: A Data Manager for Beginners

Don't Reinvent the Wheel

Paul Swanson
97 Jackson St
Cambridge MA 02140

Floppy-disk drives are fantastic devices to add to a computer. They hold more information and are faster and more reliable than cassette tapes or other data-management systems. For the sophisticated personal user, they are essential, but managing the amount of data they hold presents a problem—especially if you are trying to do the programming yourself. This article presents the PDQ Key-File System, a data-management method that offers a good compromise between speed of data retrieval and ease of programming.

Basic Techniques

Fortunately, a large amount of literature is available that will allow you to select some elegantly simple data-management techniques without reinventing the wheel. The easiest way to use a floppy disk is to store data in *sequential files* (see glossary, page 260, for definitions of italicized words) and use the disk as if it were a cassette tape. With a little modification, any program that works with cassettes will work faster by using a disk, but it will not take advantage of the disk's ability to access any portion of the file almost immediately.

Random-access files are the next

step toward sophisticated data storage. Using this system, you can divide your data into *records* and read any of the records in any order; it's not necessary to read through half the file to get to one record in the middle. You can modify the file by reading just one record, changing its contents, then rewriting just that one record. You leave the rest of the file alone.

After working with random-access files for awhile, you will notice some annoyances. The one real problem is that records are stored by number. In order to find a record, you must know the right number. There are, however, ways around this: some techniques *sort* the file by arranging the records in order according to the data in each record.

When all the records in the file are sorted, a *searching* technique, usually *binary search*, must still be used to find the desired record. Sorting takes an enormous amount of time, which is another drawback to the random-access method.

Out of frustration, you may "invent" a way to store the name by which you want to find a record in an array in memory, along with the number of the record. Sorting this array in memory is much faster than

sorting the entire file, and it gives you an ordered index to the file, but it still takes a long time.

The Key to Managing Data

Reading about data-management techniques may lead you to try other methods, such as *direct hashing* (which is a good method, but allows no way to put the file in alphabetical order—an obvious disadvantage if the data you are managing contains people's names). The end of your search, if you are persistent and selective (see the list of recommended reading on page 262), may be the *key-file* system. This system normally requires an extra disk file (called the key file) to store the names by which you want to refer to the records (the names are called keys). The basic advantage of the key file is that it is smaller than the record file and is, therefore, faster to search through.

There are two drawbacks to using a key file. The first is that it requires two files instead of just one. The first file stores the keys and the other file stores the records. The second drawback is the same as the one involving a random-access file: there still must be some way to find the key in the key file.

For 5 years, we've been introducing people to the biggest names in small computers.



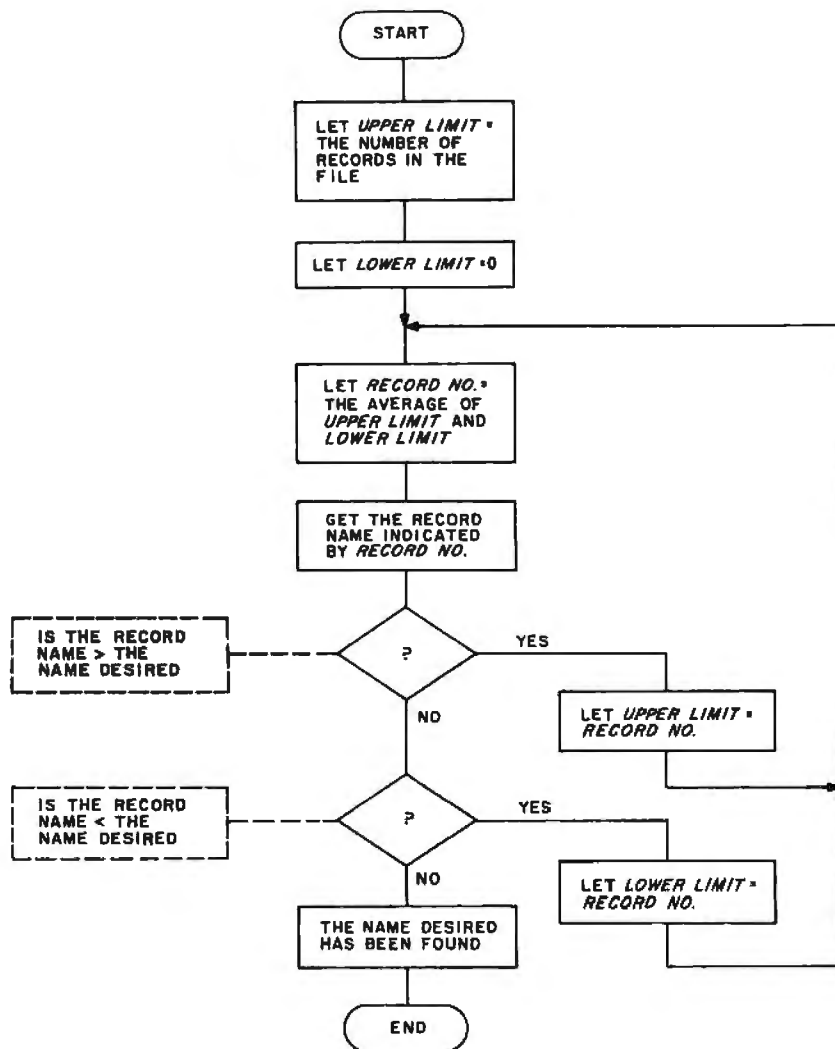
Five years may not seem like a long time. Except that's about as long as small, personal computers have been around. For example, just this year, IBM—the biggest name of all—introduced their first, the IBM Personal Computer. And they introduced it at ComputerLand. Just as Xerox did with their Series 820 Information Processor, SAM. This year, also, Wang chose ComputerLand to be the first retail outlet for their word processors. ComputerLand, the world's largest independent chain of personal computer stores, introduced the first Apple II, the first Atari computer, and the first Commodore VIC-20. And many others. In fact, our first five years have been five years of firsts. And the only place to meet all the biggest names in small computers is where they were first introduced: ComputerLand.

ComputerLand[®]

We know small computers. Let us introduce you.

Over 200 stores worldwide. For locations call 800-227-1617 X118 (in California 800-772-3545; in Hawaii call 415-930-0777 collect).

(1a)



(1b)

| RECORD NUMBER | NAME | INVENTORY NUMBER | QUANTITY | SPOIL DATE |
|---------------|--------------|------------------|----------|------------|
| 10 | ZUCCHINI | 10553 | 12000 | 9/21 |
| 9 | POMEGRANATES | 09631 | 353 | 8/17 |
| 8 | PEACHES | 08377 | 726 | 8/22 |
| 7 | OLIVES | 40163 | 68 | 8/22 |
| 6 | MANGOES | 80192 | 12 | 9/03 |
| 5 | LETTUCE | 03926 | 497 | 9/12 |
| 4 | KUMQUATS | 67167 | 521 | 9/21 |
| 3 | GRAPES | 11131 | 331 | 8/27 |
| 2 | BANANAS | 41791 | 192 | 9/17 |
| 1 | ARTICHOKES | 10767 | 226 | 9/15 |

Figure 1: Conducting a binary search through a sorted file. The flowchart for the binary search is given in figure 1a. In order for this searching technique to work, it must operate on a sorted file, as shown in figure 1b. Figure 1b is a sample of the type of information needed for the produce inventory of a market. (Most files will not be this small.)

Many different methods offer solutions to the second drawback, finding the key. One method sorts the key file. Another technique loads the key file into a large string array in memory, then sorts the string array. But that has the same speed drawbacks as sorting the record file in the first place. Hashing methods are also used, and they too have a drawback: there is no way to get the keys back in alphabetical order.

Another method involves saving a few of the keys in the file in alphabetical order, then using one of a variety of methods to load the file into memory in some semblance of alphabetical order.

Key-file systems generally require an enormous amount of programming. I have one, which I use often, that takes four or five pages, depending on the version, to list. For most applications on microcomputers, this much code is not necessary.

The PDQ Key-File System does not require an extra file for the keys. It stores all of the keys, and information required for finding them, on disk, with the records in the record file. It is also shorter to program than other key-file systems. Listing the fundamental routines requires less than two pages. The system is slower than a good separate key-file program, but it is fast enough for applications that require hundreds of records (as opposed to thousands of records).

Basic Binary Search

The PDQ method is loosely based on the same principles used in the binary search. (Binary searching requires a sorted file, but this file will not be sorted.) To understand how the PDQ system works, see the binary search example of a supermarket produce inventory shown in figure 1. Locating a record in a sorted file using the binary search involves dividing ranges of records in half. Using the flowchart of the binary-search algorithm, let's try searching through a file of 10 records for the record named "peaches."

Set the upper limit to 11 (10 plus 1). Set the lower limit to zero. The variable record no. is the average of upper limit and lower limit (6 for the

SEE US AT
COMDEX
BOOTH 1512

The 5000 SX with:

Capacity: 5.5 MB Winchester Plus Two Mini Floppies

If you know our Series 5000 table top computer line, you know that *good* things come in small packages.

Now, with the introduction of the 5000 SX, *big* things come in small packages.

One integrated package can contain two double sided, double track density floppies plus a 5.5 megabyte Winchester drive.

Speed: Load 20K in Less Than a Second

Not only does our high performance Winchester subsystem include error detection with automatic error correction, its extreme speed is comparable to that of large main frame hard disk systems.

A 20K program loads in less than one second, about 10 to 12 times as fast as a floppy.

We invite comparison with our competitors' Winchester implementation then you will see how a truly engineered solution speeds up your application programs.

Extras: You'll Be Glad You Have Them

The 5000 SX comes standard with lots of extras, starting with a fully terminated S100 mother board. Add to that 64K dynamic RAM modules, with parity, of course, and receptacles for your CRT and Printer that turn on with the main power switch.

Plus, convenient up front power reset switch, incoming power line filter and much more.

Software:

Operating Systems: CP/M, MP/M, TurboDOS

Languages: BASIC, FORTRAN, COBOL

Application Packages: FMS-80, WORDSTAR, Accounting Plus, all tailored to operate on the 5000 SX.

Quality: So Good, It's Warranted 2 Years

There isn't room on this page to even scratch the surface of the IMS International story.

However, our 2-year warranty is a dead giveaway that we produce rugged, top quality, professional equipment. We do things right the first time so they don't come back to us.

The truth is, we have fewer returns within our 2-year warranty period than other manufacturers have within their 90-day warranty periods.

For full details and the location of your nearby IMS International dealer, call us today at (714) 978-6966. Or write:

IMS
INTERNATIONAL

We Build Computers As If Your Business Depended On Them.

2800 Lockheed Way, Carson City, NV 89701
Telex: 910-385-6051

CP/M & MP/M, TM of Digital Research • TurboDOS, TM of Software 2000 • FMS-80, TM of DJR Associates • WORDSTAR, TM of MICROPRO • ACCOUNTING PLUS, TM of SYSTEMS PLUS

Circle 193 on inquiry card.

Announcing
The Table Top Computer
That Can't Be Topped.



first pass, if you round up). Load this record, "mangoes," into memory. "Mangoes" is not greater than "peaches," it is less; so we set the *lower limit* to 6 and loop back to recalculate *record no.*, but with the limits 6 and 11.

This is how the binary-search method divides the file in half. The number of records to search through has been narrowed down to about five, instead of the 10 we started with. The next loop will look at the record whose number is 9 (the average of the new limits). When this

record's name, "pomegranates," is compared with "peaches," the limits will become 6 and 9. This process of dividing the number of records to search continues until "peaches" is found, or until there are no more records to search (ie: *upper limit* is equal to *lower limit* plus one), which means that the record is not in the file.

PDQ Key-File System

As I have mentioned, the PDQ Key-File System uses a modified version of binary searching based on a

tree structure (see figure 2). Each record is stored with the key (the name) and two *pointers* that are used in searching: the *greater than* pointer and the *less than* pointer.

Using the same produce-inventory example, the first record in the file is the first one entered, "lettuce." It is simply recorded with each of the two pointers set to zero. When the second record, "olives," is entered, it is necessary to compare its name to that of the first record ("olives" is greater than "lettuce"). The second record is placed in the next available storage space, and the *greater than* pointer in the first record will be set to two. In this way, record one is said to *point to* record two, to indicate that the name of record two is greater than the name of record one. Searching this tree is as simple as following the pointers (see the flowchart in figure 2a).

Unless the keys are entered in a random order, the tree will look lopsided; there is no easy solution to this, but it is not much of a drawback. The system will work most quickly when the tree is perfectly symmetrical. In that form, the system will step through exactly the same keys as it would if it were the sorted file of figure 1b, and the binary search were used. A very lopsided tree will still work, but it will be slower than a symmetrical one. When using the system, don't enter the records in alphabetical order or the system will search the entire file sequentially. A random order is best.

A Closer Look at the System

The PDQ key-file system (see listing 1) uses an array to define such things as the record length, the key length, etc (see the REM statements on lines 40 through 110 and the DATA statement on line 160, which contains the values for the array in the indicated order). The logic of the key-file system is entirely within the subroutines starting at line 5000. The rest of the listing (lines 200 through 2010) contains a sample application.

The first subroutine gets the number of the next available record in the file. This is done using a counter that occupies record number

THE WORLD IS YOURS



Data communications can open up a whole new world to you and your computer. A world of the future. Now. A world full of information resources, time-sharing computer systems, and electronic bulletin boards. All you need for admission to this world is your CP/M-based computer, a modem, and the proper software. That's where we come in. We have the proper software. CROSSTALK, our smart terminal & file transfer program for CP/M, allows you to call into thousands of dial-up computer systems around the world, and communicate with them. REMOTE, our CP/M remote console program, allows you to operate your CP/M system from a remote terminal, giving your computer added flexibility and usefulness.

CROSSTALK

- Allows your computer and modem to communicate with other computers, including other CROSSTALK systems, public-access "bulletin board" systems, main frame computers, subscription "information utilities" such as THE SOURCE, and much more.
- Simple, easy to use "plain English" command structure makes CROSSTALK easy to learn, yet provides a powerful tool for exchanging files, capturing data, and controlling modem parameters.
- Concurrent printer and video allows you to print data while viewing it on the CRT.
- Fully error-checked file transfers using 16 bit CRC protocol. Protocol transfers allow exchanging files which are larger than the system's memory.
- Built in "DIR" command.
- Data capture allows saving received data onto your disk.
- Auto-dial, redial, and auto-answer (if supported by modem).

Available for the following modems:

- Hayes 80-103a
- Hayes Smartmodem™
- Hayes Micromodem 100™
- PMMI Communications MM-103
- Hayes Micromodem II™ for the Apple II*
- Any RS-232C modem, including 1200 baud modems

REMOTE

- Allows remote use of your computer from a remote terminal location.
- May be called as a subroutine from BASIC, PASCAL, or any other program to allow answering under program control.
- Provides nulls if needed for printing terminals.
- Uses less than 1k of memory space.
- Automatically selects proper baud rate.
- Available for S-100 modems (Hayes and PMMI) only.

For details, see your computer retailer, or contact us directly.

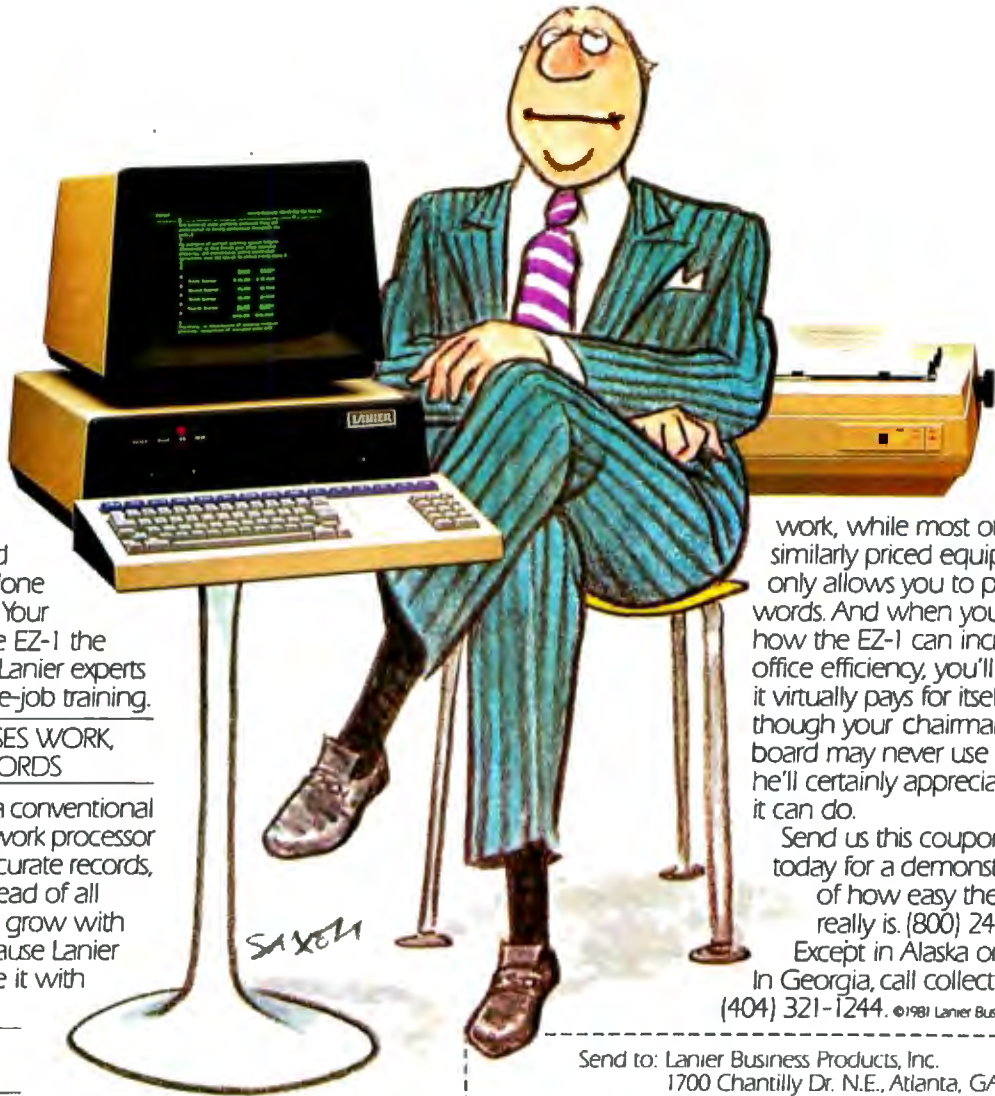


Microstuf, Inc.
 Box 33337
 Decatur, Georgia 30033
 (404) 491-3787 (voice)
 (404) 839-1520 (demo system)

Smartmodem™ and Micromodem™ are trademarks of Hayes Microcomputer Products, Inc. Apple is a registered trademark of Apple Computer, Inc. CROSSTALK is a trademark of Microstuf, Inc. CP/M is a registered trademark of Digital Research, Inc.

DEALER INQUIRIES WELCOME.

Introducing a work processor so easy even the chairman of the board can operate it.



With Lanier's new EZ-1,[™] suddenly it's easy to type reports, letters, memos, lists, and more. And get them done accurately right away. Your staff can start using the EZ-1 the day it arrives, because Lanier experts offer immediate on-the-job training.

THE EZ-1 PROCESSES WORK, NOT JUST WORDS

The EZ-1 is more than a conventional word processor. It's a work processor that also files, keeps accurate records, and helps you stay ahead of all your paperwork. It can grow with your business too, because Lanier will continually update it with new capabilities.

HARD WORK WAS NEVER THIS EASY

Your secretary types on a TV-like screen instead of on paper, so changes are made before printing. That saves time and helps avoid typos. All your work is produced in letter-quality printing at less than 30 seconds per page. 50-200 pages can be stored on a single memory disc. In addition, the EZ-1 does more than one job at a time, which can free your secretary to work on other administrative tasks.

EASY TO AFFORD

The new EZ-1 gives you the ability to process all kinds of

work, while most other similarly priced equipment only allows you to process words. And when you consider how the EZ-1 can increase office efficiency, you'll see how it virtually pays for itself. Even though your chairman of the board may never use the EZ-1, he'll certainly appreciate all it can do.

Send us this coupon, or call today for a demonstration of how easy the EZ-1, really is. (800) 241-1706. Except in Alaska or Hawaii. In Georgia, call collect: (404) 321-1244. ©1981 Lanier Business Products, Inc.

Send to: Lanier Business Products, Inc.
1700 Chantilly Dr. N.E., Atlanta, GA 30324

Show me how easy the EZ-1 is.

Name

Title

Phone Best Time to Call

Firm Address

City County State Zip

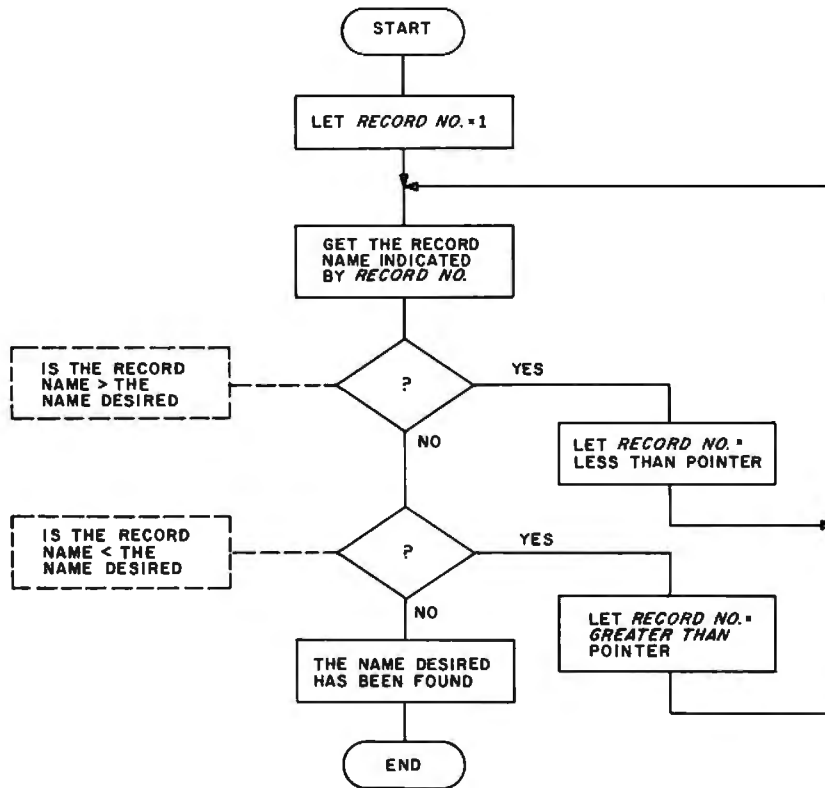
LANIER

We make your good people even better.

Oct 81 Byte 4 81 B J1

Makers of the TypeMaster[™] No Problem[®] Typewriter, No Problem Shared System[™] and EZ 1[™] Work Processor.

(2a)



(2b)

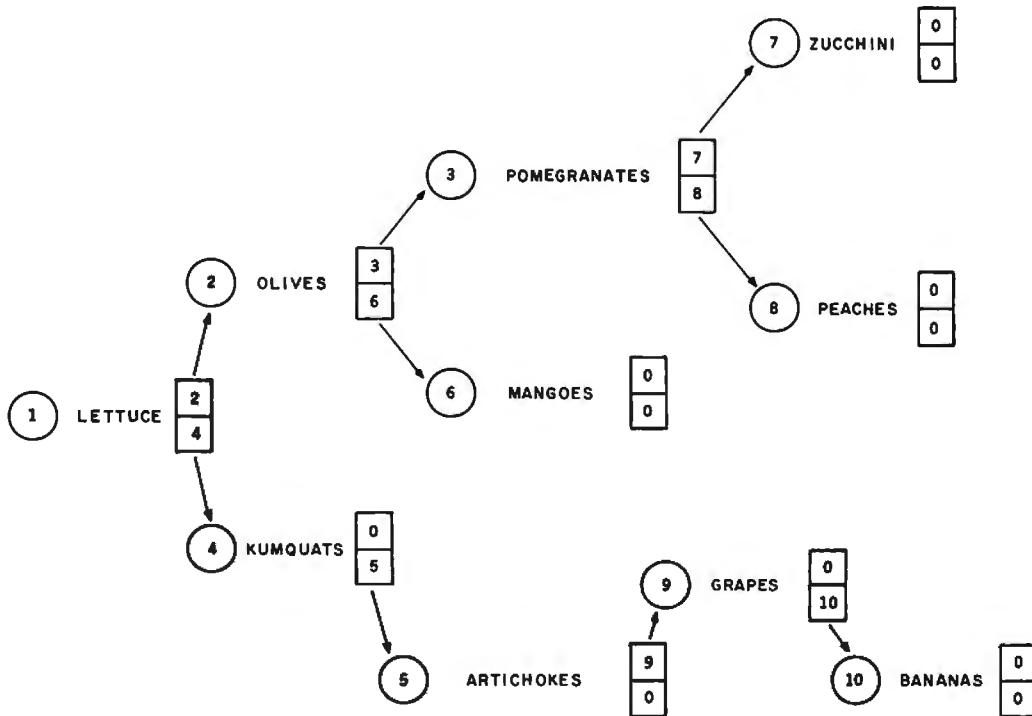


Figure 2: Traversing the PDQ tree. Figure 2a is the flowchart for a method of searching a tree. Note its simplicity when compared to the binary-search method of figure 1a; searching the tree requires fewer steps and calculations. A sample PDQ tree (of the same data used in figure 1b) is shown in figure 2b.

Please call (213) 883-8594.

Our Epson prices are so low, we're not allowed to print them.

EPSON MX-80\$CALL

80 cps/9x9 matrix/Lower case with true descenders/Bi-directional & Logic seeking/Adjustable tractor/Expanded printing/Block graphics/Forms control/Compressed printing/Double-strike printing/Correspondence quality/Emphasized printing mode/Standard parallel interface

EPSON MX-80 F/T\$CALL

Same features as the MX-80 plus Friction Feed. Adjustable removable tractor is standard for ease of handling forms and single sheets.

EPSON MX-100 F/T\$CALL

Same features as the MX-80 & MX-80 F/T but on 15½ inch carriage for printing 132 columns with standard 10 cpi font or 232 columns in the compressed character font. The MX-100 is complete with Dot Resolution Graphics

EPSON INTERFACES & OPTIONS

| | | | |
|-----------------------------------|--------|-------------------------------------|--------|
| TRS 80 MODEL I III CABLE | \$ 30 | SERIAL INTERFACE (2K BUFFER) | \$ 149 |
| TRS-80 MODEL I Keyboard Interface | \$ 95 | SERIAL CABLE Male to Male | \$ 30 |
| TRS 80 MODEL II CABLE | \$ 30 | DOT RESOLUTION GRAPHICS | \$ 90 |
| APPLE INTERFACE & CABLE | \$ 100 | REPLACEMENT RIBBON | \$ 13 |
| IEEE 488 INTERFACE | \$ 60 | REPLACEMENT PRINT HEAD (Quiet type) | \$ 40 |
| SERIAL INTERFACE | \$ 70 | EPSON SERVICE MANUAL | \$ 40 |

Alpha Byte STORES

We built a reputation on our prices and your satisfaction.

We guarantee everything we sell for 30 days. If anything is wrong, just return the item and we'll make it right. And, of course, we'll pay the shipping charges.

We accept Visa and Master Card on all orders. COD accepted up to \$300.00. We also accept school purchase orders.

Please add \$2.00 for standard UPS shipping and handling on orders under 50 pounds, delivered in the continental U.S. Call us for shipping charges on items that weigh more than 50 pounds. Foreign, FPO and APO orders please add 15% for shipping. California residents add 6% sales tax.

31245 La Baya Drive, Westlake Village, California 91362

Listing 1: The PDQ Key-File System for the Radio Shack TRS-80 Model III. This program both creates and searches the PDQ tree for files of moderate length. The program should be easily portable for any computer using a form of Microsoft BASIC.

P SWANSON - PDQ KEY FILE SYSTEM

---- SAMPLE INVENTORY PROGRAM USING KEY FILE SYSTEM ----

```
10 CLEAR 3000
15 DIMCA(6)
20 OPEN"R",1,"NEWFILE:0": '*** NEWFILE = NAME OF FILE ***
30 FIELD1,255ASB$
40 REM ***** PARAMETER ARRAY *****
50 REM ***** 1 # RECORDS/BLOCK *****
60 REM ***** 2 RECORD LENGTH *****
70 REM ***** 3 FIRST BYTE OF GR *****
80 REM ***** 4 FIRST BYTE OF LR *****
90 REM ***** 5 KEY LENGTH *****
100 REM***** 6 # RECORDS IN FILE (MAX) ***
110 REM*****
120 RESTORE
130 FORI=1TO6
140 READCA(I)
150 NEXTI
160 DATA 8,30,6,8,5,199
199 REM***** 200 SELECTOR *****
200 CLS
210 PRINT"          ** INVENTORY PROGRAM **"
220 PRINT
230 PRINT" 1. ADD A RECORD TO THE FILE"
240 PRINT" 2. EDIT A RECORD ON FILE"
250 PRINT" 3. PRINT FILE DUMP"
260 PRINT
270 INPUT"ENTER NUMBER OF YOUR SELECTION";N
280 IFN=27THEN400
290 ONNGOTO600,900,1400
300 GOTO270
399 REM***** 400 INITIALIZE FILES *****
400 CLS
410 PRINT"*****FILE INITIALIZATION*****"
420 PRINT
430 PRINT"ENTER PASSWORD:";
440 P$=""
445 CC=0
450 Q$=INKEY$:IFQ$=""THEN450
460 IFQ$=CHR$(13)THEN500
470 PRINT"X";
480 P$=P$+Q$
490 GOTO450
500 IFF$="SECRET"THEN510:ELSE200
510 B1$=STRING$(255,32)
520 FORI=1TO25
530 LSETB$=B1$
540 PUT1,I
550 NEXTI
560 MID$(B1$,1,2)=MKI$(0)
570 LSETB$=B1$
580 PUT1,1
590 GOTO200
599 REM***** 600 ADD A RECORD TO THE FILE ***
600 CLS
610 PRINT"          ** ADD A RECORD TO THE FILE **"
620 PRINT
630 INPUT"ITEM NUMBER";I$
640 A$=I$
650 GOSUB7000
```

Listing 1 continued on page 246

BETA COMPUTER DEVICES

AVAILABLE NOW ... SYSTEM 2800 FROM SYSTEMS GROUP

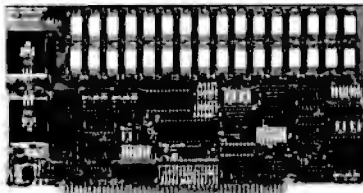
FEATURES

- IEEE S-100 Bus Compatible Systems, Z80A Based
- Two 8-Inch Drives: Single or Double Sided, Double Density Floppy Disk Drives or 10MB Winchester Hard Disk Drive
- 20MB Winchester and Tape Backup
- 8-Slot Shielded and Terminated Motherboard
- System Software Selection includes CP/M*, MP/M* or OASIS**
- Single-User or Multi-User Systems, Expandable to 6 Users
- Table Top or Rack Mountable
- Two Switched AC Outlets on Rear Panel
- One Year Warranty on Entire System

2812 CP/M, 2 Single Sided Floppies.....\$3775.00
 2814 CP/M, 2 Double Sided Floppies..... 4425.00
 2819 CP/M, 1 10 MB Winchester &
 1 Double Sided Floppy..... 6675.00
 2824 MP/M, 2 Double Sided Floppies.... 5235.00
 2829 MP/M, 1 10 MB Winchester &
 1 Doubled Sided Floppy.... 7500.00

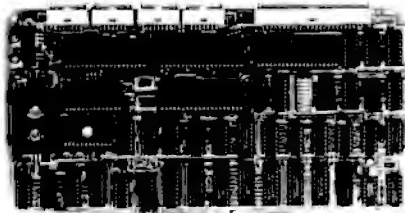


S-100 PRODUCTS



QUALITY RAM FROM SYSTEMS GROUP

- Z-80 4MHZ operation with no wait states
 - IEEE compatible timing - 200 NS 4116's
 - Factory assembled, tested & burned in
- DMB6400 64K (Bank Select, shown).....\$ 740.00
 DM6400 64K..... 540.00
 DM4800 48K..... 510.00
 DM3200 32K..... 475.00



CONFIGURE A COMPLETE S-100 SYSTEM WITH 2nd GENERATION* PRODUCTS FROM SYSTEMS GROUP.

- CPC 2810 (shown) Z-80A processor board (4MHZ) with 4 serial & 2 parallel ports.....\$369.00
- CPC2813 - same as CPC2810 but 2 serial ports only.....\$345.00
- FDC2801/8 - 8" floppy disk controller board, up to 4 single/double sided drives, single or double density.....\$349.00
- INO-2804 - 4 channel serial I/O..... 329.00
- CRA-100 - Cromix* adaptor board.. 555.00

CALL US FOR OUR MOST CURRENT PRICES!

*2nd Generation is a trademark of Measurement Systems and Controls, Inc. Cromix is a trademark of Cromemco, Inc. CP/M and MP/M are trademarks of Digital Research. OASIS is a trademark of Phase One Systems.

16K MEMORY EXPANSION KIT \$24.00

For Apple, TRS-80 keyboard, Exidy, and all other systems using 4116 dynamic rams or equivalent. All IC's are prime Mitsubishi MI 4116-3, 200 NSEC, burned-in and fully tested.

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

Adds Viewpoint CRT.... 569.00

PAPER TIGER PRINTERS

IDS 460G 9x9 Dot Matrix Printer..... 890.00
 IDS 560G Wide Carriage Printer..... 1099.00

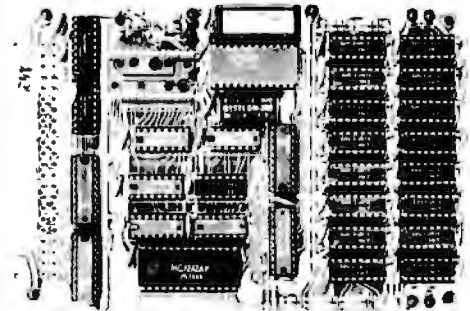
8" DISK DRIVES

Shugart 801R..... \$399.00
 NEC FD1160 (double sided)..... 589.00
 Memorex MRX-101 8" Winchester style, hard disk drive, 10 megabytes.....\$2,000.00

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.

6502 PRODUCTS



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 & 6 hard-to-get parts. 99.00
 PET interface kit. Connects the 32K RAM board to a 4K or 8K PET.....\$ 69.00

AIM Professional Enclosure...\$175.00

BETA COMPUTER DEVICES

1230 W. COLLINS AVE.
 ORANGE, CA 92668
 (714) 633-7280



Listing 1 continued:

```
660 IFE=OTHERPRINT"DUPLICATE - KEY ALREADY IN FILE":GOTO2000
670 INPUT"DESCRIPTION";D$
680 INPUT"QUANTITY IN STOCK";Q
690 INPUT"UNIT PRICE";P
700 INPUT"ARE ALL VALUES CORRECT (Y/N)";Q$
710 IFQ$="N"THEN600
720 IFQ$<>"Y"THEN700
730 PRINT"***** SAVING RECORD IN THE FILE *****"
740 A$=STRING$(CA(2),32)
750 MID$(A$,1,5)=I$
760 MID$(A$,10,14)=D$+STRING$(14,32)
770 MID$(A$,24,2)=MKI$(Q)
780 MID$(A$,26,4)=MKS$(P)
790 GOSUB6000
800 GOTO200
899 REM*** 900 EDIT A RECORD ON FILE ****
900 CLS
910 PRINT"          ** EDIT RECORDS ON FILE **"
920 PRINT
930 INPUT"ENTER ITEM NUMBER OR END";I$
940 IFI$="END"THEN200
950 A$=I$
960 GOSUB7000
970 IFE=OTHER1000
980 PRINT"ITEM NOT IN FILE"
990 GOTO930
1000 I$=LEFT$(A1$,5)
1010 D$=MID$(A1$,10,14)
1020 Q=CVI(MID$(A1$,24,2))
1030 P=CVS(MID$(A1$,26,4))
1040 CLS
1050 PRINT"***** EDITING ITEM NUMBER ";I$
1060 PRINT
1070 PRINT"ENTER";TAB(15);"TO CHANGE";TAB(40);"CURRENT VALUE"
1080 PRINT"  -1";TAB(15);"TO QUIT AND NOT POST CHANGES"
1090 PRINT"   0";TAB(15);"TO END AND SAVE CHANGES"
1100 PRINT"   1";TAB(15);"DESCRIPTION";TAB(40);D$
1110 PRINT"   2";TAB(15);"QUANTITY";TAB(40);Q
1120 PRINT"   3";TAB(15);"UNIT PRICE";TAB(40);:PRINTUSING"#####.##";P
1130 PRINT
1140 INPUT" ENTER NUMBER OF YOUR CHOICE FROM ABOVE LIST";N
1150 GNN+2GOTO900,1160,1290,1310,1330
1155 GOTO1140
1160 A$=STRING$(CA(2),32)
1170 MID$(A$,1,5)=I$+STRING$(5,32)
1180 MID$(A$,6,2)=MKI$(GR)
1190 MID$(A$,8,2)=MKI$(LR)
1200 MID$(A$,10,14)=D$+STRING$(14,32)
1210 MID$(A$,24,2)=MKI$(Q)
1220 MID$(A$,26,4)=MKS$(P)
1230 GOSUB5500
1240 B1$=B$
1250 MID$(B1$,CA(2)*(RN-1)+1,CA(2))=A$
1260 LSETB$=B1$
1270 PUT1,BN
1280 GOTO900
1290 INPUT"NEW DESCRIPTION";D$
1300 GOTO1040
1310 INPUT"NEW QUANTITY";Q
1320 GOTO1040
1330 INPUT"NEW UNIT PRICE";P
1340 GOTO1040
1399 REM*** 1400 PRINT INVENTORY LISTING ****
1400 CLS
1410 PRINT"          ** INVENTORY LISTING **"
1420 PRINT
```

Listing 1 continued on page 248



Check the Osborne Books You Want

Assembly Language Program Series

by Lance Leventhal and co-authors

You needn't know anything about assembly language to use these books. Each one is a straightforward, self-teaching textbook that is both precise and easy to understand.

NEW

- 68000..... #62-4, \$16.99 □
- 6809..... #35-7, \$16.99 □
- 6502..... #27-6, \$16.99 □
- Z80..... #21-7, \$16.99 □
- Z8000..... #36-5, \$19.99 □
- 6800..... #12-8, \$15.99 □
- 8080A/8085..... #10-1, \$15.99 □

The 8086 Book

by Russell Rector and George Alexy

Part assembly language text and part hardware reference, this book covers all of the 8086's most important features.

#29-2, \$16.99 □

Interface

NEW

Interfacing to S-100 (IEEE 696) Microcomputers

by Sol Libes and Mark Garett

Describes the S-100 Bus with unmatched precision. Covers mechanical and electrical design, logical and electrical relationships, bus interconnections, and much more.

#37-3, \$15.00 □

NEW

Microprocessors for Measurement and Control

by D.M. Auslander and P. Sagues

Learn to design mechanical and process equipment using microprocessor based "real-time" computer systems. This book allows readers (even those unfamiliar with machine or assembly language) to initiate projects.

#57-8, \$15.99 □

Circle 476 on Inquiry card.

PET and the IEEE 488 Bus (GPIB)

by E. Fisher and C.W. Jensen

Provides chapters on all aspects of the General Purpose Interface Bus. Includes lines, signals, specifications, and much more.

#31-4, \$15.99 □

Microelectronic References

Osborne 4 & 8 Bit Microprocessor Handbook

by Adam Osborne and Gerry Kane

The one source for complete, objective and accurate information on 4 and 8 bit microprocessors. This book describes virtually every 4 and 8 bit microprocessor on the market today, and allows you to evaluate any device or combination of devices.

#42-X, \$19.95 □

Osborne 16-Bit Microprocessor Handbook

by Gerry Kane and Adam Osborne

A total reference book on virtually every 16-Bit microprocessor, this book permits objective evaluation and comparison of these new devices.

#43-8, \$19.95 □

An Introduction to Microcomputers: Volume 3 - Some Real Support Devices

by Gerry Kane and Adam Osborne

Available with or without 3-ring binder or updates. Each device is described in detail, including an analysis of the best uses for that device.

Book - #18-7, \$15.00 □

Binder - #19-5, \$6.99 □

Six Updates - #98, \$25.00 □

Handbooks

68000 Microprocessor Handbook

by Gerry Kane

This handbook offers more information about the 68000 than the manufacturer's data sheets.

#41-1, \$6.99 □

CRT Controller Handbook

by Gerry Kane

Describes five devices in the same thorough detail you'll find in Volume 3. Contains 13 tables and 149 separate illustrations.


#45-4, \$6.99 □

8089 I/O Processor Handbook

by Adam Osborne

A complete presentation of the 8089. The 8289 Bus Arbiter is also described with the same careful attention to design and application.

#39-X, \$6.99 □

 Osborne/McGraw-Hill
630 Crocraoft Way, Berkeley, CA 94710

Call Toll Free: 800-227-2895
in California (415) 548-2805

Dept. B21



Book#, Price: _____

Name _____

Address _____

City/State/Zip _____

Plus: .75/item 4th class \$1.50/item UPS \$2.50/item Air Mail \$10.00/item Overseas
(California residents add applicable tax.)

Total amount enclosed \$_____ or charge my Visa Mastercharge

Card# _____ Expiration Date _____

Listing 1 continued:

```
1430 INPUT"START AT ITEM";SI$
1440 INPUT"END AT ITEM";EI$
1450 IFSI$>EI$THEN1430
1452 SI$=SI$+STRING$(5,32)
1454 EI$=EI$+STRING$(5,32)
1460 IFSI$>STRING$(5,32) THENMID$(SI$,5,1)=CHR$(ASC(MID$(SI$,5,1))-1)
1470 L9=55:P9=0
1475 TV#=0
1480 A$=SI$
1490 GOSUB8000
1500 IFE<>0THEN1690
1510 IFLEFT$(A1$,5)>LEFT$(EI$,5) THEN1690
1520 L9=L9+1
1530 IFL9<55THEN1590
1540 IFF9<>0THENFORI=L9TO65:LPRINT" ":NEXTI
1550 P9=P9+1
1560 LPRINT"                INVENTORY LISTING REPORT                PAGE";P9
1570 LPRINT" "
1575 LPRINT"ITEM NO.";TAB(10);"DESCRIPTION";TAB(30);"QUANTITY";TAB(45);"UNIT PRI
CE";TAB(60);"EXT. VALUE"
1580 L9=4
1590 Q=CVI(MID$(A1$,24,2))
1600 P=CVS(MID$(A1$,26,4))
1610 LPRINTLEFT$(A1$,5);TAB(10);MID$(A1$,10,14);TAB(30);
1620 LPRINTUSING"#####";Q;:LPRINTTAB(45);
1630 LPRINTUSING"####.##";P;:LPRINTTAB(60);
1640 EV#=Q*P
1650 TV#=TV#+EV#
1660 LPRINTUSING"#,###,###.##";EV#
1670 A$=A1$
1680 GOTO1490
1690 LPRINT" "
1700 LPRINT"TOTAL VALUE OF INVENTORY =";
1710 LPRINTUSING"#,###,###.##";TV#
1720 GOTO200
2000 INPUT"PRESS ENTER WHEN FINISHED VIEWING";Q$
2010 GOTO200
4998 STOP
4999 REM**** GET NEXT FREE RECORD - FR ****
5000 GET1,1
5010 FR=CVI(LEFT$(B$,2))+1:          ?--- Record 0, bytes 1 & 2 ---
5020 B1$=B$:                          ?--- contain the count of ---
5030 MID$(B1$,1,2)=MKI$(FR):          ?--- records used. FR is ---
5035 LSETB$=B1$:                        ?--- next available rec. # ---
5040 PUT1,1
5050 RETURN
5499 REM**** 5500 GET RECORD #RR - A1$ ****
5500 BN=INT(RR/CA(1)):                ?--- BN = block no. ---
5510 RN=RR-BN*CA(1)+1:                ?--- RN = reference on block---
5520 BN=BN+1
5530 GET1,BN
5540 A1$=MID$(B$,CA(2)*(RN-1)+1,CA(2))
5560 GR=CVI(MID$(A1$,CA(3),2)):        ?--- GR = greater reference---
5570 LR=CVI(MID$(A1$,CA(4),2)):        ?--- LR = lesser reference ---
5580 RETURN
5999 REM**** 6000 PUT RECORD A$ INTO FILE ****
6000 GOSUB5000:                        ?--- Get next free record ---
6010 IFFR>1THEN6100:                  ?--- The first record gets ---
6015 A1$=A$+STRING$(CA(2),32):        ?--- special treatment. ---
6020 A$=LEFT$(A1$,CA(2)):              ?--- Pack A$... ---
6022 MID$(A$,CA(3),2)=MKI$(0)
6024 MID$(A$,CA(4),2)=MKI$(0)
6030 RR=FR:                            ?--- Set record number (=1)---
6040 GOSUB5500:                        ?--- Get record. ---
6050 B1$=B$
6060 MID$(B1$,CA(2)*(RN-1)+1,CA(2))=A$
```

Listing 1 continued on page 250

Systems II Ex a total business system.



SYSTEMS II EX — EX for EXTENDED PERFORMANCE. Westware brings you the most completely integrated and simplest to use business software for your Apple Computer. The SYSTEMS II EX is complete with an integrated Database. Yes! The DBII Database can move your system's files into Database format for customized reports or labels.

Although the SYSTEMS II EX is a fully integrated system, you may purchase

individual modules and later add additional modules, such as Job Costing for contractors. The power of our system is in the KSAM Firmware card that plugs into the Apple. This card permits high speed searches and eliminates running sort routines to get your files in order.

SYSTEMS II is available on 5¼" drives, and also on the Corvus hard disk. A Corvus based system will give you the power and capacity that challenges larger computers.

COMING SOON — Cash flow analysis with graphics, Database II with graphics, and Bill of Materials for small manufacturers.

CURRENT OPTIONS AVAILABLE — Job Costing, Cycle Invoicing, Order entry, and Layaway.

All Checks, statements and invoices use NEBS forms.

Dealer and OEM inquiries invited.

Apple is a trademark of Apple Computers.



Westware
Systems II Ex

2455 S.W. 4th Ave.
Suite 2
Ontario, OR 97914
(503) 881-1477



2455 S.W. 4th Ave.
Suite 2
Ontario, OR 97914
(503) 881-1477

Yes, I would like to sample your software. Please send me the Systems II Demo Package. My check for \$25 is enclosed.

Name _____

Title _____

Company Name _____

Address _____

City _____ State _____ Zip _____

Listing 1 continued:

```
6070 LSETB#=B1$: '--- Insert new record, ---
6080 PUT1,1: '--- & put it in the file. ---
6090 E=0:RETURN
6100 RR=1: '--- Start search with # 1.---
6102 IFFR<=CA(6)THEN6110: '--- Check for end of file.---
6104 E=2:RETURN
6110 GOSUB5500: '--- Get record no. RR ---
6120 IFLEFT$(A$,CA(5))<LEFT$(A1$,CA(5))THEN6200
6130 IFLEFT$(A$,CA(5))>LEFT$(A1$,CA(5))THEN6300
6140 E=1: '--- Equal - duplicate key ---
6142 GET1,1: '--- Restore original value---
6144 B1#=B#: '--- of record counter ---
6146 MID$(B1$,1,2)=MKI$(FR-1)
6148 LSET B#=B1$
6150 PUT1,1
6152 RETURN
6200 IFLR=0THEN6240: '--- Branch if no more recs---
6210 RR=LR: '--- RR= next to search ---
6220 GOTD6110: '--- Continue searching. ---
6240 MID$(A1$,CA(4),2)=MKI$(FR): '--- Spot found - pack loc.---
6250 B1#=B#
6260 MID$(B1$,CA(2)*(RN-1)+1,CA(2))=A1$
6270 LSETB#=B1$
6280 PUT1,BN: '--- Save pointer record ---
6290 GOTD6400
6300 IFGR=0THEN6340: '--- Branch if no more recs---
6310 RR=GR: '--- RR= next to search ---
6320 GOTD6110: '--- Continue searching. ---
6340 MID$(A1$,CA(3),2)=MKI$(FR): '--- Spot found - pack loc.---
6350 B1#=B#
6360 MID$(B1$,CA(2)*(RN-1)+1,CA(2))=A1$
6370 LSETB#=B1$
6380 PUT1,BN: '--- Save pointer record ---
6400 RR=FR: '--- RR now=new record no. ---
6420 GOSUB5500: '--- Load record space... ---
6430 A#=A#+STRING$(CA(2),32): '--- Init.& pack new record---
6440 A1#=LEFT$(A$,CA(2))
6442 MID$(A1$,CA(3),2)=MKI$(Q)
6444 MID$(A1$,CA(4),2)=MKI$(Q)
6450 B1#=B#
6460 MID$(B1$,CA(2)*(RN-1)+1,CA(2))=A1$
6470 LSETB#=B1$
6480 PUT1,BN: '--- and save it on disk. ---
6490 E=0:RETURN
6999 REM**** 7000 GET RECORD A# FROM FILE ****
7000 RR=1: '--- Start with first rec. ---
7010 GOSUB5500: '--- Get record from file ---
7020 IFLEFT$(A$,CA(5))<LEFT$(A1$,CA(5))THEN7100
7030 IFLEFT$(A$,CA(5))>LEFT$(A1$,CA(5))THEN7200
7040 E=0: '--- Equal - record found ---
7050 RETURN
7100 IFLR=0THENE=1:RETURN: '--- Not found ---
7110 RR=LR: '--- Cont. search at # LR ---
7120 GOTD7010
7200 IFGR=0THENE=1:RETURN: '--- Not found ---
7210 RR=GR: '--- Cont. search at # GR ---
7220 GOTD7010
7999 REM**** 8000 GET NEXT GREATER KEY ****
8000 A#=A#+STRING$(CA(2),32): '--- Incr. last byte of key ---
8005 MID$(A$,CA(5),1)=CHR$(ASC(MID$(A$,CA(5),1))+1)
8010 A2#=STRING$(CA(5),255): '--- Initialize indicator ---
8020 RR=1: '--- Begin search at no. 1 ---
8030 GOSUB5500: '--- Get record & compare ---
8040 IFLEFT$(A$,CA(5))<LEFT$(A1$,CA(5))THEN8100
8050 IFLEFT$(A$,CA(5))>LEFT$(A1$,CA(5))THEN8200
8060 E=0: '--- Found directly.
```

Listing 1 continued on page 252

DEALERS: By now you know that it takes

SOFTWARE TO SELL COMPUTERS

and International Micro Systems can provide you with the largest selection of quality business applications ever developed for the microcomputer industry.

If you are just looking for a G.L., A/P, and Payroll, you can find them in a dozen ads in this magazine. But there's a much bigger market for micros out there than that. Where can you find a fully interfaced Wholesale/Retail Distribution System? How about Manufacturing Inventory Control including Production Scheduling & Control. See that one anywhere else? Maybe your market is Medical/Dental and IMS has the full systems there too. You can't sell computers without software and IMS has the finest selection of software available for you. Each system has been developed by the IMS professional staff and we support what we sell.

But that's not all. International Micro Systems has the strongest dealer marketing plan in the industry. With our

\$295 Dealer Demo System.

we put all the software shown below in your office or store ready to demo to your prospects and we include the promotional material and our unique video sales presentation to help you move systems. Give us a call or drop us a card and let us show you what selling business systems should be all about.

Financial Systems

GL, A/P, A/R
Payroll
Cash Receipts/Disb.
Job Costing
Mailing List Mgmt.

Medical/Dental

Office Scheduler
Patient Billing & A/R
Insurance Forms

Governmental/Educational

Student Record Keeping
and Scheduling
Fund Accounting

Wholesale Distribution System

Purchasing & Receiving
Inventory Control
Invoicing & Receivables
Salesman Comm. Reporting
Backorder Management

Manufacturing Inventory Control

Finished Goods Inventory Mgmt.
Parts Inventory Mgmt.
Parts Purchasing & Receiving
Bill of Material
Production Scheduling



INTERNATIONAL
MICRO
SYSTEMS

For details on our Demo Special, contact us at:
6445 Metcalf, Shawnee Mission, KS 66202
Phone: (913) 677-1137

Listing 1 continued:

```
B070 RETURN
B100 IFLEFT$(A1$,CA(5))<LEFT$(A2$,CA(5))THENA2#=A1$
B110 IFLR>OTHENB150:          *--- Check for end of search---
B120 A1#=A2$:                  *--- A2$ holds next greater---
B130 IFLEFT$(A1$,1)=CHR$(255)THENE=1:ELSEE=0
B140 RETURN
B150 RR=LR:                    *--- Continue at rec no. LR---
B160 GOTOB030
B200 IFGR>OTHENB250:          *--- Check for end of search---
B210 GOTOB120:                *--- Borrow a few statements---
B250 RR=GR:                    *--- Continue at rec no. GR---
B260 GOTOB030
```

Text continued from page 240:

zero. This is the first record in the file, physically, and is numbered zero by the way the mathematics of the next subroutine work. This first subroutine simply loads the value, increments it, then resaves it, storing the value of the record in the variable FR (for "free record").

The second subroutine, starting at line 5500, finds a record by number and loads it into memory as the variable A1\$. The record number is assumed to be in the variable RR. Since this subroutine set allows for more than one record per file block, a

few formulas are required. Lines 5500 through 5520 calculate the number of the block and the relative number (ie: number of the record on the block) of the record. Line 5540 extracts the correct part of the buffer (B\$) for the record. Lines 5560 and 5570 "decode" the two greater than and less than pointers so that the other subroutines don't have to deal with that job.

These first two subroutines are there to simply help the other ones. They can be used in any random-access file (except for the unpacking of GR and LR). The rest of the

subroutines handle the actual logic of the system.

Line 6000 starts the subroutine that puts a new record into the file. If it is the very first record, it is simply saved as record number one and the two pointers are both set to zero. This happens in lines 6015 through 6090. The subroutine that gets the number of the next available record (line 5000) is used in this subroutine.

If it is not the first record, then a more complicated solution is required; this begins at line 6100. First, the file must be searched for the alphabetical position of the new record. Start with record number one (see line 6100). Before the routine goes any further, it tests the record number to see if there is any more room in the file. If there isn't, then there is no reason to go any further, because the record cannot be added to the file. Note the use of the variable E. This is used as a form of error code. If, when the subroutine returns, E is 0, then everything went as planned. If E is returned as 2 it means that the file is full and the record is not saved. If E is 1, the key is already in the file and the new record is not saved. This will come up later in this subroutine.

The search is somewhat like the binary search. The record is looked up in line 6110, which uses the subroutine at line 5500. Lines 6120 and 6130 test to see which is greater. These branch to other parts of this subroutine. If these two tests "fall through," the record has a key equal to the one to be inserted. Lines 6140 through 6152 take care of this situation. First, E is set to 1 to indicate the error. Next, since the record number

ATTENTION GOVERNMENT D P USERS AND PURCHASERS

We represent many fine micro products and manufacturers on the U.S. Government's GSA Schedule, including

**Apple, Cromemco, Micropolis, NorthStar,
Osborne and Seequa Computers**

Purchasing from the Schedule will save you the time consumed by the bid process. Products shipped throughout the United States and world-wide. Visit or write any of our stores for more information or to receive our catalogue of products represented.

**Computers,
Etc.....
the dependable store**

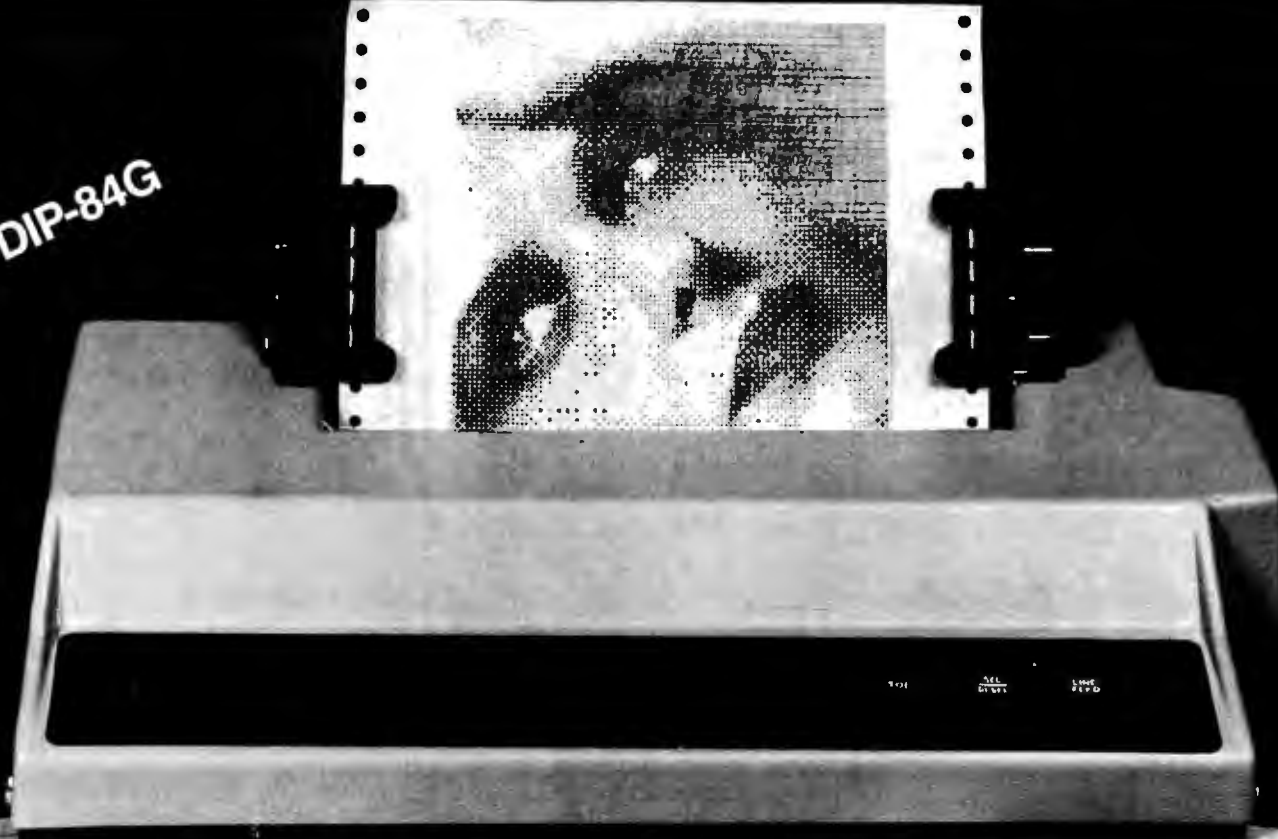
257 West Street, Annapolis, MD 21401 - (301) 268-6505
13A Allegheny Avenue, Towson, MD 21204 - (301) 296-0520
9330 Georgia Avenue, Silver Spring, MD 20910 - (301) 588-3748
6671 Backlick Road, Springfield, VA 22150 - (703) 644-5500
Plaza 38, 2442 Route 38, Cherry Hill, NJ 08002 - (609) 779-0023

Callers outside metropolitan areas served by our stores

Please call (301) 268-5801

Career Opportunities Available * An Equal Opportunity Employer

DIP-84G



Want a Better Printer @ Lower Cost? Compare DIP with the other best seller.

| | <u>DIP-84G</u> | <u>XX-80 F/T</u> |
|------------------|---------------------|--------------------|
| Print Speed | 100CPS | 80CPS |
| Head Life | 100x10 ⁶ | 50x10 ⁶ |
| Character Sizes | 40,48,66,80,96,132 | 40,66,80,132 |
| RS232C | STD | \$ 89.00 |
| Dot Graphic | STD | \$ 90.00 |
| Friction Feed | STD | \$100.00 |
| Matrix | 7x7/11x7 | 9x9 |
| Paper Handling | Rear&Bottom | Rear |
| Short Line Logic | STD | STD |
| Continuous Input | STD | None |
| Buffer Size | 10 Lines | 1 Line |
| 2K Buffer | \$ 30.00 | ? |
| Ribbon Life | 5 Million | 3 Million |
| Price Basic | \$795.00 | \$645.00 |
| Friction | STD | \$100.00 |
| RS232C | STD | \$ 89.00 |
| Dot Graphic | STD | \$ 95.00 |
| | <u>\$795.00</u> | <u>\$929.00</u> |

YOU COMPARE
THE DIFFERENCE

DISTRIBUTOR
INQUIRIES INVITED

In addition, we offer

DIP-81 \$499.00
DIP-82 \$695.00
DIP-85 \$895.00

Low Cost Friction Feed
11x7, High Performance, Friction Feed
X-on/X-off, 9600 Baud



745 Atlantic Avenue • Boston, MA 02111 • (617) 482-4214

Circle 142 on Inquiry card.

"Forget Memory Loss Problems"

RAMLOK FEATURES:

- * $\pm 10\%$ LINE VOLTAGE LIMITS
- * MAX. ONE CYCLE RESPONSE TIME
- * BROWNOUT/SURGE PROTECTION
- * BUILT IN BATTERY CHARGER
- * NOISE INTERFERENCE PROTECTION

GET STANDBY POWER
WITH
RAMLOK

UNIT PRICE \$495.00
Dealer inquiries invited



LADCO

LADCO DEVELOPMENT CO., INC.
P. O. BOX 464, OLEAN, N. Y. 14760
716-372-0168

will not be used, the value of the variable used to count the number of records used must be restored. It was incremented by the GOSUB 5000, so lines 6142 through 6150 decrement it, then 6152 returns to the main program.

If the key to be inserted is less than the key in the record just loaded, line 6120 branches to line 6200. If there are no records indicated by the variable LR (ie., LR=0), then the spot to link up this new record is found and line 6200 branches to line 6240. If LR does contain a record number, then RR, which is the record number to test, is set to this pointer (LR), and the routine returns to line 6110 to continue the search.

Line 6240 begins the section of program that inserts the record when it is less than the last one found in the search. The *less than* pointer is updated in lines 6240 through 6260 so that it will point to the new record. It is resaved in line 6270, then the routine branches to line 6400 to pack and save the new record.

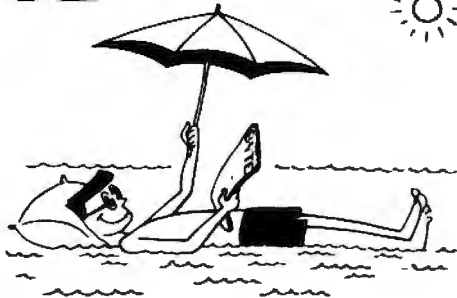
Between line 6290 and that routine in line 6400 is the routine that handles the situation where the record to be inserted is greater than the record being tested in the search. Line 6130 tests this and branches to line 6300 if the condition is true. This is almost the same as the routine just described that starts at line 6200. The difference is that GR is the pointer used instead of LR.

Line 6400 packs and saves the new record. By the time the routine gets to this line, the record that points to it has been updated. This part of the program just sets up the record and saves it on disk. E is set to 0 just before the RETURN statement to indicate that all went well.

The other two subroutines are variations of the search described for the subroutine that puts a new record into the file. The subroutine starting at line 7000, which gets a record from the file given the key, is the search with the values of the error code (the variable E) set to 0 if the record is found and to 1 if it is not in the file.

The last subroutine allows the reports to be in alphabetical order. It will take a key and find the next one

BYTE Back Issues for sale



The following issues are available:

- 1976: July
 - 1977: April thru December except October
 - 1978: February thru December except October and November
 - 1979: January thru December except March
 - 1980: January, March thru August
 - 1981: February to current issue except March
- Cover price for each issue through August 1977 is \$1.75 Domestic; \$2.75 Canada and Mexico; \$3.75 Foreign.
September 1977 through October 1979 issues are \$2.50 Domestic; \$3.50 Canada and Mexico; \$4.50 Foreign.
November 1979 to current is \$3.00 Domestic; \$4.00 Canada and Mexico; \$5.00 Foreign.

Send requests with payment to:

Please allow 4 weeks for domestic delivery and 8 weeks for foreign delivery.

* Payments from foreign countries must be made in US funds payable at a US bank.

BYTE Magazine
70 Main St, Peterborough NH 03458
Attn: Back Issues

TRANSWAVE'S Tiny BASIC MICROCOMPUTER K-8073

The Computer That

Recaptures Simplicity

STD (MOD) BUS 4.5 x 6.5 in.
5 Volt Only—Cassette
Tape In/Out—2 Sense—
3 Flags—Interrupts

INS8073 Microinterpreter
Tiny BASIC Processor

1K Byte Local RAM
[Expandable to 33K]

ART/RC Master, For Single
Wire Data I/O Of 128 Slave Units

Autostart EPROM
2K Byte

Real Time Clock
W/Ext. Battery Backup
Yr, Mo, Wk, Day, Hour, Sec.

Utilities Firmware, For
Software Dev., EPROM 2K

RS-232 For CRT
110—4800 Baud

EPROM—2K Byte
[Expandable to 24K]

EPROM Programmer, 2K
Byte Prm. Decoded—Req.
Ext. 25V Only

PPI, Programmable I/O,
24 Lines

PPI Interface Ribbon
Connector

PS-5/25
Development Station
\$225

DO-8028
8 CHN TRIAC
Controller
\$296

DI-8020
20 CHN A/D
\$262

K-8073
Microcomputer
\$388
SINGLE UNIT



INPUT ►►►►► DECISION ►►►►► OUTPUT

TODAY'S NEEDS

How many times have you thought about designing or purchasing the ultimate intelligent control system but were discouraged by the R&D time or price? Transwave took the initiative of designing one for you. Combining versatility with low cost, the K-8073 Tiny BASIC Microcomputer has already taken the lead in the process control market. Programming is reduced to mere hours because of the on-chip Tiny BASIC Microinterpreter. I/O is extended to previously unheard of limits because of the on-board ART/RC (Asynchronous Receiver Transmitter/Remote Controller).

This processor-like chip provides bi-directional serial communication between the K-8073 and its remotely located peripheral I/O devices. In addition, the K-8073 can operate in a stand-alone, satellite, or host mode. When interfaced thru RS-232, you can utilize your host computer, large or small, for polling, editing and mass data storage.

INPUT

The DI-8020 is a 20 channel A/D input module designed to collect data from remote sensors monitoring temperature, humidity, light, pressure, etc. Each A/D module is capable of monitoring 16 analog and 4 digital signals. Remarkably versatile, the DI-8020 is adaptable to any environment.

In addition to an extensive input range, this A/D module eliminates the usual installation hassles because of the unique ART/RC communications route. A single twisted pair or coaxial wire serves as the bi-directional DPW (Data Pathway) between the DI-8020 and the K-8073 Tiny BASIC Microcomputer.

DECISION

After receiving data, the K-8073 executes from your EPROM based Tiny BASIC program.

OUTPUT

Completing the cycle of I→D→O is the DO-8028; an 8 channel TRIAC Control Module. This board features 8 optically

isolated TRIACS with a maximum rating of up to 300 Watts AC control per channel. Receiving commands from the K-8073 via the full duplex DPW, you can daisy chain as many as 128 of these "slave" stations.

STAND ALONE SIMPLICITY

Whether you free your mainframe, free your mini or start from scratch, you can let closed loop control be the minimum configuration it should be. These cards are exactly the fundamental pieces needed for today's control applications. To order your K-8073 or for further information on the Vanderbilt Series 8000 Product Line, write or call:
TRANSWAVE CORPORATION, Cedar Valley Building, Vanderbilt, PA 15486
Phone: (412) 628-6370.

TRANSWAVE
COMPUTER DIVISION OF UTSC

Z8000

MICRO PRICE for MINI POWER
MICRO-MINI™ matches Series I by IBM
DELIVERING CURRENT ORDERS

- You cannot buy a more powerful micro:
- **Power:** 1 to 32 independent users
 - **Memory:** directly addresses to 16 Meg!
 - **Mapping:** efficient memory management
 - **Disk:** 2M to more than 250M
 - **Speed:** throughput 10 times Z80
 - **Files:** simultaneous access
 - **Communication:** inter-user via terminals
 - **Security:** all files password protected
 - **Options:** expandable in the field
 - **Bus:** Intel Multibus™ compatible
 - **Languages:** Pascal, BASIC, COBOL, FORTRAN

System 3 \$7053

This 16-bit Multibus™ computer system includes:

- Z8001 CPU and 256K RAM
 - 8 serial I/O ports
 - 15-slot backplane
 - Dual floppy disk drives
 - Multiuser Operating System
 - Field upgrade to 16MB RAM, 268MB of hard disk, 32 users.
- Pascal, BASIC, C, COBOL and FORTRAN languages.

Call for further system specifications.



AMPEX Dialogue 80™

Dialogue 80™ fully-featured video terminal:

- Full ASCII with numeric and edit keypads
- Elegant case with detachable keyboard
- Display 24 lines with 25th status line
- 20 user programmable function keys
- 2 pages display memory (4 optional)
- 11 graphics and 21 control codes
- 10 modes including block, protect, program
- Transparent mode displays control codes

Dialogue 80™\$1045

Dialogue 80™ with phone coupler.....1194

Applications: word processing, data entry, interactive programming, data base inquiry/response/update, transaction processing, whether on-site or remote. For our system or for yours, this interactive terminal is the perfect match.

Prices: Prepaid or Purchase Order Net 10.
 Prices subject to change without notice.
 Warranty: 120 day minimum on all systems.
 Interfacing cables free with all systems.
 10% down fixes price, guarantees priority.
 MasterCard and VISA cards accepted.



(312) 684-3183

COMPUTEX
 MICROCOMPUTER SYSTEMS
 5710 Drexel, Chicago, IL 60637

in the file that is greater. How it works is fairly simple. It first increments the value of the last byte in the key, which makes it the next possible key higher than the one given. It then searches the file in the same manner as the other two sub-routines.

If the key is found, there is no problem. The key found is the next higher key in the file. The interesting part is the condition where the key is not found. The key found may not be the next greater key (the "key found" meaning the last one tested in the search). A2\$ is used to locate the next greater key. It is initially set to the highest possible value for a string (ASCII code 255). When, in the process of searching, the key loaded is greater than the key being searched (which causes line 8040 to branch to line 8120), the key loaded may be the correct one. It is greater than the one being searched. If it is also less than A2\$, then line 8100 sets A2\$ equal to it.

The rest of the searching is the same except for the end of the search, which is handled by lines 8120 through 8140. A1\$ is the string that is to contain the next greater record, so it is set to A2\$. Line 8130 checks to see if a greater key was found. If there are no greater keys in the file, then the first byte of A1\$ will be CHR\$(255). If it is not, then the next greater key was found. Line 8130 sets E equal to 1 if there are no greater records in file and to 0 if the next greater record is found and returned in A1\$.

Deleting Keys

This is the simplest key-file system I know. Like the bubble sort, it is slower than other methods, but is so much simpler to program that it is hard to pass it up in favor of other methods. One drawback, however, is not easy to ignore: there is no way to delete a key. This is due to the pointers. Unless the key was at the end of one of the branches (ie., both pointers were zero), deleting it would involve changing the pointers of many records. This would be a complicated routine.

A simple solution is to insert a code

in the record of a deleted key, leaving the pointers and key intact so that the key will not interfere with future searches. When the file is getting full and there are a lot of deleted records in it, a program can be set up to read this file as a simple random-access file and insert the records that do not have the delete code into a new file using the subroutines. This will form a new file with no deleted records in it.

Accessing the Key File

The program used to access these files will show how to use the sub-routines. It begins at line 200 with a selector. The selector lists three selections and requests the operator's choice by number. A "hidden" selection is used to allow initialization of the file. This must be used before the first record is entered and can be used at any time to wipe out all of the records in the file and start out fresh.

The rest of the program is divided by line number into functions corresponding to the selections. The first routine, starting at line 400, is the "hidden" selection (number 27). Lines 430 through 500 request and interpret a password so that some protection in addition to the hidden selection is provided to prevent someone from wiping out your data. Lines 510 through 590 save blocks full of spaces in each block that can be used according to the parameter array. The program then saves a 0 in the first two bytes of record number 0 so that the subroutine at line 5000 can use it as the record counter.

The function starting at line 600 allows the addition of a new record into the file. In this example, the key is the item number and that is requested first. Next, the function uses the subroutine starting at line 7000, which gets the record given the key. If this subroutine finds the key and returns E equal to 0, then the key is already in the file. This causes the error message to be displayed. If it is not found (E=1), then the function proceeds to request the information you want the record to contain. When this has been entered, lines 730 through 790 pack it all into the string A\$ and call the subroutine starting at

AH-HA!



EUREKA!

ALL-RIGHT!



Introducing "Popular Computing," the key to understanding.

Now you don't have to be a computer professional to unlock all the mysteries, potential, and pleasures of home and small business computers. *Popular Computing*, the new monthly magazine from McGraw-Hill, is the key.

Created in response to growing demand for our informative quarterly *onComputing*, *Popular Computing* explores every aspect of personal computers and their use. All reported in easy-to-understand nontechnical language.



The answer to "Computerphobia."

Even the most computer-unsophisticated reader will find *Popular Computing* interesting and stimulating. Every issue will contain straight-talking product reviews,

special news briefs, and feature articles by famous guest contributors (like Isaac Asimov). There'll even be a helpful glossary of computer jargon we couldn't avoid using, and much, much more.

Special Introductory Offer.

Send in this coupon today, and take advantage of *Popular Computing's* Special Introductory Offer.



POPULAR COMPUTING

THE KEY TO UNDERSTANDING
P.O. Box 397, Hancock, NH 03449



Mail Today to:
POPULAR COMPUTING
 P.O. Box 307, Martinsville, NJ 08836

SUPER SAVINGS FOR ME... I'm taking advantage of this super introductory offer of 12 issues for only \$11.97 saving me \$3.03 on the basic rate of \$15.00—and saving me \$18.03 off the 12 issue newsstand rate of \$20.00 if my 30-day review of your first issue doesn't 100% please me, I may cancel my subscription and you will promptly refund ALL my money or give me a FULL credit on my charge card marked below:

Check Enclosed for \$11.97
 Charge \$11.97 to:
 Visa Mastercard

Card No. _____ Expires _____
 Signature _____
 Name (Please Print) _____
 Address _____
 City _____ State _____ Zip _____

DATA FILE LAYOUT

FILE NEWFILE — Inventory file to test subroutines
FILE TYPE Key ACCESS BY Item Number

| VARIABLE | START | LENGTH | PACK | DESCRIPTION |
|----------|-------|--------|------------------|-----------------|
| I\$ | 1 | 5 | Integer | Item no. (key) |
| GR | 6 | 2 | Integer | Greater pointer |
| LR | 8 | 2 | Integer | Lesser pointer |
| D\$ | 10 | 14 | Alphanumeric | Description |
| Q | 24 | 2 | Integer | Quantity |
| P | 26 | 4 | Single precision | Unit Price |

Total Rec. Length = 30
Rec./block = 255/30 = 8
First byte of GR = 6

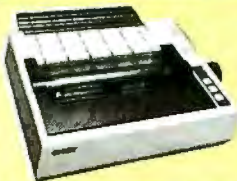
First byte of LR = 8
Key Length = 5
Rec. in file = 199

Table 1: A data-file layout form. It shows the variables that the values will be stored in when the record is in the memory and where each field is packed in the memory.

line 6000 to insert this new record into the file. Note that there is no check for the error code E if E is equal to 1, which indicates that this is a duplicate key, because that was already checked by the subroutine called in line 650. There is a need to check for the end-of-file condition where E is equal to 2. This could be added to the function at this point.

The fields in the file are shown in table 1, which is a data-file layout form. This table shows the variables that the values will be stored in when the record is in the memory and where each field is packed in the record. The information on this sheet is used to determine much of the in-

IMPORTS



EPSON MX-80's / 100's
Call for prices!
Okidata M-80 \$374.00
Okidata M-82A \$589.00
Okidata M-83A \$765.00

HIGH SPEED



Anadex
9500/9501 \$1274.00
Datasouth - 180
New CP-Graphics call
TI 810 Basic \$1295.00

PAPER TIGERS



445G \$749
460G \$895
560G \$1129

MORE PRINTERS

Centronics 739 \$649.00
Molibu
Dual Mode 200 \$2095.00
DEC LA 34AA \$1049.00
Mannesmann-Tally
MT-1802 \$2095.00

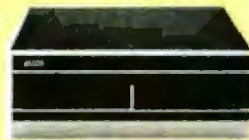
• NEC 5510 \$2689.00
• Diablo 630 \$2295.00
C.Irah Starwriter..... \$1370.00
Gume
Sprint 9/45 \$2095.00
*Tractors Included in price

COMPUTERS



NORTHSTAR

Burned and tested - backed by fast warranty service. Exclusive Sell® CP/M® increases drive capacity. Octals and Winchester available. Our Northstars are better than "factory sealed" - call us - we'll tell you why. (free games disk).
HRZ II 64K DD \$2795.00
HRZ II 64K Quad \$3095.00
Advantage Call



ALTOS

Single user 8000-2 Includes dual 8" double density drives (1 Mg. capacity), two serial ports, two parallel ports, and CP/M®.
Call for other Altos prices.
ACS8000-2 w/ CP/M ... \$2995.00
ATARI 800 \$739.00 / ONYX SYSTEMS CALL



TELEVIDEO

A new line of micros from the leading name in terminals. System 1 includes 64K RAM, CP/M®, 1 MG on floppy, diagnostics, and more.
System 1 \$2085.00



ZENITH

The all-in-one computer that's backed by your local Zenith/Heath service center. Green Phosphor screen and CP/M® included.
Z89 w/48K 2 510's \$2144

NEW



Televideo 910 \$589
Hazeltime Esprit \$589
ADD5 Viewpoint \$559
Sorec IQ 130 \$589

TELEVIDEO



Televideo 912 \$710
Televideo 920 \$759
Televideo 950 \$949

TERMINALS



Ampex D80 \$925
D80 Amber \$969
Mime Acr 5A \$799
ADM - 3A \$775
Sorec 120 \$674

ORDERING

MAIL ORDER ONLY

2% cash discount included/charge cards add 2%. Prices subject to change, product subject to availability. Arizona residents add 5% F.O.B. point of shipment Scottsdale. 0-20% restocking fee for returned merchandise. Warranties included on all products. Personal checks take 3 weeks to clear.
CP/M is a registered trademark of Digital Research.



Scottsdale Systems Ltd.

6730 E. McDowell Road, Suite 110, Scottsdale, Arizona 85257



(602) 941-5856



Call 8-5 Mon.-Fri.

(We Export) TWX 910-950-0082 (IMEC SCOT)

WE'RE LETTING YOU IN ON A BIG SECRET

For the last couple of years we have been quietly delivering thousands of Tandon mini floppy disc drives into British computer manufacturers. Unfortunately, from the front they look very like someone else's but as soon as you boot your system, little things like the 3mS step speed not to mention capacities up to 1 M/byte start to give the game away.

Our range runs from the 100 K/byte TM100-1 through to the 1M/byte TM100-4 which is presently manufactured at the rate of over 20,000 units a month. Many floppy disc manufacturers will tell you that they make their own

read/write heads, but what they really mean is that a lot of the time they buy in pre-ground core sets and coils and then glue all the bits together. Tandon grind their own cores, wind their own coils and more importantly control the quality themselves. This means that when the pieces go together they perform the way they are supposed to. Tandon build heads with electrical and mechanical specifications that the competition cannot even approach. When you start to pack 1M/byte onto the drive you will see what we mean.

Tandon

MAKE MORE OF WHAT THEY MAKE.

Half-size 8" Floppy

Our revolutionary new THINLINE can pack a fantastic 2M/bytes into the space normally occupied by a single conventional 8" floppy disc drive. The THINLINE uses only DC power and has a step speed of ONLY 3mS. The read/write head is guaranteed for 15,000 media contact hours and the double sided drive uses the patented Tandon head design to work reliably without damaging the media. The TM848-1 single sided and the TM848-2 double sided drives are also available in packaged form complete with power supplies as are our minis.

TM600 Series Winchester..... 9.57

M/bytes in a mini floppy size package
Our new mini Winchesters pack up to 9.57 M/bytes into a desk top size disc package and come complete with controllers and interfaces, where needed, to work directly with CP/M 2.2 on most of the popular micros. 6.38 M/byte systems start from as low as £1425.00. TM600 Winchesters pack

enough data to run serious business or technical applications software on small systems.

Our 650 Winchester controller is the definitive OEM product...simple to interface and built completely from TTL components. It supports two discs with ease and while others are struggling with less stable analog data separators and speed eating error correction circuits, we use a high performance digital design which literally locks into the data stream and stays there. CP/M BIOS with extensive development aids on either 5 1/4" or 8" floppies combined with our own support team makes integration simple.

Service and Support

We at HAL know that when an OEM customer buys a product he is sticking his neck out and putting his trust in the supplier. We supply promptly and if you have any technical problems we will help you to sort them out. Call us any time knowing that you will get support that is

second to none. We hold emergency spares, we can fix drives in a top priority 24 hours when really needed and we have a large investment in in-house auto drive testing equipment which allows us to run up to 73 different diagnostics on your drives. To our knowledge there is no other supplier in Europe that does this. Our auto testers, by the way, are the same ones that Tandon use on the end of their production line. If you need less expensive test equipment, ask us about our OASIS 820 portable tester which we manufacture ourselves to fix not only disc drives but a lot of other peripherals as well. We also run regular training courses for service and production engineers.

If you want to use the most up to date small disc drives made by the undisputed market leader and you would like to deal with a supplier who understands your needs and works to get your product into the field and then helps you keep it there, give us a call. **HAL Computers.....making small discs work for you.**

HAL Computers Limited
57 Woodham Lane New Haw
Weybridge Surrey ENGLAND
Telephone: Weybridge 48346/7

**Exclusive UK
Distributor**

THE MOST

POWERFUL SMALL BUSINESS COMPUTER

IN THE WORLD

The IBC ENSIGN business computer was designed from the ground up to run MP/M, multi-user OASIS, MVT-FAMOS, and other multi-user Z-80 operating systems faster than any other computer in the world.

Consider these features:

- Up to 16 users
- Up to 768K byte memory
- Up to 150M bytes/disk drive
- 17M byte tape cartridge
- 46M byte 9 track tape
- 6 MHz Z-80B CPU

But it takes more than a lot of I/O ports, memory, and disk storage to make a super multi-user computer. The ENSIGN has what it takes.

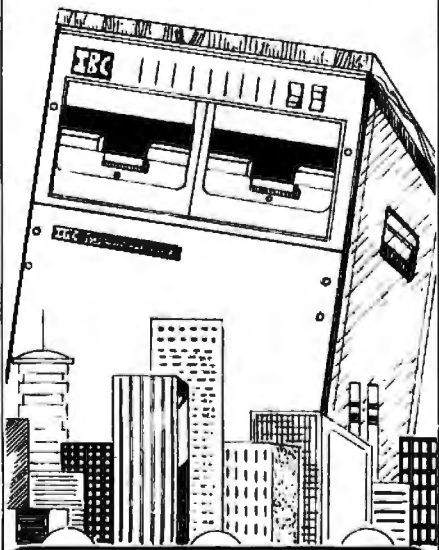
MULTIPLE MICROPROCESSORS: The ENSIGN has two separate Z-80's and 32K byte memory buffer to handle all I/O between CRT's and printers at baud rates up to 19,200 baud.

A third Z-80 handles all disk and tape I/O. Commands from the main CPU are totally supervised by the disk slave Z-80.

And the main CPU is the new 6 MHz Z-80B running at full speed with 120 nsec memory.

PERIPHERALS: The ENSIGN supports the tape and winchester disk family from Kennedy Co. These drives, tape cartridges, and 9 track tape drives are the premier of the industry. Yet prices are low on the ENSIGN.

SOFTWARE: If you are running MP/M, OASIS, or MVT-FAMOS you will run better on an ENSIGN. And if you're not already tied to one of these systems you may want to try IBC-SUPERDOS. SUPERDOS is very powerful and very very fast.



For dealership information contact:

IBC / Integrated Business Computers

22010 S. Wilmington Avenue, Suite 306
Carson, CA 90745 • Call (213) 518-4245

The following have registered trademarks: / IBM, ZILOG, MP/M, DIGITAL, RESHARE, OASIS, FIRST ONE SYSTEMS, MVT-FAMOS, MVT MICROCOMPUTER SYSTEMS.

Glossary

Array: A list or table for holding data in such a way that each datum may be accessed by one or two index numbers.

Binary search: A method of searching an ordered list for a test value by comparing the test value with the value located at the middle of the list. This procedure effectively divides the list into two sections, and the search proceeds in the section having the value being tested for by, again, comparing the test value with the value located at the middle of the section.

Character: A number or symbol that represents some amount (usually 8 bits) of information.

Fields: A region of data within a record that refers to the same general properties as corresponding regions in other records.

Hashing: A method of searching a list by using a portion of the test value as an index.

Key: The field of a record that may be compared with a test value.

Pointer: A variable or memory location whose value is the address of a memory location.

Random-access file: A disk file whose records may be read in any order.

Records: Divisions of data in a file such that each of the divisions contains the same type of information at corresponding positions.

Search: To examine a file to locate certain information.

Sequential file: A disk file whose records may be read only in sequential order.

Sort: To put the records of a file in order according to the data they contain.

Test value: The information that a file is being searched for.

formation required in the parameter array.

The next function, which starts at line 900, allows you to change data in records that have already been saved in the file. Lines 900 through 1030 get the item number to edit, load, and unpack the record, and perform some checking concerning the key entered. The checking consists of two parts. The first allows an "escape" from the function. If the key entered is "END," the function branches back to the selector. The second check is if the record is in the file. If it is not, the message at line 980 is displayed. The checking is on the error code E after the GOSUB 7000.

The rest of this function could take many different forms. The one I used here allows the operator to select, by number, 1, 2, or 3 for the field to edit, 0 to end editing and resave the record, or -1 to end the edit of this item and not post any changes. A -1 simply causes a branch back to the beginning of the function. The 0 is handled in lines 1160 through 1280. Lines 1160 through 1220 repack the fields into the string A\$. In order to

resave the record, this function first reloads it (the "old" version before the changes were made), then replaces the area in the buffer with the new version of the record.

The last function, the printout, uses the "get next higher key" subroutine. This function begins at line 1400. Lines 1430 and 1440 request the starting and ending keys for the listing. After these are checked (to make sure the starting key is not greater than the ending key), line 1460 decrements the first key. The listing will be in alphabetical order by continually calling the subroutine starting at line 8000, which gets the next higher key. By decrementing the first key, the first key that will be printed could be the key entered, if it is in the file. If this decrementing were not done, and the starting key were a key in the file, the function would start with the next greater key rather than the one entered.

The part of this function that controls which key is to be printed is in lines 1490 and 1500: 1490 gets the next greater key and line 1500 checks for the end-of-file condition. Added

Yes.

I want to turn my microcomputer into a powerful information and communications system. Send me your free Information Kit.

No.

Thanks anyway, I'm already on-line with THE SOURCE.SM

If you are not one of the more than 11,000 microcomputer, data terminal or communicating word processor owners who already subscribe to The Source, send in this coupon or call us toll-free. We will send you our free Information Kit that describes the over 1200 programs and services now available from The Source. You'll see how easy it is to turn your microcomputer into a powerful information and communications system.

With TheSource, you get hundreds of useful services for the home or for helping you run your business more profitably. You can get current stock prices, make airline reservations, find a good restaurant, barter goods and services, get up-to-the-minute sports and news from UPI. You can communicate instantly through electronic mail with branch offices and field representatives subscribing to The Source; you can create your own business programs, on either a simple or sophisticated level.

In addition to all this, you also have access to hundreds of easy-to-use data bases, electronic games, informative and educational

programs (including lessons in geometry and spelling, foreign language drills and math reviews), and a unique shop-at-home service that lets you buy over 30,000 brand name

items at discount prices.

You can do all of this easily and inexpensively with a local phone call in more than 350 cities across the country, and at a one-time subscription fee of only \$100.00 and usage costs as low as \$4.25/hour.

If you'd like to get the most out of your personal computer or data terminal, call our toll-free number or send for your free kit today.

For free Information Kit call toll free 1-800-323-1718.

Ask for operator 91. In Illinois, 1-800-942-8881



16-page color brochure.
Complete listing of 1200 programs.

You have nothing to lose and a world of information to gain.

Mail to: Source Telecomputing Corporation, Dept. (HG-5)
1616 Anderson Road, McLean, Virginia 22102.

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone () _____

Type of Equipment _____

THE SOURCE
AMERICA'S INFORMATION UTILITY

The Source is a servicemark of Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc.

DISCOUNT HARDWARE

IEEE 696/S-100 Standard Boards
\$50,000 inventory — we probably have your board in stock!!!!



STATE OF THE ART CPU BOARDS

DUAL CPU 8/16 bit. \$349
Z-80 CPU. \$189

FAST RELIABLE STATIC MEMORY

32K. \$395 64K. \$ 695
48K. \$549 128K. \$1,495

SYSTEM AUGMENTATION

I/O-I or I/O-II \$199
DISK-1 DMA Disk Cont. \$399
SUPPORT-1 Multifunction \$299

Accolades —

"I appreciate the way you do business and you can count on me to be an advocate of your company..."

Dr. Graham Palmer,
Professor Biochemistry — RICE University

DISCOUNT HARDWARE

Division of System Interface Consultants, Inc.
17440 Revello Drive
Pacific Palisades, CA 90272

Enclosed is \$ _____
Please express the following assembled, tested, and warranted IEEE 696/S-100 boards:

Name _____

Address _____

Phone () _____

Add \$25 to each order for express shipping, handling and insurance. California residents add 6% tax. Allow 2 weeks for personal checks. Prices subject to change

Follow the lead of the developers of dBASE-II, buy your Dual CPU, Disk-1, Support-1, 64K memory, and CP/M-86 from DISCOUNT HARDWARE

Special Offer DUAL CPU Package \$1,974.00
Z-80, Disk-1, I/O-I, 64K memory, and CP/M-80
Special Offer Z-80 Package \$1,595.00

10 slot mainframe with 2 Qume Double Density — DOUBLE SIDED disk drives, and power supply \$1,795.00

System Interface Consultants, Inc.

(213) 454-2100

Established 1969

Recommended Reading

In 1973, Donald E Knuth of Stanford University produced what must be the definitive work on computer-programming techniques: *The Art of Computer Programming (Addison-Wesley)*. It is a set of three volumes covering nearly every useful software trick, and it rates many varied competing techniques to show what works best under given circumstances.

Because the computer's main purpose is to keep, sort, and search lists of data (just as the wheel's reason for being is to roll), a large portion of Knuth's work is dedicated to the storage, arrangement, and selection of data. I especially recommend:

Volume 1, Fundamental Algorithms

Chapter 2, Information Structures (page 228)

Volume 3, Sorting and Searching

Chapter 5.2, Internal Sorting (page 73)

Chapter 5.3, Optimum Sorting (page 181)

Chapter 6, Searching

section 6.2.1 Searching an Ordered Table (page 406)

section 6.2.2 Binary-Tree Searching (page 422)

to this control is the logic in line 1510, which checks that the new key is not greater than the ending key, and line 1670, which places the last key printed into A\$ for the next search.

The remaining statements simply format the output. Added to the function for the inventory application is the extended value, which is the quantity times the unit price. This is accumulated in line 1650 so that the total value of inventory can be printed at the end of the report.

Possible Modifications

The program given in the listing has no provision for deleting a record. As noted above, a key cannot be deleted from this type of file without extensive reshuffling of the pointers. A few simple alterations can add this function.

The file layout must be altered first to add a one-byte field that is to serve as the delete code. For all active, not-deleted records, this field can store the letter A. When a record is deleted, use it to store the letter D. The easiest way to do this is to shorten the description by one byte and put the code where the last byte of the description was.

Change the two packing routines to reflect this adjustment. There is one in the input section starting at line 740 and there is another one in the edit section starting at line 1160. Also change the printout section at line 1610. Additional changes will also be

required to check this byte in the edit and report sections so that a deleted record will not be edited or printed.

In the input section, you may want to introduce some way to change the delete status if the user enters the key of a deleted record. This could be part of the edit function, where it would be easier to program, but it would be easier for the user if it was added to the input section.

The subroutines are fairly short, but they can be made even shorter by combining some code. This is a fairly new subroutine set for me, so it has not been subjected to any refinement. It has passed several tests, but it may still have some bugs. One obvious part of the program that can be shortened is to replace lines 6015 through 6090 with a GOTO 6400. Although the variable use is a little different, these routines do exactly the same thing. You may want to find some of these condensable parts or, since the subroutines work the way they are, you may want to use them without any changes.

The programming was done on a Radio Shack Model III system. Since this uses a form of Microsoft BASIC, adaptation of this program to other systems that also use Microsoft BASIC should not be a big problem. Adaptation to other types of BASIC may be a little more difficult. I hope the structure of the program and the remarks make this task easier for anyone attempting that. ■



Turn your Apple into the world's most versatile personal computer.

The SoftCard™ Solution. SoftCard turns your Apple into two computers. A Z-80 and a 6502. By adding a Z-80 microprocessor and CP/M to your Apple, SoftCard turns your Apple into a CP/M based machine. That means you can access the single largest body of microcomputer software in existence. Two computers in one. And, the advantages of both.

Plug and go. The SoftCard system starts with a Z-80 based circuit card. Just plug it into any slot (except 0) of your Apple. No modifications required. SoftCard supports most of your Apple peripherals, and, in 6502-mode, your Apple is still your Apple.

CP/M for your Apple. You get CP/M on disk with the SoftCard package. It's a powerful and simple-to-use operating system. It supports more software than any other microcomputer operating system. And that's the key to the versatility of the SoftCard/Apple.

BASIC included. A powerful tool, BASIC-80 is included in the SoftCard package. Running under CP/M, ANSI Standard BASIC-80 is the most powerful microcomputer BASIC available. It includes extensive disk I/O statements, error trapping, integer variables, 16-digit precision, extensive EDIT commands and string functions, high and low-res Apple graphics, PRINT USING, CHAIN and COMMON, plus many additional commands. And, it's a BASIC you can compile with Microsoft's BASIC Compiler.

More languages. With SoftCard and CP/M, you can add Microsoft's ANSI Standard COBOL, and FORTRAN, or

Basic Compiler and Assembly Language Development System. All, more powerful tools for your Apple.

Seeing is believing. See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

Complete information? It's at your dealer's now. Or, we'll send it to you and include a dealer list. Write us. Call us. Or, circle the reader service card number below.

SoftCard is a trademark of Microsoft. Apple II and Apple II Plus are registered trademarks of Apple Computer. Z-80 is a registered trademark of Zilog, Inc. CP/M is a registered trademark of Digital Research, Inc.

MICROSOFT
CONSUMER PRODUCTS

Microsoft Consumer Products, 400 108th Ave. N.E.,
Bellevue, WA 98004. (206) 454-1315

Circle 272 on inquiry card.

Orchestra-80

Elizabeth Cooper and Yvon Kolya
POB 22
Peterborough NH 03458

Soon after the release of the Radio Shack TRS-80 microcomputer by the Tandy Corporation, programs promising to turn the TRS-80 into a music-producing instrument appeared. These programs used an AM radio to pick up and amplify the RFI (radio-frequency interference) given off by the Z80 microprocessor and its support devices. The RFI produced by carefully arranging routines executed by the computer played recognizable notes through the radio.

The disadvantages to this method were:

- the limited range of notes that could be produced
- the odd timbre of the notes
- distracting noises produced by the system were also played through the radio, usually at the same time as the notes

The next stage in this development involved the use of the cassette-data port. Specific notes were generated by

mathematical algorithms. These notes were then sent to the cassette port of the computer, where they were either recorded on tape or played through a small audio amplifier.

This procedure produced a wider range of purer-sounding notes, but they sounded as if they were made by a toy electronic organ rather than by a true musical instrument. This was due to the circuitry used in the TRS-80 to process signals sent to the port.

Now, three years after its appearance on the market, it is possible to use the TRS-80 to its fullest capabilities in music generation.

The company responsible for this breakthrough is Software Affair Ltd. The product is Orchestra-80 (see photo 1).

Orchestra-80 claims to be a "unique combination of hardware and software that can turn any 16 K-byte TRS-80 (Model I) Level II into a high-quality musical instrument," and it is.

The hardware is a small circuit board soldered to a 40-pin edge-card connector that attaches to the TRS-80 expansion port, either on the computer keyboard unit or the expansion interface (see photos 2a and 2b). The circuit board has an RCA-type phono jack that can be connected to any hi-fi amplifier with an RCA-type patch cord. The circuit board is not an amplifier, but a buffering device between the TRS-80 and a hi-fi amplifier. This

TRISWATCH

Keeps your TRS-80 Mod II up with the times.

The Triswatch, formally known as the CCB-II, is a clock, calendar, and audio alarm rolled into one!

- For TRSDOS users, the CCB-II eliminates the hassle of setting the time and date when you reset your Mod II.
- The P&T CP/M® 2 system date and time are synchronized to the CCB-II each time the system is reset.
- The CCB-II is directly accessible from any language that allows direct port input and output.
- A pacemaker battery is included, which provides over 8 years of continuous timekeeping.

Keep up with the times and order the CCB-II for \$175 plus shipping.



TRS-80 is a trademark of Tandy Corp.
CP/M is a registered trademark of Digital Research Inc.

PICKLES & TROUT

P. O. BOX 1206, GOLETA, CA 93116, (805) 685-4641

Warning: Installation requires opening the Model II, which may void its warranty. We suggest waiting until the warranty period has expired before installing the CCB-II.

At a Glance

Name
Orchestra-80

Type
music-generation software/hardware combination

Manufacturer
Software Affair Ltd
473 Sapena Ct, Suite 1
Santa Clara CA 95051
(408) 295-9195

Price
\$79.95

Dimensions
2 by 1 by 1 3/4 inches
(hardware)

Documentation
40-page manual

Format
cassette tape

Computer
TRS-80 Model I, Level II,
16 K programmable
memory
TRS-80 disk-based
Model I

Audience
music schools, teachers,
students, and anyone interested in computer-generated music

Take a look at our EPROM blaster for your Apple™ or TRS-80™



Apparat announces the most versatile EPROM burner available today for your TRS-80 model I and III or Apple computer . . . the Apparatus PROM Blasting system (A.P.B.). Most EPROM burners will program only one type of EPROM. The A.P.B. system will program all commonly used 24 pin EPROMs by using special personality modules that adapt the unit to the EPROM. The following EPROMs are programmable: 2704, 2708, 2716, (3-volt) & (5-volt), 2732, 2508, 2516 and 2532.

The versatility and power of the A.P.B. system means you're getting a PROM burning package with extensive capabilities. The price, \$149.00, insures you're getting the most cost-effective PROM burner on the market today.

With a unique combination of personality modules and

sophisticated software, A.P.B. will perform many operations impossible with conventional PROM burners. Here's a brief list of some of A.P.B.'s capabilities:

- Verify ROM is erased
- Read ROM
- Copy ROM
- Copy between different ROM types
- Program ROM
- Partial programming and copies
- Verify programming
- Read or save ROM data on disk or cassette (Apple only)
- Program directly from computer memory
- Examine and/or modify working memory
- Preset working memory

The A.P.B. system is the most flexible PROM burner available. The A.P.B. system package consists of an interface card that plugs directly into an expansion slot*, a complete set

of personality modules, software on disk and a detailed instruction manual. The software will run under NEWDOS/80, or TRSDOS™ for the TRS-80, and APPLE DOS™ or APEX for the Apple.

If you're looking for a powerful, versatile and cost efficient EPROM burner, call APPARAT today. Dealer inquiries welcome.

(303) 741-1778

*TRS-80 version requires the TRS-80 bus extender (Cat. # 1-025) or a separate user provided power supply and cable. TRS-80, and Apple are trademarks of Tandy Corp. and Apple Computer



 **Apparat, Inc.**

4401 So. Tamarac Parkway, Denver, CO 80237 (303) 741-1778

"ON GOING SUPPORT FOR MICROCOMPUTERS"

4MHZ, DOUBLE DENSITY, COLOR & B/W GRAPHICS. .THE LNW80 COMPUTER



When you've compared the features of an LNW80 Computer, you'll quickly understand why the LNW80 is the ultimate TRS80 software compatible system. LNW RESEARCH offers the most complete microcomputer system at an outstanding low price. We back up our product with an unconventional 6 month warranty and a 10 days full refund policy, less shipping charges.

LNW80 Computer \$1,450.00
 LNW80 Computer w/B&W Monitor & one 5" Drive \$1,915.00
 All orders must be prepaid, CA residents please include 6% sales tax.
 Contact us for shipping charges

* TRS80 Product of Tandy Corporation.
 ** PMC Product of Personal Microcomputer, Inc.

COMPARE THE FEATURES AND PERFORMANCE

| FEATURES | LNW80 | PMC-80** | TRS-80* MODEL III |
|---|-------------------|-------------------|----------------------|
| PROCESSOR | 4.0 MHZ | 1.8 MHZ | 2.0 MHZ |
| LEVEL II BASIC INTERP. | YES | YES | LEVEL III BASIC |
| TRS80 MODEL I LEVEL II COMPATIBLE | YES | YES | NO |
| 48K BYTES RAM | YES | YES | YES |
| CASSETTE BAUD RATE | 500/1000 | 500 | 500/1500 |
| FLOPPY DISK CONTROLLER | SINGLE/ DOUBLE | SINGLE | SINGLE/ DOUBLE |
| SERIAL RS232 PORT | YES | YES | YES |
| PRINTER PORT | YES | YES | YES |
| REAL TIME CLOCK | YES | YES | YES |
| 24 X 80 CHARACTERS | YES | NO | NO |
| VIDEO MONITOR | YES | YES | YES |
| UPPER AND LOWER CASE | YES | OPTIONAL | YES |
| REVERSE VIDEO | YES | NO | NO |
| KEYBOARD | 63 KEY | 53 KEY | 53 KEY |
| NUMERIC KEY PAD | YES | NO | YES |
| B/W GRAPHICS, 128 X 48 | YES | YES | YES |
| HI-RESOLUTION B/W GRAPHICS, 480 X 192 | YES | NO | NO |
| HI-RESOLUTION COLOR GRAPHICS (NTSC), 128 X 192 IN 8 COLORS | YES | NO | NO |
| HI-RESOLUTION COLOR GRAPHICS (RGB), 384 X 192 IN 8 COLORS | OPTIONAL | NO | NO |
| WARRANTY | 6 MONTHS | 90 DAYS | 90 DAYS |
| TOTAL SYSTEM PRICE | \$1,915.00 | \$1,640.00 | \$2,187.00 |
| LESS MONITOR AND DISK DRIVE | \$1,450.00 | \$1,375.00 | --- |

LNW80

- BARE PRINTED CIRCUIT BOARD & MANUAL \$89.95

The LNW80 - A high-speed color computer totally compatible with the TRS-80*. The LNW80 gives you the edge in satisfying your computation needs in business, scientific and personal computation. With performance of 4 MHz, Z80A CPU, you'll achieve performance of over twice the processing speed of a TRS-80*. This means you'll get the performance that is comparable to the most expensive microcomputer with the compatibility to the world's most popular computer (TRS-80*) resulting in the widest software base.

FEATURES:

- . TRS-80 Model I Level II Software Compatible
- . High Resolution Graphics
 - . RGB Output - 384 x 192 in 8 Colors
 - . NTSC Video or RF MOD - 128 x 192 in 8 Colors
 - . Black and White - 480 x 192
- . 4 MHz CPU
- . 500/1000 Baud Cassette
- . Upper and Lower Case
- . 16K Bytes RAM, 12K Bytes ROM
- . Solder Masked and Silkscreened

LNW SYSTEM EXPANSION

- BARE PRINTED CIRCUIT BOARD
 AND MANUAL \$69.95
 WITH GOLD CONNECTORS \$84.95

The System Expansion will allow you to expand your LNW80, TRS-80*, or PMC-80** to a complete computer system that is still totally software compatible with the TRS-80* Model I Level II.

FEATURES:

- . 32K Bytes Memory
- . 5" Floppy Controller
- . Serial RS232 20ma I/O
- . Parallel Printer
- . Real Time Clock
- . Screen Printer Bus
- . On Board Power Supply
- . Solder Masked and Silkscreened

LNW RESEARCH CORPORATION

2620 WALNUT ST.
 TUSTIN CA. 92680

ORDERS & INFO. NO. 714-544-5744
 SERVICE NO. 714-641-8850

Circle 229 on Inquiry card.

VISA MASTER CHARGE UNLESS NOTED
 ACCEPTED ADD \$3 FOR SHIPPING

LN Doubler & DOS PLUS 3.3D

- Assembled and Tested W/DOS PLUS 3.3D \$175.00

Double-density disk storage for the LNW Research's "System Expansion" or the Tandy's "Expansion Interface". The LN Doubler™ is totally software compatible with any double density software generated for the Percom's Doubler***. The LN Doubler™ provides the following outstanding features.

- . Store up to 350K bytes on a single 5" disk
- . Single and double density data separation
- . Precision write precompensation circuit
- . Software switch between single and double density
- . Easy plug in installation requiring no etch cuts, jumpers or soldering
- . 35, 40, 77, 80 track 5" disk operation
- . 120 day parts and labor Warranty

*** Doubler is a product of Percom Data Company, Inc.

DOS PLUS 3.3D

Micro Systems software's double density disk operating system. This operating system contains all the outstanding features of a well developed DOS, with ease in useability.

KEYBOARD

LNW80 KEYBOARD KIT \$84.95

The Keyboard Kit contains a 63 key plus a 10 key, P.C. board, and remaining components.

CASE

LNW80 CASE \$84.95

The streamline design of this metal case will house the LNW80, LNW System Expansion, LNW80 Keyboard, power supply and fan, LN Doubler™, or LNW Data Separator. This kit includes all the hardware to mount all of the above. Add \$12.00 for shipping

PARTS AVAILABLE FROM LNW RESEARCH

- . 4116 - 200ns RAM
 - . 6 chip set \$26.00
 - . 8 chip set \$33.50
 - . 16 chip set \$64.00
 - . 24 chip set \$94.00
 - . 32 chip set \$124.00
- . LNW80 "Start up parts set" LNW80-1 \$82.00
- . LNW80 "Video parts set" LNW80-2 \$31.00
- . LNW80 Transformer LNW80-3 \$18.00
- . LNW80 Keyboard cable LNW80-4 \$16.00
- . 40 Pin computer to expansion cable \$15.00
- . System Expansion Transformer \$19.00
- . Floppy Controller (FD1771) and UART (TR1602) \$30.00

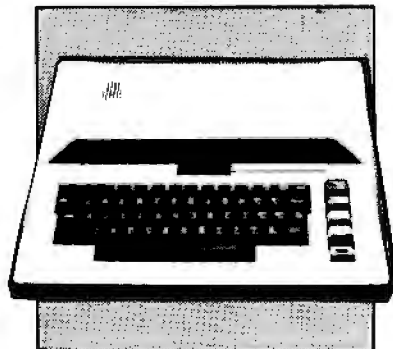


EAST/WEST

LOOK NEXT MONTH FOR
OUR NEW SUPER
SPECIALS FOR
1982!

**Ω OMEGA
SALES CO.**

LOOK
CLOSELY
AT THESE
CHRISTMAS
SAVINGS!!



ATARI 800 16K

\$ 749



EPSON MX-80

\$ 469

**EAST COAST
1-800-556-7586**



**WEST COAST
1-800-235-3581**

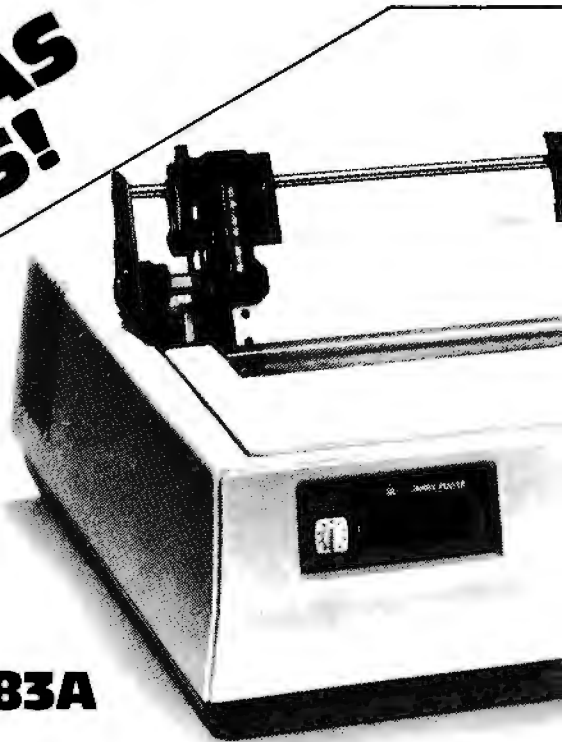
PRICES ARE SUBJECT TO CHANGE
W/O NOTICE.

SAVINGS!

**CHRISTMAS
SPECIALS!**



**OKIDATA
MICROLINE-83A**



| | |
|---|---------------|
| INTERTEC SUPERBRAIN 64K RAM | \$2799 |
| QD SUPRBRAIN | 2999 |
| NEC5510 SPINWRITER (7710) | 2345 |
| NEC 5520 SPINWRITER (7720) | 2695 |
| NEC 5530 SPINWRITER (7730) | 2345 |
| NEC 12" MONITOR | 229 |
| NEC COLOR 12" MONITOR | 339 |
| NEC PC 8023 Printer 100 CPS Tractor & Friction | 639 |
| OKIDATA MICROLINE-80A | 399 |
| OKIDATA MICROLINE-82A | 529 |
| OKIDATA MICROLINE-83A | 769 |
| DIABLO 630 | 1995 |
| APPLE II PLUS 48K | 1139 |
| APPLE DISK w/ 3.3 DOS Controller | 525 |
| APPLE DISK w/ o Controller | 449 |
| EPSON MX-80 | 469 |
| INTERFACES: | |
| IEEE S55, TRS-80 S35, APPLE INTERFACE & CABLE \$90, RS-232 \$70 | |
| HAZELTINE 1420 | 799 |
| NORTHSTAR HORIZON II 32K QD | 2925 |
| ANADIX DP-9500/9501 | 1249 |
| TELEVIDEO 912C | 669 |
| TELEVIDEO 920C | 729 |
| TELEVIDEO 950 | 929 |



We Accept C.O.D.'s • Stock Shipments Same Day or
Next • No Surcharge for Credit Cards • All
Equipment Factory Fresh w/ MFT Warranty •

We carry the complete line of Personal Software.

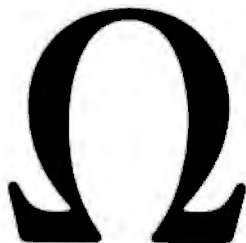




\$749

| | |
|--|----------------|
| CBM 8032 COMPUTER | \$ 1149 |
| CBM 8050 DISK DRIVE | 1349 |
| CBM 4032 COMPUTER | 1029 |
| CBM 4040 DISK DRIVE | 1029 |
| CBM 402 | 649 |
| CBM VIC-20 | 269 |
| LEEDEX / AMDEK 100 | 139 |
| LEEDEX / AMDEK 100G | 169 |
| LEEDEX / AMDEK COLOR-1 13" Color Monitor | 329 |
| MICROTEK 16K RAMBOARD for Atari | 79 |
| MICROTEK 32K | 149 |
| ATARI 800 16K | 749 |
| ATARI 400 16K | 349 |
| ATARI 810 Disk Drive | 449 |
| ATARI 82040 Column Printer | 299 |
| ATARI 822 40 Column Thermal Printer | 349 |
| ATARI 825 80 Column Printer | 599 |

OMEGA SALES CO.



**EAST COAST
1-800-556-7586**

OMEGA SALES CO.
12 Meeting St.
Cumberland, RI 02864
1-401-722-1027

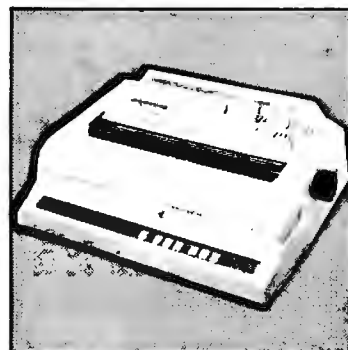
**WEST COAST
1-800-235-3581**

OMEGA SALES CO.
3533 Old Conejo Rd. #102
Newbury Park, CA 91320
1-805-499-3678
CA. TOLL FREE 1-800-322-1873

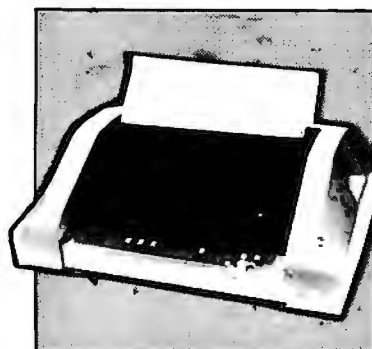
OMEGA SALES CO.



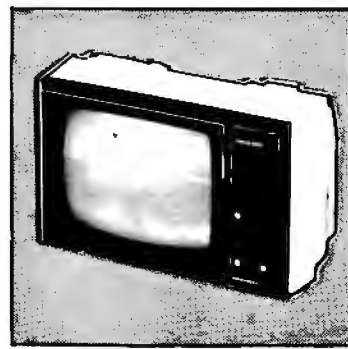
CBM 8032 COMPUTER \$1149



DIABLO 630 \$1995



ANADEX DP-9500/9501 \$1249



LEEDEX/AMDEK COLOR-1 13" \$ 329



Photo 1: The complete Orchestra-80 system. The system is simple, and is mainly software intensive, as evidenced by the small size of the hardware interface.

quate.

The editor in Orchestra-80 is easy to use. It uses the arrow keys on the keyboard to position the cursor wherever you want within the piece you are working on. Additionally, you can insert duplicate lines anywhere you want and move lines forward or backward through your file.

When you are finished with a piece, or you want to hear what you have created, type SCORE and any syntax errors will be pointed out. Then type PLAY and listen to

what you've typed in.

When you are in the command mode, you can read in previously scored pieces from cassette tape or disk. Pieces can also be "chained" from the storage medium, so several pieces can be played one after the other without intervention from the operator. The disk-based version includes a directory command that lets you see what files are on your disks. Both versions, tape and disk, allow printing of any file in memory, a valuable feature in any program.

The computer code used in composing music is quite straightforward. You can choose any musical key by stating the number of sharps or flats, for example: K1# means the key has one sharp, ie: the key of G.

From there, you can automatically transpose the music to a higher or lower key by inserting a line with the symbol > (greater than) or < (less than) followed by the number of half-steps you wish the music transposed up or down.

On another line, you define the time signature and tempo. (Although a tempo conversion chart is supplied, a limitation of the program is that the tempo must be determined largely by trial and error.)

Next, you define the tone-color registers of up to four voices; in other words, how you want them to sound. A bit of experimentation reveals that if you want the first voice to play with a clear, bright sound and the second voice to have a fuller, more textured sound, you type V1YA V2YD. By defining each of the voices' tones using

DISCOUNT PRINTER RIBBONS

Brand New, Top Quality, Exact Replacement Ribbons & Cartridges. These Ribbons Produce Super Jet Black Impressions and Ultra Reliable Print Life. They Are Delivered to Your Door Promptly for Much Less Than Most Retail Stores

★SPECIAL! BUY 10 and GET ONE FREE!

40% OFF!!

OR MORE!

TERMS:
 MINIMUM PURCHASE - \$20
 PAYMENT BY: C.O.D.(UPS), CHECK, MASTER CARD, OR VISA CHARGE CARD.
 VOLUME DISCOUNTS:
 20 - 50 PACKS 10%
 51 - 100 PACKS 15%
 *UNDER \$20, ADD \$5 HANDLING.
 **APPROX. RETAIL. PRICE VARIES.

| YOUR PRINTER | PACK SIZE | RETAIL LIST** | YOUR WHOLESALE PRICE | SIZE | COMMENTS | CAT ORDER# |
|---|-----------|---------------|---------------------------------|---------------------|-------------------|------------|
| ANADIX 9000 Series | 1/pk | 14.00 ea | 14.00 (14.00 ea) | 5/8" x 45' | Nylon Jet Bk | C-777 |
| CENTRONICS 700-703, 737, 779 | 3/pk | 18.95/3 pk | 11.95/3 pk (13.98 ea) | 1" x 108' | Nylon Jet Bk | C-700 |
| CENTRONICS 100, 101A, 102, 103, 300, 301, 306, 308, 330, 358, 398, 500, 501, 503, 508, 588, 620, 820 | 3/pk | 26.33/3 pk | 17.55/3 pk (15.85 ea) | 5 ml High Speed | Nylon Jet Bk | C-100 |
| CENTRONICS 704-705 | 1/pk | 16.95 ea | 13.95/Giant Cart (13.95 ea) | 5 1/8" x 210' | Giant Cart | C-7045 |
| DEC 1/2 x 40YD | 3/pk | 17.77/3 pk | 12.95/3 pk (14.32 ea) | 1 2" x 120' | Double Speeds | R-600 |
| DEC 1/2 x 80YD | 3/pk | 20.12/3 pk | 14.25/3 pk (14.75 ea) | 1 2" x 180' | Double Speeds | R-844 |
| DIABLO HYTYPE II (M/S BLK) HI YIELD FITS 70 PRINTERS! | 1/pk | 9.31 ea | 6.87 ea (6.87 ea) | 5 1/8" x High Yield | 300,000 plus imp | C-511 |
| EPSON MX70-80 | 1/pk | 16.00 ea | 13.95/Cart (13.95 ea) | 5/8" x 50' | Nylon Jet Bk | C-522 |
| IBM "SILVER DOLLAR" Sys 34, Sys 32 MOLA, Series (MDL4974, 5258, 3287, 377U, 3771-3774, 4974, 5100, 5103, 5110, 5228, 5256, 5320MDLA | 5/pk | 5.80 ea | 14.90/5 pk (12.98 ea) | 9 1/8" x 30' | Nylon Jet Bk | R-300 |
| IBM - HARMONICA 1/2" SERIES I, MOD 4973/A, 3200, 3288, MOD 2 | 3/pk | 9.42 ea | 20.85/3 pk (16.95 ea) | 1 7" x 108' | Nylon Jet Bk | C-350 |
| NEC SPINWRITER | 4/pk | 23.40/3 cart | 23.60/4 pk re load (15.90 ea) | 1 2" x 51' | Nylon/Ex Lng Life | R-400 |
| QUME (FITS 80 PRINTER MODES) | 3/pk | 18.00/3 pk | 13.95/3 pk (14.65 ea) | 1 4" x 310' | Multistrike Film | C-525 |
| RADIO SHACK DAISY WHEEL II | 1 pk | 24.95/3pk | 8.25 (18.25 ea) | 250' | Mylar Multistrike | C-789 |
| RADIO SHACK LPIL LPV | one pk | 13.85/cart | 8.95/Reload rb' only (18.95 ea) | 500" x 45' | Nylon Incl Instl | R-73 |
| RADIO SHACK LPIL LPV | 3/pk | 18.95/3 pk | 11.95/3 pk (13.98 ea) | 5/8" x 45' | Nylon Jet Bk | C-100 |
| TELETYPE MOD 33, 28, 35, 37, 38, 88 | 10/pk | 2.40 ea | 13.90/10 pk (11.39 ea) | 1 2" x 36' | Nylon Jet Bk | R 450 |
| WANG M/S 5541W, WC, 5581, WD, 5581W, 2281W | 1/pk | 6.85 ea | 5.95 ea (15.95 ea) | 5, 18" x 393' | Multistrike Film | C-550 |

ANCIE LABORATORIES
 3204 Baltimore Blvd College Park, MD 20740 301-345-6000 (Wash D.C. Local) 301-792-2060 (Balt. MD Local)
800-638-0987 (National)

| | | |
|---|---|--|
| NAME _____ ADDRESS _____ CITY _____ STATE _____ ZIP _____ | QTY _____ CAT.# _____ AMT. _____ _____ _____ TOTAL _____ | <input type="checkbox"/> Check Enclosed <input type="checkbox"/> C.O.D. <input type="checkbox"/> VISA <input type="checkbox"/> MASTER CHARGE ACCT. # _____ EXP. DATE _____ MIN. ORDER \$20 PRICES SUBJECT TO CHANGE |
|---|---|--|



When two leaders in the complex information field get together, the results can be surprisingly simple.

In the beginning, there was information. Executives analyzed it, discussed it, used it to predict the future. But as the volume of information continued to grow, it got harder and harder to handle. Until the executives found that they could no longer get at the information they wanted when they needed it.

Then SPSS Inc., developer of the world's largest-selling computer applications software, and McGraw-Hill, America's leading business publisher, got together. And came up with a simple solution.

SPSS Inc. created a series of software packages for analyzing and presenting information that were powerful yet easy to use. And McGraw-Hill published a series of guides for the software that were

so clear and comprehensive, they became the standard of the industry.

Now the executives could once again get their hands on their company's information and even create their own computer-generated reports and color graphics—all without any programming.

Today SPSS software is serving the data analysis and management needs of over 3000 installations around the world. And McGraw-Hill has sold more than half-a-million SPSS software guides.

The moral of this story is simple. If you're looking for the fastest, most cost-effective way to handle your company's information, talk to SPSS Inc. and McGraw-Hill today. And write your own happy ending.

Partners in Information



444 N. Michigan Avenue
Chicago, Illinois 60611
(312) 329-2400



College Division
McGraw-Hill Book Company
1221 Avenue of the Americas
New York, New York 10020
(212) 997-6611

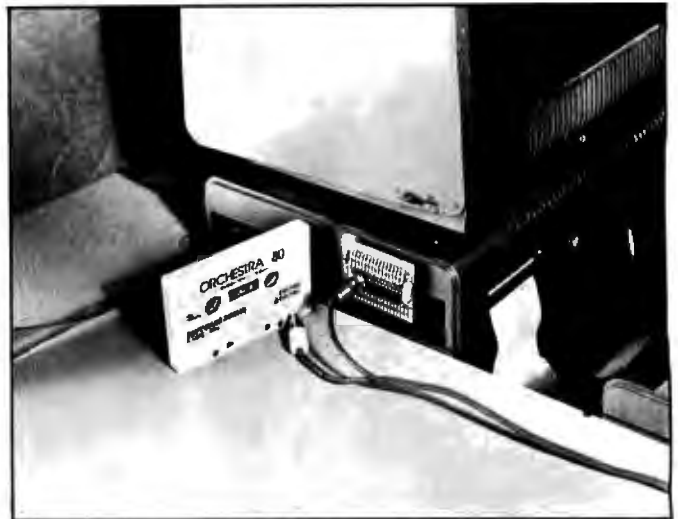


Photo 2: Orchestra-80 can be connected to either of the expansion connectors available on TRS-80 computer systems.

A, B, C, or D, in different combinations, you can achieve a variety of effects. When you're ready for the actual notes and rests, you can transcribe anything from whole notes to sixty-fourth notes, dotted notes to triplets, and you can choose whether or not to modify any note with short or long staccato, or short or long articulation. These modifiers determine how sharply a note ends, and give expression to your music. To further alter the mood of a particular phrase or section of music, you can define a new part (P followed by a two-digit number) and change the tempo, tone color, etc, to achieve the desired effect. Repetition of a phrase or an entire part is easily achieved by entering the correct symbols (parenthesis, or R, followed by the number of the part to be repeated).

There is one major limitation to Orchestra-80. It is in the area of dynamics. You can't change the loudness or softness of a phrase—there is no piano, forte, crescendo, or decrescendo. It is possible to compensate somewhat for this by altering the tone-color registers of the voices

here and there, but the effect is like that of a modified harpsichord. In fact, the music composed when that instrument was in vogue (the 17th to mid-18th centuries)—the even-tempered, full sound of the baroque period—is particularly suited to interpretation by Orchestra-80, although the program has much wider potential.

Orchestra-80 is an excellent package for the programmer or musician interested in making music with a TRS-80 computer. It requires neither an accomplished programmer nor a professional musician to operate. Its instructions are clear and well written, and the hardware is simple to attach and use. ■

Since this review was written, Software Affair has introduced Orchestra-85, featuring stereo output, percussion, new editing features, and an optional fifth voice for use with speed-up modifications; it is compatible with existing Orchestra-80 files. Orchestra-85 costs \$129.95. An upgrade for Orchestra-80 systems is also available.

COMPUSTAR ***** SUPERBRAIN *****

DEALER & OEM PACKAGES AVAILABLE NOW!

NOW AVAILABLE AND IN STOCK - THE ALL NEW AND EXCITING MULTIUSER COMPUSTAR AND STAND-ALONE SUPERBRAIN. WE ARE THE LARGEST AUTHORIZED INTERTEC DATA SYSTEMS DEALER IN THE SOUTHEAST. OUR OFFICE IS ONLY 80 MILES FROM THE FACTORY, THEREFORE WE CAN BEST ACCOMODATE YOU. CALL! CALL! CALL!

7301 South Blvd.
CHARLOTTE N.C. 28210

* DESK-TOP COMPUTERS *

(704)
553-7441

WHY THE MICROSOFT RAMCARD™ MAKES OUR SOFTCARD™ AN EVEN BETTER IDEA.

Memory — you never seem to have quite enough of it.

But if you're one of the thousands of Apple owners using the SoftCard, there's an economical new way to expand your memory dramatically.

16K ON A PLUG-IN CARD.

Microsoft's new RAMCard simply plugs into your Apple II,™ and adds 16k bytes of dependable, buffered read/write storage.

Together with the SoftCard, the RAMCard gives you a 56k CP/M™ system that's big enough to take on all kinds of chores that would never fit before (until now, the only way to get this much memory was to have an Apple Language Card installed).

GREAT SOFTWARE: YOURS, OURS, OR THEIRS.

With the RAMCard and SoftCard, you can tackle large-scale business and scientific computing with our COBOL and FORTRAN languages. Or greatly increase the capability of CP/M

applications like the Peachtree Software accounting systems. VisiCalc™ and other Apple software packages can take advantage of RAMCard too.

And RAMCard gives you the extra capacity to develop advanced programs of your own, using the SoftCard and CP/M. *Even with the RAMCard in place, you can still access your ROM BASIC and monitor routines.*

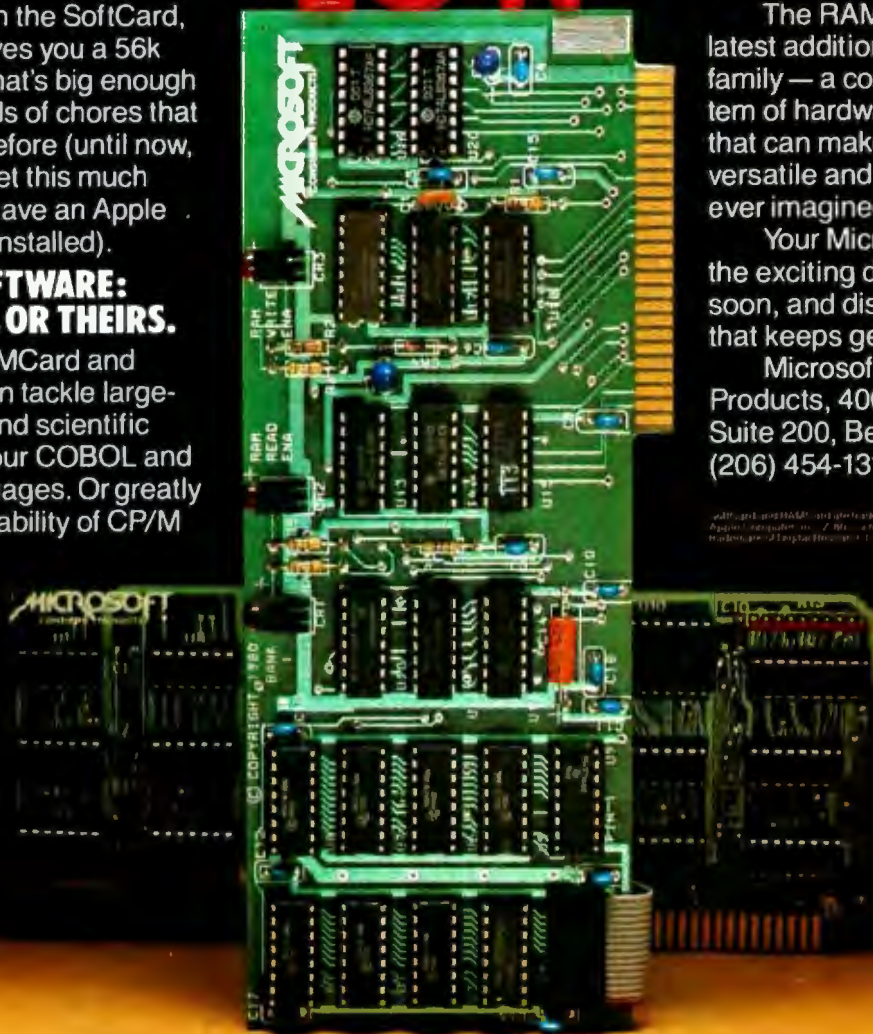
JOIN THE SOFTCARD FAMILY.

The RAMCard is just the latest addition to the SoftCard family — a comprehensive system of hardware and software that can make your Apple more versatile and powerful than you ever imagined.

Your Microsoft dealer has all the exciting details. Visit him soon, and discover a great idea that keeps getting better.

Microsoft Consumer Products, 400 108th Ave. N.E., Suite 200, Bellevue, WA 98004. (206) 454-1315.

16 k



MICROSOFT

Apple II File-Management Systems

Ken Blochowiak
c/o KRB Associates
POB 11894
Milwaukee WI 53211

[Simonides] inferred that people desiring to train this faculty [of memory] must select places and form mental images of the things they wish to remember and store those images in the places, so that the order of the places will preserve the order of the things, and the images of the things will denote the things themselves.

Cicero, De Oratore

Strictly speaking, the terms *database management system*, *data management system*, and *data-base system* refer to programs that meet the CODASYL (Conference On Data SYstems Languages) standards for data-base systems. MDBS from Micro Data Base Systems is one such example of a system modeled after the CODASYL standards. The systems we'll be examining are traditionally referred to as file-management systems (see reference 5 for a more complete discussion). Because of various practical limits (such as time and space), we will not cover any programs that run under Digital

About the Author

Ken Blochowiak edits a newsletter, called *Bits of Data*, for the *Cybernetic Mechanism*. He is president of KRB Associates, which provides information about Decision Support Systems (DSS) and small computers, and vice chairman of the Milwaukee chapter of the Association for Computing Machinery.

Research's CP/M operating system.

At the highest level of generality we will be looking at the portability, maintainability, and current utility of the following systems: Infotree, the CCA DMS (Data Management System), the Data Factory, the On-Line Database, and High Technology's DBMS (Data-Base Management System) and Information Master (with Data Master). (See textboxes for addresses and ordering information.)

Portability includes the notion of both the independence of the software from the Apple computer and the independence of your data from the software. Maintainability of the software system includes the ability to back up disks and access the source code. Maintainability of your information includes sort-and-file redefinition facilities. Current utility includes initial definition (system creation), data entry, retrieval, and report printing. Although we will be emphasizing effectiveness, we will also cover several efficiency characteristics, such as whether or not data entry is I/O (input/output) intensive, whether or not disk space is wasted, and whether or not searching or sorting is excessively slow.

Your application and your values determine the importance of these various features. To effectively evaluate the systems, you must know yourself. If you use your microcomputer to produce reports according to country and type of equipment for the multinational corporation you

work for, your needs may differ from those you would have if you used your system for order entry and inventory information at your local computer store.

Defining the Features

Portability is divided into machine independence and data-file independence. In the face of the vast uncertainty about what equipment will be obsolete, portability frees you from the need to anticipate. Machine independence gives you the ability to

At a Glance

Name
Infotree

Type
Tree-structured information system

Distributor
Siro-tech
6 Main St
Ogdensburg NY 13669
(315) 393-2640

Price
\$70

Format
5-inch floppy disk in UCSD format

Language
UCSD Pascal

Documentation
12 pages

FUTRA COMPANY

P.O. BOX 4380 - DEPT. B
TORRANCE, CA 90510
(213) 328-8951

Hours: Mon. - Fri.: 8:00 am to 5:00 pm
Sat: 10:00 am to 4:00 pm (PST)

...ing solutions and being competitive is our business. At Futra Company we believe that it is possible to find solutions to your automation problems at the lowest possible prices. We carry a complete line of products from major manufacturers and a variety of other accessories and software to suit your home, professional and business needs.



**HEWLETT
PACKARD**

HP-85 and HP-83



HP-85 \$2575.00

HP-83 \$1790.00

Hewlett Packard Computers powerful problem solvers for professional. Quality built for industrial, scientific and business applications that can not afford a penny due to equipment failure. Extremely versatile the HP-85 or can offer functions from detailed analysis in an office to rolling devices on test equipment or numerical controlled industrial machines. The HP-85 comes with a tape recorder, printer and a CRT display and the

HP-83 is the same in capabilities of the HP-85 less the tape storage and printer.

2903A HP-85/83 16K Memory Module \$255.00

Firmware Enhancements:

| Firmware Enhancements: | Interfaces: | | |
|------------------------|------------------------|---------|-------|
| 82936A ROM Draw | 82937A HP-IB | \$ 42 | \$339 |
| 15001 Mass Stor. | 82938A Serial (female) | 196 | \$389 |
| 15002 Plotter/Print | 82939 opt 001 (male) | \$195 | \$339 |
| 15003 In/Output | Same 002 (carrt tp) | \$274 | \$339 |
| 15004 Matrix | 82940A GPI0 | \$186 | \$421 |
| 15005 Adv. Prop. | 82941A BCD | \$274 | \$420 |
| 15007 Assembly | 82948A Printer Int. | \$127.5 | \$266 |



7225
Graphics Plotter
\$2089.95



HP 2631B
Matrix Printer
\$3295.00



HP 82902M
Disk Drive
\$1275.00

HP APPLICATION PACS

\$79.00 each

| | |
|-----------------------------|--|
| 13001 Standard | 85-13011 Linear Programming |
| 13002 Basic Training | 85-13034 Text Editing |
| 13003 Gen. Statistics | 85-13035 Wave Form Analysis |
| 13005 Math | 85-13036 Basic Statistics and Datamanipulation |
| 13006 AC Circuit Analysis | 85-13037 Regression Analysis |
| 13010 Games | \$166 |
| 13042 VisiCalc PLUS | \$175 |
| 13045 Information Mgmt. | \$175 |
| 13046 Surveying | \$175 |
| 13044 Data Communications | CALL |
| 13038 Graphics Presentation | \$175 |



\$299.00
Z-80 Soft Card
with CP/M



\$159.00
16K Ram Card

...n your Apple II computer to a larger world. With the Z-80 Soft- and 16K RAM Card you can now run CP/M compatible software, and your memory for specific application, act as a firmware card much more. If you add any boards to your Apple this year these are the ones.

VIDEX 80 x 24 VIDEOTERM AND KEYBOARD ENHANCER



\$269.00
Videterm



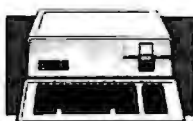
\$110.00
Keyboard Enhancer

...tain optimum software compatibility industry wide. By adding the videterm 80 x 24 videoboard and keyboard enhancer your Apple acts similar to CRT Terminals on larger systems. Combine this with the Z-80 Softcard and you've got some system.

APPLE COMPUTERS



APPLE II "Plus"
16K \$1069.00
48K \$1129.00



APPLE III
128K \$3255.00

What can we say except that they're super systems and the prices are a steal.

Apple II

| | | | |
|---------------------------|-------|---------------------|-------|
| • Disk II w/cont | \$509 | • Hand Controllers | \$ 27 |
| • Disk II 2nd | \$445 | • Vinyl Carrier | \$ 33 |
| • AppleSoft Firmware | \$149 | • Joystick II | \$ 45 |
| • Centronics Printer Int. | \$179 | • Graphics Tablet | \$665 |
| • Communications Card | \$179 | • Silentype Printer | \$365 |
| • High speed Serial Int. | \$155 | | |
| • Pascal Language Syst | \$379 | | |
| • Integer firmware | \$149 | | |
| • Parallel Printer Int. | \$149 | | |

Apple III

| | |
|------------------------------------|-------|
| • Information Analyst Software Pkg | \$345 |
| • Disk II for AIII | \$292 |
| • Silentype Printer III | \$495 |

ADD ON PRODUCTS

California Computer Systems:

| | | | |
|----------------------|------|------------------------|-------|
| • 12K PROM/ROM Brd | \$78 | • Asynchronous Serial | \$135 |
| • Centronics Cable | \$30 | • Synchronous Serial | \$149 |
| • Calendar Clock | \$99 | • Parallel Interface | \$ 99 |
| • Programmable Timer | \$95 | • Centronics Interface | \$111 |
| • A/D Converter | \$95 | • Arithmetic Proc/Disk | \$325 |
| • GPIB IEEE 488 | CALL | • Arithmetic Proc/ROM | \$345 |

Mountain Computer Inc.

| | | | |
|----------------------|-------|----------------------|--------|
| • Apple Clock | \$210 | • Music System | \$485 |
| • Supertalker | \$255 | • A/D → D/A | \$299 |
| • Romplus | \$131 | • Keyboard Filter | \$48 |
| • Romwriter | \$152 | • Keyboard Filter | \$48 |
| • Romwriter | \$152 | • Copy Rom | \$48 |
| • X10 Controller | \$172 | • I/O Cable Assembly | \$47 |
| • X10 System | \$270 | • Expansion Chassis | \$649 |
| • CPS Multi-function | \$239 | • Card Reader | \$1085 |

Other:

| | | | |
|------------------------|-------|------------------------|-------|
| • SSM AIO | \$159 | • ABT Barwand | \$175 |
| • SSM A488 | CALL | • TKC Joystick II | \$ 45 |
| • ABT Keypad | \$115 | • TKC Keypad II | \$149 |
| • ABT Soft Key | \$145 | • ThunderClock | \$120 |
| • Novation Cat Modem | \$155 | • Hayes Micromodem II | \$303 |
| • Novation D-Cat Modem | \$155 | • Hayes Micromodem 100 | CALL |
| • Novation Apple Cat | \$320 | | |

ADD ON SOFTWARE

Apple Computers:

| | | | |
|------------------|------|--------------------|-------|
| • Apple Post | \$44 | • Stellar Invaders | \$23 |
| • Shell Games | \$28 | • Apple Plot | \$57 |
| • Apple Bowl | \$23 | • Adventure | \$33 |
| • DOS 3.3 Update | \$57 | • AP Music Theory | \$47 |
| • Apple Writer | \$65 | • Tax Planner | \$114 |
| • DOS Tool Kit | \$65 | | |

Personal Software:

| | | | |
|--------------------|-------|----------------------|-------|
| • VisiCalc 3.3 | \$159 | • VisiTerm | \$125 |
| • Desk Top/Plan II | \$165 | • VisiPlot | \$147 |
| • CCA Data Mgt. | \$84 | • VisiDex | \$159 |
| | | • VisiTrend/Visiplot | \$229 |

Microsoft (requires Z80 SoftCard & CP/M)

| | | | |
|---------------------|-------|--------------------|----------|
| • Basic Compiler | \$296 | • COBAL Language | \$562.50 |
| • Assembly Language | \$94 | • Fortran Language | \$149.00 |

Peachtree/40: (requires Z-80 SoftCard & 16K RAM Card)

| | | | |
|---------------------|-------|-------------|-------|
| • General Ledger | \$195 | • Payroll | \$195 |
| • Accounts Rec | \$195 | • Inventory | \$195 |
| • Accounts Payables | \$195 | • Mail List | \$195 |

Misc: (48K AII or AII+)

| | | | |
|-------------------------|-------|-----------------------------------|----------|
| • Stoneware "DB Master" | \$179 | • Software Publishing Corp. "PFS" | \$ 87.50 |
| • BPI General Ledger | \$315 | • "PFS: Report" | \$ 87.50 |
| • BPI Inventory Control | \$315 | • MicroFocus "GDSOL" | \$743.00 |
| • BPI Payroll | \$315 | • MicroPro Wordstar | \$229.00 |
| • BPI Job Cost Sys. | \$315 | | |

CPM Software Packages - 8" Diskettes

| | | | |
|-----------------|--|-------------------|--|
| • Peachtree CPM | | • Accounting Plus | |
| • MicroPro | | | |

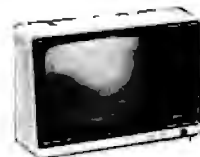
COMPUTER SUPPLIES:

| | | | |
|-----------------------------|------|-----------------------------|------|
| 3M Scotch 5" Diskettes (10) | \$26 | 3M Scotch 8" Diskettes (10) | \$32 |
| • 744-0 5" SS/SD soft sect. | \$26 | • 740-0 8" SS/SD | \$36 |
| • 744-10 5" SS/SD 10 sect. | \$26 | • 741-0 8" SS/DD | \$44 |
| • 744-16 5" SS/SD 16 sect. | \$26 | • 743-0 8" DS/DD | \$44 |
| • 7440 5" Head Clean.Kit | \$29 | • 7400 8" Head Clean.Kit | \$30 |

MISC.

| | | | |
|--------------------------|--------|----------------------|--------|
| • Silentype Paper (roll) | \$4.50 | • Vinyl Disk Sleeves | \$8.95 |
| • 5" Vinyl disk sleeves | \$8.95 | | |

ZENITH MONITOR



12" GREEN
DATA MONITOR
\$119.00

Reduce eyestrain with the monitor from the people who say "The quality goes in before the name goes on." Excellent for AII, AIII Atari and others.

ALTOS



8000-2
8000-10 \$CALL
8000-15 \$CALL

XEROX



820-1 5 1/4" \$CALL
820-2 8" \$CALL

Altos 8000 series and Xerox 820 series
Don't buy anything until you've checked with us.

VIDEO TERMINALS & VIDEO MONITORS

Sanyo:

| | |
|---------------------|-------|
| • 12" Green Monitor | \$269 |
| • 12" B&W Monitor | \$239 |
| • 13" Color Monitor | \$432 |
| • 9" B&W Monitor | \$169 |
| • 9" Green Monitor | CALL |

NEC:

| | |
|---------------------|-------|
| • 12" Green Monitor | \$282 |
| • 12" Color (RGB) | CALL |
| • 12" Color Monitor | \$402 |

VIDEO TERMINALS:

| | |
|----------------------|-------|
| • ADDS Viewpoint CRT | \$582 |
| • Soroc 130 | \$595 |
| • Televideo | \$595 |

AMDEK:

| | |
|---------------------|-------|
| • 12" B&W Monitor | \$144 |
| • 12" Green Monitor | \$174 |

EPSON PRINTERS MX-100

Your price \$759.00

Probably the best buy in a printer this year. Compare features with any other and compare price (especially ours). 4 character sizes all may be placed into letter quality enhanced mode. Friction and removable tractor. 9 by 9 to 18 by 18 dot Matrix, logic seeking, and much more. Not to mention DOT PLOTTING?GRAFTRAX option built right in. WOW! What a printer!

| | | | |
|--------------------|-------|--------------------------------|---------|
| • MX 80 FT Printer | \$569 | • MX Ser.Interface Opt | \$85 |
| • MX 80 Printer | \$479 | • Epson Apple Par.Int. | \$89 |
| • MX 70 Printer | \$384 | • Epson Par.Cable | \$22.50 |
| • MX 80 Ribbons | \$14 | • MX-80 or 80/ft Graf-trax ROM | \$78 |

CALIFORNIA COMPUTER SYSTEM

The CCS 2210 is a low cost \$100, Z80 computer system with 64K of memory, disk controller, parallel/serial I/O and CPM operating system.

\$1743.00

Separate Components

| | | | |
|-------------------|-------|--------------------|-------|
| • 2200A Mainframe | \$454 | • 24221 Disk Cntr. | \$354 |
| • 2810A CPU | \$247 | • 2718 Par/Ser I/O | \$275 |
| • 2065 64K RAM | \$540 | | |

ATARI COMPUTER SYSTEMS ATARI 800 16K Computer

Your price: \$785.00

The Atan 800 Computer with accessories and software make up a complete system for home, educational, financial and business use.

| | | | |
|---------------------|--------|---------------------|-------|
| • Atari 400 | \$347 | • 853 16K RAM Mod | \$83 |
| • 810 Disk Drive | \$475 | • 930 Acoustic Mod | \$156 |
| • 815 Dual Disk Dr. | \$1218 | • 850 Interface Mod | \$80 |
| • 825 80 col.print. | \$780 | • 410 Prog.recorder | \$79 |

TERMS: Shipping: add 3% for product shipped within continental USA via UPS surface (minimum \$3.00). If the Order placed is prepaid with U.S. funds in the form of check or money order, a Total Charge of \$3.00 for shipping is all you pay within the continental USA via UPS surface. Allow 14 working days for personal and company checks to clear. Credit card charges limited to \$1000. No COD's. FPO, APO or orders outside continental USA call or write for shipping charges or add 10% to purchase price (any difference will be refunded). California residents add 6% sales tax. All offers subject to change or withdrawal without notice.

SOFTWARE DEVELOPMENT TOOLS FOR INDUSTRY

CP/M CROSS-ASSEMBLERS

Fast, comprehensive cross-assemblers to run under CP/M.* Extensive pseudocode include full listing control, nested conditionals, mnemonic synonyms, and inclusion of external source files. Generate object file, assembly listing, and symbol table from source code for nine popular microprocessor families.

XASM05 6805
 XASM09 6809
 XASM18 1802
 XASM48 8048/8041
 XASM51 8051
 XASM65 6502
 XASM68 6800/6801
 XASMF8 F8/3870
 XASM400 COP400

Assemblers... \$200.00 each
 Manual only... \$ 25.00

8048 DEVELOPMENT PACKAGE

Now you can use the 8048 family of single-chip microcomputers without buying expensive equipment. Develop 8048 software with the XASM48 cross-assembler. Then plug our EPROM board into your S-100 system to program the 8748 EPROM version.

8048 Development Package... \$574.00
 EPROM alone \$449.00

EPROM SIMULATOR BOARD

Debug dedicated systems quickly. Our PSB-100 PROM Emulator is an S-100 board with up to 8K of RAM. Cable with 24-pin plug replaces 2708 or 2716 EPROM(s) in your target system for instant program testing.

PSB-100 EPROM Simulator... \$445.00
 w/2K RAM

*Trademark of Digital Research



804 SOUTH STATE ST.
 DOVER, DEL. 19901
 302-734-0151

Visa and Mastercard accepted. We ship 8" single-density and Softcard + 5.25" diskettes. Ask us about other formats. OEM AND DEALER INQUIRES INVITED.

+ Trademark of Microsoft

move from machine to machine and not waste time learning new software. Data-file independence gives you freedom to use your data file with another file-management system. None of the systems described in this article gives true CODASYL data independence, but some give you more flexibility than others. With a text editor, a copy of the structure of your record, a little analysis, and some programming, you can often achieve considerable flexibility, even if at first glance your record structure seems to be set in concrete.

Maintainability consists of backup, access to source code, sort facilities, and redefinition facilities, and it refers to your ability to continue operating your system. If your data files need some slight changes, if your program has a bug, or if your "locked" (uncopyable) disk doesn't work any

more, how do you get up and running again? This area is complicated by the spectre of software piracy and the high mortality rate among new businesses.

Current utility refers to initial definition, data entry, data retrieval, report printing, interface to outside packages, human factors, documentation, and something I call "macro-efficiency." No matter how portable and maintainable a system is, if it's not useful there's no point in having it.

Portability

Infotree is the most *machine-independent* system we will examine here. It is distributed in UCSD Pascal (developed at the University of California at San Diego) *p-code* (pseudo-code) and, with the proper utilities, can be transferred to other UCSD systems. The CCA DMS also has slight

| | Infotree | CCA DMS | Data Factory | On-Line Database | DBMS | Data Master | Information Master |
|---------------------------------|----------|---------|--------------|------------------|------|-------------|--------------------------|
| Source code available | N | Y | N | N | N | N | N |
| Copyable disk | Y | Y | N | N | Y | N | N |
| Characters per field | NA | 232 | 239 | 26 | 100 | NA | 99, alpha 19, numeric |
| Fields per record | NA | 24 | 88 | 20 | 20 | NA | 20 |
| Characters per record | NA | 232 | 21 K | 239 | 2 K | NA | 1980 |
| Select by specified range | N | Y | Y | Y | Y | Y | Y |
| Select by partial match | N | N | Y | N | N | Y | Y |
| Select using multiple fields | N | N | Y | N | Y | Y | Y |
| Allows subsorts | Limited | Y | Limited | Y | Y | NA | Y |
| Prints mailing labels | Y | Y | Y | Y | Y | NA | Y |
| User-defined print formats | N | Y | Y | Y | Y | NA | Y |
| Multiline defined print formats | N | Y | Y | N | Y | NA | Y |
| Add/delete fields to/from file | Y | N | Y | N | N | Y | N |
| Merge files | N | N | Y | N | N | Y | N |
| Calculation options | N | Y | Y | N | Y | Y | Y |
| In-memory data entry | N | N | Y | Y | N | NA | Limited |
| Data entry default values | N | N | N | Y | N | NA | Y |
| Interface to VisiCalc | N | Y | N | N | N | N | N |

Table 1: A quick summary of features for Apple II data-base management systems. DBMS and Information Master are both file-management programs used in conjunction with Data Master, a file-restructuring program. Infotree's tree structure gives record sizes slightly different meanings (each node is identified by a key of up to 18 characters in length; each node can contain up to 18 lines of 26 text characters).



Nobody's better protection than The Marshal in Winchester territory.

You got yourself a Winchester disk drive with all that large system power. Great! But trying to utilize your floppy drive for backup just isn't working. And bit-streaming tape cartridge drives offers no practical protection, because the usual need is archival storage and replacement of individual files lost through operator error; but the streamer tape data cannot be reconstructed by separate files easily.

Enter The Marshal to your rescue.

He's the only match in speed, capacity, and capability for your Winchester. As Thomas S. Stelling, Manager of Marketing Literature with Computer Service Systems Network, Inc. stated in InfoWorld, "Intelligent tape subsystems, combining the 1/4-inch tape cartridges with file-oriented software offers the best solution to hard disk backup...a utility program...allows the user to save every file in the system, as well as to restore individual files by name."

The Marshal from TKS Corporation.

The only complete hardware/software protection device for computer hard disk systems.

The Marshal follows commands, is fast, and thinks for himself.

Formatted capacity is 13.4 megabytes. The transfer rate is 192,000 bits per second. And he can determine which files have been updated since last saved, in order to recopy only those specific files — saving time. Then records the date he made the copy.

Perfect protection for the perfect price.

Your OEM Distributor can introduce you to a rack mount unit or a table top console for much less than you'd guess. Take this ad to your dealer today, save a heap of money off the regular price, and get the best protection available in Winchester territory.

The Marshal from Turnkey Systems Corporation would sure be happy to help you. Call 1-800-327-2848.



Turnkey Systems Corporation
8472 NW 56 Street, Miami, FL 33166

potential for machine independence; it is available in source code and could be translated into another dialect of BASIC. The other systems (Data Factory, On-Line Database, and High Technology's DBMS and Information Master) come on locked or unlistable disks and have no machine independence.

At a Glance

Name

The Data Factory 3.0

Type

File management and retrieval system

Distributor

Micro Lab
811 Stonegate
Highland Park IL 60035
(312) 433-7877

Price

\$150

Format

Locked 5-inch floppy disk

Language

Applesoft BASIC

Documentation

88 pages

At a Glance

Name

CCA Data Management System 5.2

Type

File management and retrieval system

Distributor

Personal Software
1330 Bordeaux Dr
Sunnyvale CA 94086
(408) 745-7841

Price

\$100

Format

5-inch floppy disk

Language

Applesoft BASIC

Documentation

130 pages

Infotree does not include any data-file transfer utilities, but there is a text file on the program disk that details how data is stored. Infotree uses a binary tree and consists of a set of records that can be used for text or as nodes in the tree.

The CCA DMS provides utilities for transferring data between VisiCalc and DMS using Software Arts' DIF (Data-Interchange Format). The documentation provides information on the structure of DMS records and examples of the use of this information (including a program that uses DMS files).

The Data Factory provides a Construct/Append option that enables you to read text files created by other systems into Data Factory files. The Data Factory can also add or delete fields in a record and create new files that include the new format and your old data. Information is not provided on the structure of Data Factory files. This system provides flexible methods of moving data into the system, but no documented way of moving data out to other systems.

The On-Line Database does not provide any transfer utilities or file-structure information.

High Technology's DBMS has no utilities that increase flexibility, but both Data Master and Information Master will accept DBMS files. An option for transferring data from Information Master to DBMS is not provided. Data Master can create new DBMS files from old DBMS files.

Data Master is a package of utilities for use with either DBMS or Information Master. It does not document methods of working with files created by other systems. Data Master includes some nice options for adding or deleting fields in a record and for transferring records that meet user-specified criteria to another data file. There is a Data Master equivalent to the command "Select all records where the ZIP code field has the value 22153, and the Amount Owed field is greater than \$10,000; then, transfer only those records to a new data file leaving out the phone number but including a new field called *Comments* whose value is *big spender*. Data

Master does supply an extensive set of file restructuring features that are quite useful.

Maintainability

With the coming of the locked disk, a widespread misnomer has developed an appropriate meaning. I refer to "software maintenance." Infotree and the CCA DMA come on copyable disks, which enables you to keep as many backup disks as you wish. The Data Factory comes on two uncopyable disks. "Disk insurance" is available for \$17.50 per year. This provides for replacement of blown disks and updates to the system. Data Factory disks can also be renewed for a \$10 fee if you don't have disk insurance. A backup copy of the On-Line Database is available for \$15. When you return High Technology's license, you are sent a backup copy of Data Master or Information Master. DBMS is copyable but it cannot be listed. High Technology says it will replace blown disks for \$25.

Only the CCA DMS provides access to source code. Access to source code is reassuring to a purchaser (but see Gemignani's "Legal Protection for Computer Software" for a discussion of the current legal situation concerning software protection).

Infotree provides a file compression option that removes deleted information and improves access time by sorting and relinking the remaining data. Sorting is also done during data entry. The only subsorts are those built into the tree structure (the subbranches of each branch are sorted).

The CCA DMS allows up to ten levels of subsorts. (Whenever two records have the same primary-sort field, they are arranged by the secondary-sort field, and so on.) The use of source and destination disks allows you to sort large files.

The Data Factory allows what amounts to sorting by subfields for day, month, and year. But that's all. And since this information must be in one field, in an invariant format (dd/mm/yy), you lose considerable flexibility of ad hoc query. Of course, you could do without time subsorts (or enter the data twice). Single- or

MicroDaSys
68K

MiniFrame Power



features:

- Virtual Memory Management
- Motorola 68000 Processor
- 12 Mhz operation
- 32 bit computations
- 4 Billion byte addressing
- LRU demand paging
- Peripheral processor
- UNIX multi-user operating system

Only the world's finest minicomputer offers these features in systems available TODAY. Complete single-user systems start under \$10,000. And a 6 user UNIX-based 16 MB virtual system with 512K Bytes RAM and 24M Bytes hard disc costs under \$25,000! Want proof? Call or write now for brochures and information on our 68K Seminars. Or send \$75 for the complete technical manual set.

MicroDaSys
2811 Wilshire Blvd., Santa Monica, CA 90403
Call (213) 829-6781

TWX: 910-321-2378

A free poster of this ad is available while supply lasts.
UNIX is a trademark of Bell Laboratories.
68K MiniFrame is a trademark of MicroDaSys, Inc.

© 1984, Inc.

dual-drive sorts of a full-disk data file are possible.

The On-Line Database allows subfield sorts. Data is sorted at time of entry, but with reasonably small sets of defined sorts, data entry is not slowed too much.

The High Technology DBMS also allows subfield sorts, but sorting is separated from data entry. An Omit Sort Update option allows Informa-

tion Master to postpone sorting until the end of your entry or file-modification session. Sorting can also be completely separated from data entry, but some extra work is involved (deleting and redefining sort-definition files). Technically, Data Master performs no sorting, but is simply a utility program for reorganizing files into different formats.

Infotree allows you to add or delete nodes, one by one, to or from your "infotree"—not a particularly powerful method. The On-Line Database doesn't have any facilities of this sort.

There are no explicitly documented methods of adding or deleting fields from an existing CCA DMS data file. But a small file could be transferred to a VisiCalc program that added or deleted columns and transferred back to DMS (a VisiCalc row is a DMS record and a VisiCalc column is a DMS field). This may seem awkward, but it is possible.

The Data Factory has several file redefinition facilities: Construct/Append is the most useful, but Replace and Math can also be useful. Construct/Append allows you to add or delete fields from your record definition, change field length or field position, or append files that have fields of different lengths or in different positions. Replace lets you enter a constant into a specified field of all or selected records. Math lets you do one arithmetic operation involving two fields and store the result in a third field.

Data Master is a comprehensive file-redefinition system. It requires source and destination files created by DBMS or Information Master. It can relocate fields and transfer selected subsets of a file, and create files that have an increase or decrease in the number of fields per record. It can merge files by multiple transfers to the same source file. You can transfer the results of calculations that use up to ten intermediate variables (like a calculator with memory locations) and, apparently, as many arithmetic operations as you have fields. Record selection can be by inequalities, equalities, or pattern matching (leading or trailing string, floating string, or character in a specified position).

Information Master has no file-redefinition options of its own. Its initial file-definition features are required to create Data Master source files. Information Master allows you to load, edit, and save an existing file definition with a new name. A new file definition can be edited until data is entered into the file it defines. This capability simplifies the process of defining new source files for Data Master if the required file is similar to an existing file.

Current Utility

What will these systems do for you right here, right now? We will be examining features that tell you whether or not you can use these systems to define a data file that meets your needs, enter your data easily, get the reports you want, or exchange data with outside packages. We will see whether or not the systems take human factors into consideration, and will look at the documentation and discuss "macroefficiency."

With Infotree, the initial definition of the information structure (which most of the systems refer to as system creation) is intimately related to data entry. As you enter data you create a tree structure. If this structure fits your application naturally and isn't too redundant, it can be very pleasant to use. If it doesn't fit, or results in redundancy, then it isn't pleasant to use. Each node in the tree is identified by a key. Keys may contain up to eighteen letters. Text may be stored at each node. Text lines are twenty-six characters long and multiple lines can be appended. Each node has only one parent but may have multiple children.

The CCA DMS has a close-to-standard record-definition block that includes information on field number, field ID (identification), field name, and field length. Sorts are defined separately. DMS allows you to define fields in which values are calculated automatically. You can say the DMS equivalent of "add field one to field two and put the result in field three." The length of a DMS record must be less than 233 characters, and a record may contain up to twenty-four fields.

The Data Factory has fairly stan-

At a Glance

Name

Data Base Management System
(DBMS) 5.2

Type

File management and retrieval system

Distributor

High Technology
POB 14665
8001 Classen Blvd
Oklahoma City OK 73113
(405) 840-9900

Price

\$100

Format

5-inch floppy disk

Language

Applesoft BASIC

Documentation

55 pages

At a Glance

Name

Data Master 3.2

Type

File-reorganization utility

Distributor

High Technology
POB 14665
8001 Classen Blvd
Oklahoma City OK 73113
(405) 840-9900

Price

\$100

Format

Locked 5-inch floppy disk

Language

Applesoft BASIC

Documentation

36 pages

CB80

Ultra *FAST* BASIC Compiler

CB80™ Compiler System's new native code Basic compiler, offers maximum speed and flexibility in creating applications to solve today's business problems.

CBASIC™ compatible: As an addition to the CBASIC family, CB80 has all the features of CBASIC (14 digit accuracy, long variable names, stream and record I/O, multiple line functions) plus these extras:

- Relocatable machine code • 32K byte strings
- Nested IF statements • ON ERROR GOTO
- Variable type declarations • CALL statement with parameters • EXTERNAL and PUBLIC functions
- Local variables in functions • Alphanumeric labels • Record LOCK and UNLOCK

Expand your versatility. CB80 includes our LK80™ linker. It allows you to create programs in separate modules and easily combine them. Powerful CHAINING capabilities, multiple library scanning, and easy linkage to assembly routines, are all part of LK80.

CP/M™ and MP/M II™ compatible: CB80 supports the popular CP/M and MP/M II operating systems. CB80's record LOCK and UNLOCK, combined with its superior speed makes it a natural for multiuser environments.

Increase productivity and profits. Faster execution boosts system throughput and maximizes your computer's resources — an essential user feature. Coupled with reduced programming time, CB80 definitely improves your bottom line benefits.

For your free CB80 brochure and licensing details, call us at (408) 649-3896, or write us today.



DIGITAL RESEARCH®

P.O. Box 579, Pacific Grove, California 93950

Europe: Vector, Int'l., Leuven, Belgium, 32(16)202498

Far East: Microsoft Assoc., Tokyo, Japan, 03-403-2120

CBASIC™

Solving complex business problems with *BASIC* simplicity

CB80, CBASIC, LK80 and MP/M II are trademarks of Digital Research. CP/M is a registered trademark of Digital Research. © Copyright 1981 Digital Research

ard file-definition features, although some are implemented strangely. For example, your field name must not be larger than your field. The tradeoff forced by this peculiarity will be discussed later. A field may have up to 239 characters. The number of fields per record must be less than 89.

Initial definition for the On-Line Database is standard. You specify the

number of fields in your record, and for each field you specify its name and length. You can have up to twenty fields per record, twenty-six characters per field, 239 characters per record, nine sort keys per file, and unlimited subsorts per sort (three is recommended as a practical limit).

DBMS gives you simple, direct file-definition features. You can define sorts during or after your initial definitions, and subsorts are allowed. You can have up to twenty fields per record, and 100 characters per field.

Information Master provides extensive system-creation options. You can have up to twenty fields per record, 99 characters per alphanumeric field, nineteen characters per numeric field, five sort keys per file, and five subsorts per sort. Up to 1000 records are allowed per file, but not as many long records will fit on a disk: the number of records is limited to what will fit on one disk.

Data entry for Infotree is disk-I/O intensive (as it is for all systems that don't let you accumulate data in memory). You spend a lot of time waiting for it to write information to disk. Worse, if you need the same information in two separate branches of your tree, you must enter this information twice. Data-entry commands are simple and direct (although they could be better documented).

The CCA DMS does not allow you the option of inspecting and correcting a record after you have finished entering it and before it is saved. If you wish to make corrections, you must use individual search, and update or delete commands. CCA DMS uses the standard prompt: it lists the field names before you enter your data. DMS does not have in-memory data entry.

The Data Factory has good and bad data-entry features. It does have in-memory data entry, but it forces you to choose between cryptic prompts or efficient use of disk. (This is discussed in more detail under macroefficiency.) You can verify your entry before moving to the next record.

The On-Line Database has the best data-entry features of any of the sys-

tems I have examined. You can define default entries, and do in-memory data entry and avoid waiting for the completion of needless disk I/O. Incorrect entries may be easily corrected by directing the cursor to the spot and reentering the data.

DBMS allows field correction at the end of the entry of a record—it also does error checking. However, it does not allow in-memory data entry or default values. Information Master does not have user-controlled in-memory data entry. Sometimes it accepts more than one record on its own initiative. Sometimes (rarely) it will miss characters because an internal Applesoft operation takes place. It allows you to correct records before saving them to disk, and it beeps after writing to disk. (The previous entry to any field is the default value of the current field.)

The benefit of systems like these comes from the reports they produce. We will examine the way these systems select a record to report, format the report, and calculate any derived results.

Infotree's retrieval commands retrieve either information about the tree structure or information that you have stored at the various nodes. The commands are easy to learn (even though the documentation is a bit sparse), but they are not very powerful. If you do not anticipate the requests you need to make of Infotree and build them into your tree structure, you will not be able to ask them, much less get an answer. If your tree structure goes directly from the "information retrieval systems" node to the specific program nodes without passing through a "for the Apple" node, you will not be able to ask Infotree "what information retrieval systems run on the Apple?"—not even if that information is somewhere further up the tree.

Several record-selection options are scattered through the CCA Data Management System. You can select records that have a particular record number, records that have a particular value in a particular field ("Display all records that have a value of *information system* in the *type of software* field"), and records for

At a Glance

Name

On-Line Database

Type

File management and retrieval system

Distributor

Blue Lakes Computing
3240 University Ave
Madison WI 53705
(608) 233-6502

Price

\$100

Format

Locked 5-inch floppy disk

Language

Applesoft BASIC

Documentation

21 pages

At a Glance

Name

Information Master 3.10

Type

File management and retrieval system

Distributor

High Technology
POB 14665
8001 Classen Blvd
Oklahoma City OK 73113
(405) 840-9900

Price

\$150

Format

Locked 5-inch floppy disk

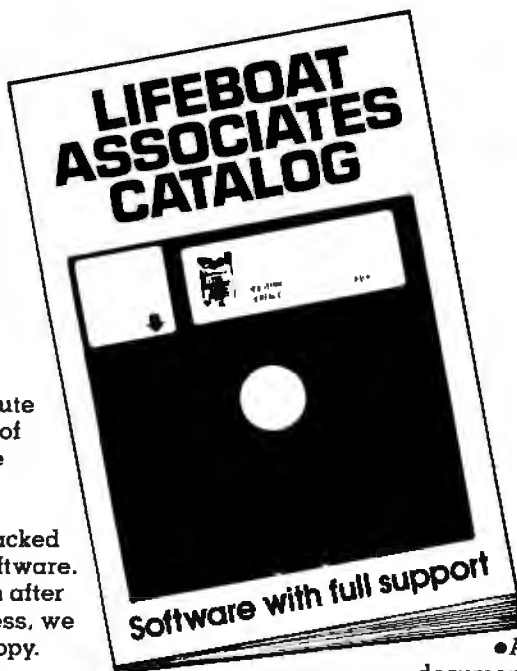
Language

Applesoft BASIC

Documentation

145 pages

When it comes to microcomputer software we wrote the book.



How do you stay up-to-the-minute with the rapidly changing world of microcomputer software? Get the Lifeboat Catalog.

The Latest Innovations

The new Lifeboat Catalog is packed with the latest state-of-the-art software. And if we publish a new program after the latest catalog has gone to press, we enclose a flash bulletin in your copy.

The Greatest Selection

Because Lifeboat is the world's largest publisher of microcomputer software, our catalog offers you the greatest selection of programs for business, professional and personal use. Our more than 200 programs range from integrated accounting and professional practice systems to office tools for bookkeepers and secretaries to sophisticated tools for programmers. Included are business systems, word processors, programming languages, database management systems, application tools and advanced systems utilities.

We specialize in software that runs on most small business computers. Our more than 60 media formats, including floppy disks, data cartridges, magnetic tape and disk cartridges, support well over 100 computer brands of domestic and foreign manufacture.

LIFEBOAT WORLDWIDE offers you the world's largest library of software. Contact your nearest dealer or Lifeboat:

Lifeboat Associates
1651 Third Ave
New York N.Y. 10028
Tel: (212) 860-0300
Telex: 640693 (LBSOFT NYK)
TWX: 710-581-2524

Lifeboat Inc.
OK Bldg., 5F
1-2-8, Shiba-Darmon
Minato-ku, Tokyo 105, Japan
Tel: 03-437-3901
Telex: 2423296 (LBJTYD)

Lifeboat Associates, Ltd
PO Box 125
London WC2H 9LU, England
Tel: 01-836-9028
Telex: 893709 (LBSOFTG)

Lifeboat Associates GmbH
Hinterbergstrasse
Postfach 251
6330 Cham Switzerland
Tel: 042-36-8586
Telex: 865265 (MICO CH)

Intersoft GmbH
Schlossgartenweg 5
D-8045 Ismaning W Germany
Tel: 089-366-444
Telex: 5213643 (ISOFD)

Lifeboat Associates, SARL
10, Grande Rue Charles de Gaulle
92600 Asnieres, France
Tel: 1-733-08-04
Telex: 250303 (PUBLIC X PARIS)

Lifeboat Associates
Software with full support

Get Full Support

We give the crucial dimension of after-sales service and full support to everything we sell. That includes:

- A telephone hotline where technical and customer service representatives will answer your questions 11 hours a day.

- An update service for software and documentation.

- Telephone, telex and mail-order service at the New York headquarters and at overseas offices in England, France, Switzerland, West Germany and Japan.

- Export service providing software delivery to six continents.

- Subscriptions to *Lifelines*™, the monthly magazine that offers comparative reviews, tips, techniques, identified bugs and updates that keep you abreast of change.

Get It Now

Lifeboat now serves tens of thousands of satisfied customers with our breadth of up-to-date, fully tested, fully supported and competitively priced software.

You may not need all we offer, but we offer just what you need. After all, we wrote the book.

Mail coupon to: Lifeboat Associates, 2015
1651 Third Avenue, New York, New York 10028
or call (212) 860-0300.

- Please send me a free Lifeboat Catalog.
 Please send me *Lifelines* subscription information.

Name _____ Title _____

Company _____

Street _____

City _____ State _____ Zip _____

Lifelines is a trademark of Lifelines Publishing Corporation.
Copyright © 1981, by Lifeboat Associates



which the value of a particular field lies within a certain range ("Display all records for which the value of the *cost* field is between \$50 and \$400"). You cannot, however, do selections that require testing the values of multiple fields ("Display all records where the value of the *host machine* field is *Apple* and the value of the *allows multiple selection criteria* field is *yes*"). The system does select on partial matches. DMS has a somewhat limited set of features that are quite cumbersome to use.

The Data Factory includes several methods of selecting records that are not, however, grouped together. List, Search, Level Search, From/To, Compare, and Inspect/Change are separate main-menu options. The Level Search option allows multiple-criteria searching and searching for partial matches. You can specify record numbers if you wish. A comprehensive set of features is provided, but using them is more difficult than need be.

The On-Line Database does not allow selection by multiple criteria on multiple fields. You can specify a range that the value of a particular field must satisfy in order to select the record ("Select all records for which the *last name* field has a value of *Dijkstra* or greater and *Wirth* or less"). You cannot search for partial matches.

DBMS allows multiple selection criteria on multiple fields. Inequalities are allowed, but not partial matches. Since subsorts are allowed, I consider these features to be reasonably complete. They are certainly very easy to use.

Data Master has sophisticated selection features, but they are used to restructure files. They are not used directly for report purposes. Up to seven selection criteria may be entered. Multiple fields may be tested. You can test for equality, inequality, or pattern match (leading, trailing, floating, or in a particular position).

Information Master provides the same selection features as Data Master. The only difference is that they are used for reports rather than

restructuring. They even use the same notation and menu format. Both systems are comprehensive and usable.

Infotree allows you to print mailing labels, text you've stored at a node, or the structure of your tree. You don't have the power to create your own formats, so the program is limited in this area.

The CCA DMS gives good control over the format of your reports. You can create single- or multiple-line formats. Field position is variable in each line. You can save and reuse the formats you've created and use DMS to print mailing labels. Pages can be titled. Formatting features seem reasonably complete, and they're less cumbersome to use than other DMS features.

In-memory data entry speeds up file-management systems by reducing continuous disk-intensive I/O.

The Data Factory allows multiline formats, but gives no spacing option. You can specify the number of fields per line, title your report, print mailing labels, and save formats, but these features are somewhat limited.

The On-Line Database has a mailing-label format, but otherwise does not allow multiline formats. You can specify field position in its single-line format and save these formats. Its features are limited.

Information Master allows you to create up to fifteen report formats per data file. You have up to 15 columns per line. Each column can have a heading, and you can specify that decimal points be aligned. You can also specify totals, subtotals, and algebraic calculations, insert short labels (such as "total," "subtotal," etc), and define multiline formats and print mailing labels. A nice set of features.

DBMS has a mailing-label format and allows multiline printed reports. You can specify which columns your fields are to occupy, insert unchanging characters into your report formats ("literal strings"), and save formats. It's complete and easy to use.

Infotree does not provide any calculation options. Neither does the On-Line Database. The DBMS provides totaling.

The CCA DMS allows you to create calculated fields at the time you define your data file. Available functions are addition, subtraction, multiplication, division, and exponentiation. The total number of characters used in your formulas must be less than 228. Within this limit, you can create as many formulas as you wish and specify which fields should be used to store the results.

The Data Factory provides a calculation option called Math. You can add, subtract, multiply, or divide two fields, and store the result in a third field. You can also receive a report on the total, average, or count (number of records) of a specified field. You can enter selection criteria and use these functions at any time.

Data Master allows you to add, subtract, multiply, or divide one field by another field, or use intermediate variables that you define. The intermediate variables are like memory locations on a calculator. You can use up to ten intermediate variables. Multiple-step calculations are allowed.

Information Master allows the same operations as Data Master, as well as exponentiation and roots. Multiple-step calculations are allowed.

DML (Data-Manipulation Language), as provided by CODASYL data-management systems, lets you read and write information into your data base from outside programs (among other things). None of the systems we're examining gives you a data-manipulation language, but some give you a little help. I get a headache when I think about all the incompatible files I'm collecting and want all the help I can get (see Martin's *Principles of Data-Base Management* for more about data-manipulation languages). Software Arts' DIF (Data-Interchange Format) is used to transfer information to and from VisiCalc and the CCA DMS. If DIF is widely used we might get some relief from incompatibility headaches.

Only the CCA DMS provides a di-



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

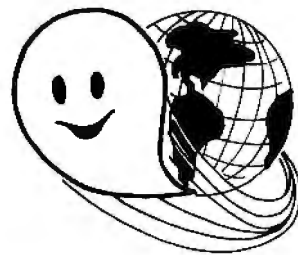
- (Software and drives not included) **\$3798.39**
- to substitute 128KB CMOS RAM with battery back-up, add 600.00
- for each additional 64KB NMOS STATIC RAM board, add 639.67
- for each additional 64KB CMOS STATIC RAM board, add 988.64
- for 50 Hz export power supply, add 30.00

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 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, PerkinElmer, Johnson Controls, Associated Press, Aydin, Newkirk Electric, Revere Sugar, HI-G/AMS Controls, Chevron. **Computer Inframe and peripheral manufacturers,** IBM, OKI, Computer Peripherals Inc., Qume, Floating Point Systems. **Software users;** Microware, T.S.C., Lucidata, Norpak, Talbot, Stylo Systems, AAA, HHH, Frank Hogg Labs, Epstein Associates, Northwest, 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

GIMIX* and GHOST* are registered trademarks of GIMIX Inc.

© 1981 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

rect interface to VisiCalc. Perhaps I should qualify that by saying VisiCalc "programs" often require some editing before interchange (unless you like empty fields and literals interspersed in your data). Since VisiCalc provides only primitive filing options and limited information storage in main memory, I expect that many file-management systems for the Apple II computer will eventually supply a direct interface.

Infotree provides a text file that contains information about how to interface your own software to the Infotree data files. Neither the Data Factory nor the On-Line Database provides such information. DBMS has new documentation (which I haven't seen). The old documentation didn't provide any interface information. Both the CCA Data Management System and Information Master provide useful information. DMS and Information Master give you the layout of their files and describe the purpose of each field. The CCA package even includes sample programs.

Commands are simple and direct with Infotree. A help command prints out a list of possible commands with a brief explanation of each command. The command notation is consistent. Infotree is pleasant to run.

There is considerable room for improvement in this area for the CCA DMS. Commands are complex and the formats are not consistent. You must remember the correct places to put commas, exclamation points, apostrophes, and various cryptic codes. (Two good discussions of human factors are Shneiderman, 1980 and Snodgrass, 1980.)

The Data Factory has the largest main menu of any of the seven packages. Many of the main-menu options are slight variations of each other and could easily be grouped together as suboptions of a single main-menu item. This would improve the clarity of the system. The Data Factory asks you whether or not you have a printer each time you boot the system or shift from one data file to another. These are not the characteristics of a

considerate system. On the other hand, it does have in-memory data entry (and that shows some consideration for human factors). The Data Factory is a little harder to use than need be.

The On-Line Database is the most understanding in term of human factors. It is menu driven, simple, and direct, and the data-entry features are outstanding. The menus are easy to understand, and because the system searches for the next record as you view the current one, your waiting time is greatly reduced. Very pleasant to use.

DBMS has a few weaknesses (one being an excessively long main menu that distinguishes between "search the data base," "print the data base in user's format," and "print the data with mailing list format"). But, all things considered, it's reasonably well engineered and the menu format is generally uniform throughout the system.

Information Master and Data Master have good consideration for human factors. Menus are not excessively long and commands are grouped logically. Their command structure is less uniform than that of DBMS, but otherwise seems well designed. High Technology made an intelligent decision in using the same command format for both Information Master and Data Master (the two programs were designed for each other). They could have achieved more uniformity within that command format (either letters or numbers for specifying menu options, but not both; a single format for menus, etc), but their consideration for human factors is generally good.

Documentation serves different purposes at different times. The kind of documentation that is best when you're first learning a system is *not* the best when you've had some experience. The writer must include a tutorial, reference material, and consider who the reader is (a novice? A grandmaster? someone in between?).

Infotree's documentation is sparse, but because its user interface is well designed, this is acceptable. A text file on the program disk explains

Text continued on page 292

NEW! Speech Synthesis using the
Votrax SC-01 with the
S-100 P.C. BOARD

ads SYNTHETALKER!

- 64 PHONEMES AND 4 INFLECTIONS PROVIDE AN UNLIMITED VOCABULARY THAT IS USER PROGRAMMABLE.
- MORE NATURAL SPEECH OR MULTIPLE VOICES ALSO, WITH PROGRAMMABLE OSCILLATOR.
- EASILY PROGRAMMED IN BASIC! • CALL OR WRITE FOR COMPLETE DETAILS.

NEW! 6809 SMALL BASIC: **ads** BASIC!

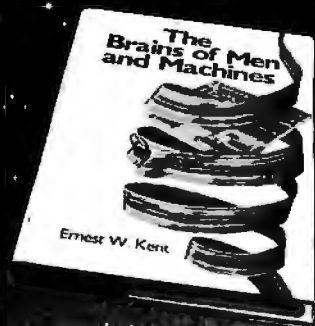
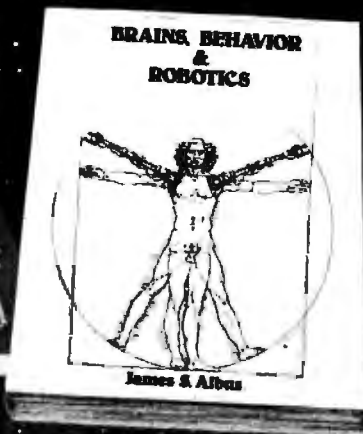
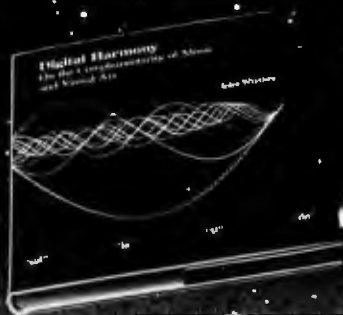
- 2K INTEGER BASIC FOR ADS MONITOR ADSSMON (ADSSMON I/O CALLS ALTERABLE).
- POSITIONABLE ON ANY PAGE BOUNDARY.
- 20 INTEGER VARIABLES AND AN INTEGER ARRAY.
- 7 BUILT-IN FUNCTION CALLS ARITHMETIC, LOGICAL AND RELATIONAL OPERATORS AND MUCH MORE!

*Votrax Trademark
Federal Screw Works

Ackerman Digital Systems, Inc.
110 No. York Rd., Suite 208
Elmhurst, IL 60126
(312) 530-8992

*A gift of the future...
from BYTE Books*





AVAILABLE FALL 1981

DIGITAL HARMONY

by John Whitney

A new synthesis of sight and sound

Digital Harmony lays the foundation for the whole new field of audio-visual art made possible by microcomputers. John Whitney, a pioneer of the special effects technology used in STAR WARS and 2001: A SPACE ODYSSEY, explains the special union of computer graphics and music. His computer-generated visual art graphically depicts the laws of harmonic motion common to all music.

Digital Harmony includes a complete description of Whitney's computer, peripherals, and film techniques. Colorful illustrations are included, as well as the program listings that generated them. The descriptions are sufficient for anyone to begin to explore this new territory as a composer and computer experimenter - transforming the small computer into an ideal instrument for creating compositions in aural and visual art.

John Whitney is on the Faculty in the Department of Art at the University of California, Los Angeles.

ISBN 0-07-070015-X
240 pages
hardcover
over 50 color
photographs

\$21.95

INVERSIONS A Catalogue of Calligraphic Cartwheels

by Scott Kim
Foreword by Douglas Hofstadter
Backword by Jef Raskin

Surprising symmetries in design and letterforms

Illusion . . . calligraphy . . . visual magic - Scott Kim's new book, *Inversions*, delights the eye and enchants the mind. Filled with intriguing designs, words that read the same right-side up and upside down, words within words, and unexpected symmetries, these compositions create a fresh way to look at the alphabet. The text includes the visual principles of symmetry, lettering, and problem solving that are basic to these images. The author also draws parallels to related exercises in perception in such diverse areas as art, music, word play, and mathematics. Scott Kim's original inversion designs first appeared in *Omni* magazine, inspiring an overwhelming reader response. An irresistible challenge, invertible writing appeals to everyone who loves beauty in mathematics and design.

Scott Kim is a doctoral student in Computer Science at Stanford University and is a concert pianist and composer.

ISBN 0-07-034546-5
128 pages
softcover
over 50 illustrations
available summer 1981

\$8.95

BRAINS, BEHAVIOR, AND ROBOTICS

by James S. Albus

Robotics design and applications

This computer-oriented guide explores how the brain functions primarily as a computer device for generating and controlling behavior. The author assesses behavior as a product of three hierarchies of computing modules:

- memory modules
- behavior-generating modules
- sensory-processing modules

A section on artificial intelligence ties this hierarchical model to vital computer science techniques such as planning, problem-solving, machine vision, natural language understanding and knowledge representation. A closing section on robotics discusses the design considerations in constructing a robot control system fashioned after this model of the brain, and explores the current and potential use of robots in our environment.

Dr. James S. Albus is Project Manager with the National Bureau of Standards.

ISBN 0-07-000975-9
400 pages
hardcover
180 illustrations

\$16.95

THE BRAINS OF MEN AND MACHINES

by Ernest W. Kent

Human models for computer design

When the "Brains of Men and Machines" series of articles first appeared in *BYTE* magazine, the response was immediate and enthusiastic. Now Ernest W. Kent has expanded his ideas about the brain into a full-length book. As researchers begin to unravel the mysteries of the brain's chemical, electrical, and synaptic circuitry, their findings are becoming immediately applicable to advances in robotic behavior and computer design. The Brains of Men and Machines "dissects" the brain to provide new insights into computer design and artificial intelligence.

It is one of the rare books that transcends disciplinary boundaries. In it the ever-increasing relationship between man and machine is freshly examined - a relationship, Professor Kent concludes, that is today being reexamined in the light of man's own neurological self-image.

Dr. Ernest W. Kent is a Professor of Physiological Psychology and Psychopharmacology at the University of Illinois at the Chicago Circle Campus.

ISBN 0-07-034123-0
304 pages
hardcover
illustrated

\$15.95

The BYTE BOOK Collection

Circle 55 on inquiry card.

BASIC SCIENTIFIC SUBROUTINES, VOLUMES 1 AND 2

by Fred Ruckdeschel

BASIC
SCIENTIFIC
SUBROUTINES

Valuable programs for professional and hobbyist

Designed for the engineer, scientist, experimenter, and student, this series presents a complete scientific subroutine package in BASIC.

- Volume 1 covers plotting, complex variables, vector and matrix operation, random number generation, and series approximations.
- Volume 2 continues with least-squares approximation, special polynomial functions, approximating techniques, optimization, roots of functions, interpolation, differentiation, integration, and digital filtering.

These volumes feature routines written in both standard Microsoft and North Star BASIC, extensive appendices, and subroutine cross-references.

Dr. Fred Ruckdeschel is a Principal Scientist with Dynacomp, Inc.

VOLUME 1
ISBN 0-07-054201-5
336 pages
hardcover
illustrated

VOLUME 2
ISBN 0-07-054202-3
384 pages hardcover
illustrated
available Fall 1981

\$19.95

\$23.95

The BYTE Book of
Pascal

Edited by Blaise W. Liffick

THE BYTE
BOOK
OF
PASCAL

Blaise W. Liffick, Editor

A powerful, structured language

Based on articles, language forums, and letters from BYTE magazine, this work is a valuable software resource. Pascal continues to be popular as a structured programming language. Written for both potential and established users, this book introduces the Pascal language and examines its merits and possible implementations. Featured are two versions of a Pascal compiler, one written in BASIC and the other in 8080 assembly language; a p-code interpreter written in both Pascal and 8080 assembly language; a chess-playing program, and an APL interpreter.

ISBN 0-07-037823-1
334 pages
hardcover

\$25.00

THREADED INTERPRETIVE LANGUAGES

by Ronald Loeliger



How to implement
FORTH on your Z80

Threaded languages (such as FORTH) are compact, giving the speed of assembly language with the programming ease of BASIC. They combine features found in no other programming languages. This book develops an interactive, extensible language with specific routines for the Zilog Z80 microprocessor. With the core interpreter, assembler, and data type defining words covered in the text, it is possible to design and implement programs for almost any application and equivalent routines for different processors.

Ron Loeliger is a Senior Analyst with Intermetrics, Inc.

ISBN 0-07-038360-X
272 pages
hardcover
illustrated

\$18.95

BEGINNER'S GUIDE FOR THE UCSD PASCAL SYSTEM

by Kenneth L. Bowles



The most popular Pascal
version explained by its creator

Written by the originator of UCSD Pascal System, this informative book is an orientation guide to the UCSD Pascal System. For the novice, this book steps through the System, bringing the user to a sophisticated level of expertise. Once familiar with the System, the reader will find the guide an invaluable reference tool for creating advanced applications. The package offers programs which may be run without alteration on:

- DEC PDP-11 or General Automation minicomputers
- Western Digital Microengines
- 8080, 8085, Z80, 6502, 6800, 9900 or AM-100 based microcomputers (including the popular Apple II and Radio Shack TRS-80 microcomputers)

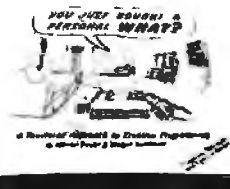
Dr. Kenneth L. Bowles is Director of the Institute for Information Systems, University of California, San Diego.

ISBN 0-07-006745-7
204 pages
softcover

\$11.95

YOU JUST BOUGHT A PERSONAL WHAT?

by Thomas Dwyer and Margot Critchfield



A Structured Approach to
Creative Programming

Intended for both the novice programmer and the experienced computer enthusiast, this book presents practical ideas for personal computer use at home or at work.

Its approach is especially suitable for educational purposes. Written by the leading contributors of computer education material, this book is an entertaining and resourceful tool. There are over 60 ready-to-use programs written in Microsoft and Level II BASIC for the TRS-80 in the areas of educational games, financial record keeping, business transactions, disk-based files, and word processing.

Dr. Thomas Dwyer is a Professor of Computer Science at the University of Pittsburgh.

Margot Critchfield is a doctoral student in Foundations in Education at the University of Pittsburgh.

ISBN 0-07-018492-5
343 pages
softcover
78 illustrations

\$11.95

BEYOND GAMES: SYSTEM SOFTWARE FOR YOUR 6502 PERSONAL COMPUTER

by Kenneth Skier



Creating programs for the Apple, Atari, Challenger and PET computers

At last, a complete programming guidebook for owners of personal computers utilizing the 6502 microprocessor. A self-contained course in structures programming and top-down design, this book presents a powerful set of tools for building an extended monitor, disassembler, hexadecimal dump routine, and text editor programs. Programs are thoroughly explained, with clear instructions for modifications.

Kenneth Skier is a Systems Programmer for Wang Laboratories, Inc., and a Lecturer at MIT.

ISBN 0-07-057860-5
440 pages
softcover
illustrated

\$14.95

stimulating, provocative, problem-solving

CIARCIA'S CIRCUIT CELLAR

by Steve Ciarcia



Practical uses for home computers

Imaginative and practical, Ciarcia's Circuit Cellar details a variety of microcomputer projects. A collection of the best articles from the popular series in BYTE magazine, this volume includes

- D/A conversion
- Programming EPROMS
- AC remote-controlled appliances
- digitized speech
- touch input video display

Complete instructions are given on how to construct each project. With amusing anecdotes and an easy-going style, Ciarcia presents his material in such a manner that even a neophyte need not be afraid of it.

ISBN 0-07-010960-5
125 pages
softcover
color photographs and diagrams

\$8.00

CIARCIA'S CIRCUIT CELLAR, VOLUME II

by Steve Ciarcia



More practical uses for home computers

Composed of popular articles from BYTE magazine, this volume tells how microcomputers can be uniquely interfaced to our environment. Projects include

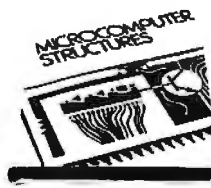
- building a computer controlled home-security system
- computerizing appliances
- transmitting digital information over a beam of light
- building the Intel 8086 microprocessor system design kit
- input-output expansion for the TRS-80

ISBN 0-07-010963-X
224 pages
softcover
photographs and diagrams

\$12.95

MICRO- COMPUTER STRUCTURES

by Henry D'Angelo



Digital Electronics, Logic Design, and Computer Architecture

Today, there is an increasing demand for computer users who are not only well-versed in software, but who can also maintain, modify, and design their own hardware systems.

This text introduces computer users with little or no background in digital hardware to the basic computer structures used in microcomputer design and microcomputer interfacing. Helpful examples and end-of-chapter exercises further illustrate the various concepts presented, and a detailed bibliography provides additional reading opportunities. As a resource and textbook, it will assist

- programmers and systems analysts
- engineers and scientists
- managers
- students

Detailed Instructor's Manual also available.

Dr. Henry D'Angelo is the Associate Dean of the College of Engineering and Professor of Manufacturing Engineering at Boston University

ISBN 0-07-015294-2 288 pages
hardcover
314 illustrations
available spring 1981

Instructor's Manual
ISBN 0-07-015298-5
softcover

\$8.95

\$18.95

BYTE Books' reputation is based on providing technically accurate, useful, and timely information. Established on the same principle as BYTE magazine, BYTE Book's evolved in response to the rapidly expanding audience of home and business computer users. Computer professionals and enthusiastic newcomers need to keep pace with this unabated growth. This selection of BYTE books can expand your library of knowledge and expertise.

**TO ORDER, CALL TOLL
FREE 800-258-5420, OR
FILL OUT YOUR CHOICES
IN THIS COUPON and
return it with check,
money order, or charge
card number to:**

**BYTE
BOOKS**

70 Main Street
Peterborough,
New Hampshire 03458

BUILD YOUR OWN Z80 COMPUTER

by Steve Ciarcia



Every step spelled out for do-it-yourself buffs

For the engineer, computer technician, student, and anyone interested in building a computer rather than buying one, this practical guide shows how to build a working computer based on the Zilog Z80 microprocessor. Each computer subsystem is fully explained and supported by proven design and testing information. The description focuses on a basic single-board microcomputer containing

- easy expansion to include a video terminal
- a 1 K-byte operating system
- serial and parallel ports
- hexadecimal display
- audio cassette mass storage

Readers can modify the system to meet personal needs.

Steve Ciarcia is a Computer Consultant, Electrical Engineer, and author of "Ask Byte" and "Ciarcia's Circuit Cellar" columns in BYTE magazine.

ISBN 0-07-010962-1
330 pages
softcover
available summer 1981

\$15.95

**BYTE
BOOKS**

70 Main Street
Peterborough, New Hampshire 03458

Name _____

Address _____

City _____ State _____ Zip _____

- Check enclosed in the amount of _____
- Bill Visa. Card Number _____
- Bill Master Charge. Card Number _____
- Expiration Date _____

Include 75c per book to cover postage and handling.

| TITLE | PRICE | QUANTITY | AMOUNT |
|-------|-------|----------|--------|
| | | | |
| | | | |
| | | | |
| | | | |

SHIPPING
TOTAL

order now . . . !



Circle 57 on inquiry card.

The MICROMINT Z8 BASIC COMPUTER/CONTROLLER board represents a milestone in microcomputer price-performance. It is cheap enough to be programmed directly in a high level language, and efficient enough to be battery operated if required. The entire computer is 4" by 4½" and includes a tiny BASIC interpreter, 4K bytes of program memory, one RS-232 serial port and two parallel ports, plus a variety of other features. Using a powerful Z8 microcomputer chip and Z6132 4K X 8 RAM, the Z8 BASIC COMPUTER/CONTROLLER board is completely self-contained and optimized for use as a dedicated controller. The unit is assembled and tested and comes with over 200 pages of documentation.

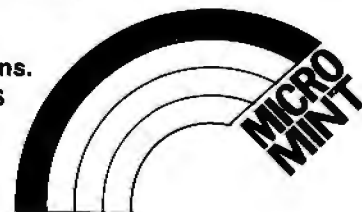
The price, in single quantity, a tiny \$195.*
 Optional power supply (+ 5, + 12 and - 12V) \$35.
 Please include \$4 for shipping and handling.
 *Call Micromint for quantity pricing

- Z8 MICROCOMPUTER**
- On board tiny BASIC interpreter.
 - Parallel and serial I/O ports.
 - 6 interrupts.
- RS-232 CONNECTOR**
- Just attach a CRT terminal and immediately write control programs in BASIC.
- 4K BYTES OF RAM**
- Z6132 4K X 8 low power quasi-static RAM. EPROM pin compatible.
- SWITCH SELECTABLE BAUD RATES**
- 110-9600 BPS.
- FULLY EXPANDABLE**
- Data and address buses available for 124K memory and I/O expansion.
 - 2 onboard parallel ports.
 - 7.3728MHZ crystal for fast control operations.
- JUMPER SELECTABLE MEMORY OPTIONS**
- 4K RAM, 2716 or 2732 EPROM operation.
- LOW POWER**
- Consumes only 1½ WATTS at + 5, + 12 and - 12V (optional power supply available).

To Order:
 Call Toll Free
 1-800-645-3479

For Information Call
 1-516-374-6793

MICROMINT INC.
 917 Midway
 Woodmere, N.Y. 11598



Micromint will put both a computer development system and an OEM dedicated controller in the palm of your hand for only \$195.



Circle 447 on inquiry card.

As featured in Byte Magazine, July, August, 1981.

Z8 is a trademark of Zilog Inc.

Text continued from page 286:

Infotree's file structure. There is a table of contents, but no index. A handful of examples would improve things: Infotree's documentation is tutorial.

The documentation for the CCA Data Management System is clear and quite complete. In addition to all DMS functions (including the transfer of information between DMS and VisiCalc) there is, as previously noted, information on the format of DMS files and how to work with them from your own programs. The documentation includes a table of contents and an index. The documentation is both tutorial and for reference.

The Data Factory has reasonably complete documentation, but unfortunately it is sometimes unclear and most things are only explained once. The structure of the manual follows the structure of the main menu. For the most part, the manual works, but a little more detail (or an example or two) would make things clearer.

There is a table of contents, but no index. Acceptable for both initial learning and subsequent reference.

The documentation for the On-Line Database is very clear. It includes a procedure for designing an application using the system and a backup procedure that uses disk rotation (similar to rotating your car's tires). Unfortunately, no descriptions of file structure have been included. There is a table of contents, but no index. It is mainly tutorial, but has some reference uses.

Quite recently, High Technology introduced new documentation for DBMS. The previous documentation was sparse and I haven't seen the new documentation. But since it is reported to be fairly extensive (55 pages), and written by the same person who wrote the documentation for Information Master and Data Master (see the next paragraph), I expect it to be generally good.

The documentation for Data Master is generally good, as is Information Master's documentation. Both

manuals have essentially identical virtues. Chapter sections are divided into synopses and tutorial subsections, and examples are numerous and detailed. The manuals go beyond describing the options and what they do; for example, under "Efficient methods for entering data," the Information Master manual describes which options work best for entering large amounts of data that don't need to be accessed prior to completion, and which options work best when data comes in little by little and the data file needs to be accessed in-between. Each manual has a table of contents, a quick reference chart, and an index. They are useful for initial learning and for reference.

A "microefficient" program is slightly faster or uses slightly less memory than average (often at the expense of error-prone, hard-to-maintain dirty tricks). A "macroefficient" program is substantially faster, or uses much less memory (usually because of intelligent choice of algorithm or data representation). For a

\$5\$5

We Want To Give You \$5.00 !



Yes that's right, we want to give you a certificate worth \$5.00, redeemable on your first order of \$50.00 or more AND our NEW 48 page Catalog showing a complete line of Hardware & Software for APPLE, HEWLETT-PACKARD and TEXAS INSTRUMENTS computers, PLUS TEXAS INSTRUMENTS, HEWLETT-PACKARD, SHARP & CANON calculators and ITT telephones.

Name _____

Address _____

City _____ State _____ Zip _____

Surveyors Supply Co.

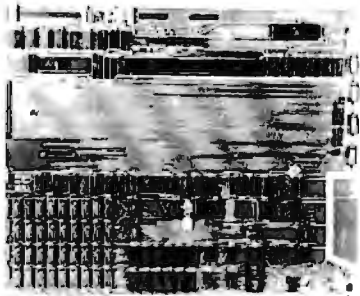
P. O. Drawer 808 Hwy. 64 at Old Hwy. 1 Apex, N. C. 27502-0808
(919) 362-7000



\$5\$5

"THE BETTER BOARD"

SB-80 Single Board Computer



**Z-80-A
64K RAM**
Fully Assembled and Tested

Size: 16" x 13"
Same as 2 8" floppy drives. Requires:
+5V 1.5 Amp
-5V 1.0 Amp
+12V 1.5 Amp

\$825.00

The SB-80 single computer board along with 1 or 2 8-inch disk drives, a power supply, an enclosure, and a CRT give you a complete computer system that can be used for either business or personal use and will still allow for upgrade options (up to 4 floppy drives, 5 to 40 meg hard disk, or 24 x 80 character video).

CONSTRUCTION

- Computer is fabricated on a single printed circuit board
- Sockets for all integrated circuits
- 50 pin connector allows access to system for future expansion.

PROCESSOR

- Z80A with 4 MHz system clock with no wait states.

MEMORY

- 64K of 200ns dynamic RAM is standard. 4116 IC's.
- Parity protection is standard. A memory error places the system in a permanent wait state and lights on LED indicator

ROM

- 256 bytes bootstrap ROM.

2 SERIAL I/O's

- Z80A-SIO/O dual channel chip.
- Two complete bidirectional serial ports with RS232C buffering. Fully programmable for Asynch, Bi-synch, and SDLC.
- Programmable dual baud rate generator on board. Selectable baud rates up to 19.2kb. Provisions for modem supplied clocks.
- Interrupts or polling under program control

2 PARALLEL I/O's

- Z80A-PIO chip
- Two complete TTL eight-bit bidirectional ports with extra hand-shake lines. Interrupts or polling under program control
- Printer support through one parallel port

CP/M* 2.2 & BIOS

CP/M* 2.2 & BIOS modified by S & M systems to run on single board is available for

\$145.00

HOW TO ORDER

Phone orders using American Express, Visa, MasterCharge, Bank wire transfer, Cashier's or Certified check, Money Order, or Personal check (allow 10 days to clear). Please add 5% for shipping, handling and insurance minimum \$500.00. Conn. residents add 7.5% sales tax. All equipment is subject to price changes and availability without notice. All equipment is new and comes complete with manufacturers warranty. Showroom prices may differ from mail-order advertisement.

* CP/M is a trademark of Digital Research Corp.

** 1 to 4 pieces domestic US price.

SB-80

The Price Is Nice.



Introductory offer... \$2425.

Basic system with: 600K bytes

- 1.2 megabytes \$2990.
- 2.4 megabytes \$3490.

Single Board Technology

A Z80A CPU combined with the CP/M® operating system opens new vistas to software availability for eight-bit micros. FORTRAN, COBOL, BASIC, APL, PL/1 and Pascal are available now to accommodate today's scientific, educational, sophisticated small business and personal system users.

- 4 MHz Z80A CPU
- CP/M 2 operating system
- 64K 200ns main memory
- 8-inch dual floppy drives
- 50-pin expansion connector
- 2-serial ports
- 2-parallel ports
- 4-counter/timers
- Hard disk options available

CPU — DISK DRIVE CABINET

Metal cabinet with proportionately balanced air flow-convection cooling. AC power cord connector; lighted power switch; Fuse assembly; 0L65 Dual drive power supply (Will also power single board CPU). All hardware included to mount 2 8" disk drives. Includes space area to mount any single board computer. Fully assembled and tested.

SB- Cabinet Kit \$395.00

SB- Bare Cabinet \$95.00

SS/DD DISK DRIVE SYSTEM

SB Assembled tested with 2 8" drives . \$1185.00

DD/DD DISK DRIVE SYSTEM

SB Assembled tested with 2 8" drives . \$1650.00

8" FLOPPY DISK DRIVES:

Single Sided/Double Density Double Sided/Double Density

Shugart 800/801R \$395.00 2/\$770.00

Shugart 850/851R \$590.00 2/\$1140.00

PRINTERS

Okidata Microline 82A Bidirectional Friction/Pin Feed 9 x 9 Pin Head \$595.00

Okidata Microline 83A 120 cps: Bidirectional 9 x 9 Pin Head \$795.00

82A Tractor \$75.00

C. Itoh Starwriter (Parallel) 25 cps, Daisywheel \$1550.00

C. Itoh Starwriter (Parallel) 45 cps, Daisywheel \$1850.00

C. Itoh Starwriter Tractor \$190.00

TERMINALS

Televideo 910 \$625.00

912C \$725.00

920C \$770.00

ADDS Viewpoint \$620.00

16K Static RAM 4116 200ns \$2.30 ea. 16/\$32.00

Z80A CPU \$6.00

Z80A CTC \$6.00

Z80A PIO \$6.00

Z80A SIO/O \$19.00

IC's



Colonial Data Services Corp.

105 Sanford Street Hamden, Conn. 06514

(203) 288-2524 • Telex: 956014

more extensive discussion of this issue, see Ledgard's *BASIC With Style*.

Only the Data Factory and the On-Line Database have practical in-memory data entry. All the other systems spend a lot of time writing to the disk. Because it regularly requires redundant data entry (if the same information is required by two branches of its tree) Infotree can be even more "inefficient."

All the systems, except the Data Factory, make reasonably efficient use of disk space. Most systems allow you to give your fields a name that is longer than the data field itself. But if you wish to entitle a field "The Num-

ber Of Years You've Owned This System," the Data Factory requires you to reserve enough space in your record to hold the entire title. This means that you are regularly forced to choose between cryptic data-entry prompts and fairly large amounts of wasted disk. If you wish to sort your file in more than one order, there is more bad news. The Data Factory requires you to maintain a complete copy of your data file for each sort. Five sorts, five complete copies.

The Data Factory's version of multicriteria selection requires multiple readings of the data file. This is inefficient. By contrast, the On-Line Database searches for the next record that

meets your selection criteria while you view the current one. If the time you spend viewing the current record exceeds the search time, your next record seems to arrive the instant you request it.

If you can choose when to sort, sorting speed becomes less important. Both Infotree and the On-Line Database require you to sort during data entry. You have no discretion (Infotree also has a discretionary sort that performs slightly different functions). All the other systems allow you to choose when to sort. If you use a fairly small number of subsorts, On-Line Database and Infotree perform all right. The sorting efficiency of these

KEEP YOUR EYE ON THE BALL

THE FORMULA™ allows the computer professional to focus on the most important part of business: the needs of the client. Customized systems for any business application can be created in a fraction of the time required by conventional methods.

- Interactive data entry, file updating, and maintenance routines are automatically generated from a definition of the fields.
- Reports can be created through a unique full screen editor simply by typing a sample format.
- Menus and job streams are defined through a preprogrammed parameter-driven procedure.
- Fast response time is insured because each routine can be interpreted directly by the computer and data management is controlled by an efficient ISAM algorithm.

THE FORMULA™ is a complete system language which brings the process of developing applications closer to the user's description of his needs. That's THE FORMULA™ for success.

Disk and manual, \$595. Manual only, \$60.

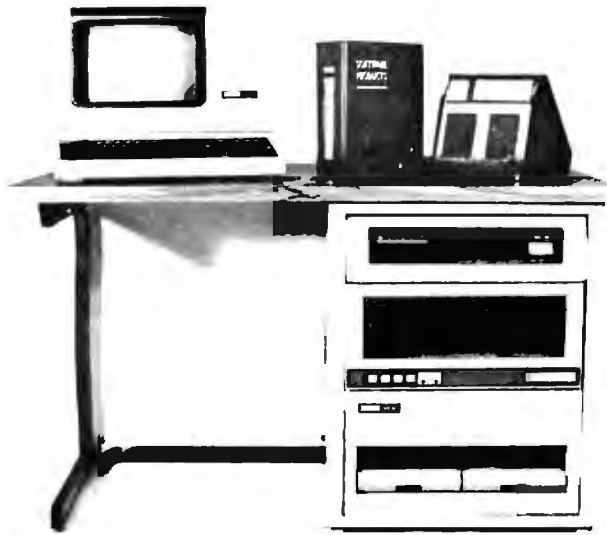
THE FORMULA™ will run on any 8080 or Z80 computer with CP/M,* 48K RAM, 300K total disk storage, and a CRT.

DMA • WE SPEAK YOUR LANGUAGE.

DYNAMIC MICROPROCESSOR ASSOCIATES • 545 Fifth Avenue, New York, New York 10017 • (212) 687-7115
We ship prepaid and COD orders. Shipping & handling charges extra: \$5 UPS areas, \$7 non-UPS areas, Mexico, Canada: \$10+ elsewhere. MasterCard and VISA accepted.
New York State residents add appropriate sales tax. *CP/M is a trademark of Digital Research.

Microcomputer Workstations

from \$7,995.00



CI-MWS03-SB — LSI 11/2 computer workstation. LSI 11/2 CPU, 64KB Memory, power supply, KEV 11, in 16 slot rack mountable chassis. 2 port serial I/O. CRT terminal. 1 mega byte floppy disk system. Desktop workstation **\$7,995.00**

CI-MWS23-MB — LSI 11/23 computer workstation. LSI 11/23 CPU, MMU, 256KB Memory, power supply, in 16 slot rack mountable chassis. CRT terminal. 10 mega byte cartridge disk system. 4 port serial I/O. Desktop workstation **\$11,995.00**

CI-1103LK — LSI 11/2 CPU, 64KB Memory, power supply, KEV 11 in 16 slot rack mountable chassis **\$2,450.00**

PDP 1103SE — LSI 11/2 CPU, 64KB Memory, power supply, KEV 11 in 8 slot rack mountable chassis **\$2,695.00**

CI-11/23 AC — LSI 11/23 CPU, MMU, 256KB Memory, power supply, in 16 slot rack mountable chassis **\$4,995.00**

CI9448-96 — 96 mega byte cartridge disk system with controller. 80 mega bytes fixed and 16 mega bytes removable **\$10,500.00**



DON'T ASK WHY WE CHARGE SO LITTLE, ASK WHY THEY CHARGE SO MUCH.



Chrislin Industries, Inc.

31352 Via Colinas • Westlake Village, CA 91362 • 213-991-2254 • TWX 910-494-1253

LSI 11 is a trademark of Digital Equipment Corp.

★ 20% ★ DISCOUNT COUPON

Bring this COUPON into one of our stores or mail to our Mail Order address shown below and receive a 20% DISCOUNT on purchases from this page of \$50.00 or more. Offer EXPIRES on December 15, 1981

NAME _____

ADDRESS _____

CITY _____ STATE _____

ZIP _____ PHONE NO _____

Coupons accepted only with full name and address listed on this.

Z-80 SERIES

| | | |
|------------------|--------------------|-------------------|
| 2.5 MHz | 4.0 MHz | |
| Z-80-CPU \$ 1.10 | Z-80-SIO/0 \$20.10 | Z-80A-CPU \$ 0.05 |
| Z-80-CTC \$ 9.90 | Z-80-SIO/8 14.50 | Z-80A-CTC \$ 0.25 |
| Z-80-FIB \$ 5.90 | Z-80-DMA 21.50 | Z-80A-FIB \$ 0.25 |
| Z-80-DMRT 14.30 | | Z-80A-DMRT 15.50 |

EPROM 2732 \$11.90

EPROM 2716-5 \$6.50

(5 VOLT)

EPROM Erasing Lamps

- ERASES 4 CHIPS IN LESS THAN 20 MINUTES
- SIMPLE TO USE • SAFETY INTERLOCK
- ERASES 2708, 2716, 1702A, etc.

UVS-11E \$85.00

SORCERER COMPUTER — Speaks Your Language

FEATURES 280 - 4K RAM - 32K RAM - Dual Cassette I/O - 30 Lines of BA Characters - 84 Defined Characters and 84 User Defined Characters - 512 x 740 Graphic Resolution - Edge Code Conversion to S-100 Bus - Serial and Parallel I/O

Order Part No. DP1002-2.38K \$1395.00

* MICROPROCESSOR CRYSTALS *

| PRICE | CARD #/A | PRICE | CARD #/A | PRICE | CARD #/A | PRICE | CARD #/A |
|-------|------------------|-------|------------------|-------|------------------|-------|----------|
| 1.00 | MC21 0718 00.40 | 9.00 | MC18 0778 00.00 | 15.00 | MC10 0718A 04.76 | | |
| 1.50 | MC22 0818 00.40 | 9.00 | MC19 0778A 00.00 | 18.00 | MC11 0718A 4.76 | | |
| 2.00 | MC23 0778 00.76 | 9.00 | MC10 0738 00.00 | 18.40 | MC12 0718 1.75 | | |
| 2.40 | MC33 0798 00.76 | 9.75 | MC11 0738 00.00 | 19.50 | MC13 0718 4.76 | | |
| 2.70 | MC34 0738 00.00 | 9.00 | MC12 0738 00.00 | 18.00 | MC14 0718 5.38 | | |
| 4.00 | MC10 0718 00.00 | 18.00 | MC13 0718 4.76 | 22.00 | MC15 0718 0.18 | | |
| 4.00 | MC11 0718 00.00 | 18.00 | MC14 0718 4.76 | 22.00 | MC16 0718 0.18 | | |
| 4.00 | MC12 0718 00.00 | 18.00 | MC15 0718 4.76 | 22.00 | MC17 0718 0.18 | | |
| 4.00 | MC13 0718 00.00 | 18.00 | MC16 0718 4.76 | 22.00 | MC18 0718 0.18 | | |
| 4.00 | MC14 0718 00.00 | 18.00 | MC17 0718 4.76 | 22.00 | MC19 0718 0.18 | | |
| 4.00 | MC15 0718 00.00 | 18.00 | MC18 0718 4.76 | 22.00 | MC20 0718 0.18 | | |
| 4.00 | MC16 0718 00.00 | 18.00 | MC19 0718 4.76 | 22.00 | MC21 0718 0.18 | | |
| 4.00 | MC17 0718 00.00 | 18.00 | MC20 0718 4.76 | 22.00 | MC22 0718 0.18 | | |
| 4.00 | MC18 0718 00.00 | 18.00 | MC21 0718 4.76 | 22.00 | MC23 0718 0.18 | | |
| 4.00 | MC19 0718 00.00 | 18.00 | MC22 0718 4.76 | 22.00 | MC24 0718 0.18 | | |
| 4.00 | MC20 0718 00.00 | 18.00 | MC23 0718 4.76 | 22.00 | MC25 0718 0.18 | | |
| 4.00 | MC21 0718 00.00 | 18.00 | MC24 0718 4.76 | 22.00 | MC26 0718 0.18 | | |
| 4.00 | MC22 0718 00.00 | 18.00 | MC25 0718 4.76 | 22.00 | MC27 0718 0.18 | | |
| 4.00 | MC23 0718 00.00 | 18.00 | MC26 0718 4.76 | 22.00 | MC28 0718 0.18 | | |
| 4.00 | MC24 0718 00.00 | 18.00 | MC27 0718 4.76 | 22.00 | MC29 0718 0.18 | | |
| 4.00 | MC25 0718 00.00 | 18.00 | MC28 0718 4.76 | 22.00 | MC30 0718 0.18 | | |
| 4.00 | MC26 0718 00.00 | 18.00 | MC29 0718 4.76 | 22.00 | MC31 0718 0.18 | | |
| 4.00 | MC27 0718 00.00 | 18.00 | MC30 0718 4.76 | 22.00 | MC32 0718 0.18 | | |
| 4.00 | MC28 0718 00.00 | 18.00 | MC31 0718 4.76 | 22.00 | MC33 0718 0.18 | | |
| 4.00 | MC29 0718 00.00 | 18.00 | MC32 0718 4.76 | 22.00 | MC34 0718 0.18 | | |
| 4.00 | MC30 0718 00.00 | 18.00 | MC33 0718 4.76 | 22.00 | MC35 0718 0.18 | | |
| 4.00 | MC31 0718 00.00 | 18.00 | MC34 0718 4.76 | 22.00 | MC36 0718 0.18 | | |
| 4.00 | MC32 0718 00.00 | 18.00 | MC35 0718 4.76 | 22.00 | MC37 0718 0.18 | | |
| 4.00 | MC33 0718 00.00 | 18.00 | MC36 0718 4.76 | 22.00 | MC38 0718 0.18 | | |
| 4.00 | MC34 0718 00.00 | 18.00 | MC37 0718 4.76 | 22.00 | MC39 0718 0.18 | | |
| 4.00 | MC35 0718 00.00 | 18.00 | MC38 0718 4.76 | 22.00 | MC40 0718 0.18 | | |
| 4.00 | MC36 0718 00.00 | 18.00 | MC39 0718 4.76 | 22.00 | MC41 0718 0.18 | | |
| 4.00 | MC37 0718 00.00 | 18.00 | MC40 0718 4.76 | 22.00 | MC42 0718 0.18 | | |
| 4.00 | MC38 0718 00.00 | 18.00 | MC41 0718 4.76 | 22.00 | MC43 0718 0.18 | | |
| 4.00 | MC39 0718 00.00 | 18.00 | MC42 0718 4.76 | 22.00 | MC44 0718 0.18 | | |
| 4.00 | MC40 0718 00.00 | 18.00 | MC43 0718 4.76 | 22.00 | MC45 0718 0.18 | | |
| 4.00 | MC41 0718 00.00 | 18.00 | MC44 0718 4.76 | 22.00 | MC46 0718 0.18 | | |
| 4.00 | MC42 0718 00.00 | 18.00 | MC45 0718 4.76 | 22.00 | MC47 0718 0.18 | | |
| 4.00 | MC43 0718 00.00 | 18.00 | MC46 0718 4.76 | 22.00 | MC48 0718 0.18 | | |
| 4.00 | MC44 0718 00.00 | 18.00 | MC47 0718 4.76 | 22.00 | MC49 0718 0.18 | | |
| 4.00 | MC45 0718 00.00 | 18.00 | MC48 0718 4.76 | 22.00 | MC50 0718 0.18 | | |
| 4.00 | MC46 0718 00.00 | 18.00 | MC49 0718 4.76 | 22.00 | MC51 0718 0.18 | | |
| 4.00 | MC47 0718 00.00 | 18.00 | MC50 0718 4.76 | 22.00 | MC52 0718 0.18 | | |
| 4.00 | MC48 0718 00.00 | 18.00 | MC51 0718 4.76 | 22.00 | MC53 0718 0.18 | | |
| 4.00 | MC49 0718 00.00 | 18.00 | MC52 0718 4.76 | 22.00 | MC54 0718 0.18 | | |
| 4.00 | MC50 0718 00.00 | 18.00 | MC53 0718 4.76 | 22.00 | MC55 0718 0.18 | | |
| 4.00 | MC51 0718 00.00 | 18.00 | MC54 0718 4.76 | 22.00 | MC56 0718 0.18 | | |
| 4.00 | MC52 0718 00.00 | 18.00 | MC55 0718 4.76 | 22.00 | MC57 0718 0.18 | | |
| 4.00 | MC53 0718 00.00 | 18.00 | MC56 0718 4.76 | 22.00 | MC58 0718 0.18 | | |
| 4.00 | MC54 0718 00.00 | 18.00 | MC57 0718 4.76 | 22.00 | MC59 0718 0.18 | | |
| 4.00 | MC55 0718 00.00 | 18.00 | MC58 0718 4.76 | 22.00 | MC60 0718 0.18 | | |
| 4.00 | MC56 0718 00.00 | 18.00 | MC59 0718 4.76 | 22.00 | MC61 0718 0.18 | | |
| 4.00 | MC57 0718 00.00 | 18.00 | MC60 0718 4.76 | 22.00 | MC62 0718 0.18 | | |
| 4.00 | MC58 0718 00.00 | 18.00 | MC61 0718 4.76 | 22.00 | MC63 0718 0.18 | | |
| 4.00 | MC59 0718 00.00 | 18.00 | MC62 0718 4.76 | 22.00 | MC64 0718 0.18 | | |
| 4.00 | MC60 0718 00.00 | 18.00 | MC63 0718 4.76 | 22.00 | MC65 0718 0.18 | | |
| 4.00 | MC61 0718 00.00 | 18.00 | MC64 0718 4.76 | 22.00 | MC66 0718 0.18 | | |
| 4.00 | MC62 0718 00.00 | 18.00 | MC65 0718 4.76 | 22.00 | MC67 0718 0.18 | | |
| 4.00 | MC63 0718 00.00 | 18.00 | MC66 0718 4.76 | 22.00 | MC68 0718 0.18 | | |
| 4.00 | MC64 0718 00.00 | 18.00 | MC67 0718 4.76 | 22.00 | MC69 0718 0.18 | | |
| 4.00 | MC65 0718 00.00 | 18.00 | MC68 0718 4.76 | 22.00 | MC70 0718 0.18 | | |
| 4.00 | MC66 0718 00.00 | 18.00 | MC69 0718 4.76 | 22.00 | MC71 0718 0.18 | | |
| 4.00 | MC67 0718 00.00 | 18.00 | MC70 0718 4.76 | 22.00 | MC72 0718 0.18 | | |
| 4.00 | MC68 0718 00.00 | 18.00 | MC71 0718 4.76 | 22.00 | MC73 0718 0.18 | | |
| 4.00 | MC69 0718 00.00 | 18.00 | MC72 0718 4.76 | 22.00 | MC74 0718 0.18 | | |
| 4.00 | MC70 0718 00.00 | 18.00 | MC73 0718 4.76 | 22.00 | MC75 0718 0.18 | | |
| 4.00 | MC71 0718 00.00 | 18.00 | MC74 0718 4.76 | 22.00 | MC76 0718 0.18 | | |
| 4.00 | MC72 0718 00.00 | 18.00 | MC75 0718 4.76 | 22.00 | MC77 0718 0.18 | | |
| 4.00 | MC73 0718 00.00 | 18.00 | MC76 0718 4.76 | 22.00 | MC78 0718 0.18 | | |
| 4.00 | MC74 0718 00.00 | 18.00 | MC77 0718 4.76 | 22.00 | MC79 0718 0.18 | | |
| 4.00 | MC75 0718 00.00 | 18.00 | MC78 0718 4.76 | 22.00 | MC80 0718 0.18 | | |
| 4.00 | MC76 0718 00.00 | 18.00 | MC79 0718 4.76 | 22.00 | MC81 0718 0.18 | | |
| 4.00 | MC77 0718 00.00 | 18.00 | MC80 0718 4.76 | 22.00 | MC82 0718 0.18 | | |
| 4.00 | MC78 0718 00.00 | 18.00 | MC81 0718 4.76 | 22.00 | MC83 0718 0.18 | | |
| 4.00 | MC79 0718 00.00 | 18.00 | MC82 0718 4.76 | 22.00 | MC84 0718 0.18 | | |
| 4.00 | MC80 0718 00.00 | 18.00 | MC83 0718 4.76 | 22.00 | MC85 0718 0.18 | | |
| 4.00 | MC81 0718 00.00 | 18.00 | MC84 0718 4.76 | 22.00 | MC86 0718 0.18 | | |
| 4.00 | MC82 0718 00.00 | 18.00 | MC85 0718 4.76 | 22.00 | MC87 0718 0.18 | | |
| 4.00 | MC83 0718 00.00 | 18.00 | MC86 0718 4.76 | 22.00 | MC88 0718 0.18 | | |
| 4.00 | MC84 0718 00.00 | 18.00 | MC87 0718 4.76 | 22.00 | MC89 0718 0.18 | | |
| 4.00 | MC85 0718 00.00 | 18.00 | MC88 0718 4.76 | 22.00 | MC90 0718 0.18 | | |
| 4.00 | MC86 0718 00.00 | 18.00 | MC89 0718 4.76 | 22.00 | MC91 0718 0.18 | | |
| 4.00 | MC87 0718 00.00 | 18.00 | MC90 0718 4.76 | 22.00 | MC92 0718 0.18 | | |
| 4.00 | MC88 0718 00.00 | 18.00 | MC91 0718 4.76 | 22.00 | MC93 0718 0.18 | | |
| 4.00 | MC89 0718 00.00 | 18.00 | MC92 0718 4.76 | 22.00 | MC94 0718 0.18 | | |
| 4.00 | MC90 0718 00.00 | 18.00 | MC93 0718 4.76 | 22.00 | MC95 0718 0.18 | | |
| 4.00 | MC91 0718 00.00 | 18.00 | MC94 0718 4.76 | 22.00 | MC96 0718 0.18 | | |
| 4.00 | MC92 0718 00.00 | 18.00 | MC95 0718 4.76 | 22.00 | MC97 0718 0.18 | | |
| 4.00 | MC93 0718 00.00 | 18.00 | MC96 0718 4.76 | 22.00 | MC98 0718 0.18 | | |
| 4.00 | MC94 0718 00.00 | 18.00 | MC97 0718 4.76 | 22.00 | MC99 0718 0.18 | | |
| 4.00 | MC95 0718 00.00 | 18.00 | MC98 0718 4.76 | 22.00 | MC100 0718 0.18 | | |
| 4.00 | MC96 0718 00.00 | 18.00 | MC99 0718 4.76 | 22.00 | MC101 0718 0.18 | | |
| 4.00 | MC97 0718 00.00 | 18.00 | MC100 0718 4.76 | 22.00 | MC102 0718 0.18 | | |
| 4.00 | MC98 0718 00.00 | 18.00 | MC101 0718 4.76 | 22.00 | MC103 0718 0.18 | | |
| 4.00 | MC99 0718 00.00 | 18.00 | MC102 0718 4.76 | 22.00 | MC104 0718 0.18 | | |
| 4.00 | MC100 0718 00.00 | 18.00 | MC103 0718 4.76 | 22.00 | MC105 0718 0.18 | | |
| 4.00 | MC101 0718 00.00 | 18.00 | MC104 0718 4.76 | 22.00 | MC106 0718 0.18 | | |
| 4.00 | MC102 0718 00.00 | 18.00 | MC105 0718 4.76 | 22.00 | MC107 0718 0.18 | | |
| 4.00 | MC103 0718 00.00 | 18.00 | MC106 0718 4.76 | 22.00 | MC108 0718 0.18 | | |
| 4.00 | MC104 0718 00.00 | 18.00 | MC107 0718 4.76 | 22.00 | MC109 0718 0.18 | | |
| 4.00 | MC105 0718 00.00 | 18.00 | MC108 0718 4.76 | 22.00 | MC110 0718 0.18 | | |
| 4.00 | MC106 0718 00.00 | 18.00 | MC109 0718 4.76 | 22.00 | MC111 0718 0.18 | | |
| 4.00 | MC107 0718 00.00 | 18.00 | MC110 0718 4.76 | 22.00 | MC112 0718 0.18 | | |
| 4.00 | MC108 0718 00.00 | 18.00 | MC111 0718 4.76 | 22.00 | MC113 0718 0.18 | | |
| 4.00 | MC109 0718 00.00 | 18.00 | MC112 0718 4.76 | 22.00 | MC114 0718 0.18 | | |
| 4.00 | MC110 0718 00.00 | 18.00 | MC113 0718 4.76 | 22.00 | MC115 0718 0.18 | | |
| 4.00 | MC111 0718 00.00 | 18.00 | MC114 0718 4.76 | 22.00 | MC116 0718 0.18 | | |
| 4.00 | MC112 0718 00.00 | 18.00 | MC115 0718 4.76 | 22.00 | MC117 0718 0.18 | | |
| 4.00 | MC113 0718 00.00 | 18.00 | MC116 0718 4.76 | 22.00 | MC118 0718 0.18 | | |
| 4.00 | MC114 0718 00.00 | 18.00 | MC117 0718 4.76 | 22.00 | MC119 0718 0.18 | | |
| 4.00 | MC115 0718 00.00 | 18.00 | MC118 0718 4.76 | 22.00 | MC120 0718 0.18 | | |
| 4.00 | MC116 0718 00.00 | 18.00 | MC119 0718 4.76 | 22.00 | MC121 0718 0.18 | | |
| 4.00 | MC117 0718 00.00 | 18.00 | MC120 0718 4.76 | 22.00 | MC122 0718 0.18 | | |
| 4.00 | MC118 0718 00.00 | 18.00 | MC121 0718 4.76 | 22.00 | MC123 0718 0.18 | | |

64K Static RAM

available now from stock

Ultra Fast - 100 nsec. chips

Fast access allows memory management manipulation without wait states.

8/16 - 8 or 16-bits wide

Dynamically switches data path width per IEEE Standard.

Low Power

Typical power consumption less than 2 amps for active board. Less for power down boards.

Extended Addressing

24-bit IEEE addressing allows 16-megabyte range. Single shunt changes to 16-bit addressing.

Fully Static

No clocks, no refresh required for easy DMA use.

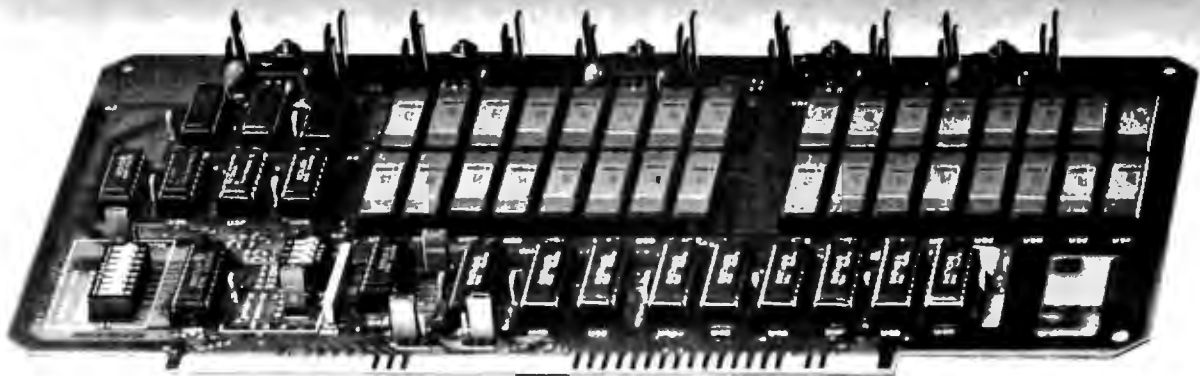
Special Features

Any 4K block can be disabled. Or, can disable everything above or below any 4K boundary. Available in 16K increments for OEM quantities.

\$995

100 nsec. Chips - Qty. 1-3

OEM & Dealer prices also available.



TO ORDER:

May be ordered through your local computer store or factory direct. Personal checks, CODs, VISA and MC accepted from within USA. 10-day return privilege on factory orders. Shipping paid by SCP on prepaid USA and Canadian orders. All boards fully assembled, guaranteed one year.

SEATTLE COMPUTER

1114 Industry Dr. Seattle WA 98188

Information Hotline: 206/575-1830

Send more information: () _____

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

you a fairly comprehensive set of features at a reasonable price, but it is harder to use than need be.

The On-Line Database

The On-Line Database comes on a locked disk. It does not provide any utilities or information that would help you transfer information from system to system. A backup disk can be purchased for \$15. There are no file-redefinition facilities.

Initial definition is easy and sub-sorts are allowed. The limit of twenty-six characters per field and 239 characters per record might be too confining for some applications. The data-entry options for the On-Line Database are excellent. Default entries, cursor-oriented editing of entries, in-memory data entry, and other options provide outstanding features. No calculation options are provided. Mailing labels and user-defined single-line formats are the only formatting options. Multiple-criteria selection on multiple fields is not

allowed, but subsorted keys are available. No interface to outside software is supplied. Documentation has some nice touches (the applications-creation procedure, for example). Sorting is tied to data entry. The entire program resides in memory, eliminating the swapping of modules. While you examine one record, it is searching for the next one. The On-Line Database is well suited to applications requiring fast response. Regard for human factors is *consistently good*. A pleasant system to use.

The High Technology DBMS

DBMS comes on a copyable disk. It has no data-file independence features of its own, but Data Master and Information Master will accept its files. You cannot catalog or list it, but it is copyable. In combination with Data Master, DBMS has extensive file-maintenance features. (Alone it has none.)

The system has standard initial-definition features. It provides sub-sorts. In-memory data entry is not provided. It can select records for reports using multiple criteria on multiple fields. It allows multiple-line report formats and mailing labels. It will calculate the total and the average of a field, and you can decide when to do your sorts. The only outside software packages DBMS is designed to work with are Data Master and Information Master. Menus have too many options (extra options should be in submenus), but menu format is uniform throughout the system. Fairly good regard for human factors. There is new documentation.

Data Master

Data Master is designed to be used with DBMS or Information Master and comes on an uncopyable disk. There are extensive file-reorganization options. You can merge files (with a series of transfers to a single destination file), you can add or de-

PLAIN TALK ABOUT "COPY PROTECTION"

A lot has been said and written about copy protection and software piracy since Omega made Locksmith available to Apple II users earlier this year. We have been accused of encouraging illegal copying of copyrighted software. Software publishers have threatened to boycott magazines which carry our advertising, and the pros and cons of Locksmith and copy protection devices have been debated in Apple forums throughout the country. But, we at Omega haven't really told you, the Apple user, our side of the story.

Locksmith was originally developed as an intellectual exercise by an Apple user over a year ago. And we suspect that sufficient information about the Apple DOS and the way information is stored on a disk has been long available to the general public, so that ANYONE who was REALLY interested, and who wished to spend a LOT of time, could have written a program that does many of the things that Locksmith does. Similarly, there is really no "secret" to writing data base programs, adventure programs, or even spread sheet programs. The literature is there if you want to look for it. But it takes a lot of hard work to develop any software package that works in all cases, that is crashproof, that interfaces easily with a non-experienced computer user, and that is well documented. A LOT of hard work.

But even before Locksmith was available to us, we, as Apple users, recognized a definite problem with the software we were buying and using. Much of it worked well. But it was very aggravating to not be able to make a backup copy of certain "copy protected" programs. Most software publishers didn't supply backups of their programs, and those that had any policy required signing oppressive agreements or paying questionably high yearly fees for presumed, but not guaranteed, updates. Among those who did not offer back-up was one who 'sold

us a new copy (when we returned our crashed disk). Although they advertised the importance of having their program running every day, they made us wait up to 6 weeks to get the replacement. Most vendors just ignored the problem. We, as consumers, were simply taken advantage of. In many cases we relied so much on a particular program, that it became very costly to have to wait weeks or more to replace a blown disk. Software publishers were just not responsive to the users problems caused by "copy protection".

When we first became aware of Locksmith, we investigated the state of the law, and discovered that no one knew whether the owner of a program could copy it for backup. And for quite a while we debated whether we should market Locksmith.

On December 12, 1980, a change was made to the Copyright Act which resolved these questions. It is now the law of the United States that the existence of a copyright notice on a computer program does NOT make it illegal for the legitimate owner of that program to copy it for archival purposes. Backups are now clearly legal. (Of course, when you sell your purchased program, you must destroy the backups you have made). Only after such use clearly became legal did we decide to sell Locksmith.

Now with the new copyright law, which for the first time gave software publishers clear rights that were enforceable in court, but which also gave "backup" rights to software purchasers, and with the demonstration that Locksmith could and would provide back-up for the user, we assumed that software publishers would drop their copy protection schemes and educate the public as to their rights and responsibilities. Even the use of hardware protection that gives copy-ability to the software would be acceptable. Unfortunately, their

response has been to pressure magazine publishers into refusing our advertising, and to invent new copy protection schemes.

Well, the word about Locksmith was impossible to stop. We couldn't advertise, but we have sold a gratifyingly large number of programs. As to new copy protection schemes, the new Locksmith (version 4.0) will adjust to them, and copy virtually anything protected that way. But please. For us, for yourselves, and for the entire industry, use Locksmith only for its intended legal purposes.

The new version is more than just the best copy program available. There are also four additional utilities included. A disk speed program, a degausser, a nibble editor and a media surface analyzer are included. And we stand behind our products. Our customer service department is available (and anxious) to help with problems.

Locksmith 4.0 is available from us, or your local dealer. Visa and Mastercard users call Toll Free 1-800-835-2246. Kansas residents call 1-800-362-2421 or send \$99.95. (Registered owners of prior versions can obtain an update for only \$20. If you haven't received a letter from us, please call.)

Another Quality Product from Omega MicroWare, Inc.

(formerly Omega Software Products, Inc.)
222 So. Riverside Plaza
Chicago, IL 60606
Phone 312-648-1944



©1981 Omega MicroWare, Inc.
Apple is a registered trademark of Apple Computer, Inc.

ATTENTION COMPARISON SHOPPERS

HOW DOES A \$299 BYTEWRITER-1 STACK UP AGAINST A \$650 EPSON MX-80? YOU DECIDE!

| FEATURES | BYTEWRITER-1 | EPSON MX-80* |
|-----------------------|---|--|
| Print speed | 60 lines per minute | 46 lines per minute |
| Paper feed | Friction feed original plus 3 copies | Pin feed original plus 2 copies |
| Ribbon | Black, cartridge \$9.95 | Black, cartridge \$14.00 |
| Life expectancy | Printhead — 100 million char. Drive Mech. — 10 million char. Ribbon — 5 million char. | 50 — 100 million char. 5 million char. 3 million char. |
| Dimensions | 3.8" x 15" x 9" | 5.2" x 14.7" x 12" |
| Character set | 96 ASCII | 96 ASCII |
| Interface | Parallel | Parallel |
| Warranty | 90 days | 90 days |
| Printhead replacement | \$29.95 | \$30 |
| Cost | \$299 | \$650 |

*Data source: Epson MX-80
Operation Manual

The Only 80 Column Dot Matrix Printer Under \$300.

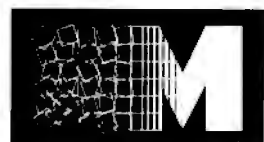
Why do we dare to compare the Bytewriter-1 to the Epson MX-80, the industry leader? Because we feel strongly that dollar for dollar, the Bytewriter-1 is tough to beat for performance and quality.

Our extensive testing has proved that the Bytewriter-1 interfaces problem-free to the TRS-80, the Apple II and the Atari 400 and 800.

We are not going to tell you that the Bytewriter-1 is better than the MX-80, but by comparison, and for half the cost, you get more than a reliable printer — you get a great value.

Call or write for more information today.

**Comparable features.
Uncomparable price.**



MICROTEK inc.

9514 Chesapeake Drive
San Diego, CA 92123
(714) 278-0633
Outside CA call
TOLL FREE (800) 854-1081
TWX. 910-335-1269

TRS-80 is a trademark of Radio Shack, Div.
of Tandy Corp.

Apple II is a trademark of Apple Computer,
Inc.

Atari 400 & 800 are trademarks
of Atari, Inc.

MX-80 is a trademark of
Epson America, Inc.

Circle 338 on Inquiry card.



**30 Day
Money Back
Guarantee**



SITTING PRETTY

You can use just about any desk for a computer terminal stand. But with CF&A, you're sitting pretty. Our full range of desks, workstations, and terminal stands are designed to accommodate a variety of computer equipment. Choose from our Classic Series desks, DR Series desks and enclosures, specialty items like our Apple II desk, or a universal printer stand. You'll be sitting pretty with attractive color selections, durable construction, versatile configurations, useful options, competitive prices, quick delivery, and personal service. It's our way of doing business.

CF&A

Computer Furniture and Accessories, Inc.
1441 West 132nd Street
Gardena, CA 90249
(213) 327-7710

lete fields to or from records, and you can create subsets of a file that meet certain selection criteria.

Data Master requires a source and destination file defined by DBMS or Information Master. It cannot create its own record definition. Both its documentation (extensive) and its regard for human factors are generally good. Use with outside software is possible but not documented; efficiency is adequate. Data Master is an extremely useful addition to DBMS or Information Master.

Information Master

Information Master comes on an uncopyable disk. As mentioned above, Data Master provides it with considerable redefinition capabilities.

In addition to the standard file-definition options, Information Master can edit existing file definitions (useful if a new application shares some characteristics with an existing one). Your previous entry is the default value of your current entry. Extensive selection and calculation options are available (inequalities, leading strings, trailing strings, floating strings, characters in particular positions). Multiple-criteria selection on multiple fields is permitted. The file information eases the interface of outside software to Information Master. Regard for human factors is generally good (Data Master and Information Master have the same command format). Efficiency is adequate. A very practical system (particularly in combination with Data Master).

Conclusions

•The worst system we could construct using the features these systems provide would have the poor consideration for human factors of the CCA Data Management System, the inflexible tree structure and limited query options of Infotree, the huge menus and inefficient use of disk space of the Data Factory, the limited record size and lack of field redefinition options of the On-Line Database, the nonuniform menu formats of Data Master/Information Master, and the numeric error codes of DBMS. It would come with sparse documentation on a locked disk.

•Even if the traditional distinction between the words "file-management system" and "data-base system" is lost, be aware of the difference between systems that meet the CODASYL data-base standards and those that don't.

•Software Arts' DIF holds out the possibility of relief from data-file-incompatibility headaches.

•The best system we could create using the features these systems provide would have the basic characteristics of the very practical Information Master/Data Master combination; the data entry features, quick response, and general pleasantness of the On-Line Database; the interface to VisiCalc and good documentation of the CCA DMS; the educational value and good regard for human factors of Infotree; the uniformity of command format of DBMS; and the cost per feature of the Data Factory. It would, of course, come in source code on an unlocked disk. ■

References

1. Brandon, Dick H. *Data Processing Contracts: Structure, Content, and Negotiations*. New York: Van Nostrand Reinhold, 1976.
2. Gemignani, Michael C. "Legal Protection for Computer Software: The View from '79," *Rutgers Journal of Computer Technology Law* 7, 2, 1980, 269-312.
3. Ledgard, Henry F and Paul Nagin. *BASIC With Style: Programming Proverbs*. Rochelle Park NJ: Hayden, 1978.
4. Ledgard, Henry F et al. *Pascal With Style: Programming Proverbs*. Rochelle Park NJ: Hayden, 1979.
5. Martin, James. *Principles of Data Base Management*. Englewood Cliffs NJ: Prentice-Hall, 1976.
6. Shneiderman, Ben. *Software Psychology (Human Factors in Computer and Information Systems)*. Cambridge MA: Winthrop, 1980.
7. Snodgrass, Richard. "A Sophisticated Microcomputer User Interface," *Proceedings of the Third Symposium on Small Systems*, jointly sponsored by SIGSMALL and SIGPC of the Association for Computing Machinery, 1980, 97-107.

**AFTER YOU'VE SEEN
HOW ALL THE
OTHER PRINTERS
STACK UP...**

**THE ONE ON TOP
WILL SURPRISE YOU.**



The Novell IMAGE 800 dot matrix printer is on top because it is *the* performance printer.

The printer mechanism has been running in the lab continuously since January, 1980—24 hours a day, 7 days a week—without failing—and it's still going. That's Novell quality. That's 100% duty cycle.

The Novell IMAGE 800 is state-of-the-art: microprocessor controlled... 30 programmable functions... compressed or expanded print... correspondence quality print... 11 channel programmable VFU.

If you require 150 CPS print speed and 136 column output, you can't do better anywhere. And at \$1,395, *we're hundreds less than comparable units.*

Check these other features:

- 80 or 132 columns
- Bi-directional print
- 9 x 9 dot matrix
- Dual tractor paper feed
- RS232C or parallel interface
- 110-9600 baud
- 6 or 8 lines per inch vertical spacing
- Tear bar
- True descenders
- Subscripting & superscripting
- Vertical tabulation

Compare. Find out how the others stack up. It won't take you long to see why Novell is on top. A Novell IMAGE 800 dot matrix printer can help you stay on top, too. Because higher performance means lower overhead.

GENEROUS OEM DISCOUNTS.
DISTRIBUTOR INQUIRIES INVITED.

 **NOVELL**
DATA SYSTEMS, INC.

1170 No. Industrial Park Drive, Orem, Utah 84057
Telephone: (801) 226-8202

California —

R.C. Data, Inc. (408) 988-7510,
Video Specialists, Inc. (714) 557-5112,
Vitek (714) 744-8305

Colorado —

R.C. Data, Inc. (303) 425-9075

Arizona —

The Systems Store (602) 255-0700

Texas —

System Technology Assoc. (214) 343-0845,
(512) 451-2018, (713) 440-8340

Washington —

Desco Northwest (206) 883-6336

Utah —

Peripheral Equipment, Inc. (801) 272-7414

Pennsylvania —

Bartlett Associates, Inc. (215) 688-7325
O.E.D. Electronics (215) 674-9600

Illinois —

Kaltronics (312) 291-1220

Oregon —

Rush S. Drake Assoc. (503) 224-3145

New York —

Bartlett Assoc., Inc. (914) 649-6476

Massachusetts —

Butler Associates, Inc. (617) 965-1080

Maryland —

The Computer Supply Store (301) 424-1650

Minnesota —

Computer Marketing, Corp. (612) 894-7150

Circle 310 on inquiry card.

News and Speculation About Personal Computing

Conducted by Sol Libes

IEEE S-100 Standard Is On The Way: The IEEE-696 Standard for the S-100 microcomputer bus has been completed by the working group and submitted to the IEEE (Institute of Electrical and Electronics Engineers) Computer Standards Committee for adoption. Formal acceptance is expected by early 1982.

The S-100 bus has been changed radically from its original implementation in 1975 by MITS, who employed the bus in the Altair 8080 microcomputer. New features include 8- or 16-bit-wide data path (to accommodate the new 16-bit microprocessors), direct-memory addressing of up to 16 megabytes (previously 64 K bytes), direct I/O (input/output) addressing for as many as 65,536 ports (previously 256 ports), a new protocol that can handle 16 masters on one bus, timing specifications for 6 MHz clock operation (some manufacturers envision operating at over 10 MHz), and an expanded interrupt system of up to 11 lines (previously 7).

The standard will dispense with pin assignment and timing conflicts that plagued S-100 users because of variations between manufacturers. It also allows for future expansion of the bus to support changes in the state of the art (e.g., 32-bit microprocessors).

The importance of the standard is that there are almost 40 manufacturers of S-100 systems and about 50 others making hundreds of S-100-compatible products. There is no doubt the IEEE 696/S-100 is presently the

most powerful microcomputer bus in wide use.

If you would like a copy of the proposed IEEE-696 Standard, write to Sol Libes, IEEE-696 Committee Secretary, POB 1192, Mountainside NJ 07092. Please note that each copy costs \$6 in the US and \$8 elsewhere (US funds only).

Japanese Find Moving Into US Computer Market Hard: The Japanese are starting to move into the US small-business-computer market in force, but they're finding it more difficult than expected. The Japanese appear prepared for a long-term commitment: most are setting up dealer organizations and developing software packages for their hardware. However, it is becoming evident to the Japanese that their hardware is suited to the American market but their software is not. Because of this, it is likely that their penetration will take two to three years to become significant.

Although NEC (Nippon Electric Corporation) has been selling systems in Japan for more than two years, it has met resistance from American dealers because of a lack of software applicable to the US market. NEC is recruiting software suppliers to overcome this problem.

Mitsubishi introduced its small-business computer in the US in 1979 and boasted that within three years it would have 10% of the market. Now Mitsubishi realizes that the US market is hard to crack. It, too, has met with considerable resistance from

dealers and is attempting to have several software packages developed.

Toshiba has taken another tack by opening two computer stores in the Los Angeles area. The stores carry Toshiba's entire line of office products, including its desk-top computer.

Sony appears to be having problems delivering its Series 35 word processor, which was introduced at the beginning of the year. Also, it only just started shipping samples of the new 3 1/4-inch disk drive to OEMs (original-equipment manufacturers). Rumors abound about a Sony personal computer, but none has yet surfaced either in the US or Japan.

Canon has decided to play the role of an OEM, thus passing its CX1 desk-top system's software problems on to distributors. (The CX1 is based on Motorola's 6809 microprocessor.) Canon has disclosed an agreement with a software supplier for seven accounting packages.

Sharp has introduced the YX-3200 small-business system to the US market. It had been sold previously in Japan. For the US version, Sharp has decided to go with Digital Research's CP/M operating system and the software packages currently available to operate under it. Sharp plans to sell the YX-3200 through systems houses, office-machine dealers, and office-supply houses.

Half-Size 5-Inch Floppy Drives Coming: At least three floppy-disk makers will soon introduce 5-inch floppy-disk drives that are only 2 1/8 inches tall

(half the height of a standard floppy disk). It will be possible to fit two drives in the space previously occupied by one.

The first "slimline" drive is expected to be introduced by Alps Electric Inc (a Japanese concern). It's actually less than half-size, being only 1 1/8 inches high. It will be available in 125 K- and 250 K-byte versions. Remex, Irvine, California, is expected to have its 2 1/8-inch-tall drive out by year's end. The Oyx division of Exxon is making a half-size drive that's already being used in a smart typewriter.

Microprocessor Makers To Add Floating Point: Intel, Motorola, and Zilog will soon be adding floating-point functions (FPFs) to their 16-bit microprocessors. All three will use separate integrated circuits functioning as coprocessors. Intel is already providing samples of its iAPX 86-20, which contains both the 16-bit 8086 microprocessor and the 8087 numeric processor; production is expected to begin early next year.

Motorola plans a coprocessor for its 16-bit 68000 microprocessor but, in the meantime, will supply an FPF firmware package that allows 32-bit multiplication and division. Both Intel and Motorola will conform to the proposed IEEE (Institute of Electrical and Electronics Engineers) FPF Standard. Zilog is rumored working on an FPF device for the Z8000. It should be announced by year's end.

THINK DIGITAL MARKETING. THINK AHEAD.



NOVEMBER

2670 Cherry Lane • Walnut Creek, CA 94596 (415) 938-2880

MILESTONE™—\$295. Manual alone—\$30. "Critical path" network analysis program for scheduling manpower, dollars and time to maximize productivity.
NEW IMPROVED. Interactive project management program that runs under CP/M. MILESTONE can be used to track paper flow, build a computer, check a department's performance, or build a bridge. MILESTONE can be used by executives, engineers, managers, and small businessmen

- Produce PERT chart in minutes.
- Find critical tasks that can't be delayed
- Investigate tradeoffs between manpower, dollars and time.
- Give plans to others using a printed project schedule.
- Change details and immediately see the results on screen.
- Balance time, manpower and costs.

Requires 56K RAM and CP/M. Specify Z80 or 8080. Also available for Apple Pascal, UCSD Pascal or CP/M-86 operating systems. Formats: B, NS, MP, SB, TRS2, APPL, OB-1, XX, I-5

ACCESS/80™

A report generator and cross-tabulator. Virtually any report that can be described on paper can be generated by using your existing ASCII data files. Produces reports in minutes that would take hours to program in BASIC.

Level I—Report Generator and Cross-tabulator—\$295. Read ASCII files and create sorted reports with subtotaling capability. Provides multi-dimensional cross tabulation and compilation. Includes operating system commands.

Level II—Output and Logic Processor—\$495. Everything in Level I plus, write out new files in any sorted order (including subtotaling). Load arrays from files. Performs binary search on sorted arrays in memory. Includes control language extensions for complex applications

Level III—Information Management System—\$795. Available 1st Qtr '82
 Everything in Level I and II plus full screen data entry and updating, and three indexing
 Requires CP/M and 48K RAM. Formats: B, NS, MP, CDOS, SB, TRS2, APPL

DATEBOOK II™—\$295. Manual alone \$25.

- Schedules appointments for up to 27 different doctors, lawyers, rooms, etc.
- File structure allows for appointments up to one year in advance
- Searches for openings that fill time of day, day of week and/or day of year constraints.
- Appointments made, modified or cancelled easily.
- Copies of day's appointments can be printed quickly.

Requires 56K RAM and CP/M. Specify Z80 or 8080. Also available for Apple Pascal, UCSD Pascal or CP/M-86 operating systems. Formats: B, NS, MP, SB, APPL, TRS2, OB-1, XX, I-5

PLAN80™—\$295. Manual alone—\$30.

A financial modeling system that's easy to use and powerful enough to replace your timesharing applications. Lets you calculate IRR and depreciation as well as trig functions effortlessly. You write a PLAN80 model just the way you would write a letter using any editor or word processing program

PLAN80 results can be incorporated into any report that requires a financial model. It also tackles any numeric problem that can be defined on a worksheet. You'll remember how you created the model because calculations are defined using real English—not matrix coordinates.

At any point in the PLAN80 model you may display or print the results on your screen, printer or disk. Save all or part of the results for use by other models, or play "what if?" by inputting new values interactively.
 Requires 56K RAM and CP/M. Also available for CP/M-86. Specify Z80, 8080, or 8086. Formats: B, NS, MP, SB, OB-1, XX, I-5.

CBASIC/86™—\$325. Manual alone—\$30. Industry standard intermediate code basic compiler with run-time interpreter for CP/M-86. Features include chaining, integer and external precision arithmetic, random and sequential records of any length (not limited to 256 bytes). Requires CP/M-86. Formats: B, I-5.

PROPERTY MANAGEMENT PROGRAM—\$895. Tracks income properties from house rentals to apartment complexes, shopping centers or office buildings. Permits entry of all expenses in any of 99 different categories for over 150 separate properties.

Now you can generate operating statements in minutes including totals of receipts and expenditures by category. Need more reports? This package includes a summary of transactions report, vacancy report, late rent report, rent roll report, check register and property management fees report.
 Requires CP/M, 48K RAM and CBASIC2. Formats: B, NS, SB, TRS2, APPL, MP

Personal PEARL™—\$295. User friendly application software generator. A fourth generation language, automatically creates completely new programs in CBASIC. Excellent documentation makes it easy to create "personal" software such as checking and financial programs, name, address and telephone lists, etc.
 Requires CP/M, CBASIC2 and 48K RAM. Formats: B, NS, SB, TRS2, APPL, OB-1, MP

MICROSTAT™ VERS. 2.0—\$295. Manual alone—\$25. Now includes stepwise and more flexible file structure. Code size smaller (= more data area). Also a data management subsystem for editing, sorting, ranking, lagging, data file transfers PLUS eleven data transformations (e.g. linear, reciprocal, exponential, etc.)

- Frequency and 8 probability distributions
- Multiple regression, correlation analysis
- Time series
- Crosstabs/Chi-Square, non-parametrics
- Factorials, permutations, combinations
- Scatterplots
- ANOVA (one and two-way)

Requires 48K RAM, Northstar Basic or CP/M & CBASIC2 or Microsoft Basic 80. Formats: B, NS, MP, SB, TRS2, CDOS, APPL, XX

SPELLBINDER™—\$495. Manual alone—\$50. Full feature word processing system with Office Management capabilities. Its special features include ease-of-use by office personnel, flexible print formatting & output, and a powerful macro capability which allows features to be added for the unique requirements of each user. Mail list macro is included for mail merge with form letters. Requires CP/M & 32K RAM. Formats: B, NS, MP, CDOS, SB, APPL, XX

ACT I™—\$125. Manual alone—\$15. CP/M compatible macro assembler for Z80, 8080/85, 6502 & 6800.

Assembler family supporting all major 8 bit micros. ACT features include full macro capabilities, comprehensive pseudo-ops, link-file structures, cross reference map, and algebraic expression processor. Requires 24K RAM & CP/M.

ACT II—\$175. Manual alone—\$20. CP/M 2.x compatible cross assembler for 8086/88

ACT III—\$125. Manual alone—\$20. CP/M 2.x compatible cross assembler for 6809

ACT I and ACT II together—\$225. Formats: B, NS, CDOS, MP/M, TRS2, APPL, OB-1, XX

PASCAL/M™—\$225. Manual alone—\$20. CP/M compatible language for 8080/Z80 CPUs, supports full Jensen & Wirth plus 45 extensions to Standard Pascal including Random access files, 40 segment procedures & 16 bit BCD real type. Also includes symbolic debugger which features trapping on stores, examining and changing variables and tracing of program execution.
 Requires CP/M 2.2 & 56K RAM. Formats: B, NS, APPL, TRS2

PASCAL/M™ for 8086/88—\$270. Manual alone \$20. All the features of Pascal/M for the 8086 and 8088 processors running under CP/M-86.
 Requires CP/M-86 and 128 K RAM. Formats: B, I-5.

SUPERCALCT™—\$295. Allows a layman to manipulate business data in a variety of forecasting and accounting applications. Combines the interactive nature of an electronic spreadsheet with the power and convenience of a simple simulation language. Video display can be scrolled over entire worksheet using cursor controls. Symbolic vector references eliminate repetitive low-level data manipulation commands. Easy to use menu driven "Help" commands. Requires CP/M and 48K RAM. Formats: B, NS, MP, SB, APPL, TRS2
 Call for terminal formats.

SUPERDOST™—\$129. Upgrade of CP/M 2.2 for Superbrain. Includes ADM/31, Hazeltine, or Superbrain Terminal emulation mode. Other new features include 132 character keyboard buffer, repeat on all keys, key click, user programmable numeric keypad, 30% disk read/write improvement, real time clock, baud rates to 19.2K on RS232 ports, printer handshake modes, 4 new utilities, and 4 fixes.
 Requires Superbrain 3.0. Format: SB

TRANS86™—\$125. Manual alone—\$20. 8086/88 Translator for existing 8080/Z80 programs. New source code is easily edited and assembled using ACT II to produce hex code which is executed by 8086/88 CPU. Emphasizes the extensions and features available in the 8086/88.
 Requires CP/M & 32K RAM. Formats: B, NS, APPL, OB-1, XX

| MORE SOFTWARE | PRODUCT/MANUAL ALONE |
|-------------------------|----------------------|
| TEXTWRITER III | \$125./\$25. |
| SPELLGUARD | \$295./\$20. |
| MCALL | \$ 85./n/a |
| PEARL LEVEL 3 | \$650./\$50. |
| CBASIC2 | \$120./\$25 |
| ULTRASORT-II | \$175./\$20. |
| FABS | \$175./\$20 |
| AMCALL | \$ 95./n/a |
| SELECTOR/86 | \$650./\$35. |
| SELECTOR IV | \$550./\$35 |
| GLECTOR for SELECTOR IV | \$450./\$35 |
| S-BASIC | \$295./\$35 |
| baZic | \$195./\$25. |
| dBASE II | \$695./\$50. |
| MAGIC MENU | \$ 75./n/a |
| w/Spellguard option | \$ 95./n/a |
| SPELL MENU | \$ 95./n/a |
| MOONEY MAESTRO | \$200./n/a |

DEALER INQUIRIES INVITED

FORMAT CODES: B (8" single density IBM soft-sectored) NS (NorthStar DD), MP (Micropolis Mod II/Vector MZ), SB (Superbrain 3 Q), CDOS (8" Cromemco CDOS), TRS2 (TRS-80 Mod II), APPL (Apple II), OB-1 (Osborne-1), XX (Xerox 820), I-5 (IBM 5 1/4")

SOFTWARE
 SOFTWARE
DIGITAL MARKETING
 DIGITAL MARKETING

Access/80 trademark Friends Software. Money Maestro trademark Innosys. Pearl trademark Relational Systems. Pascal/M, ACT, Trans 86, SuperCalc trademarks Sorclin. CBASIC2, CBASIC/86 trademarks Compiler Systems Dalebook II, Milestone, Textwriter III trademarks Organic Software Spellguard trademark ISA CP/M, CP/M-86 trademarks Digital Research Superbrain trademark Inter-tec Data Systems Microstat trademark Ecosoft S-Basic trademark Topaz Programming Spellbinder trademark Lexisoft MCALL, AM-CALL trademarks Micro-Call Services Selector IV, Selector/86, Glector trademarks Micro-App Prices subject to change without notice for shipping add \$7. per item California residents add sales tax Terms: Prepaid check Am. Exp. M/C, VISA or in US CDO (UPS) Prices quoted do not include dealer installation & training Prices and availability subject to change without notice.
 Telex 17-1852 (DIGMKTG WNCK) DEALER INQUIRIES INVITED. OUTSIDE CALIFORNIA CALL (501) 442-0864. INSIDE CALIFORNIA CALL (415) 938-2883.

Japanese Robotics Industry On The Upswing:

The Japanese government is subsidizing its nation's robot makers in the same way that the computer industry was backed ten years ago. In April 1980, the Japan Robot Leasing Company was launched. After one year of operation, it is already renting \$5.5 million worth of robots and expects to raise this to \$12.5 million by the end of next year.

Japanese robot production last year totaled \$375 million and is projected to rise to \$1 billion by 1985. Last year, only 3% of robotic production was exported. One problem with these figures, however, is that they include human-operator manipulative and pick-and-place machines.

About 40% of the robots are used in the automobile industry, about 20% in electrical machinery manufacturing, and about 10% in plastics molding. There are an estimated 130 robot manufacturers in Japan.

Local Networks ... What's Up?

Xerox is staking a big pile of money on the "office of the future" concept using its Ethernet local networking system. The system is intended for lawyers, engineers, analysts, and other professionals wishing to zip documents, data files, graphics, and so forth between offices. Xerox has introduced several pieces of Ethernet equipment of which the latest is the Star workstation. The Star can be used as a stand-alone system or as a communications device between other Stars, file servers, and even non-Xerox equipment via an Ethernet system.

The Star is very impressive. Xerox has invested a

great deal of energy in developing a workstation with a highly intelligent user interface. In fact, a user can know next to nothing about computers and still use it proficiently because a four-hour machine-guided set of lessons is provided.

Star's most striking feature is its high-resolution video display that shows you two pages, side by side, exactly as they will appear in hard copy. You can vary character fonts, size detailed graphics, change gray tones, justify columns, move text on the screen, look into separate areas of different documents, and more. Using a standard keyboard, it has a free-roaming cursor controlled by a "mouse" and uses small graphic symbols to signify functions. No particular language is needed to tell the system what to do.

There is no doubt that the Star is ahead of the times—perhaps too far ahead! Despite support from several other vendors (Intel, Digital Equipment Corporation, and Hewlett-Packard), there is still no standard for exchanging information via Ethernet. At this time, the IEEE Local Networking Standard Committee appears hopelessly deadlocked. So there is no guarantee that a file created on an HP (Hewlett-Packard) computer, for example, will be compatible with Star's file-handling capabilities.

Even bigger problems are looming: each week there seems to be another new local-network system announced. Also, some of the personal-computer makers have indicated that they will introduce their own network systems, which, undoubtedly, will be non-Ethernet-compatible. Thus, we appear headed for chaos, where there will be neither hardware nor software compatibility among vendors.

On top of all of this, local networks are expensive: the Star workstation costs \$17,000. The Ethernet coaxial cable costs an estimated \$2 per foot, plus installation, and an Ethernet file server is more expensive than the Star. Hence, a Xerox Ethernet system appears to be prohibitively expensive for a small business. It is interesting to note that Xerox's new 820 system, with an under-\$3000 price tag, does not include any Ethernet interfacing (of course, it could be introduced as an option).

Everyone is watching to see how well Xerox will do with Ethernet. You can be sure that several manufacturers have networking systems in advanced stages and, if they feel it is worthwhile, will quickly jump into the marketplace. This includes IBM, DEC, several personal-computer makers, and the Japanese.

Data-Processing Law-suits and Awards Increasing:

An estimated 600 computer-related lawsuits are before the courts. This is expected to surge up to 5000 by 1985, placing them second only to personal-injury cases.

A typical computer lawsuit costs a company \$500,000 and takes seven years to complete. Most cases are the result of an adverse relationship between users and vendors. Users appear to be ignorant of what they are buying and expect the vendor to furnish a system to meet all their requirements, but vendors only offer standard systems. So there is a wide gulf between user expectations and vendor capabilities.

Other causes are poor machine reliability and poor system performance. Many suits involve undercapitalized small systems, soft-

ware, and consulting firms that would rather sell the wrong machine or software package than to lose a sale. But vendors counter that purchasers are infatuated with the best and fastest hardware rather than concerning themselves with the problems to be solved. Also, many vendor contracts contain phrases that may waive warranties.

In a recent court case, NCR (National Cash Register) was ordered to pay the Glovatorium (a wholesale suede and leather cleaner) \$2.3 million. The jury found NCR guilty of willfully selling the Glovatorium a mini-computer package it knew would not work. NCR claimed that it was protected from some of the award by a nonconsequential damages clause in the user contract. The judge overruled the clause, which held that NCR was not liable for any loss of business, profits, or consequential damages suffered by the user.

Newspaper Guild Wants Video-Display Terminals Probed:

The president of the Newspaper Guild, Charles A. Perlík Jr., has urged a congressional subcommittee to back testing of possible long-term effects on operators of video-display terminals. Perlík conceded that tests performed by the National Institute for Occupational Health and Safety have found the radiation to be minimal; however, he claimed that the incidence of cataracts among video-terminal users at newspapers was unusually high. He asserted that the test included only a small number of terminals in use. The Guild has arranged for the Mount Sinai School of Medicine to conduct a "wide-ranging study."

1-UPMANSHIP.



We opened our doors with two basic goals:

To distribute as many software packages to as many dealers as possible.

And to make money doing so.

Our success on both counts is the result of hard work, a positive business attitude and a recognition that you, as a retailer, have a right to be treated fairly and honestly by your distributor.

We're 1-up for three good reasons:

1. We always offer a wide selection of the latest and best microcomputer software packages available anywhere. (Why should you have to hunt for what you need?)
2. Our dealer discounts start with quantities of 1. (Remember all those times you just wanted one or two to see how they'd sell?)
3. We don't play The BackOrder Game. (If we can't ship your order within 48 hours we'll let you know, instead of hanging you out to dry.)

If there's anything else we can do for you, just let us know. Because we're 1-up and we intend to stay that way.

Software Distributors, 9929 Jefferson Blvd., Culver City, CA 90230. Telex 4990032 BVHL, ATT: DISCSOFT.

For our dealer info package, call (213) 668-0238 today.

SOFTWARE DISTRIBUTORS

We won't leave you holding the bag.

Computer Crime On The Rise:

Two recently reported crimes involved computers. In the first, a student at San Jose State University was arrested and charged with unauthorized access to systems throughout the state and possibly other countries. The student illegally bypassed the school's security system and used the time to play games with other students, some as far away as Sweden and Taiwan. In the process, he accumulated more than \$7000 in long-distance telephone bills. He was also accused of erasing programs belonging to other students.

In the other case, a former programmer in Louisiana was arrested after admitting that he stole more than \$100,000 in money orders from a system he had programmed. The programmer had been retained by a software house to remove bugs from a software package being prepared for a customer. In the process of "fixing" the program, he altered the software so that he could write checks that were ignored by the system; consequently, the losses were not revealed.

Computer Science Graduates Command High Starting Salaries:

According to a survey conducted by the College Placement Council, this year's computer science college graduates commanded an average starting salary of \$20,000. Only engineers—particularly petroleum specialists—earned more (averaging \$26,000).

UNIX Vs CP/M: There is no doubt that CP/M is the de facto standard for 8-bit microcomputers. It has been implemented on virtually all 8-bit machines, including the

TRS-80, Apple, Heath, Xerox, Wang, Hewlett-Packard, and many of the new Japanese desk-top microcomputers. However, as we move into the 16-bit machine and multiuser/multiprocessing era, CP/M's supremacy is being challenged by UNIX-like operating systems. The battle as to which will be dominant on 16-bit systems is just beginning to develop, and I estimate that it will take another year or two (or possibly three) to determine the victor, if indeed there is one. The battle of words is already raging within the Department of the Army's Readiness Command (DARCOM), in magazines, and on several bulletin-board systems.

The arguments: CP/M currently exists in only one unique version (2.2), compared to at least five versions of UNIX, with more to come when "UNIX-like" systems actually hit the market. UNIX is a multiuser system, while CP/M is a single-user system. File size on UNIX is limited to 1000 megabytes, for CP/M it's 8 megabytes, but both support random-access files. Currently, UNIX runs only on PDP-11-based machines, while CP/M runs on 8080-, 8085-, 8088-, 8086-, and Z80-based machines. UNIX employs a tree-directory structure with an infinite number of levels and path names, whereas CP/M has a dual-level directory structure with a limited path. Both systems allow linking files. There is complete device transparency and redirectability with UNIX, but this is limited in CP/M. UNIX's user interface is contained in a "shell" that is easily replaced. CP/M, however, uses a command control processor that is not easily replaced. UNIX has a complicated command language in comparison to CP/M. UNIX's commands

have redirectable I/O (input/output). Only terminal I/O is redirectable in CP/M. UNIX has more extensive wild cards in addition to interprocessor information transfer (pipes) and coroutines, both of which are lacking in CP/M. UNIX has type-ahead, while CP/M may not. UNIX allows parallel processes but CP/M does not. CP/M is limited to 20 arguments, yet UNIX allows indirect command files with no limit to arguments. Conditional and construct execution of files are permitted only in UNIX. Also, UNIX allows shell variables and command substitution that CP/M does not provide.

Both have proven reliability, but UNIX provides better security. UNIX is written in the C language, and CP/M is written in PL/M and assembler. CP/M appears to have much more public-domain and commercial software available for it than does UNIX.

IBM Market Share Eroding:

In 1956 when 100% of the computer industry was geared toward big mainframes, IBM shipped 55% of all the data-processing equipment and had a handful of competitors. With the introduction of the minicomputer in 1972, the number of competitors increased to over 600. Last year, because of the microcomputer, the number of computer manufacturers rose to 3000. Although IBM has introduced mini- and microcomputers, its share of units shipped has dropped to 25%.

Random News Bits:

Digital Equipment Corporation claims to have more than 100,000 LSI-11 microcomputers in operation. ... Advanced Micro Devices

and Mostek are developing integrated circuits that should reduce the cost of an Ethernet interface from the current \$1000 to under \$100 by 1983. ... Seagate Technology, Scotts Valley, California, has introduced a 12.76-megabyte version of a 5-inch Winchester-disk drive. ... For the second year in a row, Fujitsu reported greater computer sales in Japan than IBM (\$2.8 billion compared to \$1.6 billion). But IBM reported greater net income (\$174 million to \$88 million). ... A recent letter in the *New England Journal of Medicine* reported on a new malady termed "Space Invaders wrist." The symptoms were a reported stiffness and pain in the right wrist. The cause was traced to "a large number of rapid, repetitive arm movements" required to play the Space Invaders game. The optimal treatment is rest. ... Japanese integrated-circuit makers expect to produce 2 million 64 K-bit dynamic memories per month by year's end. ... The largest disk drive yet is being developed by Ibis Systems, Duarte, California: 5 gigabytes. ... A four-color miniature printer that uses 2¼-inch-wide paper will be offered by Alps Electric, Rockville Center, New York. It will cost only \$300. ...

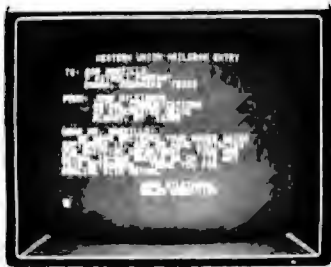
Random Rumors:

Digital Reserach of Texas' Big Board single-board microcomputer is rumored to be the heart of the Xerox 820. ... Xerox is reportedly considering the introduction of an under-\$1000 personal computer. It has already built a prototype containing a Z80, 16 K bytes of programmable memory (expandable to 256 K bytes), 64 K bytes of read-only memory, an 80-character by 25-line color display with

Teach your little Apple to talk to Western Union, Telex and TWX.

Albany

Omaha



Micro-Telegram™ lets your Apple II™ computer access Western Union™ services, worldwide. You can send Mailgrams®. Send and receive TWX®, Telex, and international cables. Receive Infomaster® up-to-the-minute news, stock, foreign exchange, gold, futures, sports, and ski reports. Use your Apple™ to wire money. To send flowers. To check the snow at Sun Valley. To see what the Yen is selling for. To contact over 900,000 TWX and Telex subscribers around the world.

And because it's more intelligent than a mechanical Teletype™ machine, Micro-Telegram lets you edit messages right on the screen, sends them automatically without you in attendance, keeps subscriber directories and distribution lists, prints when you want it to, and asks you in plain English for your commands. Besides, it doesn't clatter and churn out reams of paper.

Call our toll-free number today. And make your little Apple heard 'round the world.

MICROCOM

We make little computers talk big.

Call 800-547-5995, ext. 188, toll-free, for the Micro-Telegram-Apple dealer nearest you. *Dealer inquiries invited.*

Microcom, Inc., 89 State Street, Boston, MA 02109. (617) 367-6362

Apple and Apple II are trademarks of Apple Computer, Inc. Western Union, Infomaster and TWX are trademarks of Western Union, Inc. Teletype is a trademark of the Teletype Corp.

System Log

3:10 P.M. - System Down!

4:45 P.M. - Problem diagnosed using
DIAGNOSTICS II.

Board replaced and
system back on line.

DIAGNOSTICS II

Diagnostics II is SuperSoft's expanded Diagnostic package.

Diagnostics II builds upon the highly acclaimed Diagnostics I. It will test each of the five areas of your system:

Memory Terminal Printer CPU Disk

Every test is expanded.

Every test is "submit"-able. A "submit" file is included in the package which "chains" together the programs in Diagnostics II, achieving an effective acceptance test. All output can be directed to a log file for unattended operation, for example over night testing. Terminal test is now generalized for most crt terminals. A quick-test has been added for quick verification of the working of the system.

The memory test is the best one we have encountered. It has new features, including:

- default to the size of the CP/M Transient Program Area (TPA)
- printout of a graphic memory map
- bank selection option
- burn in test
- memory speed test

Diagnostics-II still includes the only CPU test for 8080/8085/Z80.

A Spinwriter/Diablo/Qume test has been added, which tests for the positioning and control features of the Spinwriter/Diablo/Qume as well as its ASCII printing features. (Serial Interface only)

And, as with all SuperSoft products, a complete online HELP system and user manual is included.

Price: \$100.00 (manual only): \$15.00

Requires: 32K CP/M

CP/M Formats: 8" soft sectored, 5" Northstar, 5" Micropolis
Mod II, Vector MZ, Superbrain DD/QD



All Orders and General Information:
SUPERSOFT ASSOCIATES

P.O. BOX 1628
CHAMPAIGN, IL 61820
(217) 359-2112

Technical Hot Line: (217) 359-2691
(answered only when technician is available)



CP/M REGISTERED TRADEMARK DIGITAL RESEARCH

SuperSoft

First in Software Technology

graphics capabilities, radio-frequency modulator, and liquid-crystal display. ... The Apple IV could be released within the next few months. ... IBM is said to be negotiating to implement BASIC and a VisiCalc-like package on its Displaywriter word-processing system, thereby acknowledging that it is really a general-purpose computer. ... Expect about ten Japanese suppliers to enter the 5-inch hard-disk market by the end of next year, which should cause a softening of prices. ... Rumor has it that a subset of Xerox's Smalltalk has been observed "chatting" at Apple Computer. ...

MAIL: I receive a large number of letters each month as a result of this column. If you write to me and wish a response, please include a self-addressed, stamped envelope.

Sol Libes
POB 1192
Mountainside NJ 07081

BYTE's Bits

Logo License Applications Available

The Massachusetts Institute of Technology has announced that it is accepting applications from software distributors for the licensing of the Apple Logo Educational Software System. A review of the prototype of the system is available in the June 1981 BYTE (see page 36). Companies interested in further licensing information should contact: Patent, Copyright & Licensing Office, MIT, 77 Massachusetts Ave, Rm E19-722, Cambridge MA 02139. ■

LETTER PERFECT T.M. LJK

WORD PROCESSING

ATARI 400/800

APPLE II & II+

EASY TO USE - Letter Perfect is a single load easy to use program. It is a menu driven, character orientated processor with the user in mind. FAST machine language operation, ability to send control codes within the body of the program, mnemonics that make sense, and a full printed page of buffer space for text editing are but a few features. Screen Format allows you to preview printed text. Indented margins are allowed. Data Base Merge with **DATA PERFECT** by LJK, form letters, accounting files and mailing labels only with **MAIL MERGE/UTILITY** by LJK. **FEATURES** - Proportional/Incremental spacing * Right Justification * File Merging * Block movement * Headers * Footers * Print Multiple Copies * Auto Page Numbering * Scroll forward/backward * Search and Replaces * Full cursor control * Underlining * Boldface * Superscripts * Subscripts * Auto page numbering * Insert character/line * Delete character/line * Centering * Horizontal tabs/changeable * Multifunction format line (line spacing - left margin - page width - lines/page - change fonts - top/bot margin adjust) **MUCH MORE!** \$149.95

ATARI VERSION 2.0 #2001

Compatible with Atari DOS. Uses proportional font, right justified with Atari 825/Centronics* 737, 739 printers. Uses EPSON MX* Series + Graftrax/italicized font. Can mix type fonts on same page; mix boldface and enhanced font in same line with justification. Can be used with 16K Atari/400.

"Compared to the price of many other word processors, this package is a steal. It does everything the advertisement claims and more. On top of this the software is very easy to use." A.N.A.L.O.G. MAGAZINE

APPLE VERSION 5.0 #1001

DOS 3.3 compatible - Use 40 or 80 column interchangeably (Smarterm - ALS; Videoterm-Videx; Full View 80 - Bit 3 Inc.; Vision 80 - Vista; Sup-R-Term - M&R Ent.) Reconfigurable at any time for different video, printer, or interface. USE HAYES MICROMODEM II*LCA necessary if no 80 column board, need at least 24 K of memory. Files saved as either Text or Binary. Shift key modification allowed. Data Base Merge compatible with **DATA PERFECT*** by LJK.

"For \$150, Letter Perfect offers the type of software that can provide quality word processing on inexpensive micro-computer systems at a competitive price." INFOWORLD

DATA PERFECT T.M. LJK

Complete Data Base System. User orientated for easy and fast operation. 100% Assembly language. Easy to use. You may create your own screen mask for your needs. Searches and Sorts allowed, Configurable to use with any of the 80 column boards of Letter Perfect word processing, or use 40 column Apple video. Lower case supported in 40 column video. Utility enables user to convert standard files to Data Perfect format. Complete report generation capability. Much More!

EDIT 6502 T.M. LJK

This is a coresident - two pass **ASSEMBLER, DISASSEMBLER, TEXT EDITOR, and MACHINE LANGUAGE MONITOR**. Editing is both character and line oriented. Disassemblies create editable source files with ability to use predefined labels. Complete control with 41 commands, 5 disassembly modes, 24 monitor commands including step, trace, and read/write disk. Twenty pseudo opcodes, allows linked assemblies, software stacking (single and multiple page) plus complete printer control, i.e. pagination, titles and tab setting. User can move source, object and symbol table anywhere in memory. Feel as if you never left the environment of BASIC. Use any of the 80 column boards as supported by **LETTER PERFECT**, Lower Case optional with LCG.

LJK DISK UTILITY APPLE \$29.95

This menu driven program allows the user to manipulate a variety of different file types. Binary, Text, and Source files may be easily converted into each other. The program may be used with **APPLESOFT***, **VISCALC***, and other programs. These program files may be readily adapted for multiple use including editing with **LETTER PERFECT** word processings.

APPLE & ATARI DATA BASE MANAGEMENT \$99.95

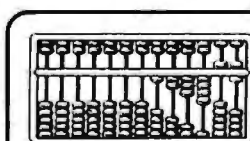
MAIL MERGE/UTILITY APPLE & ATARI \$29.95

This menu driven program combined with **LETTER PERFECT** allows user to generate form letters and print mailing labels. With the Atari, you may **CONVERT ATARI DOS FILES**, or Visicalc files compatible for editing with **LETTER PERFECT**. Utility creates Data Base files for Letter Perfect.

LOWER CASE CHARACTER GENERATOR \$34.95

!@#\$%^&*~ - /0123456789 : ; < > ? [\] ^ _ ` a b c d e f g h i j k l m n o
p q r s t u v w x y z { | } ~

Lower Case Character Generator for the Rev. 7, Apple II or II+ computers. When installed, this Eprom will generate lower case characters to the video screen. Lower case characters set has two dot true descenders. Installation instruction included. Manual includes listing of software for full support and complete instructions for shift key modification. Compatible with **LETTER PERFECT**.



LJKTM

ENTERPRISES INC

LJK ENTERPRISES INC.
P.O. Box 10827
St. Louis, MO 63129
(314) 846-6124

**DEALER
INQUIRES
INVITED**

*Trademarks of: Apple Computer - Atari Computer - Epson America - Hayes Microcomputers - Personal Software - Videx - Bit 3 Inc. - M&R Ent. - Advanced Logic Systems - Vista Computers

DYNACOMP

Quality software for*:

ATARI
PET
APPLE II Plus

TRS-80 (Level II)**
NORTH STAR
CP/M Disks/Diskettes

CARD GAMES

BRIDGE 2.0 (Available for all computers) Price: \$17.95 Cassette/\$21.95 Diskette
An addictive version of this most popular of card games. This program has BIDS and PLAYS either contract or duplicate bridge. Depending on the contract, your computer opponents will either play the offense OR defense. If you bid too high, the computer will double your contract! BRIDGE 2.0 provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice. See the software review in 80 Software Critique. Rated #1 by Creative Computing.

HEARTS 1.5 (Available for all computers) Price: \$12.95 Cassette/\$16.95 Diskette
An exciting and entertaining computer version of this popular card game. Hearts is a trick-taken game in which the purpose is not to take any hearts or the queen of spades. Play against two computer opponents who are second to none in their playing strategies. HEARTS 1.5 is an ideal game for introducing the uninitiated (your spouse) to computers. See the software review in 80 Software Critique.

STUD POKER (Atari only) Price: \$11.95 Cassette/\$15.95 Diskette
This is the dapper gambler's card game. The computer deals the cards one at a time and you (and its computer) bet on what you see. The computer does not cheat and usually beats the odds. However, it sometimes bluffs! Also included is a five card draw poker betting practice program. This package will run on a 16K ATARI. Color, graphics, sound. See review in COMPUTE.

POKER PARTY (Available for all computers) Price: \$17.95 Cassette/\$21.95 Diskette
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other computer players. Each of three players you will get to know (them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple Cassette and diskette version require a 32 K for larger Apple II.

CRIBbage 2.0 (TRS-80 only) Price: \$14.95 Cassette/\$18.95 Diskette
This is simply the best cribbage game available. It is an excellent program for the cribbage player in search of a worthy opponent as well as for the novice wishing to improve his game. The graphics are superb and assembly language routines provide rapid execution. See the software review in 80 Software Critique.

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Atari, North Star and CP/M only) Price: \$19.95 Cassette/\$23.95 Diskette

This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufactures three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) Price: \$17.95 Cassette/\$21.95 Diskette
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real aircraft. You can practice instrument approaches and navigation using radio and compass headings. The more advanced flyer can also perform loops, half-yells and similar acrobatic maneuvers. Although this program does not employ graphics, it is a racing and very addictive. See the software review in COMPUTRONICS. Runs on 16K Atari.

VALDEZ (Available for all computers) Price: \$15.95 Cassette/\$19.95 Diskette
VALDEZ is a computer simulation of supersonic navigation in the Prince William Sound/Valdez Narrows region of Alaska (included in this simulation) is a realistic and sensitive 256 x 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The position of the ship itself is accurately modeled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (including tankers and drilling rigs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software review in 80 Software Critique.

BACKGAMMON 2.0 (Atari, North Star and CP/M only) Price: \$14.95 Cassette/\$18.95 Diskette
This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play against itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating evenings of backgammon play.

CHECKERS 3.0 (PET only) Price: \$16.95 Cassette/\$20.95 Diskette
This is one of the most challenging checkers programs available. It has 10 levels of play and allows the user to change skill levels at any time. Although providing a very tough game at level 4-8, CHECKERS 3.0 is practically unbeatable at levels 6 and 10.

CHESS MASTER (North Star and TRS-80 only) Price: \$19.95 Cassette/\$23.95 Diskette
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be reset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users. See review in COMPUTING.

LEM LANDER (32K Apple Disk only) Price: \$18.95 Diskette
Plan your LEM LANDER to a safe landing on any of nine different worlds hanging from smooth to treacherous. The game paddles are used to control craft altitude and thrust. This is a real-time high res challenge!

FOREST FIRE (Atari only) Price: \$16.95 Cassette/\$20.95 Diskette
Using excellent graphics and sound effects, this simulation puts you in the middle of a forest fire. Your job is to direct operations to put out the fire while compensating for changes in wind, weather and terrain. Not providing valuable structure can result in startling penalties. Life-like variables are provided to make FOREST FIRE! very suspenseful and challenging. No two games have the same setting and there are 3 levels of difficulty.

NOMINOES JIGSAW (Atari, Apple and TRS-80 only) Price: \$16.95 Cassette/\$20.95 Diskette
A jigsaw puzzle on your computer? Complete the puzzle by selecting your pieces from a table consisting of 60 different shapes. NOMINOES JIGSAW is a versatile programming effort. The graphics are superb and the puzzle will challenge you with its three levels of difficulty. Scoring is based upon the number of guesses taken and by the difficulty of the board set-up. See review in ELECTRONIC GAMES.

MONARCH (Atari only) Price: \$11.95 Cassette/\$15.95 Diskette
MONARCH is a fascinating economic simulation regarding you in survival as a farmer (as your nation's leader). You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy.

CHOMPLO (Atari only) Price: \$11.95 Cassette/\$15.95 Diskette
CHOMPLO is really two challenging games in one. One is similar to NIM; you must lose all part of a cookie, but avoid taking the poisoned portion. The other game is the popular board game XEVRENI. It fully uses the Atari's graphics capabilities, and is hard to beat. This package will run on a 16K system.

SPACE LANES (Available for all computers) Price: \$24.95 Diskette
SPACE LANES is a simple but exciting space transportation game which involves up to four players (including the computer). The object is to form and expand space transportation companies in a competitive environment. The goal is to amass more net worth than your opponent. The economics include stock purchases and company mergers. Watch your wealth grow!

*ATARI, PET, TRS-80, NORTHSTAR, CP/M and IBM are registered trademarks and/or trademarks.

**Except where noted, all models of software is available for the Model 10. TRS-80 diskettes are not supplied with DOS or BASIC.

DYNACOMP OFFERS THE FOLLOWING

- Widest variety
- Guaranteed quality
- Fastest delivery
- Friendly customer service
- Free catalog
- 24 hour order phone

AND MORE...

STARTREK 3.2 (Available for all computers) Price: \$11.95 Cassette/\$15.95 Diskette
This is the classic Star Trek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without waiting while star attacking stations in other quadrants. The Klingons also attack with both light and heavy cruisers and move faster than the Enterprise. The Enterprise is harassed by three heavy cruisers and a starbase S.O.S. is received! The Klingons get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

BLACK HOLE (Apple only) Price: \$14.95 Cassette/\$18.95 Diskette
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the gravity well that tidal stress destroys the probe. Control of the craft is a robotically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

SPACE TILT (Apple and Atari only) Price: \$10.95 Cassette/\$14.95 Diskette
Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound smoky? Hear what the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in the habit-forming action game.

MOVING MAZE (Apple and Atari only) Price: \$10.95 Cassette/\$14.95 Diskette
MOVING MAZE employs the game paddles to direct a pack from one side of a maze to the other. However, the maze is dynamically (and randomly) built and is constantly being modified. The objective is to cross the maze without touching (or being hit by) a wall. Scoring is by an elapsed time indicator, and three levels of play are provided.

ALPHA FIGHTER (Atari only) Price: \$14.95 Cassette/\$18.95 Diskette
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy five alien warships landing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO (landing); hit the UFO's jet by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

THE RINGS OF THE EMPIRE (Atari only) Price: \$10.95 Cassette/\$14.95 Diskette
The empire has developed a new battle station protected by rotating rings of energy. Each time you blast through the rings and destroy the station, the empire develops a new station with more protective rings. This exciting game runs on 16K systems, employs extensive graphics and sound and can be played by one or two players.

INTRUDER ALERT (Atari only) Price: \$16.95 Cassette/\$20.95 Diskette
This is a fast paced graphics game which places you in the middle of the "Dreadnaught" leaving just 1000 seconds. The dreadnaught has been alerted and is directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

GIANT SLALOM (Atari only) Price: \$14.95 Cassette/\$18.95 Diskette
This real-time action game is guaranteed addictive! Use the joystick to control your path through alien courses consisting of both open and closed gates. Choose from different levels of difficulty, race against other players or simply take practice runs against the clock. GIANT SLALOM will run on 16K systems.

TRIPLE BLOCKADE (Atari only) Price: \$14.95 Cassette/\$18.95 Diskette
TRIPLE BLOCKADE is a two-to-three player graphics and sound action game. It is based on the classic video arcade game which millions have enjoyed. Using the Atari joystick, the object is to direct your blockading line around the screen without running into your opponent(s). Although the concept is simple, the combined graphics and sound effect lead to "high anxiety".

GAMES PACK I (Available for all computers) Price: \$19.95 Cassette/\$24.95 Diskette
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, GRAF, HERBERRACK, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a consistent menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) Price: \$16.95 Cassette/\$20.95 Diskette
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DAUCEY, LIFE, WUMPIUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS. Why pay \$7.95 or more per program when you can buy a DYNACOMP collection for just \$19.95?

MODN PROBE (Atari and North Star only) Price: \$11.95 Cassette/\$15.95 Diskette
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus the rate of descent and approach angle.

SPACE TRAP (Atari only, 16K) Price: \$14.95 Cassette/\$18.95 Diskette
This graphic "shoot 'em up" arcade game places you near a black hole. You control your spacecraft using the joystick and attempt to blast as many of the alien ships as possible before the black hole closes about you.

ADVENTURE

CRANSTON MANOR ADVENTURE (North Star and CP/M only) Price: \$21.95 Diskette
At last! A comprehensive Adventure game for North Star and CP/M system. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR, where you attempt to gather fabulous treasures. Lusting in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be suspended at any time and the status stored on diskette.

GUMBALL RALLY ADVENTURE (North Star only, 48K) Price: \$21.95 Diskette
Take part in this outlaw race from the east coast to the west coast. The goal is to find your way to the finish line while maintaining the highest possible speed. You may choose one of five cars available at the garage. The choice will affect your speed and range. Remember to take spare parts and don't get caught speeding!

SPEECH SYNTHESIS

DYNACOMP is now distributing the new and revolutionary TYPE 'N TALK™ (TNT) speech synthesizer from Vocox. Simply connect TNT to your computer's serial card, enter text from the keyboard and hear the words spoken. TNT is the easiest-to-program speech synthesizer on the market. It uses the least amount of memory and provides the most flexible vocabulary available anywhere!

Price: \$329.95 (Please add \$4.00 for shipping and handling)

TNT Software

The following DYNACOMP programs are available for use with TNT:

STUD POKER (Atari, 24K)
NOMINOES JIGSAW (Atari, 24K)
TEACHERS PET I (Atari and North Star)
BRIDGE 2.0 (North Star)
CHOMPLO (Atari, 24K)

TALK TO ME (TNT Atari only, 34K) Price: \$24.95 Cassette/\$28.95 Diskette
This program presents a superb tutorial on speech synthesis using the Atari 800 and TYPE 'N TALK™. TALK TO ME will illustrate natural word generation as well as phoneme generation. The documentation includes many helpful programming tips.

Please specify 'TNT' versions when ordering.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 40 countries). During the past two years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique and A.N.A.L.O.G. Our customer support is as fine as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

BUSINESS and UTILITIES

SPELLGUARD™ (CP/M only) Price: \$219.95 Disk
SPELLGUARD™ is a revolutionary new product which increases the value of your current word processing system. WORD STAR, MAGIC WAND, ELECTRIC PENCIL, TEXTED EDITOR II and others. Written entirely in assembly language, SPELLGUARD™ readily adds the user in eliminating spelling and typographical errors by comparing each word of the text against a dictionary (expandable to over 30,000 of the most common English words). Words appearing in the text but not found in the dictionary are flagged for easy identification and correction. Most administrative staff familiar with word processing equipment will be able to use SPELLGUARD™ in only a few minutes.

MAIL LIST 1.2 (Apple, Atari and North Star diskette only) Price: \$39.95
This program is unmatched in its ability to store a maximum number of addresses on one diskette (maximum of 1183 per disk etc. more than 2000 for "double density" systems). Its many features include alphabetic and zip code sorting, label printing (1, 2, or 3 ips), merging of files and a unique keyboard sensitive routine which retrieves entries by a virtually limitless selection of user defined codes. Mail List 1.2 will even find and delete duplicate entries. A very valuable program!

FORM LETTER SYSTEMS rev. 2 (Atari, North Star and Apple Diskette only) Price: \$34.95
FORM LETTER SYSTEM (FLS) is the ideal program for creating and editing form letters and address lists. It contains an easy-to-use text editor which provides fully justified text. Special codes are used in the address list to obtain personalized salutations. Form letters are produced by automatically inserting each address into a preformulated portion of your letter. FLS is completely compatible with MAIL LIST 2.2, which may be used to manage and sort your address files.
FLS and MAIL LIST 2.2 are available as a combined package for \$39.95.

SORTIT (North Star only) Price: \$29.95 Diskette
SORTIT is a general purpose sorting program written in IBM assembly language. This program will sort sequential data files generated by NORTH STAR BASIC. Primary and optional secondary keys may be numeric or one to nine character strings. SORTIT is easily used with files generated by DYNACOMP's MAIL LIST program and is very versatile in its capabilities for all other BASIC data file sorting.

PERSONAL FINANCE SYSTEM (Atari and North Star only) Price: \$34.95 Diskette
PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by date, and display information on expenditures by any of 30 user defined codes. PFS also provides a program monthly bill generator and expense reports by category. This powerful package requires only one disk drive, minimum memory (24K Atari, 32K North Star) and will store up to 800 records per disk (and over 1000 records per disk by making a few simple changes to the program). You can record checks plus cash expense so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations.

FAMILY BUDGET (Apple only) Price: \$34.95 Diskette
FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 31 different expense accounts as well as to 5 payroll and tax accounts. Data is easily reviewed giving you complete control over an otherwise complicated (and unorganized) subject.

INTELINK (Atari only) Price: \$49.95 Diskette
This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data source (e.g., the SOURCE or MICRO) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and then the server charge. You may also request the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support test cabinet and later "up-loaded" to another computer, making the Atari a very smart resource. Even Atari BASIC programs may be up-loaded. A compressed file may be built off-line and used later as a controlling input for a user-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing AND it will add up to saving both connect time and your time.

TEXT EDITOR II (CP/M) Price: \$219.95 Diskette/\$33.45 Disk
This is the second release version of DYNACOMP's popular TEXT EDITOR I and contains many new features. With TEXT EDITOR II you may build text files in either text or assembly mode. Blocks of text may be appended, inserted or deleted. Files may be saved on disk/diskette in right justified/constant format to be later printed by either TEXT EDITOR II or the CP/M ED facility. Further, ASCII CP/M files (including BASIC and assembly language programs) may be read by the editor and processed. In fact, text files can be built using ED and later formatted using TEXT EDITOR II. All in all, TEXT EDITOR II is an impressive, easy to use, but very flexible editing system.

DPLE (Atari and North Star diskette only) Price: \$19.95
This handy program allows North Star and Atari disk users to maintain a specialized data base of all files and programs in the stack of disks which inventory accumulation. DPLE is easy to set up and use. It will organize your disks to provide efficient locating of the desired file or program.

FINDIT (North Star only) Price: \$19.95
This is a three-in-one program which maintains information accessible by keywords of three types: Personal (e.g. last names), Commercial (e.g. plumbers) and Reference (e.g. magazine articles, recent albums, etc.) In addition to keyword searches, there are birthday, anniversary and appointment searches (for the personal records) and appointment searches for the commercial records. Reference records are accessed by a single keyword or by cross-referencing two or three keywords.

SHOPPING LIST (Atari and North Star only) Price: \$13.95 Cassette/\$16.95 Diskette
SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and listing data is very easy. Run with 16K.

TAX OPTIMIZER (North Star only) Price: \$295.00
The TAX OPTIMIZER is an easy-to-use, menu oriented software package which provides a convenient means for analyzing various income tax returns. The program is designed to provide a much needed data entry system. Income tax is completed by all tax methods (regular, separate, minimum and alternate minimum tax). The user may immediately observe the effect of certain financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files.

EDUCATION

HODGE PODGE (Apple only, 48K Applesoft or Integer BASIC) Price: \$19.95 Cassette/\$33.95 Diskette
Let HODGE PODGE be your child's baby sitter. Presuming you are on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1 to 9. HODGE PODGE is a non-threatening teaching device which brings a new dimension to the world of children in education.

TEACHER'S PET I (Available for all computers) Price: \$11.95 Cassette/\$15.95 Diskette
This is the first of DYNACOMP's educational packages. Primarily intended for pre-school to grade 3, TEACHER'S PET provides the young student with coloring practice, letter-word recognition and three levels of math skill practice.

MISCELLANEOUS

CRYSTALS (Atari only) Price: \$ 9.95 Cassette/\$13.95 Diskette
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari.

NORTH STAR SOFTWARE EXCHANGE (NSS) LIBRARY
DYNACOMP now distributes the 23 volume NSS Library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSS collection.
Price: \$9.95 each/\$3.95 each 10 more!
The complete collection may be purchased for \$149.95

DYNACOMP CASSETTES

DYNACOMP now offers high-quality DYNACOMP brand name C-30 cassettes for consumer use. Each cassette is guaranteed to be defect-free.

Box of 10 cassettes: \$15.95 postpaid
Box of 20 cassettes: \$29.95 postpaid

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (160Kbit density compatible) disks. Additionally, most programs can be obtained on standard (IBM format) 8" CP/M floppy disks for systems running under MBASIC.

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) Price: \$39.95 Cassette/\$43.95 Diskette
DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function of choice (from a menu of filter forms). The filter forms are subsequently converted into sum-of-products representation coefficients which permit rapid data processing. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. Three filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter function. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) Price: \$19.95 Cassette/\$23.95 Diskette
This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) Price: \$39.95 Cassette/\$43.95 Diskette
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) Price: \$19.95 Cassette/\$23.95 Diskette
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and consists of engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) Price: \$34.95 Cassette/\$38.95 Diskette
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced in order. The original data is stored and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of \$49.95 (three cassettes) and \$59.95 (three diskettes).

REGRESSION I (Available for all computers) Price: \$19.95 Cassette/\$23.95 Diskette
REGRESSION I is a unique and essential tool for statistical work-determination analysis, an extensive internal library of fitting functions; data editing; automatic data and curve plotting; a statistical analysis (eg: standard deviation, correlation coefficient, etc.) and much more. In addition, new files may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) Price: \$19.95 Cassette/\$23.95 Diskette
PARAFIT is designed to handle those cases in which the parameters are interdependent nonlinearly in the fitting function. The user simply enters the functional form, including the parameters (such as AG, etc.) at 10 to 90 user definable points. Data and results may be manipulated and plotted with REGRESSION I. (The REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions).

MULTILINEAR REGRESSION (MLR) (Available for all computers) Price: \$24.95 Cassette/\$28.95 Diskette
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides any (or all) of the usual, important, editing and plotting functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for \$31.95 (three cassettes) or \$41.95 (three diskettes).

ANOVA (Available for all computers) Price: \$39.95 Cassette/\$43.95 Diskette
ANOVA is the ANOVA analysis of variance procedure has been limited in the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those concerned with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^k-P fractional designs. For those unfamiliar with ANOVA, don't worry! The accompanying documentation was written in a casual, friendly way for a professional in the subject and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)
DYNACOMP is the exclusive distributor for the new books in the popular BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 by F. Ruchdeschel (see advertisement in BYTE magazine). These subroutines have been assembled according to chapter included with each collection as a menu program which access and demonstrates each subroutine.
Volume 1:
Collection #1: Chapters 2 and 3 - Data and function plotting; complex variables and functions.
Collection #2: Chapter 4 - Essential matrix and vector operations.
Collection #3: Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); worst approximation.
Price per collection: \$14.95 Cassette/\$18.95 Diskette
All three collections are available for \$39.95 (three cassettes) and \$49.95 (three diskettes).

Volume 2:
Collection #1: Chapter 1 - Linear, polynomial, multidimensional, non-linear least squares.
Collection #2: Chapter 2 - Series approximation techniques (interpolation, division, reversion, shifting, etc.).
Collection #3: Chapter 3 - Functional approximations by iteration and recursion.
Collection #4: Chapter 4 - COORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
Collection #5: Chapter 5 - Table interpolation, differentiation and integration (Newton, Lagrange, spline).
Collection #6: Chapter 6 - Methods for finding the real roots of functions.
Collection #7: Chapter 7 - Methods for finding the complex roots of functions.
Collection #8: Chapter 8 - Optimization by steepest descent.
Price per collection: \$14.95 Cassette/\$18.95 Diskette
All eight collections are available for \$99.95 (eight cassettes) and \$129.95 (eight diskettes). Because the texts are a vital part of the documentation, BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 are available from DYNACOMP.

BASIC SCIENTIFIC SUBROUTINES, Vol 1 (219 pages): \$19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol 2 (290 pages): \$23.95 + \$1.30 postage
See reviews in KILBOURD and Dr. Dobbs.

ROOTS (Available for all computers) Price: \$29.95 Cassette/\$34.95 Diskette
In a nutshell, ROOTS simultaneously determines all the zeroes of a polynomial having real coefficients. There is no limit on the degree of the polynomial, and because the procedure is iterative, the accuracy is generally very good. The initial guesses are required as input, and the calculated roots are substituted back into the polynomial and the resultant displayed.

ACTIVE CIRCUIT ANALYSIS (ACAP) (Atari Only) Price: \$24.95 Cassette/\$28.95 Diskette
ACAP is the analog circuit designer's answer to LOGIC SIMULATOR. With ACAP you may analyze the response of an active or passive component circuit (e.g., a transistor amplifier, band pass filter, etc.) The circuit may be probed at equal steps in frequency, and the resulting complex (i.e., real and imaginary) voltages at each component (joints) examined. By plotting the magnitude of these voltages, the frequency response may be completely determined with respect to both amplitude and phase. In addition, ACAP permits a statistical analysis of the response of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Simply describe the circuit in terms of the elements and their placement, and accurate circuit descriptions may be saved into cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library.

LOGIC SIMULATOR (Apple only; 48K RAM) Price: \$24.95 Cassette/\$28.95 Diskette
With LOGIC SIMULATOR you may easily test your complicated digital logic design with respect to 3200 set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, JK and D Flip-flops, and one-shots. The response of the output is available every clock cycle. Inputs may be clocked in with varying clock cycle lengths/delays and delays may be introduced to probe for glitches and race conditions. At the user's option, a timing diagram for any given set of nodes may be plotted using HILES graphics. Save your troubleshooting until the circuit is checked by LOGIC SIMULATOR.

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include (if appropriate) company information, if paying by VISA or MasterCard, include all numbers on card.

Shipping and Handling Charge Delivery All orders (including books) are sent First Class
Within North America: Add \$1.50
Outside North America: Add 10% (Air Mail)

Quantity Discounts (Minimum 10% when ordering 3 or more programs. Dealer discount schedules are available upon request.)

8" CP/M Disk Add \$1.50 to the base diskette price for each 8" floppy disk (IBM soft secured CP/M format). Program run under Microsoft MBASIC or BASIC-80.

16" CP/M Disk All software available on 16" CP/M disks is also available on 5 1/4" disks. North Star format.

Ask for DYNACOMP programs at your local software dealer. Write for detailed descriptions of these and other programs from DYNACOMP.

DYNACOMP, Inc. (Dept. B)

1427 Monroe Avenue

Rochester, New York 14618

24 hour order phone: (716)442-8731 recording

Office phone (9AM-5PM EST): (716)442-8960

New York State residents please add 7% NY sales tax.



The Atari Tutorial

Part 3: Player-Missile Graphics

Chris Crawford
Atari Inc
1265 Borregas Ave
POB 427
Sunnyvale CA 94086

Animation is an important capability of any personal computer system. Activity on the screen adds greatly to the excitement and realism of any program. Certainly, animation is crucial to the appeal of most computer games. More important, an animated image can convey information with more impact and clarity than a static image. It can draw attention to an item or event of importance. It can directly show a dynamic process, rather than indirectly talk about it. Animation must accordingly be regarded as an important element of the graphics capabilities of any computer system.

The conventional way to implement animation with personal computers is to move the image data through the screen memory area. This is a two-step process. First, the program must erase the old image by writing background values (ie: the values of the image "under" the moving one) to the memory containing the current image. Then the program

This article (except for the appendices) appears in slightly different form in De Re Atari, to be published by Atari, Inc, and is reproduced with its express permission.

must write the image data to the memory corresponding to the new position of the image. By repeating this process over and over, the image appears to move on the screen.

The essence of the problem of playfield animation: the screen image is two-dimensional, while the image in memory is one-dimensional.

There are two problems with this technique. First, if the animation is being done in a graphics mode with large pixels (picture elements), the motion will not be smooth; the image will jerk across the screen. With other computers, the only solution is to use a graphics mode with smaller pixels (higher resolution). The second problem is much worse. The screen is a two-dimensional image, but the screen memory is organized one-dimensionally. An image that is contiguous on the screen will not be contiguous in the screen memory. The discrepancy is illustrated in figure 1.

The significance of this discrepancy is not obvious until you try to write a program to move such an image. Look how the bytes that make up the image are scattered through memory. To erase them, your program must calculate their addresses. This calculation is not always easy to do. The assembly code just to access a single screen byte at screen location (XPOS, YPOS) would be as shown in listing 1 (this code assumes 40 bytes per screen line).

Clearly, this code to access a screen location is too cumbersome. It is not the most elegant or fastest code to solve the problem. A good programmer could take advantage of special circumstances to make the code more compact or elegant. The point of this is that accessing pixels on a screen takes a lot of computing. The routine in listing 1 takes about 100 machine cycles to access a single byte on the screen. To move an image that occupies, say 50 bytes, would require 100 accesses, 10,000 machine cycles, or roughly 10 ms. This may not sound like much, but if you want to achieve smooth motion, you have to move the object every 17 ms. If there are other objects to move or calcula-

OUR SECOND GENERATION DP-NET

We at Delta Products have been involved in 'NETWORKING SYSTEMS' for the past eighteen months. During this time we delivered our first net systems to beta test sites. These closely monitored field installations provided invaluable data, which Delta Products has incorporated into the design of our second generation of DP-NET systems.

SECOND GENERATION DP-NET

The S-4500 DP-NET system will support from one to ten users, and provide each with their own Z-80 CPU and 64K of ram memory. Each user will also have access to 40 megabytes of hard disk storage, 17.2 megabytes of file managed tape backup, and floppy disk.

TRUE RECORD & FILE LOCKOUT

By simply reading in the entire record or file you wish to protect, the DP-NET 'DISK SELECTIVE LOCKOUT' guarantees complete data integrity. The DP-NET also allows the use of today's popular micro applications languages (i.e., Cbasic®, Mbasic®, Cobol®, etc.), without having to compensate for the problems inherent to these languages in the multi-user environment, while maintaining CPM compatibility.

INTERACTIVE FAMILY OF SYSTEMS

The S-4500 is but one of many DP-NET configurations utilizing parallel and/or serial communication links. Delta Products also manufactures a wide range of conventional single and multi-user systems operating under CP/M and MP/M. Single and multi-user systems can be upgraded to DP-NET's, because their basic components are utilized in our network systems. We have intentionally developed an interactive family of systems that are completely configurable and compatible, never limiting the ability to adapt to a modification in the application. Delta Products systems are available thru a worldwide network of selective distributors and dealers. Call for the name and number of the one nearest to you.



S-4500



See This System @ Comdex Booth #'s 285, 287

*Cbasic is a registered trademark of Compiler Systems.
Mbasic and Cobol are registered trademarks of Microsoft.
CP/M and MP/M are registered trademarks of Digital Research.*

1981

MICRO-TAX

Microcomputer Taxsystems, Inc.

Are you looking for the best tax package in the USA? Call
MICRO-TAX
 For the 1981 Tax System

- Level 1: 23 Schedules and Forms
 : Multiple Clients
\$250 : Prints IRS Approved Forms
 - - -
- Level 2: 30 Schedules and Forms
 : Multiple Clients
 : Prints IRS Approved Forms
\$1,000 : Prints on IRS Forms or Overlays
 : Depreciation System
 : State Tax Interface
 : Integrated Data Base
 : Batch Compute and Print
 - - -
- Level 3: All Features of Levels 1 and 2
 plus Partnership Forms and
\$1,750 Schedules
 - - -

All levels operate under most CP/M* formats including Apple*
 Compiled Microsoft Basic.

State Income Tax Systems
 are available.

Consider the advantages this
 State-of-the-Art package
 can bring you:

- Complete System
- Versatility
- Complete In-Office Security
- Time Saving
- Pre Year-end Tax Planning

Call or write today for additional
 information.
 Circle 275 for MICRO-TAX.



MICRO-TAX

Microcomputer Taxsystems, Inc.

22713 Ventura Blvd., Suite F
 Woodland Hills, CA 91364
(213) 704-7800

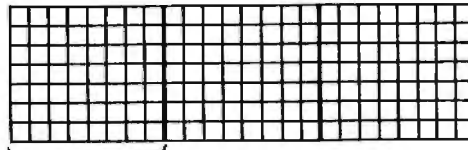
Available from

WESTICO

  (203) 853-6880
 and at most Professional Computer Retailers

*CP/M is a TM of Digital Research
 *Apple is a TM of Apple Computer, Inc.

HEXADECIMAL
 REPRESENTATION
 OF IMAGE



00 00 00
 00 99 00
 00 8D 00
 00 FF 00
 00 8D 00
 00 99 00
 00 00 00

1 BYTE

SPACING OF BYTES IN MEMORY

00 00 00 00 99 00 00 8D 00 00 FF 00 00 8D 00 00 99 00 00 00 00 00

IMAGE BYTES SCATTERED THROUGH RAM

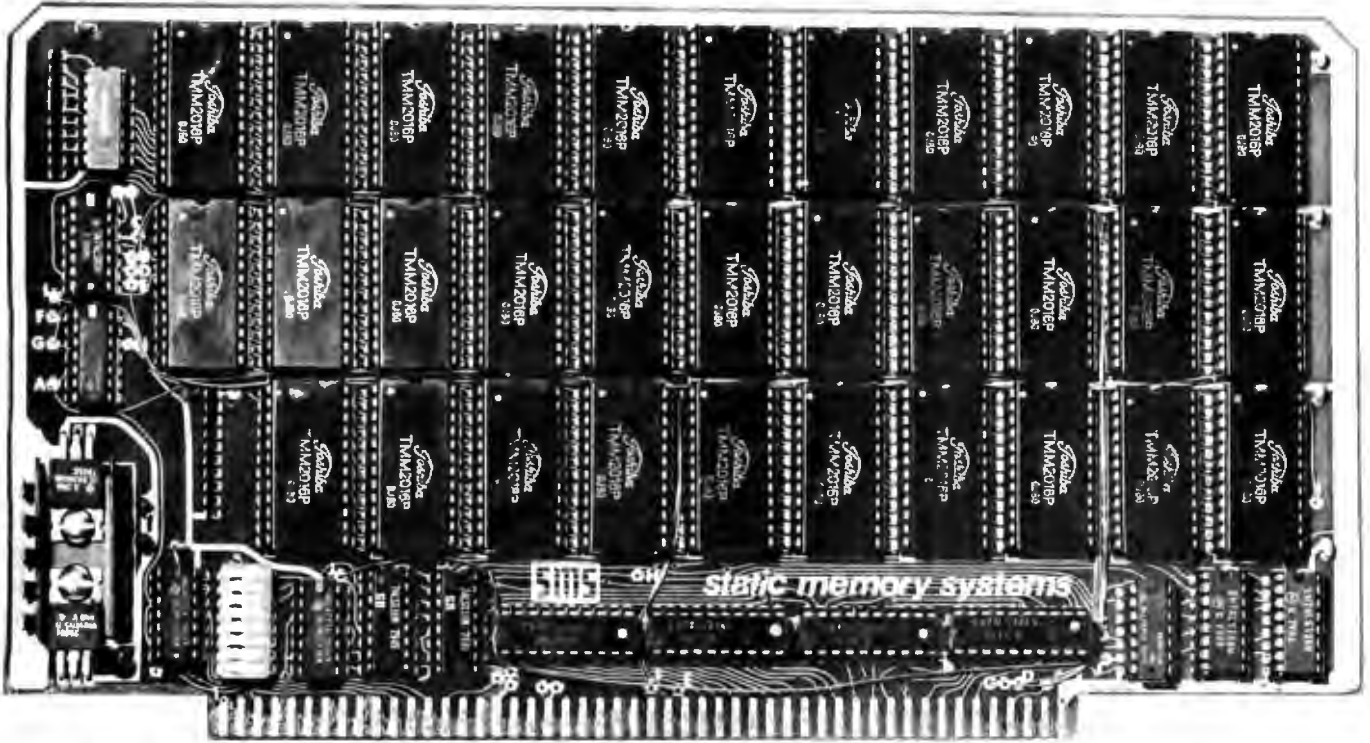
Figure 1: The problem of moving a bit-mapped graphics image. Although the image is two-dimensional, its representation is scattered through one-dimensional memory. The software necessary to change the appropriate memory locations slows down animation considerably.

Listing 1: A 6502 assembly-language program to move a bit-map image within a graphics screen that uses 40 bytes per line of graphics.

```

LDA  SCRNRM           Address of beginning of screen RAM
STA  POINTR          zero-page pointer
LDA  SCRNRM + 1      high-order byte of address
STA  POINTR + 1      high-order pointer
LDA  #$00            temporary register
STA  TEMPA + 1       vertical position
LDA  YPOS             times 2
ASL  A               shift carry into TEMPA + 1
ROL  TEMPA + 1       times 4
ASL  A               shift carry again
ROL  TEMPA + 1       times 8
ASL  A               shift again
ROL  TEMPA + 1       save YPOS*8
LDX  TEMPA + 1       into TEMPB
STX  TEMPB + 1       low byte
STA  TEMB            times 16
ASL  A               times 32
ROL  TEMPA + 1
CLC
ADC  TEMPB           add in YPOS*8 to get YPOS*40
STA  TEMPB
LDA  TEMPA + 1       now do high-order byte
ADC  TEMPB + 1
STA  TEMPB + 1
LDA  TEMPB           TEMPB contains the offset from top of screen to pixel
CLC
ADC  POINTR
STA  POINTR
LDA  TEMPB + 1
ADC  POINTR + 1
STA  POINTR + 1
LDY  XPOS
LDA  (POINTR),Y
    
```

THE LAST MEMORY



64K STATIC RAM/EPROM BOARD

At last a 64K *STATIC* memory board for S100 systems. But it's not just a 64K static RAM board, *EPROM's* can also be intermixed with RAM making it the only memory board needed for S100 systems. That's why we call it **THE LAST MEMORY**.

- **64K DENSITY**

THE LAST MEMORY uses the new 2016 byte-wide 16K static RAM to achieve a board density twice that possible with old 2114 static memories.

- **2716 EPROM COMPATIBLE**

A separate board is no longer required for EPROM's containing monitors, bootstrap loaders, etc. 2716 EPROM's can be inserted into the board without modification.

- **SIMPLE ADDRESS DECODING**

Where memory is required, just plug a RAM or EPROM in the corresponding socket. Empty memory sockets occupy no memory space, providing compatibility with memory mapped I/O devices.

- **EXTENDED ADDRESSING**

THE LAST MEMORY includes the IEEE S100 extended addresses. These are fully decoded allowing expansion to a full 16 megabyte system memory.

- **FAST**

The standard board allows 4 MHz operation.

- **LOW POWER**

Only one memory IC is ever active in byte-wide memory systems. The result is far less power consumption than older 16K static memory boards.

- **LOW COST**

Its best feature is the price:

| | Kit | A&T |
|----------------|--------|--------|
| RAM-less Board | 99.99 | 139.99 |
| 16K RAM | 249.99 | 289.99 |
| 32K RAM | 389.99 | 429.99 |
| 48K RAM | 519.99 | 559.99 |
| 64K RAM | 639.99 | 679.99 |



static memory systems

15 So. Van Buren Ave.

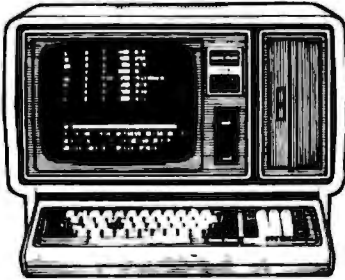
Freeport, Illinois 61032

Suite 209

(815) 235-8713



BIGGEST Discounts Ever On TRS-80™



Computers, Accessories & The Following NEW Items

Hewlett-Packard®
HP-85 Personal Computer

Atari® CX-2600
Video Computer System

Magnavox®
Odyssey²
Home Video System

Magnavox®
Magnavision®
Videodisc Player

- FREE SHIPPING in 48 continental contiguous States.
- NO SALES TAX collected on out-of-state orders.
- FREE Discount Price List available.

TOLL FREE ORDER NUMBER
800/531-7466
Texas & Principle Number
512/581-2766
Fort Worth No. 817/625-6333
Telex Number 767339

Pan American Electronics

Sales and Main Office
Dept. 11 • 1117 Conway Ave.
Mission, Texas 78572
NEW Fort Worth Branch
Dept. 11 • 2912 N. Main St.
Fort Worth, Texas 76106

TRS-80 is a trademark of Tandy Corp.

tions to carry out, the 7 ms difference doesn't allow much processor time to devote to them. This means that this type of animation (called *playfield animation*) is too slow for many purposes. You can still get animation this way, but you are limited to a few objects, small objects, slow motion, or a few calculations between motion. The trade-offs a programmer must make in using such animation are too restrictive.

A New Approach—Players

The Atari 400/800 solution to this problem is player-missile graphics. In order to understand player-missile graphics, you must understand the essence of the problem of playfield animation: the screen image is two-dimensional, while the image in memory is one-dimensional. The solution was to create a graphics object that is one-dimensional on the screen, as well as one-dimensional in memory.

What Is Shadowing?

Some of the hardware registers talked about in this article are write-only—that is, you can write values to them, but you can't read what their current contents are. Because of this, the designers of the Atari operating system created shadow registers for some of the more important hardware registers. When the Atari 400/800 has finished drawing an entire display screen of information (at a time called the vertical blank), it copies the contents of each shadow register into the corresponding hardware register (this occurs every 1/30 second). In this way, you can read the contents of a shadow register, knowing that it has the same value as its hardware register.

If you write to the hardware register itself, the old value (still in the shadow register) will be copied into the hardware register at the next vertical blank, and whatever effect you wanted to make will be almost instantly undone. Similarly, if you try to read the hardware-register location, you will get incorrect results.

To conclude, you should always read from and write to shadow registers where they exist. If you fail to do so, your program will fail to work in a way that is not always obvious.

This object (called a *player*) appears in memory as a table either 128 or 256 bytes long. The table is mapped directly to the screen. It appears as a vertical band stretching from the top of the screen to the bottom. Each byte in the table is mapped into either one or two horizontal scan lines, with the choice made by the programmer. The screen image is a simple bit-map of the data in the table. If a bit is on, the corresponding pixel in the vertical column is lit; if the bit is off, the corresponding pixel is off. Thus, the player image is not strictly one-dimensional; it is actually 8 bits wide.

Drawing a player image on the screen is simple. First, you draw a picture of the desired image on graph paper. This image must be no more than eight pixels wide. Then you translate the image into binary code, substituting 1s for illuminated pixels and 0s for empty pixels. You translate the resulting binary number into decimal or hexadecimal (depending on which is more convenient), and you store 0s into the player memory area to clear the image. Next, you store the image data into the player memory area, with the byte at the top of the player image going first, followed by the other image bytes in top-to-bottom sequence. The further down in memory you place the data, the lower the image will appear on the screen.

Animating this image is easy. Vertical motion is obtained by moving the image data through the player memory. This is, in principle, the same method used in playfield animation, but there is a big difference in practice. The move routine for vertical motion is a one-dimensional move instead of a two-dimensional move. The program does not need to multiply by 40 and it often does not need to use indirection. It could be as simple as:

```

LDX  #01
LOOP LDA  PLAYER,X
      STA  PLAYER-1,X
      INX
      BNE  LOOP
    
```

This routine takes about 4 ms to move the entire player, about half as

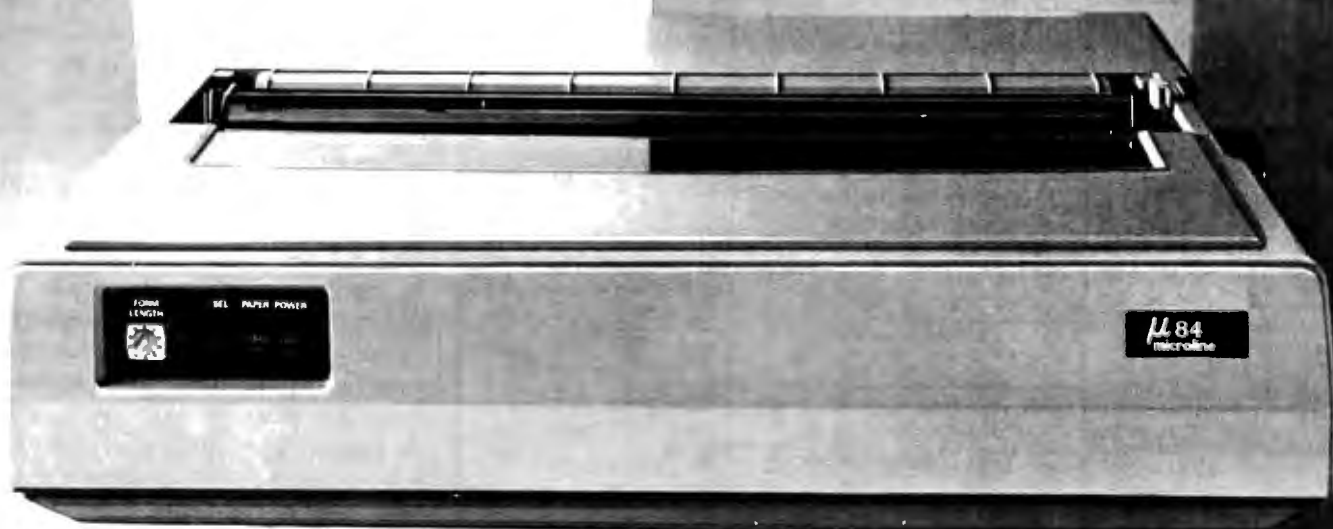
OKIDATA

Introducing the Microline 84. The newest addition to the remarkable Microline family of printers from Okidata.

The Microline 84 prints bidirectionally at 200 cps and has 72 x 72 dot-addressable and block graphics. A full 96-character ASCII II set and condensed printing. Tractor and friction feeds. Parallel Centronics-compatible or RS232 interfaces. With all that as standard, you get a full year's warranty on the print head and 4000 to 5000 hours MTBF. And print quality that's crisp and clear in both text and graphics applications.

The Microline 84 gives you the throughput and reliability you need. Once again, quality printing from the company that stands apart from the rest. Okidata.

Interested? Contact us at Ill Gaither Drive, Mount Laurel, N.J. 08054, 609-235-2600 for more information on the remarkable Microline 84. Also available through authorized Okidata distributors.



Making small printers for people who think big.

Okidata is a subsidiary of  Electric Industry Company Ltd.

CPU'S & SUPPORT CHIPS

| | | | |
|---------|------|---------------|-------|
| 8080A | 3.75 | 8276 | 2.75 |
| 8085A | 7.50 | 8279 | 4.50 |
| AMD2901 | 6.85 | 8280 | 4.50 |
| 8212 | 3.25 | 8281 (AM9617) | 7.50 |
| 8218 | 3.00 | 2051A CPU | 3.75 |
| 8216 | 3.50 | 7804 SIO | 12.95 |
| 8224 | 3.25 | 8275 | 16.95 |
| MM5302 | 9.95 | | |

| | | | |
|--------------|-------|--------------|-------|
| RAM's | | ROM's | |
| 2164 | 3.75 | 2708 | 3.95 |
| 4164 | 7.50 | 2716 5V | 7.95 |
| 8164 | 15.00 | 2732 | 16.95 |
| 1616 | 30.00 | 2732 | 16.95 |
| 2164 | 3.75 | 8257 | 1.95 |
| 4164 | 7.50 | 8257 | 1.95 |
| 8164 | 15.00 | 8257 | 1.95 |
| 1616 | 30.00 | 8257 | 1.95 |

| | |
|---------------|------|
| UART's | |
| AVS 1013 | 1.75 |
| 141802P | 3.25 |
| P11402B | 3.25 |

| | | | |
|--------------------------------|------|------------------------|------|
| INTERFACE & DRIVERS | | SHIFT REGISTERS | |
| 141802P | 3.25 | MM1402 | 1.75 |
| 141802B | 3.25 | MM1403 | 1.75 |
| 141802C | 3.25 | MM1404 | 1.75 |
| 141802D | 3.25 | MM1405 | 1.75 |
| 141802E | 3.25 | MM1406 | 1.75 |
| 141802F | 3.25 | MM1407 | 1.75 |
| 141802G | 3.25 | MM1408 | 1.75 |
| 141802H | 3.25 | MM1409 | 1.75 |
| 141802I | 3.25 | MM1410 | 1.75 |
| 141802J | 3.25 | MM1411 | 1.75 |
| 141802K | 3.25 | MM1412 | 1.75 |
| 141802L | 3.25 | MM1413 | 1.75 |
| 141802M | 3.25 | MM1414 | 1.75 |
| 141802N | 3.25 | MM1415 | 1.75 |
| 141802O | 3.25 | MM1416 | 1.75 |
| 141802P | 3.25 | MM1417 | 1.75 |
| 141802Q | 3.25 | MM1418 | 1.75 |
| 141802R | 3.25 | MM1419 | 1.75 |
| 141802S | 3.25 | MM1420 | 1.75 |
| 141802T | 3.25 | MM1421 | 1.75 |
| 141802U | 3.25 | MM1422 | 1.75 |
| 141802V | 3.25 | MM1423 | 1.75 |
| 141802W | 3.25 | MM1424 | 1.75 |
| 141802X | 3.25 | MM1425 | 1.75 |
| 141802Y | 3.25 | MM1426 | 1.75 |
| 141802Z | 3.25 | MM1427 | 1.75 |

| | |
|--------------------------|------|
| 14 PIN HEADERS | 3.51 |
| 16 PIN HEADERS | 4.00 |
| 24 PIN HEADERS | 7.50 |
| 40 PIN HEADERS | 1.10 |
| 50 PIN EDGEBOARD CONN. | 3.95 |
| 50 PIN RIGHT ANGLE CONN. | 3.95 |
| 20 PIN RIGHT ANGLE CONN. | 2.25 |

| | |
|------------------------------|---------|
| PRINTED CIRCUIT BOARD | |
| 4" x 6" DOUBLE SIDED | |
| EPXDY BOARD 1/8" THICK | |
| 6.00 ea. | 5/62.00 |

| | |
|--------------------------------|--------|
| EPOXY GLASS VELOC BOARD | |
| 1/16" thick with 1/10" spacing | |
| 4 1/2" x 6 1/2" | \$1.95 |

| | |
|---------------------------------|---------|
| DATL'S DAC-0800 | |
| 8 bit DAC — \$7.95 | |
| INTERNAL DIBIP ANALOG SWITCH | |
| 2 CHANNEL DRIVERS | \$11.50 |
| INTERNAL ICL 7104 12 CPL 12 BIT | |
| A/D CONVERTER | \$25.50 |
| RECORDER SMD 1024 ANALOG SWITCH | \$10.95 |

| | |
|--|---------|
| 7 WATT LD 65 LASER | |
| DIODE IR 68.95 | |
| 25 watt Infra Red Pulse (SG 2006 equiv.) | |
| Laser Diode (Spec sheet included) | \$24.95 |
| 2N3820 P FET | \$.45 |
| 2N5457 N FET | \$.45 |
| 2N2854 UJT | \$.45 |
| ER 800 TRIGGER DIODES | 4.61 |
| 2N 8028 PROG UJT | \$.65 |

| | |
|---|-----------|
| DISC CAPACITORS | |
| 104 10V | 100 38.00 |
| 01UF 35V | 16 51.00 |
| 100 55.00 | |
| (N4148 (IN914) 15/1.00 | |

| | | |
|----------------------------|-----------|----------|
| TANTALUM CAPACITORS | | |
| 47UF 35V 5/41.00 | 10UF 35V | \$.40 |
| 82UF 35V 5/41.00 | 22UF 10V | \$.30 |
| 15UF 35V 5/41.00 | 15UF 16V | \$491.00 |
| 2.2UF 20V 5/41.00 | 30UF 8V | 5/41.00 |
| 3.3UF 20V 4/41.00 | 33UF 20V | \$.60 |
| 4.7UF 35V 4/41.00 | 47UF 20V | \$.85 |
| 6.8UF 35V 3/41.00 | 120UF 6V | \$.75 |
| | 200UF 20V | \$1.75 |

| | |
|--------------------------------|---------|
| SANKEN AUDIO POWER AMPS | |
| SI 1010 G 10 WATTS | \$ 7.50 |
| SI 1020 G 20 WATTS | \$12.50 |
| SI 1050 G 50 WATTS | \$27.50 |
| 200 PRV 1A LASCR | .95 |

| | |
|-------------------------|--------|
| RS232 CONNECTORS | |
| DB 25P male | \$3.25 |
| DB 25S female | \$4.25 |
| HOODS | \$1.50 |

| | |
|---|--|
| POSTAGE | |
| ADD 10% FOR ORDERS UNDER \$20.00 | |
| ADD 5% FOR ORDERS BETWEEN \$20.00 AND \$50.00 | |
| ADD 3% FOR ORDERS ABOVE \$50.00 | |

C/MOS

| | | | | | | | |
|------|----|------|----|------|----|------|----|
| 4001 | 30 | 4007 | 45 | 4051 | 30 | 4074 | 80 |
| 4002 | 30 | 4008 | 45 | 4052 | 30 | 4075 | 80 |
| 4003 | 30 | 4009 | 45 | 4053 | 30 | 4076 | 80 |
| 4004 | 30 | 4010 | 45 | 4054 | 30 | 4077 | 80 |
| 4005 | 30 | 4011 | 45 | 4055 | 30 | 4078 | 80 |
| 4006 | 30 | 4012 | 45 | 4056 | 30 | 4079 | 80 |
| 4007 | 30 | 4013 | 45 | 4057 | 30 | 4080 | 80 |
| 4008 | 30 | 4014 | 45 | 4058 | 30 | 4081 | 80 |
| 4009 | 30 | 4015 | 45 | 4059 | 30 | 4082 | 80 |
| 4010 | 30 | 4016 | 45 | 4060 | 30 | 4083 | 80 |
| 4011 | 30 | 4017 | 45 | 4061 | 30 | 4084 | 80 |
| 4012 | 30 | 4018 | 45 | 4062 | 30 | 4085 | 80 |
| 4013 | 30 | 4019 | 45 | 4063 | 30 | 4086 | 80 |
| 4014 | 30 | 4020 | 45 | 4064 | 30 | 4087 | 80 |
| 4015 | 30 | 4021 | 45 | 4065 | 30 | 4088 | 80 |
| 4016 | 30 | 4022 | 45 | 4066 | 30 | 4089 | 80 |
| 4017 | 30 | 4023 | 45 | 4067 | 30 | 4090 | 80 |
| 4018 | 30 | 4024 | 45 | 4068 | 30 | 4091 | 80 |
| 4019 | 30 | 4025 | 45 | 4069 | 30 | 4092 | 80 |
| 4020 | 30 | 4026 | 45 | 4070 | 30 | 4093 | 80 |
| 4021 | 30 | 4027 | 45 | 4071 | 30 | 4094 | 80 |
| 4022 | 30 | 4028 | 45 | 4072 | 30 | 4095 | 80 |
| 4023 | 30 | 4029 | 45 | 4073 | 30 | 4096 | 80 |
| 4024 | 30 | 4030 | 45 | 4074 | 30 | 4097 | 80 |
| 4025 | 30 | 4031 | 45 | 4075 | 30 | 4098 | 80 |
| 4026 | 30 | 4032 | 45 | 4076 | 30 | 4099 | 80 |
| 4027 | 30 | 4033 | 45 | 4077 | 30 | 4100 | 80 |
| 4028 | 30 | 4034 | 45 | 4078 | 30 | 4101 | 80 |
| 4029 | 30 | 4035 | 45 | 4079 | 30 | 4102 | 80 |
| 4030 | 30 | 4036 | 45 | 4080 | 30 | 4103 | 80 |
| 4031 | 30 | 4037 | 45 | 4081 | 30 | 4104 | 80 |
| 4032 | 30 | 4038 | 45 | 4082 | 30 | 4105 | 80 |
| 4033 | 30 | 4039 | 45 | 4083 | 30 | 4106 | 80 |
| 4034 | 30 | 4040 | 45 | 4084 | 30 | 4107 | 80 |
| 4035 | 30 | 4041 | 45 | 4085 | 30 | 4108 | 80 |
| 4036 | 30 | 4042 | 45 | 4086 | 30 | 4109 | 80 |
| 4037 | 30 | 4043 | 45 | 4087 | 30 | 4110 | 80 |
| 4038 | 30 | 4044 | 45 | 4088 | 30 | 4111 | 80 |
| 4039 | 30 | 4045 | 45 | 4089 | 30 | 4112 | 80 |
| 4040 | 30 | 4046 | 45 | 4090 | 30 | 4113 | 80 |
| 4041 | 30 | 4047 | 45 | 4091 | 30 | 4114 | 80 |
| 4042 | 30 | 4048 | 45 | 4092 | 30 | 4115 | 80 |
| 4043 | 30 | 4049 | 45 | 4093 | 30 | 4116 | 80 |
| 4044 | 30 | 4050 | 45 | 4094 | 30 | 4117 | 80 |
| 4045 | 30 | 4051 | 45 | 4095 | 30 | 4118 | 80 |
| 4046 | 30 | 4052 | 45 | 4096 | 30 | 4119 | 80 |
| 4047 | 30 | 4053 | 45 | 4097 | 30 | 4120 | 80 |
| 4048 | 30 | 4054 | 45 | 4098 | 30 | 4121 | 80 |
| 4049 | 30 | 4055 | 45 | 4099 | 30 | 4122 | 80 |
| 4050 | 30 | 4056 | 45 | 4100 | 30 | 4123 | 80 |
| 4051 | 30 | 4057 | 45 | 4101 | 30 | 4124 | 80 |
| 4052 | 30 | 4058 | 45 | 4102 | 30 | 4125 | 80 |
| 4053 | 30 | 4059 | 45 | 4103 | 30 | 4126 | 80 |
| 4054 | 30 | 4060 | 45 | 4104 | 30 | 4127 | 80 |
| 4055 | 30 | 4061 | 45 | 4105 | 30 | 4128 | 80 |
| 4056 | 30 | 4062 | 45 | 4106 | 30 | 4129 | 80 |
| 4057 | 30 | 4063 | 45 | 4107 | 30 | 4130 | 80 |
| 4058 | 30 | 4064 | 45 | 4108 | 30 | 4131 | 80 |
| 4059 | 30 | 4065 | 45 | 4109 | 30 | 4132 | 80 |
| 4060 | 30 | 4066 | 45 | 4110 | 30 | 4133 | 80 |
| 4061 | 30 | 4067 | 45 | 4111 | 30 | 4134 | 80 |
| 4062 | 30 | 4068 | 45 | 4112 | 30 | 4135 | 80 |
| 4063 | 30 | 4069 | 45 | 4113 | 30 | 4136 | 80 |
| 4064 | 30 | 4070 | 45 | 4114 | 30 | 4137 | 80 |
| 4065 | 30 | 4071 | 45 | 4115 | 30 | 4138 | 80 |
| 4066 | 30 | 4072 | 45 | 4116 | 30 | 4139 | 80 |
| 4067 | 30 | 4073 | 45 | 4117 | 30 | 4140 | 80 |
| 4068 | 30 | 4074 | 45 | 4118 | 30 | 4141 | 80 |
| 4069 | 30 | 4075 | 45 | 4119 | 30 | 4142 | 80 |
| 4070 | 30 | 4076 | 45 | 4120 | 30 | 4143 | 80 |
| 4071 | 30 | 4077 | 45 | 4121 | 30 | 4144 | 80 |
| 4072 | 30 | 4078 | 45 | 4122 | 30 | 4145 | 80 |
| 4073 | 30 | 4079 | 45 | 4123 | 30 | 4146 | 80 |
| 4074 | 30 | 4080 | 45 | 4124 | 30 | 4147 | 80 |
| 4075 | 30 | 4081 | 45 | 4125 | 30 | 4148 | 80 |
| 4076 | 30 | 4082 | 45 | 4126 | 30 | 4149 | 80 |
| 4077 | 30 | 4083 | 45 | 4127 | 30 | 4150 | 80 |
| 4078 | 30 | 4084 | 45 | 4128 | 30 | 4151 | 80 |
| 4079 | 30 | 4085 | 45 | 4129 | 30 | 4152 | 80 |
| 4080 | 30 | 4086 | 45 | 4130 | 30 | 4153 | 80 |
| 4081 | 30 | 4087 | 45 | 4131 | 30 | 4154 | 80 |
| 4082 | 30 | 4088 | 45 | 4132 | 30 | 4155 | 80 |
| 4083 | 30 | 4089 | 45 | 4133 | 30 | 4156 | 80 |
| 4084 | 30 | 4090 | 45 | 4134 | 30 | 4157 | 80 |
| 4085 | 30 | 4091 | 45 | 4135 | 30 | 4158 | 80 |
| 4086 | 30 | 4092 | 45 | 4136 | 30 | 4159 | 80 |
| 4087 | 30 | 4093 | 45 | 4137 | 30 | 4160 | 80 |
| 4088 | 30 | 4094 | 45 | 4138 | 30 | 4161 | 80 |
| 4089 | 30 | 4095 | 45 | 4139 | 30 | 4162 | 80 |
| 4090 | 30 | 4096 | 45 | 4140 | 30 | 4163 | 80 |
| 4091 | 30 | 4097 | 45 | 4141 | 30 | 4164 | 80 |
| 4092 | 30 | 4098 | 45 | 4142 | 30 | 4165 | 80 |
| 4093 | 30 | 4099 | 45 | 4143 | 30 | 4166 | 80 |
| 4094 | 30 | 4100 | 45 | 4144 | 30 | 4167 | 80 |
| 4095 | 30 | 4101 | 45 | 4145 | 30 | 4168 | 80 |
| 4096 | 30 | 4102 | 45 | 4146 | 30 | 4169 | 80 |
| 4097 | 30 | 4103 | 45 | 4147 | 30 | 4170 | 80 |
| 4098 | 30 | 4104 | 45 | 4148 | 30 | 4171 | 80 |
| 4099 | 30 | 4105 | 45 | 4149 | 30 | 4172 | 80 |
| 4100 | 30 | 4106 | 45 | 4150 | 30 | 4173 | 80 |
| 4101 | 30 | 4107 | 45 | 4151 | 30 | 4174 | 80 |
| 4102 | 30 | 4108 | 45 | 4152 | 30 | 4175 | 80 |
| 4103 | 30 | 4109 | 45 | 4153 | 30 | 4176 | 80 |
| 4104 | 30 | 4110 | 45 | 4154 | 30 | 4177 | 80 |
| 4105 | 30 | 4111 | 45 | 4155 | 30 | 4178 | 80 |
| 4106 | 30 | 4112 | 45 | 4156 | 30 | 4179 | 80 |
| 4107 | 30 | 4113 | 45 | 4157 | 30 | 4180 | 80 |
| 4108 | 30 | 4114 | 45 | 4158 | 30 | 4181 | 80 |
| 4109 | 30 | 4115 | 45 | 4159 | 30 | 4182 | 80 |
| 4110 | 30 | 4116 | 45 | 4160 | 30 | 4183 | 80 |
| 4111 | 30 | 4117 | 45 | 4161 | 30 | 4184 | 80 |
| 4112 | 30 | 4118 | 45 | 4162 | 30 | 4185 | 80 |
| 4113 | 30 | 4119 | 45 | 4163 | 30 | 4186 | 80 |
| 4114 | 30 | 4120 | 45 | 4164 | 30 | 4187 | 80 |
| 4115 | 30 | 4121 | 45 | 4165 | 30 | 4188 | 80 |
| 4116 | 30 | 4122 | 45 | 4166 | 30 | 4189 | 80 |
| 4117 | 30 | | | | | | |

television to television; a conservative range is from 60 to 200. This coordinate range is sometimes clumsy to use, but it offers a nice feature: a simple way to remove a player from the screen is to set the player's horizontal position to zero. With a single load and store in assembly language (or a single POKE in BASIC), the player disappears.

The system described so far makes it possible to produce high-speed animation. There are a number of embellishments that greatly add to its overall utility. The first embellishment is that there are four independent players to use. These players all have their own sets of control registers and memory areas; thus, their operation is completely independent. The players are labeled P0 through P3. They can be used side by side to give up to 32 bits of horizontal resolution, or independently to give four movable objects. Each player has its own color register, completely independent of the playfield color register. The player color registers are called COLP(X) and are shadowed at PCOLR(X). This gives you the capability to put much more color onto the screen. However, each player has only one color; multi-colored players are not possible without *display-list interrupts* (which will be discussed in the next article in this series).

Each player has a controllable width. You can set it to have normal width, double width, or quadruple width with the SIZEP(X) registers. This is useful for making players take on different sizes. You also have the option of choosing the vertical resolution of the players. You can use single-line resolution, in which each byte in the player table occupies one horizontal scan line, or double-line resolution, in which each byte occupies two horizontal scan lines. With single-line resolution, each player bit-map table is 256 bytes long; with double-line resolution, each table is 128 bytes long. This is the only case where player properties are not independent. The selection of vertical resolution applies to *all* players. Player vertical resolution is controlled by bit D4 of the DMACTL

Atari is a reg.™ of Atari, Inc.

UPGRADE YOUR ATARI®

REPORT CARD

STUDENT *Basic A+*

PARENT *Optimized Systems Software*

SUBJECTS

| | |
|-------------------------------|----|
| ADVANCED I/O | A+ |
| STRUCTURED PROGRAMMING | A+ |
| PLAYER/MISSILE GRAPHICS | A+ |

DEPARTMENT

| | |
|---------------------|----|
| EASE OF USE | A+ |
| FLEXIBILITY | A+ |
| COMPATIBILITY | A+ |

THE
ONLY
LOGICAL
UPGRADE
FOR
ATARI
BASIC!

GRADUATE TO BASIC A+ FROM THE AUTHORS OF ATARI BASIC!

BASIC A+

BASIC A+ will rate an A+ from any Atari user! Upward compatible with Atari Basic, it adds statements and features that enhance the Atari 800's real power, flexibility, and ease of use: Superior I/O features for business and other applications. Additional file manipulation commands. Significant help in program development and debug. Structured programming aids. And MORE! A partial list of the enhancements of BASIC A+ includes:

RPUT/RGET (record I/O) BPUT/BGET (binary I/O) ERASE
PRINT USING SET TAB INPUT"... " DIR PROTECT RENAME
TRACE WHILE...ENDWHILE IF...ELSE...ENDIF
SUPERB PLAYER/MISSILE GRAPHICS

BASIC A+ requires a disk and 32K bytes of RAM. Since no cartridge is used, BASIC A+ will take advantage of all the RAM (48K bytes) in a maximum Atari 800 system (recommended) \$80

OS/A+

Completely compatible with Atari's DOS (version 2), but with an advanced, command-driven console processor. Simple. Flexible. Powerful. With an easy-to-use BATCH capability OS/A+ INCLUDES all the following utilities (and more):

EASMD (Editor ASsembler Debug) is our upgraded all-in-one assembly language development package for the 6502 microprocessor. The editor — with such features as FIND and REPLACE — can even edit BASIC A+ programs. The assembler can include multiple source files in a single assembly.

DUPDSK and FORMAT create master or slave disks. Make sector by sector copies of any OS/A+ disk.

COPY a simple, single file copy utility.

All of this power is included in our OS/A+ package .. \$80

For the utmost in capability and flexibility, our combination system — BASIC A+ and OS/A+ — is available \$150

SOFTWARE IN A CLASS BY ITSELF
AVAILABLE NOW THROUGH LOCAL DEALERS

Optimized Systems Software, Inc.
10379-B Lansdale Ave., Cupertino, CA 95014.
(408) 446-3099

WIREMASTER

A COMPILER FOR HARDWARE

● **WIREMASTER** is a software tool to aid in the design, layout, and construction of electronic hardware. Although intended primarily for wire wrap, it is also highly useful in the layout, error checking, and trouble-shooting of PC boards.

● Inputs are easily derived directly from the schematic diagram and fed to **WIREMASTER** in a CP/M* text file. Outputs include a network map that graphically shows all pins and wires (no plotter required), a wire list sorted by lengths and levels, a parts list, signal and pin cross-references, and wrap count and continuity checklists which ensure a perfect wiring job.

● **WIREMASTER** checks for syntax errors, wires that go nowhere, and duplicated pins. Network lengths are minimized, and wire lengths are calculated and sorted in descending order so that the shorter wires on top hold down the longer wires beneath for a neat wiring job.

● The resulting information is then used for wiring, PC board layouts, error-checking, component stuffing, and system debugging. This makes a complete and easily updated documentation package. Although it runs on small computers, **WIREMASTER** can handle large projects.

● The new **WIREMASTER** Version 3.11 features wire and track minimization, and includes **CHANGEMASTER**, a new program which precisely documents all differences between two versions of a board.

● **CHANGEMASTER** eliminates the confusion and loss of control caused by changes to a board during debugging and modification. It outputs a map of all networks which have been added, deleted, or modified, and automatically generates REMOVE and ADD lists so an old board can easily be brought into exact conformance with the latest design.

● **WIREMASTER** runs on any Z80* CP/M system of 47K or larger, including TRS-80* Model II and Apple II* with SoftCard*. The diskette also includes a SORT utility, a pagination and multi-column printing program, and FIX, a program which finds all bad spots on a disk, tells you which files they are in, places the bad sectors in a single file, and recovers erased files.

WIREMASTER plus CHANGEMASTER . . . \$200
Manual only. \$ 15

Update to 3.11 plus CHANGEMASTER . . . \$ 50
Update to 3.11 only. \$ 15

Call! residents add 6% sales tax

Checks, CODs, company POs are OK.
NO CHARGE CARDS

AFTERTHOUGHT ENGINEERING
7266 Courtney Drive
San Diego, California 92111
(714) 279-2868

*Digital Research trademark

register. In double-line resolution, the first 10 bytes in the player table area are lost to vertical overscan and are off the top edge of the screen, and the last 20 bytes are lost off the bottom edge of the screen. In single-line resolution, 20 and 40 bytes are lost correspondingly.

Missiles

The next embellishment is the provision of *missiles*. These are 2-bit-wide graphics objects associated with the players. There is one missile assigned to each player; it takes its color from the player's color register. Missile-shape data come from the missile bit-map table in memory in front of the player tables. All four missiles are packed into the same table (four missiles times 2 bits per missile gives 8 bits). Missiles can move independently of players; they have their own horizontal position registers. Missiles have their own size register, **SIZEM**, that can set the horizontal width as the **SIZEP(X)** registers do for players. However, missiles cannot be set to different sizes. They are all set together. Missiles are useful as bullets or for skinny vertical lines on the screen. If desired, the missiles can be grouped together into a fifth player, in which case they take the color of playfield color register 3. This is done by setting bit D4 of the priority control register (**PRIOR**). Missiles can still move independently when this option is in effect. Their horizontal positions are set by their horizontal position registers (**HPOSM0** through **HPOSM3**). Their shapes and vertical positions are determined by which bits are turned on in their area of the player-missile area (see figures 2a and 2b). The fifth player enable bit only affects the color of the missiles.

You move a missile vertically the same way you move a player: by moving the missile-image data through their two bit-positions of the missile memory area. This can be difficult to do because missiles are grouped into the same memory table. To access a single missile, you must ignore the bits for the other missiles.

An important feature of player-missile graphics is that players and

missiles are completely independent of the playfield (ie: the text or graphics information also displayed by the computer). You can mix them with *any* text or graphics mode. This raises a problem: What happens if a player ends up on top of a playfield image? Which image has priority? You have the option to define the priorities used in displaying players.

Four priority schemes are possible (see the listing for register **PRIOR** in appendix B). If you wish, all players can have priority over all playfield color registers. Or you can set all playfield color registers (except background) to have priority over all players. Or you can set player 0 and player 1 (**P0** and **P1**) to have priority over all playfield color registers, with **P2** and **P3** having less priority than the playfield. Or you can set playfield color registers 0 and 1 (**PF0** and **PF1**) to have priority over all players, which then have priority over **PF2** and **PF3**. These priorities are selected with the priority control register (**PRIOR**) that is shadowed at **GPRIOR**. This capability allows a player to pass in front of one image and behind another, allowing three-dimensional effects.

Who Did I Just Hit?

The final embellishment is the provision for hardware collision detection. This is primarily of value for games. You can check if any graphics object (player or missile) has collided with anything else. Specifically, you can check for missile-player collisions, missile-playfield collisions, player-player collisions, and player-playfield collisions. There are fifty-four possible collisions, each one with a bit assigned to it that can be checked. If the bit is set, a collision has occurred. These bits are mapped into fifteen registers in **CTIA** (another custom integrated circuit in the Atari 400/800); only the lower 4 bits are used and some are not meaningful. These are read-only registers; they cannot be cleared by writing zeros to them. The registers can be cleared for further collision detection by writing any value to register **HITCLR**. All collision registers are cleared by this command.



Into Computers? Robotics?
Want to get started?

Take 6 great books
for \$ **2⁹⁵**
(values to \$102.70)

... and get one **FREE!**

All the latest info on software, hardware, applications, and theory at savings up to 75%. Plus, discounts on software, games, cassettes, disks ... and more!



Join now and get *Computerist's Handy Databook/Dictionary* ... **FREE!!** (List \$4.95)

7 very good reasons to try The Computer Book Club ...

- **Reduced Member Prices.** Save up to 75% on books sure to increase your know-how
- **Satisfaction Guaranteed.** All books returnable within 10 days without obligation
- **Club News Bulletins.** All about current selections—mains, alternates, extras—plus bonus offers. Comes 10 times a year with dozens of up-to-the minute titles you can pick from
- **"Automatic Order".** Do nothing, and the Main selection will be shipped automatically! But ... if you want an Alternate—or no books at all—we'll follow the instructions you give on the reply form provided with every News Bulletin
- **Continuing Benefits.** Get a Dividend Certificate with every book purchased after fulfilling membership obligation, and qualify for discounts on many other volumes
- **Extra Bonuses.** Take advantage of added-value promotions, plus special discounts of software, games, and more
- **Exceptional Quality.** All books are first-rate publisher's editions, filled with up-to-the-minute info



THE COMPUTER BOOK CLUB Blue Ridge Summit, PA 17214

Please accept my membership in The Computer Book Club and send the 6 volumes circled below, plus a free copy of *Computerist's Handy Databook/Dictionary*. I understand the cost of the books selected is \$2.95 (plus shipping/handling). If not satisfied, I may return the books within ten days without obligation and have my membership cancelled. I agree to purchase 4 or more books at reduced Club prices during the next 12 months, and may resign any time thereafter.

841 985 1055 1062 1070 1088 1095 1101
1108 1111 1160 1169 1183 1187 1191 1195
1203 1205 1209 1275 1277 1295 1330 1332

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

(Valid for new members only. Foreign and Canada add 20%. Orders outside U.S. or Canada must be prepaid with international money orders in U.S. dollars) BY-1181

ATLANTIC COMPUTER INDUSTRIES

IMS. MORROW. ADDS. APPLE. TELEVIDEO
ITHACA. IBM. SCION. NEC. MUSYS
HAZELTINE. QUME. HAYES
...and much more.

MORROW - DECISION I

Multi - User, multi - tasking
CPU with uNIX and CP/M ... \$1450

MUSYS SINGLE BOARD COMPUTER

Z80A Processor, 64 K Dynamic
RAM, Console Serial Port,
S-100 Parallel Interface,
Bootstrap PROM \$1295

dBASE from Ashton-Tate

Easy to use, CP/M compatible,
extends power of your micro-
computer to jobs reserved for
larger mainframes
Money back guarantee \$595

TURBODOS - Multi - User Network OPERATING SYSTEM

CP/M Compatible, up to 6 X faster
Multi User \$749
Single User \$249

ADDS VIEWPOINT CRT \$599

ANADEX 200 c p s PRINTERS

DP 9500/9501 \$1329
DP 9000/9001 \$1249

MICROANGELO HIGH RESOLUTION GRAPHICS

System \$2225
S-100 Graphics Card \$925

QUME DISK DRIVES

Data Track 8",
Double sided disk drives \$575
2 for \$1100
2 Qume DT 8" complete with
cabinet, power supply, Fan . \$1595

MAIL ORDER ONLY

ATLANTIC

COMPUTER INDUSTRIES CORP.

80 BROAD STREET, SUITE 404
NEW YORK, N.Y. 10004
(212) 332-4500 — (212) 376-5978

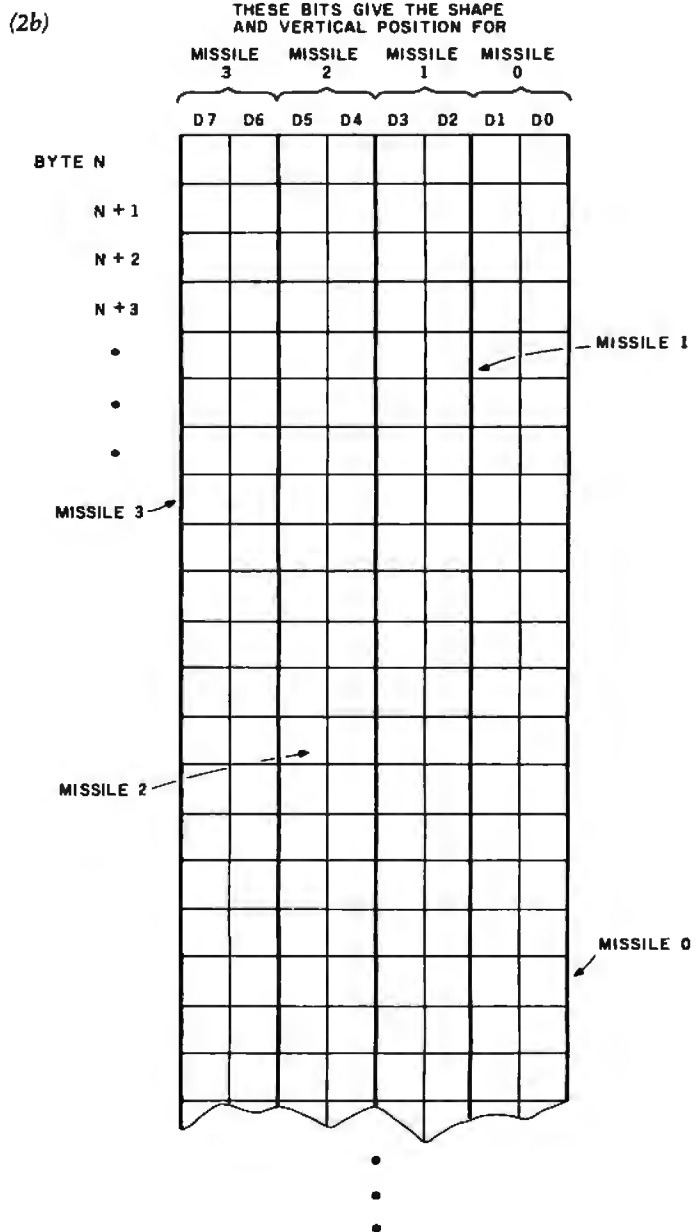
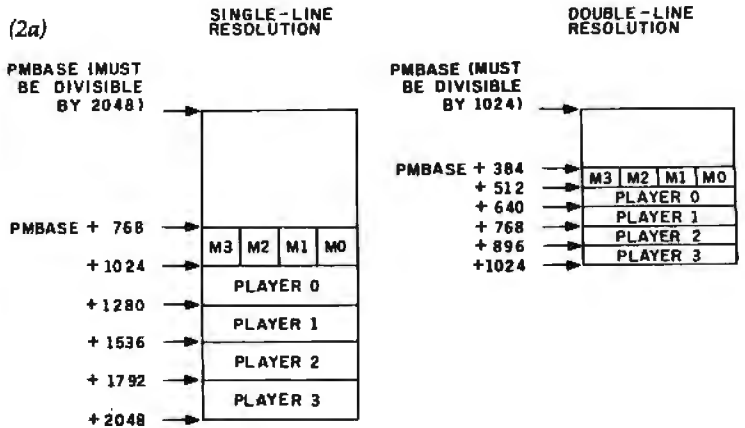


Figure 2: The player-missile area. Information on the shape and vertical position of the players and missiles is kept in a block of memory. The allocation for single-line and double-line player-missile areas is shown in figure 2a. Figure 2b shows how one area can store the shape and position of four missiles.

THE ORIGINAL MAGAZINE FOR OWNERS OF THE TRS-80™* MICROCOMPUTER

* TRS-80™ IS A TRADEMARK OF TANDY CORP.

SOFTWARE FOR TRS-80™ OWNERS

H & E COMPUTRONICS INC.

MONTHLY NEWSMAGAZINE FOR TRS-80™ OWNERS

MONTHLY NEWSMAGAZINE Practical Support For Model I, II & III

- PRACTICAL APPLICATIONS
- BUSINESS
- GAMBLING • GAMES
- EDUCATION
- PERSONAL FINANCE
- BEGINNER'S CORNER
- NEW PRODUCTS
- SOFTWARE EXCHANGE
- MARKET PLACE
- QUESTIONS AND ANSWERS
- PROGRAM PRINTOUTS
- AND MORE

NOW IN OUR 4th YEAR

PROGRAMS AND ARTICLES PUBLISHED IN RECENT ISSUES INCLUDE THE FOLLOWING:

- FINCALC - A COMPLETE FINANCIAL APPLICATIONS PACKAGE
- INFORMATION SYSTEM REVIEW
- STATISTICAL COMBINATIONS
- PASCAL'S TRIANGLE
- ASSEMBLY LANGUAGE FOR BEGINNERS
- DISK FILES
- MOD-III REVIEW
- KEYBOARD THUNDER AND LIGHTING EXPLAINED
- DOS COMMANDS IN LEVEL II
- PROBABILITY CURVE GENERATOR
- CALCULATOR SIMULATIONS
- THE MEGABYTE GAP
- STOCKS AND BONDS
- BUDGET ANALYSIS (FOR BUSINESS AND HOME)
- NEWDOS/80 REVIEW
- DUTCHING THE HORSE SYSTEM THAT CAN'T LOSE
- A SIMULATED GOLF GAME
- CONTINUOUS FORM SOURCES
- TAX/SAVER REVIEW
- ... AND MORE

FREE* WITH YOUR SUBSCRIPTION OR RENEWAL

FINCALC

A Complete Financial Analysis Package Used To Calculate Markup, Margin, Annuities, Compound Interest, Nominal And Effective Rates, Sinking Funds, Mortgage Calculations, Future Value, Savings and Insurance, Percentage Difference Between Two Numbers, Amortization Schedule and More

SEND FOR OUR NEW 64 PAGE SOFTWARE CATALOG (INCLUDING LISTINGS OF HUNDREDS OF TRS-80™ PROGRAMS AVAILABLE ON CASSETTE AND DISKETTE). \$2.00 OR FREE WITH EACH SUBSCRIPTIONS OR SAMPLE ISSUE

* All programs are supplied on cassette (add \$3 for Diskette Version - add \$5 for modified Mod-II Version).

COMPUTRONICS!

50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977

ONE YEAR SUBSCRIPTION \$24
TWO YEAR SUBSCRIPTION \$48
SAMPLE OF LATEST ISSUE \$ 4

START MY SUBSCRIPTION WITH ISSUE.....

(#1 July 1978 • #12 - June 1979 • #24 - July 1980 • #30 January 1981)

NEW SUBSCRIPTION..... RENEWAL.....

**NEW TOLL-FREE
ORDER LINE**
(OUTSIDE OF N.Y. STATE)
(800) 431-2818



**24 HOUR
ORDER
LINE**
(914) 425-1535



CREDIT CARD NUMBER _____ EXP. DATE _____

SIGNATURE _____ NAME _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

*** ADD \$12/YEAR (CANADA, MEXICO) - ADD \$24/YEAR AIR MAIL - OUTSIDE OF U.S.A., CANADA & MEXICO ***

Lowest Prices on Personal Computers

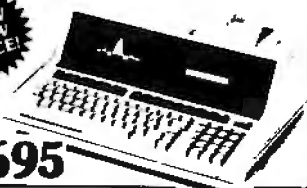


800™... \$749

ATARI® List \$1080

ATARI® 400. \$359

hp HEWLETT
PACKARD HP-85



\$2695

HP-85 Accessories

5 1/4" Dual Master Disc Drive List \$2500... \$2125
5 1/4" Single Master Disc Drive List \$1500... \$1275
HP 7225A Graphics Plotter List \$2050... \$1845
HP-85 16K Memory Module List \$395... \$355
HP-85 Application Pacs Standard List \$95... \$85
Serial (RS-232C) Interface Module List \$395... \$355
GPIO Interface Module List \$495... \$445

HP-125 \$3089



HP-41CV with five times

more memory



built in.
List \$325
\$249

HP-41C
List \$250
\$189

HP-83 \$1695

Personal PC Computer Systems

609 Butternut Street
Syracuse, N.Y. 13208
(315) 475-6800

Prices do not include shipping by UPS. All prices and offers subject to change without notice.

In hardware terms, collisions occur when a player image coincides with another image. Thus, the collision bit will not be set until the part of the screen showing the collision is drawn. This means that collision detection might not occur until as many as 16 ms have elapsed since the player was moved. The preferred solution is to execute player motion and collision detection during the vertical-blank interrupt routine. In this case, collision detection should be checked first, then collisions cleared, then players moved. Another solution is to wait at least 16 ms after moving a player before checking for a collision involving that player.

Using Player-Missile Graphics

There are a number of steps necessary to use player-missile graphics. First, you must set aside an area of RAM (random-access read/write memory) as a player-missile area and tell the computer where it is. If you use single-line resolution, this area will be 1280 bytes long; if you use double-line resolution, it will be 640 bytes long. A good practice is to use the memory area in front of the display area at the top of the computer's available RAM. The layout of the player-missile area is shown in figure 2.

The pointer to the beginning of the player-missile area is labeled

Listing 2: An Atari BASIC program that draws a player on the screen and allows the user to move the figure with a joystick.

```

1  PMBASE = 54279:REM
2  RAMTOP = 106:REM
3  SDMCTL = 559:REM
4  GRACTL = 53277:REM
5  HPOSP0 = 53248:REM
6  PCOLR0 = 704:REM
10 GRAPHICS 0:SETCOLOR 2,0,0:REM
20 X = 100:REM
30 Y = 48:REM
40 A = PEEK(RAMTOP) - 8:REM
50 POKE PMBASE,A:REM
60 MYPMBASE = 256 * A:REM
70 POKE SDMCTL,46:REM
80 POKE GRACTL,3:REM
90 POKE HPOSP0,100:REM
100 FOR I = MYPMBASE + 512 TO
    MYPMBASE + 640:REM
110 POKE I,0
120 NEXT I
130 FOR I = MYPMBASE + 512 + Y TO
    MYPMBASE + 518 + Y
140 READ A:REM
150 POKE I,A
160 NEXT I
170 DATA 8,17,35,255,32,16,8
180 POKE PCOLR0,88:REM
190 A = STICK(0):REM
200 IF A = 15 THEN GOTO 190:REM
210 IF A = 11 THEN X = X - 1:POKE HPOSP0,X
220 IF A = 7 THEN X = X + 1:POKE HPOSP0,X
230 IF A <> 13 THEN GOTO 280
240 FOR I = 8 TO 0 STEP -1
250 POKE MYPMBASE + 512 + Y + I,PEEK
    (MYPMBASE + 511 + Y + I)
260 NEXT I
270 Y = Y + 1
280 IF A <> 14 THEN GOTO 190
290 FOR I = 0 TO 8
300 POKE MYPMBASE + 511 + Y + I,PEEK
    (MYPMBASE + 512 + Y + I)
310 NEXT I
320 Y = Y - 1
330 GOTO 190

```

player-missile base pointer
OS top of RAM pointer
RAM shadow of DMACTL register
CTIA graphics control register
horizontal position of P0
shadow of player 0 color
set background color to black
BASIC's player horizontal position
BASIC's player vertical position
get RAM 2 K below top of RAM
tell ANTIC where PM RAM is
keep track of PM RAM address
enable PM DMA with 2-line res
enable PM display
declare horizontal position

this loop clears player

this loop draws the player

make the player pink
read joystick
if inactive, try again

H & E COMPUTRONICS INC.

• EVERYTHING FOR YOUR TRS-80* • ATARI* • APPLE* • PET* •

*TRS-80 is a trademark of the Radio Shack Division of Tandy Corp. - *ATARI is a trademark of Atari Inc. - *Apple is a trademark of Apple Corp. - *Pet is a trademark of Commodore



★ All orders processed within 24-Hours
★ 30-Day money back guarantee on all Software

BUSINESS PAC 100

100 Ready-To-Run

Business Programs

(ON CASSETTE OR DISKETTE).....Includes 110 Page Users Manual.....5 Cassettes (Or Diskettes)
Inventory Control.....Payroll.....Bookkeeping System.....Stock Calculations.....
Checkbook Maintenance.....Accounts Receivable.....Accounts Payable.....

BUSINESS 100 PROGRAM LIST

| | |
|---------------|--|
| 1 RULE78 | Interest Apportionment by Rule of the 78's |
| 2 ANNU1 | Annuity computation program |
| 3 DATE | Time between dates |
| 4 DAYYEAR | Day of year a particular date falls on |
| 5 LEASEINT | Interest rate on lease |
| 6 BREAKEVN | Breakeven analysis |
| 7 DEPRSL | Straightline depreciation |
| 8 DEPRSY | Sum of the digits depreciation |
| 9 DEPRDB | Declining balance depreciation |
| 10 DEPRDDB | Double declining balance depreciation |
| 11 TAXDEP | Cash flow vs. depreciation tables |
| 12 CHECK2 | Prints NEBS checks along with daily register |
| 13 CHECKBK1 | Checkbook maintenance program |
| 14 MORTGAGE/A | Mortgage amortization table |
| 15 MULTMOM | Computes time needed for money to double, triple, etc. |
| 16 SALVAGE | Determines salvage value of an investment |
| 17 RRVARIN | Rate of return on investment with variable inflows |
| 18 RRCONST | Rate of return on investment with constant inflows |
| 19 EFFECT | Effective interest rate of a loan |
| 20 FVAL | Future value of an investment (compound interest) |
| 21 PVAL | Present value of a future amount |
| 22 LOANPAY | Amount of payment on a loan |
| 23 REGWITH | Equal withdrawals from investment to leave 0 over |
| 24 SIMPDISK | Simple discount analysis |
| 25 DATEVAL | Equivalent & nonequivalent dated values for oblig. |
| 26 ANNUDEF | Present value of deferred annuities |
| 27 MARKUP | % Markup analysis for items |
| 28 SINKFUND | Sinking fund amortization program |
| 29 BONDVAL | Value of a bond |
| 30 DEplete | Depletion analysis |
| 31 BLACKSH | Black Scholes options analysis |
| 32 STOCVAL1 | Expected return on stock via discounts dividends |
| 33 WARVAL | Value of a warrant |
| 34 BONDVAL2 | Value of a bond |
| 35 EPSEST | Estimate of future earnings per share for company |
| 36 BETAALPH | Computes alpha and beta variables for stock |
| 37 SHARPE1 | Portfolio selection model-i.e. what stocks to hold |
| 38 OPTWRITE | Option writing computations |
| 39 RTVAL | Value of a right |
| 40 EXPVAL | Expected value analysis |
| 41 BAYES | Bayesian decisions |
| 42 VALPRINF | Value of perfect information |
| 43 VALADINF | Value of additional information |
| 44 UTILITY | Derives utility function |
| 45 SIMPLEX | Linear programming solution by simplex method |
| 46 TRANS | Transportation method for linear programming |
| 47 EQQ | Economic order quantity inventory model |
| 48 QJUE1 | Single server queueing (waiting line) model |
| 49 CVP | Cost-volume-profit analysis |
| 50 CONDPF0F | Conditional profit tables |
| 51 OPTLOSS | Opportunity loss tables |
| 52 FQJQOQ | Fixed quantity economic order quantity model |

| | |
|--------------|---|
| 59 WACC | Weighted average cost of capital |
| 60 COMPBAL | True rate on loan with compensating bal. required |
| 61 DISCBAL | True rate on discounted loan |
| 62 MERGANAL | Merger analysis computations |
| 63 FINRAT | Financial ratios for a firm |
| 64 NPV | Net present value of project |
| 65 PRINDLAS | Laspeyres price index |
| 66 PRINDPA | Paasche price index |
| 67 SEASIND | Constructs seasonal quantity indices for company |
| 68 TIMETR | Time series analysis linear trend |
| 69 TIMEMOV | Time series analysis moving average trend |
| 70 FUPRINF | Future price estimation with inflation |
| 71 MAILPAC | Mailing list system |
| 72 LETWRT | Letter writing system-links with MAILPAC |
| 73 SORT3 | Sorts list of names |
| 74 LABEL1 | Shipping label maker |
| 75 LABEL2 | Name label maker |
| 76 BUSBUK | HOME business bookkeeping system |
| 77 TIMECLCK | Computes weeks total hours from timeclock info. |
| 78 ACCTPAY | In memory accounts payable system-storage permitted |
| 79 INVOICE | Generate invoice on screen and print on printer |
| 80 INVENT2 | In memory inventory control system |
| 81 TELDIR | Computerized telephone directory |
| 82 TIMUSAN | Time use analysis |
| 83 ASSIGN | Use of assignment algorithm for optimal job assign. |
| 84 ACCTREC | In memory accounts receivable system-storage ok |
| 85 TERMSPAY | Compares 3 methods of repayment of loans |
| 86 PAYNET | Computes gross pay required for given net |
| 87 SELLPR | Computes selling price for given after tax amount |
| 88 ARBCOMP | Arbitrage computations |
| 89 DEPRSF | Sinking fund depreciation |
| 90 UPSZONE | Finds UPS zones from zip code |
| 91 ENVELOPE | Types envelope including return address |
| 92 AUTOEXP | Automobile expense analysis |
| 93 INSFILE | Insurance policy file |
| 94 PAYROLL2 | In memory payroll system |
| 95 DILANAL | Dilution analysis |
| 96 LOANAFFD | Loan amount a borrower can afford |
| 97 RENTPRCH | Purchase price for rental property |
| 98 SALELEAS | Sale-leaseback analysis |
| 99 RRCONVBD | Investor's rate of return on convertible bond |
| 100 PORTVAL9 | Stock market portfolio storage-valuation program |

- CASSETTE VERSION \$99.95
- DISKETTE VERSION \$99.95
- TRS-80* MODEL II VERSION \$149.95

ADD \$3.00 FOR SHIPPING IN UPS AREAS
ADD \$4.00 FOR C.O.D. OR NON-UPS AREAS
ADD \$5.00 OUTSIDE U.S.A, CANADA & MEXICO

NEW TOLL-FREE
ORDER LINE
(OUTSIDE OF N.Y. STATE)
(800) 431-2818

COMPUTRONICS
MATHEMATICAL APPLICATIONS SERVICE

50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977



24 HOUR
ORDER LINE
(914) 425-1535

| NAME | DESCRIPTION |
|------------|--|
| 53 FQEQWSH | As above but with shortages permitted |
| 54 FQEQQPB | As above but with quantity price breaks |
| 55 QUEJECB | Cost-benefit waiting line analysis |
| 56 NCFANAL | Net cash-flow analysis for simple investment |
| 57 PROFIND | Profitability index of a project |
| 58 CAPI | Cap. Asset Pr. Model analysis of project |

Circle 180 on inquiry card.

PMBASE. Because of internal limitations of the ANTIC device (a custom integrated circuit in the Atari computers), PMBASE must be on a 1 K-byte boundary for single-line resolution, or a 2 K-byte boundary for double-line resolution. If you elect

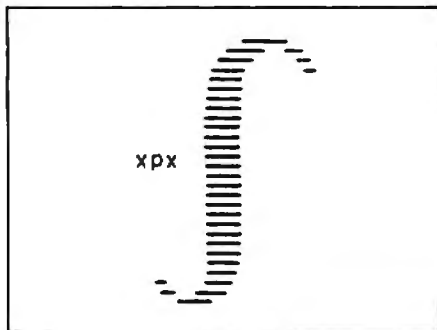


Figure 4: Use of a player as a special symbol. This can be done because players and missiles are superimposed over whatever text or graphics are in effect.

Listing 3: An Atari BASIC program to create a pseudoplayer with increased resolution. See the text and figure 3 for details.

```

1  RAMTOP = 106:REM
2  PMBASE = 54279:REM

3  SDMCTL = 559:REM
4  GRACTL = 53277:REM
5  HPOSP0 = 53248:REM
6  PCOLR0 = 704:REM

7  SIZEP0 = 53256:REM
8  GPRIOR = 623:REM
10 GRAPHICS 7
20 SETCOLOR 4,8,4
30 SETCOLOR 2,0,0
40 COLOR 3
50 FOR Y=0 TO 79:REM
60 PLOT 0,Y
70 DRAWTO 159,Y
80 NEXT Y
90 A = PEEK(RAMTOP) - 20:REM
100 POKE PMBASE,A
110 MYPMBASE = 256 * A
120 POKE SDMCTL,46
130 POKE GRACTL,3
140 POKE HPOSP0,100
150 FOR I = MYPMBASE + 512 TO MYPMBASE
    + 640
160 POKE I,255:REM
170 NEXT I
180 POKE PCOLR0,88
190 POKE SIZEP0,3:REM
200 POKE GPRIOR,4:REM
210 COLOR 4
220 FOR Y = 30 TO 40
230 PLOT Y + 22,Y
240 DRAWTO Y + 43,Y
250 NEXT Y

OS top of RAM pointer
ANTIC player-missile RAM
pointer
shadow of DMACTL
CTIA graphics control register
horizontal position register of P0
shadow of player 0 color
register
player width control register
priority control register

this loop fills the screen

must back up further for GR.7

make player solid color

set player to quadruple width
set priority

```

to use less than four players or none of the missiles, the areas of memory set aside for the unused objects may be used for other purposes. Once you decide where your player-missile area will be, you inform ANTIC of this by storing the page number of PMBASE into the PMBASE register in ANTIC.

The next step is to clear the player and missile areas by storing zeros into all locations in the player-missile memory area. Then draw the players and missiles by storing image data into the appropriate locations in the player-missile area.

Next, set the player parameters by setting the player color, horizontal position, and width registers to their initial values. If necessary, set the player/playfield priorities. Inform ANTIC of the vertical resolution desired by setting bit D4 of register DMACTL (shadowed at SDMCTL) for single-line resolution and clearing

the bit for double-line resolution. Finally, enable the players by setting the appropriate bits in DMACTL. Be careful not to disturb the other bits in DMACTL. A sample BASIC program for setting up a player and moving it with the joystick is given in listing 2.

Once players are displayed, they can be difficult to remove from the screen because the procedure by which they are displayed involves several steps. First, the ANTIC integrated circuit retrieves player-missile data from the player-missile area RAM (if such retrieval is enabled in the DMACTL register). Then ANTIC ships the player-missile data to the CTIA integrated circuit (if such action is enabled in the GRACTL register). CTIA displays whatever is in its player and missile graphics registers (GRAFP0 through GRAFP3 and GRAFM). Many programmers attempt to turn off player-missile graphics by clearing the control bits in DMACTL and GRACTL. This only prevents ANTIC from sending new player-missile data to CTIA; the old data in the GRAF(X) registers will still be displayed. To completely clear the players, the GRAF(X) registers must be cleared after the control bits in DMACTL and GRACTL have been cleared. A simpler solution is to leave the player up, but set its horizontal position to zero. Of course, if this solution is used, ANTIC will continue to use DMA to retrieve player-missile data, wasting roughly 10,000 machine cycles (about 10 ms) per second.

Uses

Player-missile graphics allow a number of special capabilities. They are of great value in animation. They do have limitations: there are only four players and each is only 8 bits wide. If you need more bits of horizontal resolution, you can always fall back on playfield animation. But for high-speed or quick-and-dirty animation, player-missile graphics work very well.

It is possible to bypass ANTIC and write player-missile data directly into the player-missile graphics registers (GRAFP(X)) in the CTIA integrated circuit. This gives the programmer

Get on the right **trak**TM in floppies with new

trakTM 5¼" & 8" disk drives



5¼" from \$399 list
8" from \$899 list

TRAK — the way to go — in floppy disk drives. Whether you are just setting up your computer system, expanding it, or re-equipping — make it TRAK.

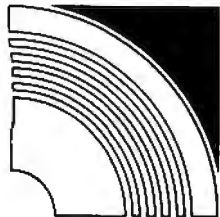
With TRAK you get the finest of industry-standard disk drives, custom electronics and custom cabinetry. In your choice of office beige or silver gray. And other options like door locks, front bezels, write-protect switch, extender card and more.

Drives with the industry's fastest access time — from 3 to 5 ms. With up to 9200 hours MTBF. 40, 77, 80 track. Single or double density. Single or double sided. Up to 1.6 Mega-Byte capacity. Single, dual or triple cabinets. With or without power supplies. And a TRAK exclusive — dual LED panel indicators for Power-On and In-Use. Convenient — as you know if you've ever left things "on" for long periods without realizing it. Compatible with TRS-80®, Heath/Zenith, Northstar, Apple II® and most S-100 based systems.

Custom electronics — custom transformers — for 110VAC or 220VAC, 50 or 60 Hz. Fused for protection. With regulation for low ripple and constant output even with input variation. Quiet convection cooling through vents on all cabinet sides without the need of noisy, bothersome fans.

Low prices. Complete 5¼" drives list as low as \$399, complete 8" drives as low as \$899 list. And your TRAK dealer gives you the best of everything — in price and service, in or out of warranty. Standard TRAK warranty is 90 days; 12 month extension available at extra cost. Check your dealer now for the right TRAK in disk drives — TRAK.

For the name of your nearest dealer and full details, Call Toll-Free 1-800-323-4853



or write:

trak

microcomputer corp.

1511 Ogden Ave., Downers Grove, IL 60515

® TRS-80 is a registered trademark of Radio Shack, a Tandy Company
® Apple II is a registered trademark of the Apple Computer Company

International inquiries invited.
Dealerships available.

| | | |
|---|--|------|
| \$25 | INTRODUCTORY FACTORY REBATE | \$25 |
| Buy from your TRAK dealer, then mail copy of sales receipt with TRAK serial number and this coupon to TRAK. We will rebate \$25 direct to you as our way of welcoming you to the TRAK drive family. | | |
| Name _____ | | |
| Address _____ | | |
| City _____ State _____ Zip _____ | | |
| Offer expires Nov. 30, 1981. Limit one rebate per customer. Offer void where prohibited. | | |

more direct control over player-missile graphics. As a result, it also increases his or her responsibilities. The programmer must maintain a bit-map of the player-missile data and move it into the graphics registers at the appropriate times. The 6502 must therefore be slaved (ie; synchronized to and triggered by) to the screen

drawing cycle. This is a clumsy technique that offers minor performance improvements in return for major programming efforts. The programmer who bypasses the hardware power offered by ANTIC must make up for it with his or her own sweat.

Player-missile graphics offer many capabilities in addition to animation.

Players are an excellent way to increase the amount of color in a display. The four additional color registers provided allow four more colors on each line of the display. Of course, the 8-bit resolution does limit the range of their application.

There is a way around this limitation that can sometimes be used. Take a player at quadruple width and put it onto the screen. Then set the priorities so the player has lower priority than a playfield color. Next, reverse that playfield color with background, so the apparent background color of the screen is really a playfield color. The player disappears behind this new false background. Cut a hole in the false background by drawing true background on it. The player will show up in front of the true background color, but only in the area where true background has been drawn. In this way, the player can have more than 8 bits of horizontal resolution. A sample program for doing this is given in listing 3. This program produces the display shown in figure 3.

Another application of player-missile graphics is for special characters. There are many special types of characters that cross vertical boundaries in normal character sets. One way to deal with these is to create special character sets that address this problem. Another way is to use a player. Subscripts, integral signs, and other special symbols can be done this way. A sample program for doing this is given in listing 4. This program produces the display shown in figure 4.

A particularly useful application of players is for cursors. With their ability to smoothly move anywhere over the screen without disturbing the contents, they are ideally suited for such applications. The cursor can change color as it moves over the screen to indicate what it has under it.

Player-missile graphics provide many capabilities. Their uses for action games as animated objects are obvious. They have many serious uses as well. They can add color and resolution to any display. They can present special characters. They can be used as cursors. Use them. ■

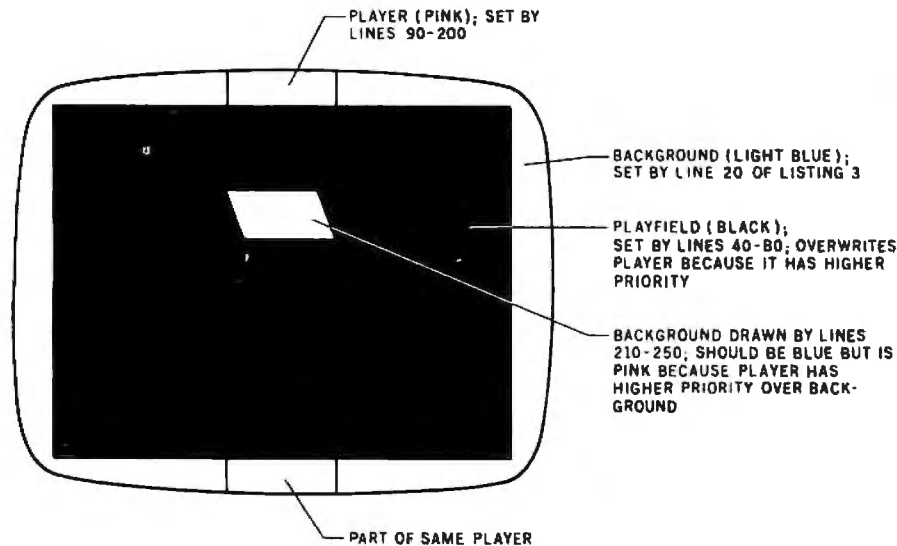


Figure 3: Playing tricks with the video display to achieve higher player resolution. This technique works by manipulating the relative priorities of the playfield, players, and background. See the text and listing 3 for details.

Listing 4: An Atari BASIC program to create a player in the shape of an integral sign. See figure 4.

```

1  RAMTOP = 106:REM
2  PMBASE = 54279:REM
3  SDMCTL = 559:REM
4  GRACTL = 53277:REM
5  HPOSP0 = 53248:REM
6  PCOLR0 = 704:REM
10 GRAPHICS 0:A = PEEK(RAMTOP)-
    16:REM
20 POKE PMBASE,A
30 MYPMBASE = 256 * A
40 POKE SDMCTL,62
50 POKE GRACTL,3
60 POKE HPOSP0,102
70 FOR I = MYPMBASE + 1024 TO
    MYPMBASE + 1280
80 POKE I,0
90 NEXT I
100 POKE PCOLR0,140
110 FOR I = 0 TO 15
120 READ X
130 POKE MYPMBASE + 1100 + I,X
140 NEXT I
150 DATA 14,29,24,24,24,24,24,24
160 DATA 24,24,24,24,24,24,184,112
170 ?" ":REM
180 POSITION 15,6
190 ?"x dx"

```

OS top of RAM pointer
ANTIC player-missile RAM pointer
shadow of DMACTL
CTIA's graphics control register
horizontal position register of P0
shadow of player 0 color register
must back up for 1-line resolution
clear screen

New

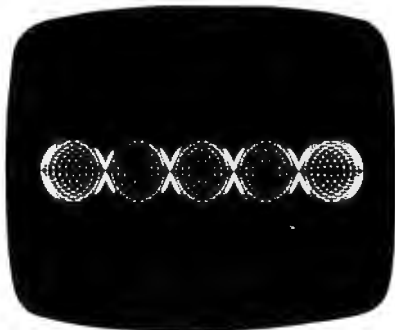
XCEL™ GRAPHICS

512 x 240 RESOLUTION

For **Z-89 & Superbrain™**

And soon for TRS-80® MODEL II

XCEL™ GRAPHICS UNIT — A completely assembled hardware retrofit package providing high resolution graphics display, normal video display or both displays simultaneously. **\$895.00**

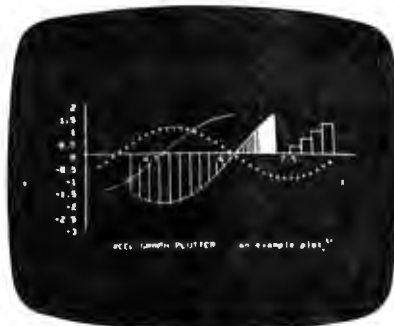


\$175.00

XCEL™ SYMBOL GENERATOR—Subroutines to generate characters and strings with bold face, and 90° rotation options, circles, arcs, vectors, rectangles, area fills with reverse video option. All callable from your programs

\$175.00

XCEL™ GRAPH PLOTTER—Choice of four representations (line, graph, histogram, bar graph and scatter plot) with automatic annotation of axes and automatic scaling that allows any number of functions to be displayed on one set of axes. All callable from your programs



\$345.00

XCEL™ 3-D GENERATOR—User accessible routines for creation, editing and viewing "wire-frame" objects from any angle and in any orientation with scaling "zoom" and a graphics editor



\$395.00

XCEL™ SURFACE PLOTTER—True perspective view, with full hidden line removal, of curved surfaces from a user defined viewpoint callable from your programs.



\$395.00

XCEL™ GRAPHICS TERMINAL—Emulates a subset of the Tektronix® 4010 Series Graphics Terminal functions. Simple menu-driven keyboard commands for configuration and dot-dash and erase mode vectors

XCEL™ software packages operate under CPM® and utilize the Microsoft parameter passing mechanism for compatibility with high level languages, such as BASIC, FORTRAN, COBOL, PL1, and PASCAL. XCEL software can be loaded into high memory and called from your programs or integrated directly into your programs through use of the Microsoft linking loader.

FOR ADDITIONAL PRODUCT INFORMATION
IN CONTINENTAL U.S. CALL TOLL FREE:

Circle 241 on Inquiry card.

(800) 421-1423

IN CALIFORNIA CALL
(213) 320-6604



MAXTEK, INC. 2908 Oregon Court, Torrance, CA 90503

Superbrain—trademark, Intertec Data Systems Tektronix—registered trademark, Tektronix, Inc. CPM—registered trademark, Digital Research TRS-80—registered trademark, Tandy Corp.

| Symbolic Name | Hardware Register Function | Location | | Symbolic Name | Shadow Register (if any) Location | |
|---------------|-------------------------------------|------------------|---------|---------------|---|---------|
| | | Hexa- decimal | Decimal | | Hexa- decimal | Decimal |
| COLBK | Color Luminance of Background | D01A | 53274 | COLOR4 | 2C8 | 712 |
| COLPF0 | Color Luminance of Playfield 0 | D016 | 53270 | COLOR0 | 2C4 | 708 |
| COLPF1 | Color Luminance of Playfield 1 | D017 | 53271 | COLOR1 | 2C5 | 709 |
| COLPF2 | Color Luminance of Playfield 2 | D018 | 53272 | COLOR2 | 2C6 | 710 |
| COLPF3 | Color Luminance of Playfield 3 | D019 | 53273 | COLOR3 | 2C7 | 711 |
| COLPM0 | Color Luminance of Player-Missile 0 | D012 | 53266 | PCOLR0 | 2C0 | 704 |
| COLPM1 | Color Luminance of Player-Missile 1 | D013 | 53267 | PCOLR1 | 2C1 | 705 |
| COLPM2 | Color Luminance of Player-Missile 2 | D014 | 53268 | PCOLR2 | 2C2 | 706 |
| COLPM3 | Color Luminance of Player-Missile 3 | D015 | 53269 | PCOLR3 | 2C3 | 707 |
| DMACTL | Direct Memory Access (DMA) Control | D400 | 54272 | SDMCTL | 22F | 559 |
| GRCTL | Graphic Control | D01D | 53277 | | | |
| GRAFM | Graphics for all Missiles | D011 | 53265 | | | |
| GRAFP0 | Graphics for Player 0 | D00D | 53261 | | | |
| GRAFP1 | Graphics for Player 1 | D00E | 53262 | | | |
| GRAFP2 | Graphics for Player 2 | D00F | 53263 | | | |
| GRAFP3 | Graphics for Player 3 | D010 | 53264 | | | |
| HITCLR | Collision Clear | D01E | 53278 | | | |
| HPOSM0 | Horizontal Position of Missile 0 | D004 | 53252 | | | |
| HPOSM1 | Horizontal Position of Missile 1 | D005 | 53253 | | | |
| HPOSM2 | Horizontal Position of Missile 2 | D006 | 53254 | | | |
| HPOSM3 | Horizontal Position of Missile 3 | D007 | 53255 | | | |
| HPOSP0 | Horizontal Position of Player 0 | D000 | 53248 | | | |
| HPOSP1 | Horizontal Position of Player 1 | D001 | 53249 | | | |
| HPOSP2 | Horizontal Position of Player 2 | D002 | 53250 | | | |
| HPOSP3 | Horizontal Position of Player 3 | D003 | 53251 | | | |
| MOPF | Missile 0 to Playfield Collisions | D000 | 53248 | | | |
| M0PL | Missile 0 to Player Collisions | D008 | 53256 | | | |
| M1PF | Missile 1 to Playfield Collisions | D001 | 53249 | | | |
| M1PL | Missile 1 to Player Collisions | D009 | 53257 | | | |
| M2PF | Missile 2 to Playfield Collisions | D002 | 53250 | | | |
| M2PL | Missile 2 to Player Collisions | D00A | 53258 | | | |
| M3PF | Missile 3 to Playfield Collisions | D003 | 53251 | | | |
| M3PL | Missile 3 to Player Collisions | D00B | 53259 | | | |
| P0PF | Player 0 to Playfield Collisions | D004 | 53252 | | | |
| P0PL | Player 0 to Player Collisions | D00C | 53260 | | | |
| P1PF | Player 1 to Playfield Collisions | D005 | 53253 | | | |
| P1PL | Player 1 to Player Collisions | D00D | 53261 | | | |
| P2PF | Player 2 to Playfield Collisions | D006 | 53254 | | | |
| P2PL | Player 2 to Player Collisions | D00E | 53262 | | | |
| P3PF | Player 3 to Playfield Collisions | D007 | 53255 | | | |
| P3PL | Player 3 to Player Collisions | D00F | 53263 | | | |
| PMBASE | Player Missile Base Address | D407 | 54279 | | | |
| PRIOR | Priority Select | D01B | 53275 | GPRIOR | 28F | 623 |
| SIEM | Sizes for all Missiles | D00C | 53260 | | | |
| SIZEP0 | Size of Player 0 | D008 | 53256 | | | |
| SIZEP1 | Size of Player 1 | D009 | 53257 | | | |
| SIZEP2 | Size of Player 2 | D00A | 53258 | | | |
| SIZEP3 | Size of Player 3 | D00B | 53259 | | | |



Make this a **COMPUTER CHRISTMAS** for your child.

The original **WORDDANCE** stories for **CHILDREN** feature animated words and graphics. Introduce your child to the computer and encourage reading too.

Titles: (1) "The Cat" (2) "The Hat With All That" (3) "The Tooth Fairy's Train" (4) "Chrys Hates Computers" (5) "Which is Left, Which is Right?" (6) "The Spelling Bee Mystery"

And introducing The Jonathan and Pandora Science Fantasy Series: (7) "The 4-D Glasses" (8) "Pandora's Telering" (9) "The History Test" (10) "Jonathan and the Cave Boy."

Titles (1)-(10) (Ages 6-12) available for TRS 80 16K and Apple II 16K.

Cassette \$24.95 (Includes all ten stories)

Disk \$29.95 (Includes all ten stories)

*Specify make and model.
Send check or M.O. to*

Negative Entropy
P.O. Box 786
Vernon, CT 06066

INCREDIBLE? BELIEVE IT!

PRINTERS



150 cps bidirectional-9x9 dot matrix, quietized case, 136 col, vertical form control and many other functions

\$1195

We feel this printer offers the best price/performance ratio available. RS-232 serial to 19,200 baud x-on, x-off add \$40

Teletype 40, 300 LPM-typewriter quality, RS-232 interface. This quality printer is available in many configurations including forms access, quietized case, etc. **from Only \$2928**

Teletype 43 **from \$995**

Teletype AP-200, 340 cps dot matrix (similar to Data Prod. M-200) **\$2799**

NEC Spinwriter-55 cps, bidirectional, letter quality R.O. **\$2560** **KSR \$2799**

DIABLO 630-40 cps, bidirectional, daisy wheel, plot/graph **\$2449**

QUME Sprint 9/45 cps, daisy wheel **\$2228**

C. ITOH Starwriter, 25 cps, daisy wheel **\$1575**

C. ITOH Starwriter, 45 cps, daisy wheel **\$1849**

EPSON MX-80, 80 cps, 9x9 dot matrix **\$CALL**

ANADEX 9500/9501, up to 200 cps, high resolution dot **\$1349**

OKIDATA Microline 80, 80 cps, 9x7 dot matrix **\$495**

Microline 82A, bidirectional, friction/pin feed **\$599**

Microline 83A, bidirectional, 120 cps, uses 15" paper **\$875**

TI-810, 150 cps, Basic **\$1449**

Package-Compressed print, vertical form control **\$1630**

CENTRONICS 704-9, 180 cps, 9x9 dot matrix, 132 col, RS-232 **\$CALL**

704-11, 180 cps, 9x9 dot matrix, 132 col, parallel **\$CALL**

730.100 cps, 7x7 dot matrix, same as R.S. LPII **\$CALL**

739.100 cps, nx9 dot matrix, FULL GRAPHICS **\$CALL**

DEC LA-34 **\$1085**

IDS 460G **\$892**

S-100 SPECIALTIES



DP/2-80A, CPU, 64K ram, floppy cont., RS-232 port, S-100 IEEE, 8 slot in Adds terminal, inc. CP/M 2.2 **\$CALL**



Delta has Winchester based networks of up to 16 users available.

Systems Group Call us for best prices on these high quality 2nd generation boards and systems.



California Computer Systems These high quality, reliable products have made CCS defacto industry standard for S-100 products Assembled and tested:

2200 H.D. Mainframe, 20 a. P.S., 12 slot MB **list \$434 only \$359**

2065C 64K dynamic RAM/Bank Select **\$720 \$580**

2810A Z-80 CPU, serial port, ROM monitor **\$310 \$259**

2422A Floppy Cont, CP/M 2.2, ROM monitor **\$425 \$345**

IMS 8000 DT w/ 64k, 1.2 MB 8" floppies, 2 serial, 3 par. CPM 2.2 **\$CALL**

FULL 2 YEAR WARRANTY!

2-80 CPU \$310

D2 Disk controller \$354

64K Dynamic Ram \$648

MICROBYTE FULL SYSTEMS AVAILABLE

SUPERBRAIN \$CALL

Similar savings on the full lines of CCS, SSM, NNC, MORROW, DELTA, NORTHSTAR, ITHACA INTERSYSTEMS, GODBOUT, NEC, TELEVIDEO, IMS

ZENITH, ADDS, DEC, DATA GEN., ATARI, DYNABYTE.

8" DISK DRIVE SALE

8" SHUGART SA801R \$450 **8" SHUGART SA 851R \$669 2 for \$1289**

QUME DATATRACK 8 \$625 2 for \$1199

Enclosure, power supply for 2 8" drives A&T \$299

NNC industrial grade enclosure for 2 drives with P.S. \$445

MORROW Discus 2D + CP/M*, MICROSOFT BASIC \$950

Discus 2 + 2 + CP/M*, MICROSOFT BASIC \$1195

HARD DISK SPECIALS

CORVUS 10MB and controller \$5350 **List only \$CALL**

20MB and controller \$6450 **List only \$CALL**

Constellation Network Multiplexer and Mirror Video Tape Disk Backup

MORROW 26MB + controller + CP/M 2.2*, M basic \$4495 \$3821

controller, CDC Hawk Drive (5 fix, 5 rem) \$7995 \$6795

controller, Western Dynex (5 fix, 5 rem) \$5995 \$5099

Winchester 5 1/4 drives complete with case, cable, software, S-100 controller. Adapter avail. for use with any Z-80 system. Cartridge drive controllers avail.

Quantity discounts available! **List \$2898**

5MB \$3398

10MB \$3398

ADDS S33-33MB Drive and Controller \$4468

S66-66 MB Drive and Controller \$5925

PRIAM 8" and 14" Winchester/tape subsystems avail.

We carry the full line of ADDES disk and tape controllers and subsystems.

We carry the full line of ADDES disk and tape controllers and subsystems.

FULLY CONFIGURED BUSINESS SYSTEMS

The following are some examples of the fully assembled and tested business and scientific computer systems which we offer. All include 64K bytes

RAM, Z-80A 4mh CPU. We offer a full line of quality, tested software.

Delta TVD w/ 1.2 Mb floppy drives, 2 serial, 3 parallel ports \$CALL

Delta 1004 w/10 MB hand disk, 1 MB floppy, 6 serial, 3 parallel ports \$CALL

CCS 2210A w/floppy controller, 1 serial port \$1849

CCS 300-1A w/1.2MB floppy drives, 2 serial, 2 parallel ports \$4849

CCS 400-1A w/10MB hard disc, 2 serial, 2 parallel ports \$6999

NNC 80 w/1 MB floppy drives, 2 serial, 3 parallel ports \$3999

NNC 80W w/ 5MB floppy, 8.4MB hard disc, (DASIS optional) \$6693

ALTDS single and multi-user systems \$CALL

MORROW Decision 1, MICROSOFT basic, UNIX \$CALL

XEROX. 820 Desktop computer-64K, 2 floppies, (CP/M AVAIL.) List \$2995 \$CALL

We offer multi-user networks by DELTA PRODUCTS, DISCOVERY, TELEVIDEO, MUSYS, IMS, DIGITAL, MICROSYS

TERMINALS

AMPEX DIALOGUE 30, 80 \$CALL

TELEVIDEO 910 C (multi-terminal) \$699 \$599

920 C \$1030 \$789

950C \$1195 \$989

SOROC IQ 120 \$995 \$729

HAZELTINE ESPRIT \$745 \$669

DEC VT-100 \$2050 \$1575

Similar savings for our HAZELTINE and LEAR SIEGLER lines

LOOK HERE! **AMPEX**

Call us for ALL your software needs **Dialogue 80™**

SYSTEMS HOUSES & EDUCATIONAL INSTITUTIONS, & GOVERNMENT AGENCIES GIVEN SPECIAL CONSIDERATION



ALL OF OUR PERIPHERALS CAN BE CONFIGURED FOR RADIO SHACK® MODEL II

DEALER and INTERNATIONAL INQUIRIES WELCOME

WASHINGTON COMPUTER SERVICES

an affiliate of **WASHINGTON ELECTRIC COMPANY** est. 1912

CUSTOM COMPUTER ROOM WIRING SINCE 1960

97 Spring Street

New York, N.Y. 10012

Hours: 8AM-5:30PM (EST) Mon.-Fri.

TO ORDER: CALL OUR TOLL-FREE NUMBER:

★ (800) 221-5416 ★ In N.Y. State and for technical information call 1-(212) 226-2121

For fast delivery, send certified checks, money order or call to arrange direct bank wire transfers. Personal or company checks require two to three weeks to clear. All prices are mail order only. Prices subject to change without notice; call for latest prices. Prices include 3% cash discount. N.Y. residents add sales tax.

Quantex is a trademark of North Atlantic Industries, Inc. Radio Shack® is a trademark of the Tandy Corp. CP/M® is a trademark of Digital Research



Appendix B: Functional Specification of Selected Atari 400/800 Hardware Registers

The following charts give the functions of the registers listed in Appendix A on a bit-by-bit basis. Although this information is not necessary to the understanding of the article, it is given for the benefit of advanced programmers who want to exercise complete control over the player-missile graphics. This information is excerpted from the *Atari Personal Computer System Operating System User's Manual and Hardware Manual* (part C016555), which contains complete technical information on this and other aspects of the Atari 400 and 800 computers. This user's manual can be purchased from Atari Customer Service, 1346 Bordeaux Dr, Sunnyvale CA 94086; the price is \$27 plus \$3 shipping and handling (California residents must add 6½% tax).

COLBK (Background Color): This address writes data to the Background Color-Luminance Register.

| Color | | | | Luminance | | | Not Used |
|-------------|----|----|----|--------------|----|----|------------------------|
| D7 | D6 | D5 | D4 | D3 | D2 | D1 | |
| X | X | X | X | 0 | 0 | 0 | Zero Luminance (black) |
| (see below) | | | | 0 | 0 | 1 | |
| | | | | 1 | 1 | 1 | |
| 0 | 0 | 0 | 0 | Grey | | | |
| 0 | 0 | 0 | 1 | Gold | | | |
| 0 | 0 | 1 | 0 | Orange | | | |
| 0 | 0 | 1 | 1 | Red-Orange | | | |
| 0 | 1 | 0 | 0 | Pink | | | |
| 0 | 1 | 0 | 1 | Purple | | | |
| 0 | 1 | 1 | 0 | Purple-Blue | | | |
| 0 | 1 | 1 | 1 | Blue | | | |
| 1 | 0 | 0 | 0 | Blue | | | |
| 1 | 0 | 0 | 1 | Light-Blue | | | |
| 1 | 0 | 1 | 0 | Turquoise | | | |
| 1 | 0 | 1 | 1 | Green-Blue | | | |
| 1 | 1 | 0 | 0 | Green | | | |
| 1 | 1 | 0 | 1 | Yellow-Green | | | |
| 1 | 1 | 1 | 0 | Orange-Green | | | |
| 1 | 1 | 1 | 1 | Light-Orange | | | |

Shadow Register: COLOR4

**FIND
OUT
WHAT
FITS
WHAT.**



Just our little effort to remove some of the vast confusion from the data processing, word processing and office products world. You can match up hardware model numbers with disc cartridges, disc packs, or diskette model numbers.

Send for our free 145-page guide. One handy book covers entire DP and WP industry usage of magnetic memory media. How can you do without it?

NASHUA

COMPUTER PRODUCTS DIVISION
Nashua Corporation, Dept. A2,
Nashua, NH 03061

We make everything to fit anything



TELEPHONE
New England and New York (800) 758-1555
East of the Mississippi (800) 758-1729
West of the Mississippi (800) 758-1340
TELEX 643406

Circle 437 on inquiry card.

**SIMPLY
AMAZING
MACHINE**



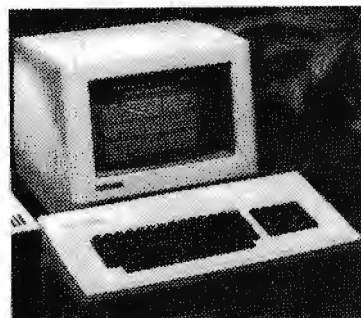
11 EDISON DRIVE
NEW LENOX, IL 60451
815/485-6439 or 800/435-9357

**XEROX
820**

The Xerox is both
a word processor
and a desk top
computer.

OPTIONS

- 2 5¼" Disc Drives
- 2 8" Disc Drives
- Letter Quality Printer
(40 CPS Daisy Wheel Printer)



**Call
For
Price**

Circle 436 on inquiry card.

QUALITY DISK SOFTWARE

BACKED BY ON-GOING APPLICATIONS SUPPORT

APPLE II (A) TRS-80 (T)

HOME FINANCE PAK I: Entire Series \$49.95 (A) (T)

CHECK REGISTER AND BUDGET: This comprehensive CHECKING ACCOUNT MANAGEMENT SYSTEM not only keeps complete records, it also gives you the analysis and control tools you need to actively manage your account. The system provides routines for BUDGETING INCOME AND EXPENSE, AUTOMATIC CHECK SEARCH, and BANK STATEMENT RECONCILING. CRT or printer reports are produced for ACTUAL EXPENSE vs BUDGET, CHECK SEARCH DISPLAY RECONCILIATION REPORT and CHECK REGISTER DISPLAY by month. Check entry is prompted by user-defined menus of standard purposes and recipient codes, speeding data entry and reducing disk storage and retrieval time. Six fields of data are stored for each check: amount, check no., date, purpose, recipient and TAX DEDUCTIBLE REMINDER. CHECK SEARCH routines allow searching on any of these data fields. Up to 100 checks/mo. storage \$39.95

SAVINGS: Account management system for up to 20 separate Savings accounts. Organizes, files and displays deposits, withdrawals and interest earned for each account. \$14.95

CREDIT CARD: Get Control of your credit cards with this program. Organizes, stores and displays purchases, payments and service charges for up to 20 separate cards or bank loans. \$14.95

UNIVERSAL COMPUTING MACHINE: \$49.95 (A)

A user programmable computing system structured around a 50 row x 50 column table. User defines row and column names and equations forming a unique computing machine. Table elements can be multiplied, divided, subtracted or added to any other element. Hundreds of unique computing machines can be defined, used, stored, and recalled, for later use. Excellent for sales forecasts, budgets, inventory lists, income statements, production planning, project cost estimates-in short for any planning, analysis or reporting problem that can be solved with a table.

COLOR CALENDAR: \$29.95 (A)

Got a busy calendar? Organize it with Color Calendar. Whether it's birthdays, appointments, business meetings or a regular office schedule, this program is the perfect way to schedule your activities. The calendar display is a beautiful HI-RES color graphics calendar of the selected month with each scheduled day highlighted in color. Using the daily schedule, you can review any day of the month and schedule an event or activity in any one of 20 time slots from 8:00 A.M. to 5:30 P.M.

BUSINESS SOFTWARE: Entire Series \$159.95 (A) (T)

MICROACCOUNTANT: The ideal accounting system for small businesses. Based on classic T-accounts and double-entry booking, this efficient program provides a journal for recording posting and reviewing up to 1,000 transactions per month to any one of 300 accounts. The program produces CRT and printer reports covering:

TRANSACTION JOURNAL BALANCE SHEET
ACCOUNT LEDGERS INCOME AND EXPENSE STATEMENT

Includes a short primer on Financial Accounting. (48K) \$49.95

UNIVERSAL BUSINESS MACHINE: This program is designed to SIMPLIFY and SAVE TIME for the serious businessman who must periodically Analyze, Plan and Estimate. The program was created using our Universal Computing Machine and it is programmed to provide the following planning and forecasting tools.

CASH FLOW ANALYSIS SALES FORECASTER
PROFORMA PROFIT & LOSS SOURCE AND USE OF FUNDS
PROFORMA BALANCE SHEET JOB COST ESTIMATOR
REAL ESTATE INVESTMENT INVENTORY ANALYSIS

Price, including a copy of the Universal Computing Machine \$89.95

BUSINESS CHECK REGISTER AND BUDGET: Our Check Register and Budget programs expanded to include up to 50 budgetable items and up to 400 checks per month. Includes bank statement reconciling and automatic check search (48K) \$49.95

ELECTRONICS SERIES VOL I & II: Entire Series \$259.95

LOGIC SIMULATOR: SAVE TIME AND MONEY. Simulate your digital logic circuits before you build them. CMOS, TTL, or whatever, if it's digital logic, this program can handle it. The program is an interactive, menu driven, full-fledged logic simulator capable of simulating the bit-time response of a logic network to user-specified input patterns. It will handle up to 1000 gates, including NANDS, NORs, INVERTERS, FLIP-FLOPS, SHIFT REGISTERS, COUNTERS and user-defined MACROS, up to 40 user-defined random, or binary input patterns. Accepts network descriptions from keyboard or from LOGIC DESIGNER for simulation \$159.95 (A) (T)

LOGIC DESIGNER: Interactive HI-RES graphics program for designing digital logic systems. Draw directly on the screen up to 10 different gate types, including NAND, NOR, INVERTER, EX-OR, T-FLOP, JK-FLOP, D-FLOP, RS-FLOP, 4 BIT COUNTER and N-BIT SHIFT REGISTER. User interconnects gates using line graphics commands. Network descriptions for LOGIC SIMULATOR generated simultaneously with the CRT diagram being drawn \$159.95 (A)

MANUAL AND DEMO DISK: Instruction Manual and demo disk illustrating capabilities of both program (s) \$29.95 (A) (T)

ELECTRONIC SERIES VOL III & IV: Entire Series \$259.95

CIRCUIT SIMULATOR: Tired of trial & error circuit design? Simulate & debug your designs before you build them! With CIRCUIT SIMULATOR you build a model of your circuit using RESISTORS, CAPACITORS, INDUCTORS, TRANSISTORS, DIODES, VOLTAGE and CURRENT SOURCES and simulate the waveform response to inputs such as PULSES, SINUSOIDS, SAWTOOTHs, etc... all fully programmable. The output is displayed as an OSCILLOSCOPE-STYLE PLOT of the selected waveforms (Apple only) or as a printed table of voltage vs time. Handles up to 200 nodes and up to 20 sources. Requires 48 RAM \$159.95 (A) (T)

CIRCUIT DESIGNER: Interactive HI-RES graphics program for designing electronic circuits. Draw directly on the screen up to 10 different component types, including those referenced above. Components interconnect list for CIRCUIT SIMULATOR generated automatically. Requires \$159.95

MATHEMATICS SERIES: Entire Series \$49.95

STATISTICAL ANALYSIS I: This menu driven program performs LINEAR REGRESSION analysis, determines the mean, standard deviation and plots the frequency distribution of user-supplied data sets. Printer, Disk, I/O routines \$19.95

NUMERICAL ANALYSIS: HI-RES 2-Dimensional plot of any function. Automatic scaling. At your option, the program will plot the function, plot the INTEGRAL, plot the DERIVATIVE, determine the ROOTS, MAXIMA, MINIMA, INTEGRAL VALUE \$19.95

MATRIX: A general purpose, menu driven program for determining the INVERSE and DETERMINANT of any matrix, as well as the SOLUTION to any set of SIMULTANEOUS LINEAR EQUATIONS. \$19.95

3-D SURFACE PLOTTER: Explore the ELEGANCE and BEAUTY of MATHEMATICS by creating HI-RES PLOTS of 3-dimensional surfaces from any 3-variable equation. Disk save and recall routines for plots. Menu driven to vary surface parameters. Hidden line or transparent plotting \$19.95

ACTION ADVENTURE GAMES: Entire Series \$29.95 (A)

RED BARON: Can you outfly the RED BARON? This fast action game simulates a machine-gun DOGFIGHT between your WORLD WAR I BI-PLANE and the baron's. You can LOOP, DIVE, BANK or CLIMB-and so can the BARON. In HI-RES graphics plus sound. \$14.95

BATTLE OF MIDWAY: You are in command of the U.S.S. HORNETS' DIVE-BOMBER squadron. Your targets are the Aircraft carriers, Akagi, Soryu and Kaga. You must fly your way through ZEROS and AA FIRE to make your DIVE-BOMB run. In HI-RES graphics plus sound. \$14.95

SUB ATTACK: It's April 1943. The enemy convoy is headed for the CONTROL SEA. Your sub, the MORAY, has just sighted the CARRIERS and BATTLESHIPS' Easy pickings. But watch out for the DESTROYERS - they're fast and deadly. In HI-RES graphics plus sound \$14.95

FREE CATALOG: All programs are supplied on disk and run on Apple II w/Disk & Applesoft ROM Card & TRS-80 Level II and require 32K RAM unless otherwise noted. Detailed instructions included. Orders shipped within 5 days. Card users include card number. Add \$1.50 postage and handling with each order. California residents add 6 1/2% sales tax. Foreign orders add \$5.00 postage and handling.

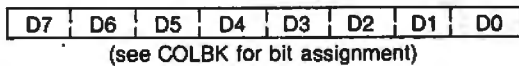


SPECTRUM SOFTWARE
142 Carlow, P.O. Box 2084
Sunnyvale, CA 94087

FOR PHONE ORDERS: (408) 738-4387
DEALER INQUIRIES INVITED.

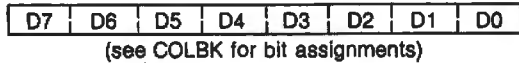


COLPF0—COLPF3 (Playfield Color): These addresses write data to the Playfield Color-Luminance Registers.



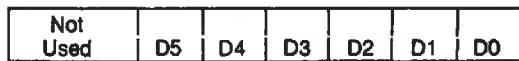
Shadow Registers: COLOR0—3

COLPM0—COLPM3 (Player-Missile Color): These addresses write to the Player-Missile Color-Luminance Registers. Missiles have the same color luminance as their player unless missiles are used as a fifth player (see bit 4 of PRIOR). A fifth player missile gets its color from register COLPF3.



Shadow Registers: PCOLR0—3

DMACTL (Direct Memory Access Control): This address writes data into the DMA Control Register.



- D5 = 1 Enable ANTIC operation (must be set to 1)
- D4 = 1 1 line Player/Missile resolution
- D4 = 0 2 line Player/Missile resolution
- D3 = 1 Enable Player DMA
- D2 = 1 Enable Missile DMA
- D1, D0 = 0 0 No Playfield DMA
- = 0 1 Narrow Playfield DMA (128 Color Clocks)
- = 1 0 Standard Playfield DMA (160 Color Clocks)
- = 1 1 Wide Playfield DMA (192 Color Clocks)

See GRACTL. Shadow Register: SDMCTL, default value hexadecimal 22

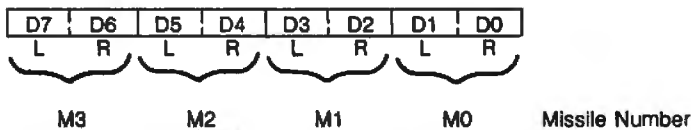
GRACTL (Graphics Control): This address writes data to the Graphic Control Register.



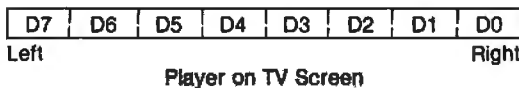
- D1 = 1 Enable Player DMA to Player Graphics Registers.
- D0 = 1 Enable Missile DMA to Missile Graphics Registers.

DMA is enabled by setting bits in both DMACTL and GRACTL. Setting DMACTL only will result in cycles being stolen, but no display will be generated.

GRAFM (Missile Graphics Registers): This address writes data directly into the Missile Graphics Register, independent of DMA. This is a bit-map of the current scan line of all four missiles. It is automatically maintained by the normal use of player-missile graphics.



GRAFP0—GRAFP3 (Player Graphics Registers): These addresses write data directly into the Player Graphics Registers, independent of DMA. This is a bit-map of the current scan line for a given player. It is automatically maintained by the normal use of player-missile graphics.



THE FORTH SOURCE™

Specializing in the FORTH Language.

MANUALS & GUIDES

| | PRICE |
|--|--------------|
| <input type="checkbox"/> "Starting FORTH" by Brodie. Prentice-Hal. Best User's manual available (soft cover) | \$ 16.00 |
| <input type="checkbox"/> "Starting FORTH" (hard cover) | 20.00 |
| <input type="checkbox"/> "Using FORTH" by FORTH, Inc. Guide to FORTH concepts | 25.00 |
| <input type="checkbox"/> "A FORTH Primer" by Stevens In-depth self-study manual. | 25.00 |
| <input type="checkbox"/> "Systems Guide to fig-FORTH" by Ting. Excellent guide to inner mechanisms. | 25.00 |
| <input type="checkbox"/> "PDP-11 FORTH User's Guide" by James. Use with PDP-11 Source. | 20.00 |
| <input type="checkbox"/> "Caltech FORTH Manual" by Ewing. Overview and structure. | 12.00 |
| <input type="checkbox"/> "FORTH-79", Latest FORTH standard. | 15.00 |
| <input type="checkbox"/> "FORTH-79 Standard Conversion" by R. C. Smith. Screens, DOES>, error conditions. | 10.00 |
| <input type="checkbox"/> "TinyPASCAL in fig-FORTH" by Zimmer. | 10.00 |
| <input type="checkbox"/> "Threaded Interpretive Languages" by Loeliger. Byte Books. FORTH adapted for Z80. | 20.00 |
| <input type="checkbox"/> "Invitation to FORTH" by Katzan. Petrocelli Books. Limited introduction. | 18.50 |
| <input type="checkbox"/> "Proceedings, 1980 FORML Conference." Technical papers. | 25.00 |
| <input type="checkbox"/> "Proceedings, 1981 Rochester University FORTH Conference." Technical papers. | 25.00 |
| <input type="checkbox"/> "METAFORTH" by Cassady. Cross-compiling, 8080 source code. | 30.00 |

INSTALLATION DOCUMENTS

| | | | |
|---|-------------------------------------|--|------------------------------------|
| <input type="checkbox"/> Installation Manual for fig-FORTH, contains FORTH model, glossary, memory map and instructions. | \$ 15.00 | | |
| <input type="checkbox"/> Source Listings of fig-FORTH, for specific CPU's and computers. The above Installation Manual is required for implementation. Price per each | 15.00 | | |
| <input type="checkbox"/> 1802 | <input type="checkbox"/> 6502 | <input type="checkbox"/> 6800 | <input type="checkbox"/> 6809 |
| <input type="checkbox"/> 8080 | <input type="checkbox"/> 8086/8088 | <input type="checkbox"/> 9900 | <input type="checkbox"/> APPLE II* |
| <input type="checkbox"/> PACE | <input type="checkbox"/> AlphaMicro | <input type="checkbox"/> PDP-11/LSI-11 | <input type="checkbox"/> NOVA* |

DISKS WITH DOCUMENTATION

| | | | | |
|--|---|-------------------------------------|---|----------|
| fig-FORTH Model and Source Listing, with Printed Installation Manual and Source Listing. | | | | |
| <input type="checkbox"/> H89/Z89 (5 1/4") | <input type="checkbox"/> APPLE II* (5 1/4") | <input type="checkbox"/> NOVA* (8") | <input type="checkbox"/> 8080/Z80* (8") | \$ 65.00 |
| Enhanced FORTH Systems with manuals. | | | | |
| <input type="checkbox"/> APPLE II/III+* by MicroMotion. fig-FORTH, FORTH-79 standard, editor, assembler, 187 pg. manual (1-5 1/4") | | | | 90.00 |
| <input type="checkbox"/> APPLE II* by R. Kuntze. fig-FORTH, editor, assembler, source listing and screens. (2-5 1/4") | | | | 90.00 |
| <input type="checkbox"/> H89/Z89 by G. Haydon, fig-FORTH, stand alone, source listing, editor, assembler, screens and tutorial on disk (3-5 1/4") | | | | 250.00 |
| <input type="checkbox"/> H89/Z89 by G. Haydon, fig-FORTH, under CP/M*, source listing, editor, assembler, screens and tutorial on disk (3-5 1/4") | | | | 175.00 |
| <input type="checkbox"/> TRS-80/I* by Nautilus Sys. fig-FORTH, editor and assembler (1-5 1/4") | | | | 90.00 |
| <input type="checkbox"/> TRS-80/I or III* by Miller Microcomputer Services. MMSFORTH, editor, assembler interpreter/compiler, virtual memory. (1-5 1/4") | | | | 130.00 |
| <input type="checkbox"/> NOVA* by Ting. fig-FORTH, editor, assembler, source listing and screens. (1-8") | | | | 90.00 |
| <input type="checkbox"/> 6809 by Talbot Microsystems. fig-FORTH, interpreter/compiler, editor, assembler, disk I/O. (FLEX* 5 1/4 or 8") | | | | 100.00 |
| <input type="checkbox"/> 6800 by Talbot Microsystems. fig-FORTH, interpreter/compiler, editor, assembler, disk I/O. (FLEX* 5 1/4 or 8") | | | | 100.00 |

Special Function FORTH Systems with manuals

| | | | | |
|--|------------------------------|------------------------------------|------------------------------------|--------|
| Cross Compilers by Nautilus Systems. Allows extending, modifying, compiling to different target processors, generates ROMable code and forward referencing. Price per each | | | | |
| <input type="checkbox"/> CP/M* | <input type="checkbox"/> H89 | <input type="checkbox"/> TRS-80/I* | <input type="checkbox"/> Northstar | 200.00 |
| <input type="checkbox"/> 6809 Target Compiler by Talbot Microsystems. | | | | 350.00 |
| <input type="checkbox"/> 6809 Enhanced System Plus by Talbot Microsystems. 2nd screen editor, macroassembler, tutorial on disk, goodies disk of debugging and documentation tools and utilities. | | | | 250.00 |
| <input type="checkbox"/> Z-80* Program Development by Laboratory Microsystems with full software floating point arithmetic. | | | | 150.00 |
| <input type="checkbox"/> Z-80* Cross Compiler (Nautilus) by Laboratory Microsystems. | | | | 200.00 |
| <input type="checkbox"/> Z-80* for AMD9511 Arithmetic Processor by Laboratory Microsystems. | | | | 150.00 |
| <input type="checkbox"/> "Going FORTH" by Creature Software. A CAI FORTH tutorial, IBM format, no manual (1-8") | | | | 65.00 |
| <input type="checkbox"/> HP-85 by H-P. fig-FORTH, editor and assembler (1-5 1/4") | | | | 65.00 |

ORDERS ONLY (415) 961-4103

DEALER & AUTHOR INQUIRIES INVITED

Ordering Information: Check, Money Order (payable to MOUNTAIN VIEW PRESS), VISA or MasterCard accepted. No COD's or unpaid PO's. California residents add 6 1/2% sales tax. Shipping costs in US included in price. Foreign orders, pay in US funds on US bank, include for handling and shipping by Air: \$5.00 for each item under \$25.00, \$10.00 for each item between \$25.00 and \$99.00, and \$20.00 for each item over \$100.00. Minimum order \$10.00. All prices and products subject to change or withdrawal without notice. Single system and/or single user license agreement required on some products. *REGISTERED TRADEMARKS

MOUNTAIN VIEW PRESS

PO BOX 4656

MOUNTAIN VIEW, CA 94040

(415) 961-4103

HITCLR (Collision "HIT" Clear): Writing to this address clears all collision bits in all the collision registers.

| |
|-------------|
| Not Used |
|-------------|

HPOSM0—HPOSM3 (Missile Horizontal Position): These addresses write data into the Missile Horizontal Position Registers (see HPOSP0 description below).

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|----|----|----|----|----|----|----|----|

HPOSP0—HPOSP3 (Player Horizontal Position): These addresses write data into the Player Horizontal Position Register. The horizontal position value determines the color clock location of the left edge of the object. Hexadecimal 30 is the left edge of a standard-width screen. Hexadecimal D0 is the right edge of a standard-width screen.

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|----|----|----|----|----|----|----|----|

M0PF, M1PF, M2PF, M3PF (Missile-to-Playfield Collisions): These addresses read missile-to-playfield collisions. A 1 bit means that a collision has been detected since the last HITCLR.

| | | | | |
|------------------------------|----|----|----|----|
| Not Used (forced to zero) | D3 | D2 | D1 | D0 |
| | 3 | 2 | 1 | 0 |

Playfield Type

M0PL, M1PL, M2PL, M3PL (Missile-to-Player Collisions): These addresses read missile-to-player collisions.

| | | | | |
|------------------------------|----|----|----|----|
| Not Used (forced to zero) | D3 | D2 | D1 | D0 |
| | 3 | 2 | 1 | 0 |

Player Number

P0PF, P1PF, P2PF, P3PF (Player-to-Playfield Collisions): These addresses read player-to-playfield collisions.

| | | | | |
|------------------------------|----|----|----|----|
| Not Used (forced to zero) | D3 | D2 | D1 | D0 |
| | 3 | 2 | 1 | 0 |

Playfield Type

P0PL, P1PL, P2PL, P3PL (Player-to-Player Collisions): These addresses read player-to-player collisions.

| | | | | |
|------------------------------|----|----|----|----|
| Not Used (forced to zero) | D3 | D2 | D1 | D0 |
| | 3 | 2 | 1 | 0 |

Player Number

(Player *n* against player *n* is always a zero.)

PMBASE (Player-Missile Address Base Register): This address writes data into the Player-Missile Address Base Register. The data specify the most-significant bits of the address of the beginning of the player-missile area.

One-Line Resolution

| | | | | | | |
|----|----|----|----|----|----------|--------|
| D7 | D6 | D5 | D4 | D3 | not used | PMBASE |
|----|----|----|----|----|----------|--------|

Two-Line Resolution

| | | | | | | | |
|----|----|----|----|----|----|----------|--------|
| D7 | D6 | D5 | D4 | D3 | D2 | not used | PMBASE |
|----|----|----|----|----|----|----------|--------|



NEECO

WHY BUY FROM THE BEST?

Service... Support... Software...



MULTI-CLUSTER

For Commodore Systems, allows 3 CPU's (Expandable to 8) to access a single Commodore Disk.

MULTI-CLUSTER (3 CPU's) \$ 795
Each Additional CPU (up to 8) . . . \$ 199



commodore

| | |
|--|--------|
| 16K B (16K RAM-40 Column) - Lim. Qty | \$ 995 |
| 32K B (32K RAM-40 Clm.) - Lim. Qty | \$1295 |
| 4016 (16K RAM 4.0 Basic-40 Clm.) | \$ 995 |
| 4032 (32K RAM 4.0 Basic-40 Clm.) | \$1295 |
| 8032 (32K RAM 4.0 Basic-80 Clm.) | \$1495 |
| 8050 Dual Disk (1 Meg Storage) | \$1795 |
| 4040 Dual Disk (343K Storage) | \$1295 |
| 8010 IEEE Modem | \$ 280 |
| C2N Cassette Drive | \$ 95 |
| CBM - IEEE Interface Cable | \$ 40 |
| IEEE - IEEE Interface Cable | \$ 50 |
| VIC 20 Home/Personal Computer | \$ 295 |

ALTOS

| | |
|---------------------------------|---------|
| ACS 8000-2 64K 1M | \$ 4500 |
| ACS 8000-15 64K 1M | \$ 5990 |
| ACS 8000-6 208K 14.5M | \$10490 |
| ACS 8000-7 208K 29.0M | \$11690 |
| ACS 8000-10 208K 10M | \$ 8500 |
| ACS 8000-10/MTU | \$10990 |

EPSON PRINTERS

| | |
|-------------------------------------|--------|
| MX-80 PRINTER | \$ 645 |
| MX-80 FT | \$ 745 |
| MX-100 | \$ 945 |
| MX-70 | \$ 459 |
| INTERFACE CARDS | |
| 8141 (RS-232) | \$ 75 |
| 8150 (2K Buffered RS-232) | \$ 150 |
| 8161 (IEEE 488) | \$ 55 |
| 8131 (Apple Card) | \$ 85 |
| 8230 (Apple Card) | \$ 25 |
| 8220 (TRS-80 Cable) | \$ 35 |

DIABLO 630 PRINTER

| | |
|--|--------|
| DIABLO 630 - Serial - RS-232 | \$2710 |
| Tractor Option | \$ 250 |

AMDEK MONITORS

| | |
|---------------------------------|--------|
| Video 100 12" B+W | \$ 179 |
| Video 300 12" Green | \$ 249 |
| Color I 13" Low Res | \$ 449 |
| Color II 13" High Res | \$ 999 |

INTERTEC COMPUTERS

| | |
|---|--------|
| 64K Superbrain (360 Disk Storage), CP/M™ | \$3495 |
| 64K QD Superbrain (700K Disk Storage), CP/M™ | \$3995 |

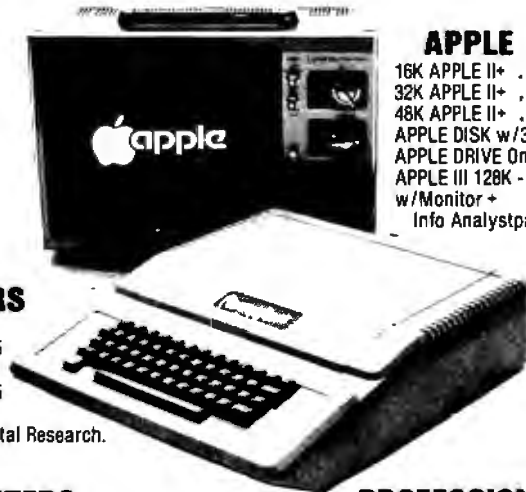
*CP/M is a registered trademark of Digital Research.

NEC SPINWRITER PRINTERS

| | |
|-----------------------------|--------|
| 5530 (Parallel) | \$3055 |
| 5510 (Serial) | \$3055 |
| 5520 (KSR-Serial) | \$3415 |
| Tractor Option | \$ 225 |

APPLE

| | |
|---|--------|
| 16K APPLE II+ | \$1330 |
| 32K APPLE II+ | \$1430 |
| 48K APPLE II+ | \$1530 |
| APPLE DISK w/3.3 DOS | \$ 650 |
| APPLE DRIVE Only | \$ 490 |
| APPLE III 128K - In Stock! w/Monitor + Info Analytpak | \$4740 |



ATARI COMPUTERS

| | |
|--|-----------|
| Atari 400 (16K RAM) | \$ 399 |
| Atari 800 (32K RAM) - good thru 8/31 | \$1080 |
| Atari 410 RECORDER | \$ 89.95 |
| Atari 810 DISK DRIVE | \$ 599.95 |

NEECO carries all available ATARI Software and Peripherals.

PROFESSIONAL SOFTWARE

| | |
|-----------------------------------|-----------|
| WordPro 1 8K | \$ 29.95 |
| WordPro 3 (40 Clm.) 16K | \$ 199.95 |
| WordPro 3+ | \$ 295 |
| WordPro 4 (80 Clm.) 32K | \$ 375 |
| WordPro 4+ | \$ 450 |

JUST A SAMPLE OF THE MANY PRODUCTS WE CARRY. CALL US FOR OUR NEW 60-PAGE CATALOG. WE WILL MATCH ANY ADVERTISED PRICE ON PRODUCTS LISTED UNDER SIMILAR "IN STOCK" CONDITIONS.



NEECO

679 HIGHLAND AVE.
NEEDHAM, MA 02194

(617) 449-1760

Telex: 951021

MON-FRI 9:00 - 5:00

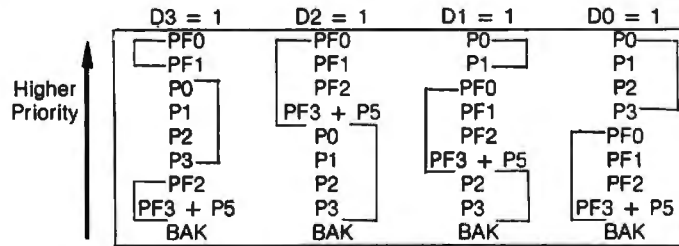


Master Charge and VISA Accepted

PRIOR (Priority Register): This address writes data into the Priority Control Register.



- D7—D6 Set to zero.
- D5 *Multiple Color Player Enable* This bit set to 1 causes the logical "or" function of the bits of the colors of Player 0 with Player 1, and also of Player 2 with Player 3. This permits overlapping the position of two players with a choice of three colors in the overlapped region.
- D4 *Fifth Player Enable* This bit causes all missiles to assume the color of Playfield Type 3. (COLPF3). This allows missiles to be positioned together with a common color for use as a fifth player.
- D3—D0 *Priority Select* Only one of these 4 bits can be a 1. These bits select one of four types of priority. Objects with higher priority will appear to move in front of objects with lower priority.



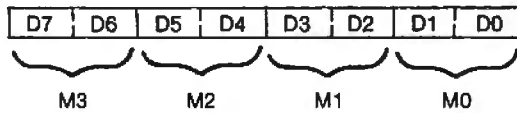
P_n = player *n*
PF_n = playfield *n*
 BAK = background
 + = logical or (PF3 and P5 are always same color)

Note: The use of priority bits in a "nonexclusive" mode (more than one bit set to 1) will result in objects whose priorities are in conflict turning *black* in the overlap region.

Example: PRIOR code = 1010: This will black out P0 or P1 if they are over PF0 or PF1. It will also black out P2 or P3 if they are over PF2 or PF3. In the one-color 40-character (playfield) modes, the *luminance* of a pixel in a character is determined by COLPF1, regardless of the priority. If a higher-priority player or missile overlaps the character, the *color* is determined by the player's color.

Shadow Register: GPRIOR

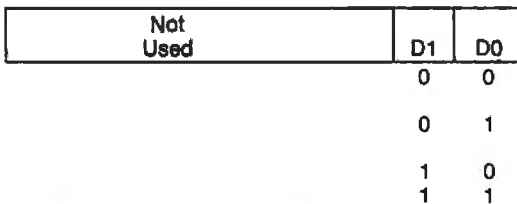
SIZEM (Missile Size): This address writes data into the Missile Size Control Register.



Horizontal Size Register (Missile)

| | | |
|---|---|--|
| 0 | 0 | Normal Size (total of 2 color clocks wide) |
| 0 | 1 | Twice Normal Size (total of 4 color clocks wide) |
| 1 | 0 | Normal Size |
| 1 | 1 | Four Times Normal Size (total of 8 color clocks wide) |

SIZEP0—SIZEP3 (Player Size): These addresses write data into the Player Size Control Registers.



Horizontal Size Register (Player)


| | | |
|---|---|---|
| 0 | 0 | Normal Size (total of 8 color clocks wide) |
| 0 | 1 | Twice Normal Size (total of 16 color clocks wide) |
| 1 | 0 | Normal Size |
| 1 | 1 | Four Times Normal Size (total of 32 color clocks wide) |

With normal-size objects, each bit in the graphics register corresponds to one color clock. This makes an 8-bit wide player 8 color clocks wide. For larger objects, each bit is extended over more than one color clock.

A Language is born

ADA

The new comprehensive, general purpose language, named after Ada Augusta Byron - the daughter of poet Lord Byron - who is credited with being the first computer programmer



Ada Augusta Byron
The Countess of Lovelace

How to use Ada effectively for solving problems

Studies in Ada Style

By P. Hibbard, M. Sherman, M. Shaw, J. Rosenberg, A. Hisgen

1981. Approx. 9 figures. Approx. 112 pages
DM 24,50; approx. US \$ 11.20
ISBN 3-540-90628-2

H. Ledgard

Ada

An Introduction

Ada Reference Manual (July 1980)

1981. XXXII, 358 pages
DM 29,80; approx. US \$ 13.60
ISBN 3-540-90568-5

Please write for further information

Towards a Formal Description of Ada

Editors: D. Bjørner, O.N. Oest

1980. XIV, 630 pages
(Lecture Notes in Computer Science, Volume 98)
DM 46,-; approx. US \$ 21.00
ISBN 3-540-10283-3

The Programming Language Ada

Reference Manual

Proposed Standard Document

United States Department of Defense

1981. X, 243 pages
(Lecture Notes in Computer Science, Volume 106)
DM 16,50; approx. US \$ 7.60
ISBN 3-540-10693-6

Prices are subject to change without notice



Springer-Verlag Berlin Heidelberg New York

GOODBYE, DISK WAIT... M-DRIVE™ HAS ARRIVED.

What does M-Drive do? Simply stated, M-Drive provides up to a 3500% increase in speed during disk-intensive computing.

How does M-Drive work? It uses G and G Engineering's Warp Drive® software to run extended address IEEE 696/S-100 RAM under CP/M® 2.2, so that the memory appears identical to a disk drive. The RAM can be formatted, it has a directory, and it can hold files which may be written, read, copied to or from another disk, or executed. There are no slowly rotating and buzzing disk drives when M-Drive is in use; only the sound of data being transferred at the speed of light.

Does this obsolete the floppy disk? Not quite. A floppy disk is still required for system initialization, and for saving finished files. At all other times, however, M-Drive saves you the tedium of going back and forth between computer and disk.

What are the hardware requirements? M-Drive is configured for systems that include a 6 MHz CompuPro CPU 8085/88 dual processor, Disk 1 DMA disk controller, and System Support 1.

How can I upgrade to M-Drive? Select either the 128K or 256K M-Drive package, then return your CompuPro CP/M disk to the factory for modification. If your CPU 8085/88 runs at 4 MHz, it must also be returned and upgraded to 6 MHz. The costs of these modifications are included in the prices below.

M-DRIVE: THE FASTEST WAY TO COMPUTE

128K M-DRIVE with low power, high speed RAM and software: \$1590
256K M-DRIVE with low power, high speed RAM and software: \$3100

BIG PRICE REDUCTIONS ON STATIC MEMORY

CompuPro memories are the fastest in the S-100 business, performing effortlessly with 6 MHz Z-80® and 10 MHz 8088/86 processors. But speed isn't all that we offer; consider the low power consumption (again, the lowest in the business), innovative technical design, fully static operation (for flawless DMA), an enviable record for reliability, and the experience we've acquired from over 6 years of making quality S-100 memory. Compare our specifications with the rest...you'll see why systems integrators world-wide choose CompuPro memory for commercial, industrial, and scientific applications. (Note: CSC boards are qualified under the Certified System Component high-reliability program, with 200 hour burn-in and 2 year extended warranty.)

8K/16K/24K/32K RAM 20 Static Memory Board. With extended addressing and bank select. **RAM 20-8K:** \$210 A/T, \$280 CSC. **RAM 20-16K:** \$285 A/T, \$355 CSC. **RAM 20-24K:** \$355 A/T, \$425 CSC. **RAM 20-32K:** \$425 A/T, \$495 CSC.

816 64K RAM 16 Static Memory Board. "Hermaphrodite" 64K memory runs in 8 bit systems as a 64K X 8 board, or in 16 bit systems as a 32K X 16 board. **RAM 16-64:** \$895 A/T, \$995 CSC.

48K/64K RAM 17 Static Memory Board. Exceptionally low power (2W max, 1.6W typ for 64K) board runs faster and cooler than dynamics, while flawlessly handling DMA. **RAM 17-48K:** \$650 A/T, \$750 CSC. **RAM 17-64K:** \$795 A/T, \$895 CSC.

816 128K RAM 21 Static Memory Board. Exceptionally low power, high speed static memory. Configure as 128K X 8 or 64K X 16. **RAM 21-128K:** \$1695 A/T, \$1895 CSC.

How to order: Call 415-562-0636 for the name of the authorized CompuPro sales center nearest you, or for placing factory direct VISA® /MasterCard® orders. Prices shown do not include tax, shipping, or dealer installation/support charges (if applicable).

LEGAL CORNER: M-Drive is a trademark of CompuPro. Warp Drive is a trademark of G and G Engineering.

CompuPro™

division

**GODBOUNT
ELECTRONICS**

BOX 2355, OAKLAND AIRPORT, CA 94614

(415) 562-0636

PROVEN COMPUTING SOLUTIONS.

We give you more of what you buy a computer for: to gain a competitive edge in your industrial, commercial, or scientific application. While other computers try to make the best of slow memory, slow processors, and me-too engineering, CompuPro is delivering solutions for today's commercial computing...proven solutions that create expandable, modular, fast, exceptionally reliable, and truly professional level machines that conform fully to the IEEE 696/S-100 standards. We back all products with a minimum 1 year limited warranty.

**When you depend on your computer, choose a computer on which you can depend:
S-100 from CompuPro.**

NOVEMBER SPECIAL: SPECTRUM COLOR GRAPHICS BOARD ON SALE!

You don't have to be jealous of those color computers any more...with Spectrum's 8K of IEEE-compatible static RAM, full duplex bidirectional I/O port for keyboard or joystick interface, and 6847-based graphics generator that can display all 64 ASCII characters, your S-100 computer can control the colors of the rainbow. 10 modes of operation, from alphanumerics/semi-graphics in 8 colors to dense 256 X 192 full graphics. Normally available assembled/tested for \$399; but for orders postmarked before 11/30/81, Spectrum is yours for **\$299!** There has never been a better time to graduate from black and white to color.

1. DISK 1 DMA DISK CONTROLLER. Disk 1 is lightning fast, thanks to properly implemented DMA (with arbitration) and data transfer that's independent of CPU speed. IBM compatible format; handles soft-sectored single or double-density, single or double-sided disks. Set up for 8" disks, but can also handle 5.25" disks. With BIOS for CP/M-80*. Manual available for \$25. \$495 A/T, \$595 CSC. Coming soon: Disk 2, the fast DMA hard disk controller.

2. CP/M-80 Available only with Disk 1 purchase. Supplied on diskette with full documentation-ready for load and go operation. \$175.

3. CP/M-86. Available only with Disk 1 purchase. Supplied on diskette with full documentation - ready for load and go operation. \$300.

4. OASIS* OPERATING SYSTEM. Single user (\$500) and multi-user (\$850) available for use with CPU Z. Supplied on diskette with full documentation. Coming soon: OASIS 16 for use with 16 bit systems.

5. COMPLETE DUAL DISK DRIVE SYSTEM. With one Disk 1 board, desktop dual drive enclosure with Shugart SA-800 series drives, and power supply cable. Also includes CP/M-80. \$2195.

6. SYSTEM SUPPORT 1. Includes battery operated clock/calendar; sockets for optional battery backup RAM, 9511 or 9512 math processor, and 2716 ROM; RS-232 serial port; triple interval timers; dual interrupt controllers; power fail interrupt; and more. Comprehensive owner's manual includes numerous software examples. \$295 Unkit, \$395 A/T, \$495 CSC (add \$195 to the above prices for optional math processor).

7. 8 BIT CPU Z. A Z-80*-based CPU board that includes all standard features plus many convenience options. Meets all IEEE 696/S-100 specifications, including timing. \$225 Unkit, \$295 A/T (both operate at 4 MHz), \$395 CSC (with 6 MHz CPU).

8. 16/8 BIT CPU 8085/88. CPU 8085/88, the only CPU board that executes the software of today and tomorrow, combines an 8088 CPU to handle 16 bit software and an 8085 CPU for 8 bit software. \$295 Unkit, \$425 A/T (both operate at 6 MHz); \$525 CSC (with 8 MHz 8085 and 8088).

9. 8088/8066 MONITOR-DEBUGGER SOFTWARE.

Ideal for use with CPU 8085/88. Supplied on single sided, single density, soft sectored 8" disk. CP/M-80 compatible (not required if you have CP/M-86). Great development tool; mnemonics used in debug conform as closely as possible to current CP/M DDT mnemonics. \$35.

10. 8 BIT CPU 8085. Same as CPU 8085/88, but without 8088. May be easily upgraded to 16 bit operation. \$235 Unkit, \$325 A/T, \$425 CSC.

11. INTERFACERS. **Interfacer 1** includes two RS-232 serial ports, with full handshaking and independently selectable Baud rates; \$199 Unkit, \$249 A/T, \$324 CSC. **Interfacer 2** includes three full duplex parallel ports and one serial port containing all the features of an Interfacer 1 serial port; \$199 Unkit, \$249 A/T, \$324 CSC. **Interfacer 3-5** includes five RS-232 serial ports (2 synchronous/asynchronous, 3 asynchronous) with full handshaking, software programmable Baud rates, and many other convenience features; \$599 A/T, \$699 CSC. **Interfacer 3-8** is similar to Interfacer 3-5 and includes eight full RS-232 serial ports (2 synchronous/asynchronous, 6 asynchronous); \$699 A/T, \$849 CSC.

12. ULTRA HIGH-SPEED MOTHERBOARDS. With all edge connectors, Faraday shielding, extensive bypassing, and split active termination. **6 slots** \$140 A/T \$190 CSC; **12 slots** \$175 A/T \$240 CSC; **20 slots** \$265 A/T, \$340 CSC.

13. DOCUMENTATION. User manuals are available for all products. Interfacer 3, \$10; Disk Controller, \$25; System Support 1, \$20; most others, \$5. Also available: "CompuPro Product User Manuals: 1975- 1980". This 250+ page book includes data on all older Godbout/CompuPro products, as well as many newer products such as the Spectrum Color Graphics board, Interfacers 1 and 2, CPU 8085/88, motherboards, CPU Z, and more. \$20 plus shipping.

14. SUPERSIXTEEN SPECIAL PACKAGE. This specially-priced package includes CPU 8085/88, Disk 1 DMA floppy disk controller, System Support 1, Interfacer 1, 128K of static RAM, CP/M 2.2, CP/M-86, four cables (three interfacer cables plus one disk cable), and complete documentation - all for \$3,495 (For CSC boards, add \$600 to the package price.) If you're ready for advanced computing, this is the package you've been looking for.

Most CompuPro products are available in Unkit form, Assembled/Tested, or qualified under the high-reliability Certified System Component (CSC) program (200 hour burn-in, more). Note: Unkits are not intended for novices as debugging may be required due to problems such as IC infant mortality. Factory service is available for Unkits at a flat service charge.

How to Order: Call 415-562-0636 for the name of the authorized CompuPro sales center nearest you, or for placing factory direct VISA® /Mastercard® orders. Prices shown do not include tax, shipping charges, or dealer installation/support services (if applicable).

*LEGAL CORNER: 6847 is a registered trademark of Zilog. CP/M is a registered trademark of Digital Research. GMS is a trademark of Rose.

CompuPro™
OAKLAND AIRPORT, CA 94614

division

GODBOUT
ELECTRONICS

(415) 562-0636

ENHBAS

Mahlon G Kelly
268 Turkey Ridge Rd
Charlottesville VA 22901

Whatever its merits or demerits, BASIC is the language most used by microcomputer programmers. Microsoft's excellent implementation of BASIC is one of the reasons the TRS-80 Model I is the most popular microcomputer today. Most of us note the absence of some particular feature (I would like to have matrix functions), but everyone's needs are different. I was, therefore, skeptical about the usefulness of an enhancement package for TRS-80 BASIC.

I am no longer a skeptic. ENHBAS (pronounced *en-base*), written by Philip A Oliver and sold by the Cornsoft Group, provides useful new functions, statements, and commands, and greatly improves the operating environment by providing keyboard, video, and audio enhancements. This software is designed for the TRS-80: it is not rewarmed and reworked from some other system. And ENHBAS makes programming much more enjoyable. In terms of packaging, documentation, ease of use, lack of bugs, and overall quality of design, ENHBAS is the best software package I have seen for the TRS-80, and that includes Microsoft's BASIC compiler, NEWDOS/80, VTOS, and Scripsit. With the release of this product, a small company and a single author have entered the big league in quality software.

ENHBAS resides in about 4 K bytes of RAM. It provides new keyboard, printer, and video drivers and a variety of new commands, statements, and functions. The drivers give a user-definable cursor,

clicks when keys are pressed, true control characters, distinctive tones for error and break, single-key entry for such things as PRINT and INPUT, a lowercase driver, and a variety of other features. The printer driver even senses whether or not a printer is on line, waits six seconds for the printer to be turned on, and if it isn't, gives an error message and returns without "hanging" the system. If a BASIC program is NEWed or even if the system is booted, simply typing RENEW after bringing BASIC back up will usually restore the program. That means no more program loss after accidental reboots. The new statements are described below in detail, and they include new graphics, branching, screen control, sorting, printer formatting, and more.

Two smaller versions, ENHSORT and ENHGRAPH, are also available at \$24.95 each. They support ENHBAS sorting routines and graphics routines, respectively. Pro-

grams written for these versions are upward compatible with ENHBAS.

ENHBAS is available for Models I, II, and III. The Model III package is nearly identical to that for the Model I, and there are disk and tape versions for both. The tape version provides all of the functions of disk BASIC except file manipulation functions and multiple USR routines. There are also many additional enhancements for the Model II, but since I used the disk-based Model I system, I'll only mention a few of those features.

Initialization and Loading

The disk version of ENHBAS comes on a special disk that is copy-protected and has its own tiny operating system. You put the disk in drive 0 and boot the system. After a prompt, you place a TRSDOS or NEWDOS 2.1 disk in the drive, and a 32 K or 48 K version of ENHBAS/CMD is dumped to that system disk.

At a Glance

Name
ENHBAS

Type
Enhanced operating environment and BASIC language

Manufacturer
The Cornsoft Group
6008 N Keystone Ave
Indianapolis IN 46220
(317) 257-3227

Price
\$59.95 (Model I or III), \$99.95 (Model II)

Format
Tape, 5- or 8-inch disk depending on computer

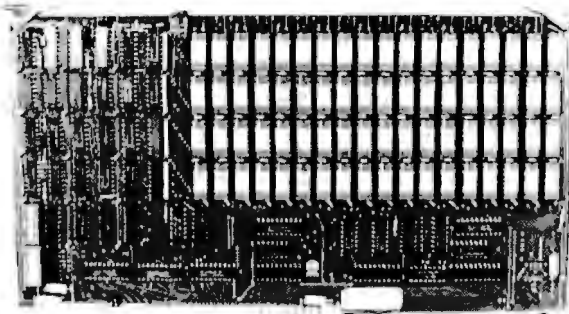
Computer
TRS-80 Model I (tape or disk), Model II, or Model III

Documentation
Three-ring binder with 55 pages of text

Audience
Any TRS-80 user

TURN ON YOUR COMPUTER WITH A **i** MEMORY

WE'LL MAKE YOUR LSI, MOTOROLA AND MULTIBUS SYSTEMS WORK LIKE THEY NEVER WORKED BEFORE.



512KB SINGLE BOARD MULTIBUS® MEMORY

First to Offer 512KB on One Board

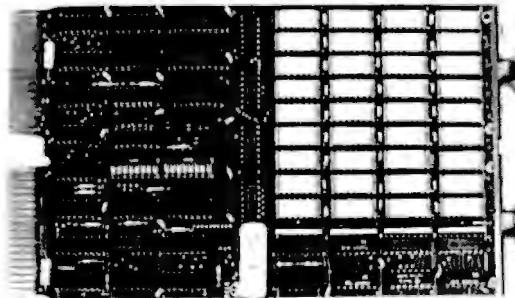
- Pin-to-pin MULTIBUS compatibility for both 8-bit and 16-bit systems.
- On-board parity with selectable interrupt on parity ERROR.
- Addressable as a contiguous block in 16K word increments up to 16 Mega Bytes.

SINGLE QTY. PRICE: 128K x 9 \$795. 512K x 9 \$1,995.

64KB LSI 11/2, LSI 11/23® SINGLE DUAL WIDTH BOARD

- Addressable as a contiguous block in 4K word increments through 4 Mega Bytes.
- On-board parity generator checker.
- Power requirements are +5V 1.0A, +12V 300mA, +12VB 300mA.

SINGLE QTY. PRICE:
32K x 18 \$575.

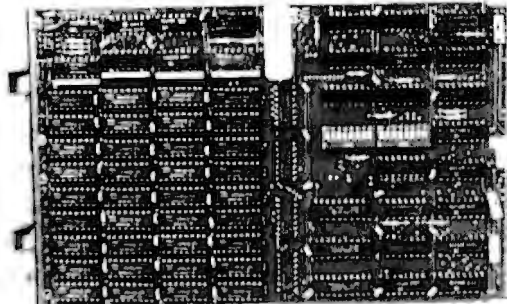


256KB LSI 11/23® SINGLE DUAL WIDTH BOARD

*First 256KB Memory on
a Single Dual Board.*

- Addressable as a contiguous block in 4K word increments through 4 Mega Bytes.
- On-board parity generator checker.
- Power requirements are +5V 1.2A.
- Battery back-up mode.

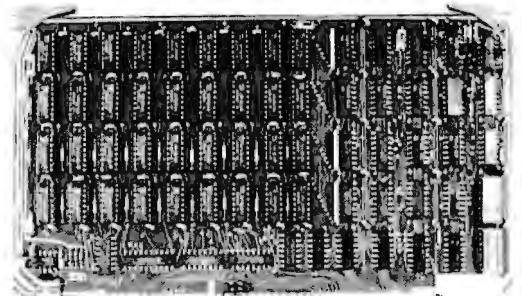
SINGLE QTY. PRICE:
128K x 18 \$1,795.



64KB EXORCISER I, II, and Rockwell System 65 Single Board Memory.

- Addressable as a contiguous block in 4K word increments with respect to VXA or VUA.
- Parity checker on board.
- Functions with on-board hidden refresh up to 1.5 megahz clock rates.
- Functions with cycle stealing refresh at 2 megahz clock rates.

SINGLE QTY. PRICE: 64K x 9 \$575.



DON'T ASK WHY WE CHARGE SO LITTLE, ASK WHY THEY CHARGE SO MUCH.



Chrislin Industries, Inc.

31352 Via Colinas • Westlake Village, CA 91362 • 213-991-2254
TWX 910-494-1253 (CHRISLIN WKVG)

Multibus is a trademark of the Intel Corp. LSI 11 is a trademark of Digital Equipment Corp. EXORciser is a trademark of Motorola.

The initialization software automatically senses the size of the system. For use with NEWDOS/80, the program must be copied from the NEWDOS 2.1 or TRSDOS disk. The author has assured me that the software is compatible with all currently available operating systems that use the TRSDOS disk format. In all, the original initialization takes about three minutes, and the original disk is needed again only if the ENHBAS/CMD program is somehow lost.

Use of the new program is just as

simple. Typing ENHBAS <ENTER> loads and initializes the package, protects a section of upper RAM (random-access read/write memory), and brings up BASIC. The memory size, file number, and program loading and running conventions are the same as before for the operating system being used, but they follow the ENHBAS command instead of BASIC. A return to command level leaves the new drivers intact. All the appropriate features are available in DOS (disk operating system) mode or

during use of any /CMD program that doesn't have its own drivers (sadly, Scripsit does). The only incompatible programs I have found are the DSET and DBLFMT commands in Software Etc's implementation of double density for NEWDOS/80, but these present trivial problems that are easily circumvented. BASIC can be reentered just as before.

Typing ENHBAS again will lock up the system, which was one of the few faults that I found; it would be nice to be able to disable ENHBAS without rebooting. Since you will almost always want ENHBAS in the system, it's most easily initialized by a CHAIN command if your operating system has such a feature. Listing 1 shows a NEWDOS/80 double-density chain file that does the initialization and reenters DOS. A file for use with ComProc or other DOSes would be similar. The tape system is initialized by typing SYSTEM; typing ENHBAS after the prompt then loads and initializes the tape.

Listing 1: A CHAIN file for use with NEWDOS/80 and the Percom Doubler to load and initialize ENHBAS. ADR disables and enables automatic recognition of double density. The POKE at line 40 enables control-H to sound the bell; the POKE at line 50 changes the cursor character. PAGE and CLM set page length and number of characters per line. Removal of ADR allows it to be used with NEWDOS/80 version 2.0.

```

10 OPEN"D",1,"ENHBAS/JCL"      OPEN THE CHAIN FILE
20 PRINT #1,"ADR OFF"         AUTO DENSITY RECOGNITION OFF
30 PRINT #1,"ENHBAS"         INITIALIZE
40 PRINT #1," POKE 16409,1"   ENABLE THE BELL
50 PRINT #1," POKE 16419,127" CHANGE THE CURSOR
60 PRINT #1," PAGE=35"       PAGE LENGTH
70 PRINT #1," CLM=132"       COLUMN WIDTH
80 PRINT #1," CMD";CHR$(34),"S";CHR$(34) RETURN TO DOS
90 PRINT #1,"ADR ON"         AUTO DENSITY RECOGNITION ON
100 CLOSE

```

ENHBAS

The TRS-80™ Programmer's Language

reviewed this month by Mahlon Kelly is available through the following dealers & distributors, who carry the complete line of products from **THE CORNSOFT GROUP**. Specify Model I/III disk, Model I/III cassette or Model II disk.

TM Tandy Corporation

Model I/III \$59.95

Model II \$99.95

Apperst Inc.
Denver, CO

Softside/TSE/Hardside
Petersborough, NH

Level IV Products
Livonia, MI

The Program Store
Washington, D.C.

Softsel
Marina Del Rey, CA

Garcia & Assoc.
Chicago, IL

Melibu Microcomputing
Malibu, CA

Pittsburgh Computer Store
Pittsburgh, PA

The Software Shack
Belton, MO

Micro Products
Wilmington, DE

The Game Preserve
Indianapolis, IN

Lee Allen & Assoc.
Indianapolis, IN

THE CORNSOFT GROUP

6008 N. Keystone

Indpls. IN 46220

[317] 257-3227

Double your disk storage capacity...



simply by switching to Omni's new reversible disk.

If you have an Apple, TRS-80, Zenith, North Star or any other single-sided 5 1/4" disk drive, you can double disk capacity by simply switching to the Flip/Floppy disk from Omni. It works just like your present disks, except you can flip it over and record on the reverse side. So you can consolidate programs and files that used to require two disks. You can halve your disk requirements. And save money.

Each disk comes with some impressive specifications: They're certified error-free at more than twice the error-threshold of your system. Rated for more than 12 million passes without disk-related errors or significant wear. And precision fabricated with such standard features as reinforced hub rings.

Call Omni toll-free today. Get premium disks. Twice the capacity. A full money-back guarantee. Unbeatable price. And if you order a ten pack now, a free \$5.00 storage case as well.

OMNI

Omni Resources

4 Oak Pond Avenue, Millbury, MA 01527
(800) 343-7620 In Mass. (617) 799-0197

Dealer inquiries invited.

Software Houses: We also offer duplicating and formatting services.

\$21.00-Five pack

(Equivalent to 10 single-sided disks)

\$40.00-Ten pack

(Equivalent to 20 single-sided disks)

Free

Protective plastic storage case with each 10 pack ordered by 12/25/81



**Order toll-free (800) 343-7620.
In Mass. (617) 799-0197.**

Send the following Flip/Floppy disks.

I understand they have a full 90 day money-back guarantee if I'm not completely satisfied.

System & model # _____

___ Five packs @ \$21.00 \$ _____

___ Ten packs @ \$40.00 * \$ _____

* includes plastic case

Shipping and handling \$ 1.50

5% sales tax (Mass. only) \$ _____

Total \$ _____

___ Check (to Omni Resources) ___ C.O.D.

___ Master Card

___ Visa

Card # _____ Exp. _____

Name _____

Address _____

Tel _____

Listing 2: ENHBAS's sort functions in action. The program in listing 2a, which produces the output in listing 2b, displays four arrays five times each. First they appear unsorted, then sorted according to the different keys and tags noted in the program's remarks.

```
(2a)
10 CLEAR 200:DEFINT A-Z
20 DIM A(20),B$(20),C(20),D$(20)
30 LPRINT "A(X)","B$(X)","C(X)","D$(X)" PRINT HEADERS
40 LPRINT STRING$(55,"#")
50 FOR I=1 TO 5 'SET UP ARRAYS AS RANDOM NUMBERS AND LETTERS
60 A(I)=RND(5) B$(I)=CHR$(70+RND(5)) C(I)=RND(999) D$(I)=CHR$(80+RND(10))
70 NEXT I
80 CSUB "PNT" PRINT THE ORIGINAL RANDOM ARRAYS
90 SCLEAR CLEAR FOR THE SORT
100 KEY A ' SORT ON INTEGER ARRAY A, ASCENDING
110 ATOP=3 USE ONLY THE FIRST FIVE ELEMENTS
120 SORT ' DO THE SORT!
130 CSUB "PNT" PRINT THE RESULTS
140 SCLEAR CLEAR FOR THE NEXT SORT
150 ATOP=5 FIRST FIVE ELEMENTS ONLY
160 KEY C SORT ON INTEGER ARRAY "C"
170 TAG A FORCE THE ELEMENTS OF ARRAY "A" TO FOLLOW "C"
180 SORT DO THE SORT
190 CSUB "PNT" PRINT THE RESULTS
200 SCLEAR SET UP FOR THE NEXT SORT
210 ATOP=5 FIRST 5 ELEMENTS ONLY
220 KEY C,B$ PRIORITY SORT ON B$. NEXT ON ARRAY C(X)
230 TAG A,D$ FORCE ARRAYS A AND D$ TO FOLLOW C AND B$
240 SORT SORT THEM
250 CSUB "PNT" PRINT THE SORT RESULTS
260 SORT (1) DO A DESCENDING SORT
270 CSUB "PNT" PRINT THE RESULT
280 LPRINT CHR$(12)
290 END
500 JNAME "PNT" PRINTING SUBROUTINE
510 FOR I=1 TO 5
520 LPRINT A(I),B$(I),C(I),D$(I)
530 NEXT I
540 LPRINT STRING$(55,"#")
550 RETURN
```

(2b)

| A(X) | B\$(X) | C(X) | D\$(X) |
|------|--------|------|--------|
| 1 | G | 577 | S |
| 5 | J | 649 | R |
| 3 | I | 874 | V |
| 5 | K | 972 | W |
| 1 | J | 429 | W |
| 1 | G | 577 | S |
| 1 | J | 649 | R |
| 3 | I | 874 | V |
| 5 | K | 972 | W |
| 5 | J | 429 | W |
| 5 | G | 429 | S |
| 1 | J | 377 | R |
| 1 | I | 649 | V |
| 3 | K | 874 | V |
| 5 | J | 972 | W |
| 5 | G | 429 | S |
| 1 | I | 649 | V |
| 1 | J | 577 | R |
| 5 | J | 972 | W |
| 3 | I | 874 | V |
| 5 | J | 972 | W |
| 1 | J | 577 | R |
| 1 | I | 649 | V |
| 5 | G | 429 | S |

TRS-80, but control-H produces a backspace, control-G sounds Westminster chimes, control-C is a break (with an echo of a down-arrow and C to the screen, which BREAK also does), control-A is a break without echo, control-I is a tab, and control-J is a linefeed with carriage return. Using the control key with numerals 1 through 6 produces special characters if lowercase is installed, control-dash gives an underline, and control-arrows puts arrows on the screen.

Four one-letter direct commands are available (similar to NEWDOS). E, R, L, and D produce EDIT, RUN, LIST, and DELETE, respectively. Similarly, single-key abbreviations are available for 35 different BASIC commands, statements, and functions by simultaneously pressing the shift key, the clear key, and the abbreviation key. Shift-clear and A produces AUTO, shift-clear and P produces PRINT, shift-clear and N produces NEXT, shift-clear and D produces DIM, and so on. I find this of little value except with the most commonly used words; otherwise it's quicker to type the word than to look it up, even if the keys are labeled. But some people may find more of these single-key abbreviations useful.

Another nice feature is formatting of program listings. The printer driver indents text by six spaces as shown in listing 2; this makes listings easier to read, and the feature works for video output as well. I've already mentioned the user-definable cursor and the ability to sense whether or not the printer is available. These enhancements of the operating environment seem to me practically worth the cost of the entire package. But they are only a minor part of ENHBAS. The main features are the enhancements to the BASIC language itself.

Language Enhancements

Programming enhancements can be divided into commands, statements, and functions. In all, 33 have been added to the language (as compared to about 85 originally available in the Microsoft Level II BASIC and about 40 added by TRSDOS), although sev-

The Operating Environment

The first thing you notice after initialization is that the cursor is now a block (this can be changed to any character by a single POKE, which is handy for letting the cursor tell you where you are in a complex program). If an amplifier is connected to the tape output, pressing a key will produce a "click" (really a very short beep). This gives a professional feel to the keyboard and it's a nice feature

for those of us who are touch typists; it's something I have longed for in Scripsit. Pressing BREAK produces a different tone, and an error produces a two-tone signal. If PRINT CHR\$(8) (ASCII bell) is in a program, Westminster chimes sound!

The CLEAR key is redefined as a true control (sometimes abbreviated as *ctrl*) key. You clear the screen by using control-@. Most of the control characters do nothing in the normal

High resolution, dot addressable graphics with vertical resolution of 72 dots per inch and up to 82 dots per inch horizontal resolution.

"Q.T." cover reduces noise to an office comfort level. This is an optional feature to our standard sound deadening case.

Single sheet feeder is very simple to use. The only front load feeder available on the market today.*

1K standard buffer permits the 88G to print while receiving data. The optional 2K buffer allows a 1920 character dump to the printer freeing the CRT.



The Features Leader

Integrated Paper Handling System

Dual tractor/friction feed allows use of pin feed, roll or single sheet paper.

Versatile Interface

Data input from most computers can be supported by the 88G. RS232C serial and Centronics[®] type parallel is standard. Options can be added for current loop, IEEE 488 and high speed serial inputs.

Letter Quality Capability

The 88G provides a selectable 11 x 7 serif style dot matrix for correspondence printing.

Cost Effective

The 88G has more features than any other impact printer in its price class. First compare the quality of the 88G, then compare the price—the 88G wins! Single unit price is less than \$800.

*Optional



Micro Peripherals, Inc. 4426 South Century Drive Salt Lake City, Utah 84107 (801) 263-3081
The Printer People

California VITEK (714) 744-8305 Computer Potentials (206) 453-9777 Colorado PLS Associates (303) 773-1218 Illinois CW Electronic Enterprises (312) 298-4830 Massachusetts Butler (617) 965-1080 Minnesota Bohlig & Associates (612) 922-7011 New Jersey Hansen & Hughes (201) 652-7055 Oregon Microware (503) 620-8150 Washington Microware (206) 451-8586 Pennsylvania QED Electronics (215) 674-9600 Utah PLS Associates (801) 466-8729 International Europe, Russet Instruments, Ltd. (0734) 868147 Telex: 849721 International, Sintel, (602) 994-3435 Telex: 165-745 Canada Norango (416) 449-2761 Texas Thorson Distributors (214) 233-5744

eral are interrelated. We'll look at the added commands and functions one by one. Most of the statements can be divided among those that control sorting, branching, graphics, screen displays, and printer formatting.

There are two new commands: RENEW and FIND. RENEW, which has already been described, is one of the most useful of ENHBAS's features, since it almost always allows recovery of a BASIC program unless there has been an attempt to overlay the BASIC memory area or a loss of power. It's even possible to leave BASIC, execute DOS commands, then reenter BASIC and bring the old program back. FIND locates a part of a program that has been labeled using the JNAME statement (described with the new branching statements below). FIND makes it possible to label a line with a name and then branch to the name rather than the line number. Since FIND locates the branching label, subroutines and branching points may each be named and easily located. All who

have suffered with improperly commented subroutines will appreciate this feature.

Sorting

The sorting routines are based on a modified Shell-Metzner technique and handle ascending and descending numeric and string sorts. These sorting routines were the inspiration for ENHBAS, since the whole thing grew out of the development of a machine-language sorting project. The sort routines are easy to set up (at least if you're used to machine-language sorts such as Racet's GSF). Only five statements are required (SCLEAR, KEY, TAG, SORT, and ATOP). It is possible to key and tag several arrays. A sort should usually be preceded by the statement SCLEAR (really a function), and then the variables to be sorted are set up using KEY (the variables may be alphabetic or numeric and are stored in an array). Thus:

```
120 KEY AGE, NAME$
```

would set up a sort in line 120 so that a string array NAME\$(x) would be sorted with top priority, and if there were duplicate entries they would be sorted by order using the numeric array AGE(x). Using KEY, you can set sorting priorities for up to fourteen different arrays. You usually want a sort to carry along another variable with the sorted elements, and TAG allows that. Thus a sort by names could carry addresses along with the names. For example:

```
130 TAG ADDR$, ZIP
```

following line 120 would force the addresses in array ADDR(x) and the zip codes in array ZIP(x) to tag along after the names and ages as they were sorted by the KEY specification in line 120. Up to fourteen arrays can tag along in the sort. The statement SORT (f) actually forces the sort. The "f" is a flag that specifies if the sort should arrange the elements from small to large or large to small. SORT (0) (or simply SORT) produces a sort in ascending order, from smallest to largest. SORT (1) does a descending sort, with the largest elements coming first. A sort will actually process all the elements dimensioned in an array, whether they have been assigned values or not (the arrays must be of equal length). When you don't need all the elements in an array, you can specify the upper limit. If we added

```
140 ATOP=(12)
```

to the previous statements, this statement would limit the sort to the first twelve array elements. The short program in listing 2 illustrates the sort procedure and its output. The sorts are very fast: 500 integers can be sorted in less than four seconds.

Branching

ENHBAS provides three new types of branching options. These are branching to labels and variables, selective restoring of DATA statements (that is, the data pointer can be restored to something other than the initial data element), and conditional looping using the WHILE/

THE TSE-HARDSIDE 1982 MICRO-COMPUTER BUYER'S GUIDE



TSE-HARDSIDE

1982
Micro-
Computer
Buyer's
Guide

is now available! We've included such valuable information as print samples from each of the printers we carry, feature-by-feature comparisons of Micro-Computer systems in an easy-to-read table format, an informative article on Micros, and pages and pages of complete product descriptions.

We're making this valuable reference available for only \$2.95 (refundable on your next purchase from TSE-HARDSIDE.) Charge customers are welcome to call our toll-free number: 1-800-258-1790 (in NH call 873-5144) THE TSE-HARDSIDE 1982 MICRO-COMPUTER BUYER'S GUIDE will soon arrive at your address via first class mail.

Send to:



TSE-HARDSIDE

Dept. C, 14 South Street
Milford, NH 03055

Yes! Send me the B11
TSE-HARDSIDE 1982 Micro-Computer Buyer's Guide.

I've enclosed \$2.95 Please send only your FREE Price List
Charge to my credit card MasterCard Visa

Card No. _____

Interbank No. _____ Exp. Date _____

Signature _____

Name _____

Address _____

City _____

State _____ Zip Code _____

Your prayers have been answered.

If you own or use a micro-computer, then chances are that from time to time, you've wished that someone could simplify programming.

Because as useful as micro-computers are, they can only ever be as good as the programs they run.

Well then, how does this sound?

No more program-coding. No more debugging. And no more time wasting.

Arguably more comprehensive and advanced than anything else of its kind, The Last One is a computer program that writes computer programs. Programs that work first time, every time.

By asking you questions in plain English about what you want your program to do, The Last One uses your answers to generate a ready-to-use program in BASIC.

What's more, with The Last One, you can change or modify your program as often as you wish. Without effort, fuss or any additional cost. So as your requirements change, your programs can too.

And if, because of the difficulties and costs of buying, writing and customising software, you've put off purchasing a computer system up to now, you need delay no longer.

Available now.

The Last One costs \$600 plus local taxes where applicable and is now available from better computer stores.

For further information, write to D.J. 'AI' Systems Ltd.,
Two Century Plaza, Suite 480,
2049 Century Park East,
Los Angeles, CA 90067.
Tel: (213) 203 0851.

THE LAST ONE[®]

WEND construct. The labeled branching enhancement uses the statements JNAME, GTO, and CSUB. JNAME places a label in a line. In listing 2, for example, the JNAME "pnt" labels the subroutine "pnt". JNAME must be the first statement in a line, and it cannot be followed by REM without a colon first; an apostrophe (') may be used, but there must never be a space after the label (despite an example to the contrary in the documentation). Labeled subroutines make programs much more readable and, of course, avoid the possibility of incorrect

branching caused by changing the number of a subroutine's first line. Branching to labels also enables you to move subroutines around without worrying about losing track of them in the calling statements.

The use of labeled subroutines requires two new calling statements. GTO and CSUB (for call subroutine) are used exactly like GOTO and GOSUB except that they call a routine labeled in a JNAME statement. GTO and CSUB can also call a line number defined by variable. For example, GTO X*100 with a value for X of 5 would force a branch to line 500.

This allows conditional branching according to whether a condition is "true" or "false." The FIND command, mentioned above, lets you locate a line previously labeled using JNAME by simply typing FIND (name); FIND "PNT" would locate that subroutine in listing 2, although FIND would normally be used with much more complex programs.

The WHILE and WEND statements go a long way toward making BASIC a structured language. They are used in the same way WHILE and WEND are used in more extended Microsoft BASICs, such as the BASIC compiler for the TRS-80. WHILE a condition is "true," WEND placed at the end of a loop will send execution back to the WHILE statement. Thus the short program:

```
10 X=0
20 WHILE X <= 8;
30 PRINT X
40 X=X+1
50 WEND
```

will have the same effect as:

```
10 FOR X=1 TO 8
20 PRINT X
30 NEXT X
```

Although the former program is longer, in a less trivial example it forces much better programming practice and a more logical program flow. Conditional loops of this sort are one of the reasons many consider Pascal a superior programming language. Note that a semicolon is needed at the end of the WHILE statement; this contrasts with the WHILE construct used by Microsoft.

RDGOTO and RDGTO both do the same thing, except that the latter statement uses the label and variable conventions of CSUB and GTO. In "normal" BASIC, the command RESTORE after reading from DATA statements sends the read pointer back to the first data element. RDGOTO sends it back to a particular line number, so that material may be read from the middle of a data list. RDGTO lets the line be specified by a variable (see the example for GTO given above). I don't

SHAKE THE DIRT OFF YOUR ROOTS ROOTS/M

A CPM Genealogy Program For Your WHOLE Family

Store, retrieve and display thousands of facts about your relatives and ancestors.

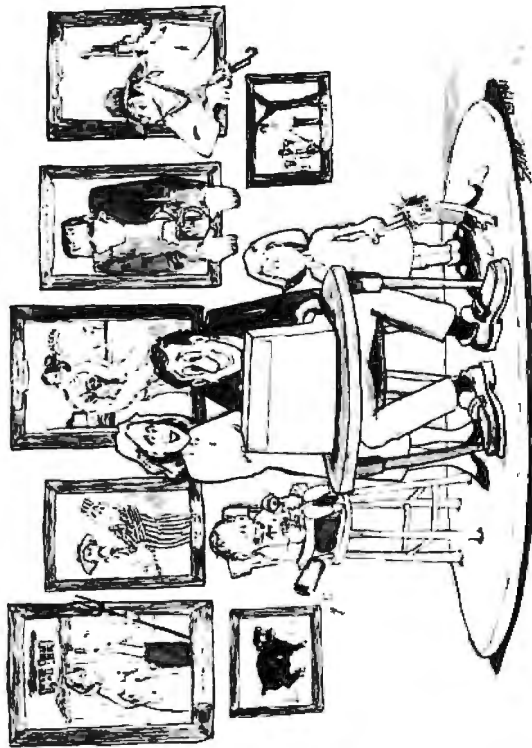
Print pedigree charts and family group sheets, calculate relationships and recall anniversaries using standard genealogical conventions.

Learn how to trace your roots with the extensive course in genealogy provided in the 100-page illustrated user's manual.

124⁹⁵

COMMSOFT

665 Maybell Avenue • Palo Alto, CA 94306
(415) 493-2184



ROOTS/M requires at least 32K RAM, a 24 x 80 addressable cursor terminal and CPM. Most popular terminals are supported. Disk formats: 8" single density / IBM soft sector, 5 1/4" NorthStar DD, 5 1/4" Heath/Zenith SD, Master Card and VISA accepted. Write or call for a free catalog of COMMSOFT products.

ROOTS89 is available for Heath/Zenith HDOS.

CPM is a registered trademark of Digital Research Corp.

Cromemco introduces System One.



Survival of the fittest. In the highly competitive marketplace of microcomputers for business, American Computers & Engineers holds the distinction of being Cromemco's largest dealership network. This privilege affords us greater discounts than anyone else.

Dealers:

We are pleased to be able to pass these savings on to you. Our discounts to OEM's cannot be matched anywhere. Immediate shipment is available on all Cromemco computer systems, peripherals, cards, and software.

Cromemco, in its long-standing tradition of leadership in innovation, has now brought the state of the art in microcomputer technology to its next triumph. System One is the ultimate in compact, general application micros:

- Dual 5¼" diskettes
- 5 megabyte hard-disk option
- S-100 bus
- 8-slot card cage
- All-metal construction
- Single/multi user
- Lightweight & portable

For more information on Cromemco microcomputer systems, contact American Computers & Engineers.

Los Angeles: Headquarters • 2001 So. Barrington Ave., Los Angeles, CA 90025 • (213) 477-6751 • **Berkeley:** 2855 Telegraph Ave., Berkeley, CA 94705 • (415) 849-0177 • **Newport Beach:** 4141 MacArthur Blvd., Newport Beach, CA 92660 • (714) 851-8700 • **Canada:** 6715 Eighth St., North East Calgary, Alberta, T2E7H7 • (403) 275-5871 • **France:** 55 Rue de Rivoli, 75001 Paris, France • 236-94-95



Maxi-performance
on minis and micros.

often use DATA statements, so I can't get excited about this, but I can see that it would be useful in some applications.

Graphics

The new graphics statements are both fun and useful. Although there are only three, PLOT, DRAW, and INVERT, they do a lot. The simplest,

INVERT, is really a command. It simply changes each graphics point from on to off, producing a black-on-white effect. Graphics blocks occupied by characters are unaffected.

PLOT is useful for data output. Recall that any graphics point on the screen can be referenced by x and y coordinates. For example, SET(22,33) turns on a point at the x coordinate 22

and the y coordinate 33. PLOT has the construct:

PLOT (flag),x1,y1 TO x2,y2

Thus,

PLOT S,22,33 to 55,44

(which uses the S flag to set points to white) would draw a line between points 22,33 and 55,44. Using the flag R resets the points to black (ie: it "turns off the lights" along a line). PLOT can also be used to draw a rectangle on the screen if the flag is set as SB (set box). Thus,

PLOT SB, 10,10 TO 30,30

would draw a box with its upper left corner at 10,10 and its lower right corner at 30,30. The flag RB is similar, except it turns off the graphics points. Here's a simple exercise. Can you figure out what

CLS: INVERT:PLOT RB,10,10
TO 30,30

would do? (Hint: It would produce a "black on white" figure.)

CLS: PLOT SB,10,10 TO 30,30:
INVERT

would do the same thing.

DRAW is more complex, but basically it allows vector graphics on the TRS-80 screen. Vector graphics can be likened to drawing a line with a pencil that moves in short increments. A previously filled array specifies the direction and the number of increments the pencil should move each time it moves. [This is similar to shape tables used to draw graphic shapes on the Apple II...GW] The structure of the statement is:

DRAW (flag), @ x,y USING
(vector array)

The flags are S or R, with the same meaning as for PLOT, and x and y are the starting point of the line to be drawn. Thus,

DRAW S, @ 30,30 USING A

Listing 3: A vector-graphics program using ENHBAS's DRAW and PLOT statements. The additional ENHBAS command INVERT is used to achieve a black-on-white effect. (The output of this program is shown in photo 1.)

```

10  DEFINIT A=Z
20  DIM A(25)
30  POKE 16426,1          *SET THE PLOT SCALE
40  POKE 16427,2          *SET THE PLOT ROTATION
50  FOR J=1 TO 3          *FILL AN INDEX ARRAY
60    FOR I=0 TO 7        TO SPECIFY THE PLOT
70      A=256*J+I+1      "
80      IF I=7 THEN A=A+256 "
90      A((J-1)*8+I)=A   "
100     NEXT I           "
110    NEXT J            "
120    A(22)=0           "
130    CLS
140    FOR X=1 TO 8      *ROTATE THRU 8 TURNS
150      FOR Y=0 TO 2    *AND DO 3 DIFFERENT PLOTS
160        POKE 16426,X  *THIS DOES THE ROTATE
170        DRAW SET @ 23+40*Y,23 USING A *THIS DRAWS THE FIG.
180      NEXT Y
190    NEXT X
200    PLOT SB, 3,2 TO 124,45  *THIS DRAWS A BOX AROUND THE FIG
210    INVERT                *AND THIS MAKES IT BLACK ON WHITE
220    PRINT CHR$(7);        *THIS PLAYS A WESTMINSTER CHIMES
230    GOTO 230

```

ATTENTION GOVERNMENT D P USERS AND PURCHASERS

We represent many fine micro products and manufacturers on the U.S. Government's GSA Schedule, including

**Apple, Cromemco, Micropolis, NorthStar,
Osborne and Seequa Computers**

Purchasing from the Schedule will save you the time consumed by the bid process. Products shipped throughout the United States and world-wide. Visit or write any of our stores for more information or to receive our catalogue of products represented.

**Computers,
Etc.....
the dependable store**

257 West Street, Annapolis, MD 21401 - (301) 268-6505
13A Allegheny Avenue, Towson, MD 21204 - (301) 296-0520
9330 Georgia Avenue, Silver Spring, MD 20910 - (301) 588-3748
6671 Backlick Road, Springfield, VA 22150 - (703) 644-5500
Plaza 38, 2442 Route 38, Cherry Hill, NJ 08002 - (609) 779-0023
Callers outside metropolitan areas served by our stores
Please call (301) 268-5801
Career Opportunities Available * An Equal Opportunity Employer

INFORMATION LINE (714) 549-7373

TOLL FREE ORDER LINES
(800) 854-0523 - OUTSIDE CALIF.
(800) 432-7066 -
WITHIN CALIF.

COMPUTIQUE®

**hp HEWLETT
PACKARD
HEADQUARTERS**



A STANDARD FOR PROFESSIONALS

- HP-67 289.95
- HP-97 584.95
- HP-33C SCI. ... 79.95
- HP-34C SCI. ... 114.95
- HP-38C BUS/RE 119.95
- HP-32E SCI. ... 49.95
- HP-37E BUS. ... 59.95
- HP-41, 41CV. ... CALL
- HP-85 CALL
- HP-83 NEW CALL
- HP-125 NEW COMPUTER SYSTEM CALL
- HP-11C NEW CALL
- HP-12C NEW CALL

apple computer MEANS BUSINESS



INTRODUCING apple III

Apple III is a highly integrated computer system evolved from the Apple II design and optimized to best serve the professional user. The new computer will be offered in packaged configurations for personal use or professional applications. Look at these special Apple III features:

- 80 character paper
- lower case display
- disc drive and integrated peripheral interfaces
- enhanced graphics capability
- an emulator mode allowing Apple II software to be run on the Apple III



APPLE II PLUS



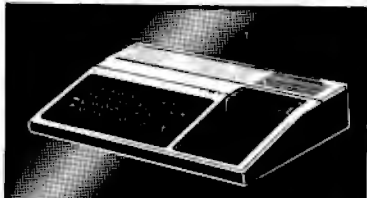
AUTHORIZED DEALER AND LEVEL 1 SERVICE CENTER

- APPLE II, II PLUS (16K, 32K, 48K)
- APPLE III
- DOS 3.3
- APPLE PLOT
- APPLE PASCAL (64K)
- APPLE FORTRAN
- VISICALC 16 SEC
- VISIPLLOT
- VISITREND
- APPLE WRITER
- GRAPHICS TABLET
- BPI (GL, AR, & PAYROLL)
- MODEM
- DDW JONES NEWS & QUOTES
- DECISION EVALUATOR
- CONTROLLER (GEN LEDGER)
- MICRO-COURIER
- EPSON
- CENTRONICS
- QUME
- SILENTYPE
- ANADEX
- SANYO, BW, COLOR, GREENSCREEN
- EXTENDED WARRANTY

COMPLETE BUSINESS, EDUCATIONAL & GAME SOFTWARE AVAILABLE.



**INNOVATIONS FROM
Texas Instruments**



FREE SPEECH SYNTHESIZER WITH PURCHASE OF TI-99/4

GET A \$20 REBATE ON THE TI-59 PROGRAMMABLE.

- | | | | |
|----------------|--------|---------------------|--------|
| TI-54 SCI NEW | 39.95 | SPEAK & SPELL, READ | 59.95 |
| TI-55II NEW | 44.95 | SPEAK & MATH | 59.95 |
| TI-57 PROG SCI | 39.95 | TOUCH & TELL NEW | 54.95 |
| PC-100C | 169.95 | TI-5100 DISPLAY | 39.95 |
| LCD-PROG NEW | 59.95 | TI-5010 HAND/PRINT | 49.95 |
| TI-30II NEW | 18.95 | TI-5120 PRINTER | 69.95 |
| TI-35SP SCI | 22.50 | TI-5130 PRINT/DISP | 79.95 |
| TI-40 SCI NEW | 28.95 | TI-5135 PRINT/DISP | 79.95 |
| BUS ANAL I | 19.95 | TI-5142 PRINT/DISP | 99.95 |
| BUS ANAL II | 44.95 | TI-58C PROG CALC | 89.95 |
| BUS CARD | 39.95 | TI-59 960 PROG | 179.95 |
| MBA | 54.95 | INVEST ANALYST | 48.95 |

PLUG INTO CONTROL

CONTROL LIGHTS AND APPLIANCES AUTOMATICALLY AND INSTANTLY.



- TC 211 TIMER 59.95
- TS 555 5 pc TIMER SET NEW 119.95
- PK 300 3 pc MINI CONTROLLER 49.95

BSR SYSTEM X-10™

THE SHARP EDGE SHARP

- EL-670 ELECTRONIC PIANO CLOCK/CALCULATOR NEW 59.95
- CT-665E TALKING CLOCK NEW 99.95
- EL-7001 ALPHANUMERIC CALC 139.95
- CT-455E POCKET DIG/ALARM CLOCK 24.95
- EL-5100 PROG/ALPHANUMERIC 89.95
- EL-8200 ALPHANUMERIC 99.95
- EL-1188 HANDHELD PRINT/DISPLAY 49.95
- EL-1182 DESK TOP PRINT/DISPLAY 74.95
- EL-5813 SCIENTIFIC PROGRAMMABLE 34.95

- Chess Challenger 7 89.95
- Sensory Chess 129.95

MATTEL ELECTRONICS™

- INTELLIVISION 259.95
- GAME CARTRIDGES 27.95
- HORSE RACE ANALYZER 27.95
- TOUCH THE FUTURE ATARI 400 (16K) 294.95
- VISICALC AVAILABLE CALL
- MP500 CORDLESS HANDHELD PHONE 189.95 (700' RANGE)

WE WILL MEET OR BEAT ANY COMPETITOR'S PRICE ON MOST ITEMS IF HE HAS THE MERCHANDISE IN STOCK

YOU'LL WONDER HOW YOU EVER GOT ALONG WITHOUT IT.

CODE-A-PHONE

The Telephone Answering System®



AND AMERICA IS GETTING THE MESSAGE.

| | NOW | SAVE |
|--------------------------------|------------|------|
| 1050 ECONOMY ANSWER | NEW 119.95 | 30. |
| 1450 SMALL WONDER | 189.95 | 90. |
| 1550 TOUCH SYSTEM | 259.95 | 120. |
| 1750 VOICE ACTIVATE | 229.95 | 100. |
| 960 MEMORY DIALER HANDHELD NEW | 79.95 | 20. |

CASIO. WHERE MIRACLES NEVER CEASE



- W-100 DEPTH-TESTED TO 100 METERS
- AA-81 2-WAY DIG/ANALOG ALARM 69.95
- VL-TONE MUSICAL INSTRUMENT/ CALC. 69.95
- W100 DEPTH TESTED ALARM CHRONO. 39.95
- FX7100 SCI CHRONO ALARM CALC. 49.95
- FX3500 SCI PROGRAMMABLE CALC 39.95
- FR100 DESK-TOP PRINT/DISPLAY 79.95
- CA-90 INVADER GAME CALCULATOR WATCH 49.95

NOW 39.95

ALSO: CANON, TOSHIBA, NSC, SEIKO, MATTEL, PEARLCORDER, ITT, GTE, AND MANY OTHERS ALL AT GREAT PRICES!

TOSHIBA NOW 99.95

BC-1232PV DIGITRON DESK TOP CALCULATOR
12-DIGIT PRINT/DISPLAY FOR FAST, ACCURATE CALCULATING AT HOME OR FOR BUSINESS

MAIL & PHONE ORDERS ONLY

WRITE OR CALL FOR FREE CATALOG

NEWPORT BEACH
COSTA MESA
3711 S HARBOR BLVD
SANTA ANA CA 92704
(714) 549-7373

All units shipped in original factory cartons with accessories according to manufacturer's specification. Visa, Mastercard, S Order, Pers Ck (14 wrkg days to clear), COD accepted Min \$4.95 for shipping in U.S.A. Air on request. CA res add 6% sales tax. All mdse subject to availability. Prices subject to change. Send orders to dept



WILSHIRE CENTER
3285 WILSHIRE BLVD
(213) 385-7777

LOS ANGELES
11986 WILSHIRE BLVD
(213) 820-0423

PASADENA
260 S LAKE AVE
(213) 795-3007

TARZANA
18665 VENTURA BLVD
(213) 705-7507

BREA
1080 E IMPERIAL HWY
(714) 990-6600

TORRANCE/LAWDALE
16611 HAWTHORNE BLVD
(213) 370-5795

Professional Discounts

Circle 105 on Inquiry card.

would produce a complicated line starting at the point 30,30 and using the directions and lengths specified in the array "A". The complications occur in setting up the array. Listing 3 is a short vector-graphics program; photo 1 shows its results. The length of the increments (which specifies the

scale of the drawing) and the rotation of the drawing can also be controlled by poking values into two locations in memory (see listing 3). One limitation of the vector graphics used here is that the direction of movement of the "pencil" can be specified only in 45-degree increments.

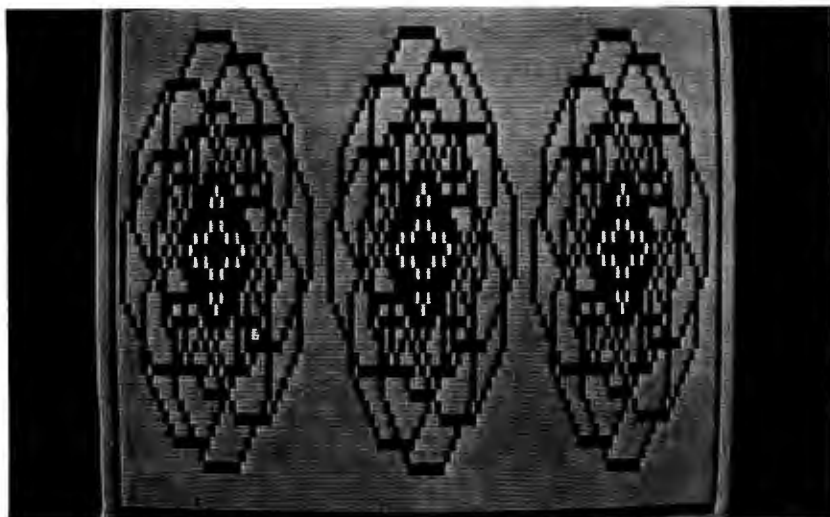


Photo 1: The output from the simple vector-graphics program given in listing 3. ENHBAS's DRAW, PLOT, and INVERT statements make it easy to program these graphics.

Screen Control

The first of the screen-control statements, LEFT, is really a command and is most useful in graphics. Its action is simple: it moves everything on the screen one character to the left. This is useful for moving graphs. For example, a sine wave might be drawn onto the screen using SET, and if LEFT were used each time a SET was done the sine wave would travel across the screen. Moving bar graphs and fancy moving graphics are also possible, especially if you combine LEFT with DRAW.

SCROLL produces professional-looking output: it splits the screen into two sections, protecting the upper section from scrolling while allowing the lower to scroll in the usual way. SCROLL is enabled by the statement SCROLL=SET, which also clears the screen. SCROLL=4, for example, then prevents the upper four lines from scrolling; they will stay in place during a listing or output from a program. SCROLL=RESET disables the scroll-protect feature. I like to use this feature when modifying programs by using it in the command mode. I can "lock" a few program lines on the upper screen and use the lower for modifications and listings. Simply typing SCROLL=RESET then brings me back to the normal mode. The screen-clearing feature can be annoying; I would prefer to be able to control clearing separately by using CLS.

Printer Formatting

The two printer-formatting statements are simple but valuable. CLM (integer) sets the maximum column width (in characters) before a wrap-around. This is necessary on printers that truncate the end of a line, and useful on others. I use a 14½-inch-wide printer format, and CLM lets me specify that the output would be narrower, thus allowing narrower paper for some applications. The default column width is 80 characters, which surprised me when I first listed a program with long lines.

The command PAGE (number) specifies the number of lines that will be printed on each page. When the

Can your ALPHA MICRO™ understand:

“ I want to see every contributor whose donation was more than \$1,000 and whose zip code is between 06500 and 06575. The status cannot be defaulted but must be pledged or given ”

“ Please rank all medications except ampicillin for me. The diagnosis must not include fracture and the date of visit should be past 1 5 80 but prior to 14 February 1980. The time of visit must be later than noon but before 4:30 PM. I also want the patient's age to be greater than 2 years 8 months yet younger than 10 yrs ”

DERVISH™ 2.0 UNIVERSAL DATABASE MANAGEMENT SYSTEM CAN!

- powerful, very sophisticated English language inquiry processor
- up to 80 fields
- up to 70 characters per field; more than 5500 characters per record
- multiple databases of hundreds of thousands of dynamically allocated, tightly packed records possible
- ultra-fast ISAM retrieval of any (or all) selected text fields
- user-controlled database design—all files (even ISAM!) created automatically
- nine self-formatting field types including cash, age (interval), and phone
- data entry and update facilitated by formatted screens and error checking
- optional user-designed entry screens
- individualized form letters, directories, and documents
- labels
- user-designed reports with column, row, and grand totals
- automatic transfer of data to and from user application programs
- automatic transfer of records to create subset or superset databases
- global field and subfield search-and-replace
- data encryption and decryption
- comprehensive documentation—written in English!
- suitable for business, professional, or scholarly applications
- no programming or operating skills needed; youngest known user is 12 years old!

ALPHA MICRO™
trademark of
Alpha Microsystems,
Irvine CA
DERVISH™ trademark
of Clinical Analytics, Inc.,
New Haven, CT

clinical analytics, inc.



77 Everit St., New Haven, CT 06511 (203) 787-3952

Lifelines®

The serious publication for the serious software user.

WHAT LIFELINES READERS
READ ABOUT IN
OCTOBER

COMING SOON:
THE INDEPENDENT GUIDE TO
THE IBM PERSONAL COMPUTER—
WRITE FOR MORE INFORMATION.

Lifelines is the publication dedicated to keeping you up-to-date on happenings in the explosive micro-computer world.

Lifelines specializes in news about software for CP/M® and similar operating systems.

Lifelines does it with a guarantee of high level, in-depth analysis of software uses and capabilities.

Lifelines does it with valuable information necessary to make intelligent software buying decisions.

Lifelines does it with the latest information on The CP/M Users Group.

Lifelines does it with thought provoking discussions on many of the more controversial issues facing computer users.

How can you live without Lifelines?

Subscribe Now!

\$18.00 for twelve issues: U.S., Canada, and Mexico.

\$40.00 for twelve issues: all other countries.

\$2.50 for each back issue: U.S., Canada, and Mexico.

\$3.60 for each back issue: all other countries.

All orders must be pre-paid by check to: LIFELINES, 1651 Third Avenue, New York, N.Y. 10028—Checks must be in U.S. \$, drawn on a U.S. bank. Or use your VISA or MASTERCARD. Call (212) 722-1700

LIFELINES



Lifelines is a registered trademark of Lifelines Publishing Corp.
The Software Magazine is a trademark of Lifelines Publishing Corp.

October 1981, Vol. 2 Issue #5

LIFELINES

The Software Magazine™

- More of Ward Christensen's popular 8080 programming tutorial.
- An Assembly Language Interface to PL/I-80™.
- Tips on starting your own computer bulletin board.
- A comparison of two dental office management packages.
- Catalogs and abstracts describing two new volumes from The CP/M Users Group.
- More on random number simulations.

PL/I-80 is a trademark of Digital Research, Inc.
CP/M is a registered trademark of Digital Research, Inc. The CP/M Users Group is not affiliated with Digital Research, Inc.
Copyright ©1981, by Lifelines Publishing Corp.

IT TOOK A BIT OF GENIUS TO PUT A SMART CRT TERMINAL ON ONE BOARD FOR ONLY \$425.

Only Standard Microsystems could build so much CRT capability in a small terminal-on-a-board at such a low price.

Our new Hawk 1 video terminal module gives you the circuitry you need to build a truly smart

terminal. The Hawk is available in either 24 x 80 or 16 x 64 displays. It has an easy-to-read 7 x 11 dot matrix in a 9 x 12 dot character field. With up to 64 graphic characters.

It can give you underlining, reverse video, character blinking, half intensity and character blanking.

Editing features include character insert/delete, line insert/delete, tab operations and full/partial screen erase.

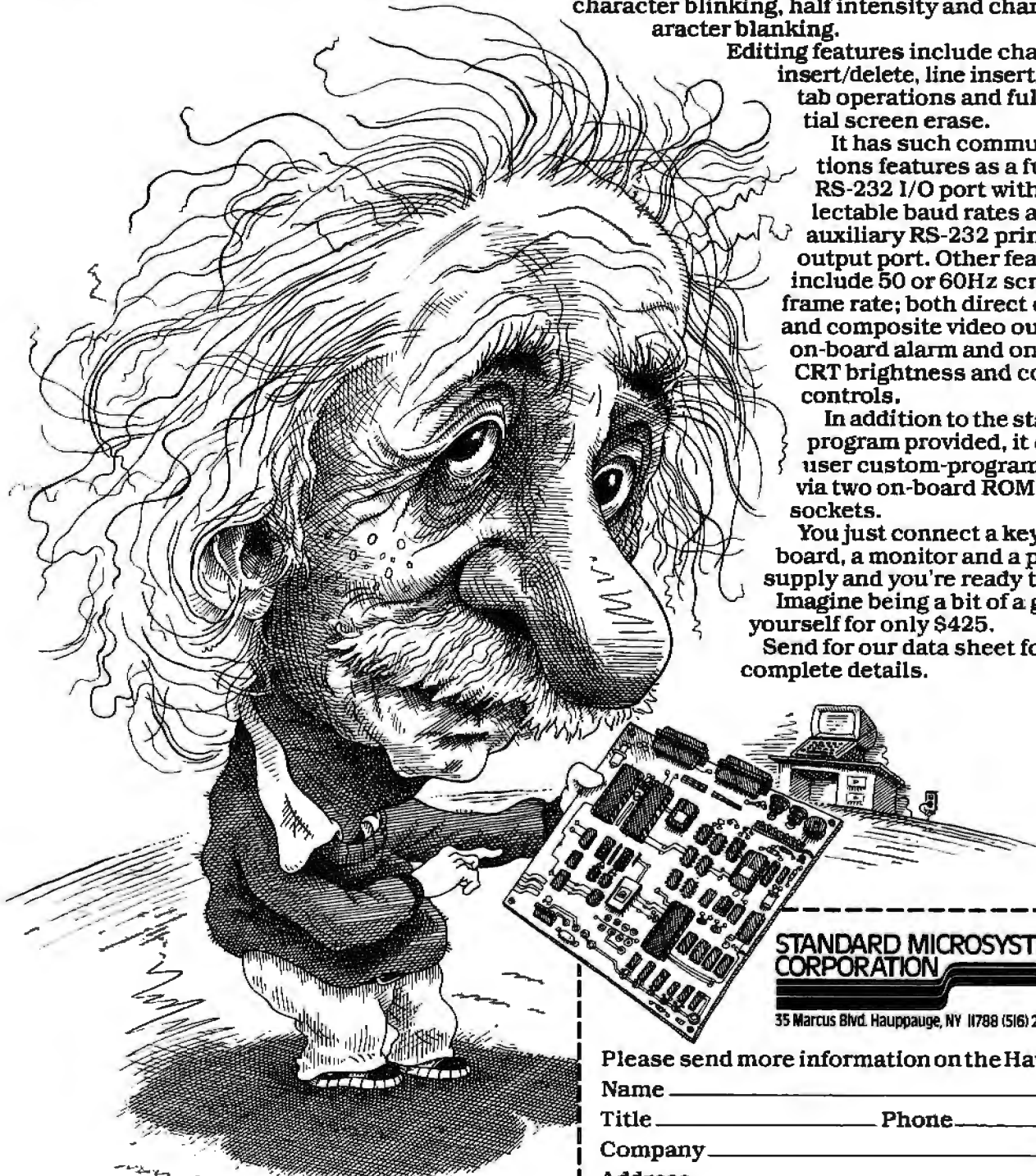
It has such communications features as a full RS-232 I/O port with 8 selectable baud rates and an auxiliary RS-232 printer output port. Other features include 50 or 60Hz screen frame rate; both direct drive and composite video outputs; on-board alarm and on-board CRT brightness and contrast controls.

In addition to the standard program provided, it can be user custom-programmed via two on-board ROM sockets.

You just connect a keyboard, a monitor and a power supply and you're ready to go.

Imagine being a bit of a genius yourself for only \$425.

Send for our data sheet for complete details.



**STANDARD MICROSYSTEMS
CORPORATION**

35 Marcus Blvd. Hauppauge, NY 11788 (516) 273-3100

Please send more information on the Hawk 1.

Name _____

Title _____ Phone _____

Company _____

Address _____

City/State/Zip _____

BY 11 81

STANDARD MICROSYSTEMS DISTRIBUTORS

ARIZONA
Cetec Molltronics
Phoenix
(602) 272-7951
Kachina Electronic Dist.
Phoenix
(602) 269-5201
Kachina Electronic Dist.
Tucson
(602) 792-2223

CALIFORNIA
Cetec Molltronics
South Gate
(213) 773-6521
(714) 521-7412
Cetec Molltronics
San Jose
(408) 263-7373
Cetec Molltronics
San Diego
(714) 278-5020
Diplomat Electronics, Inc.
Sunnyvale
(408) 734-1900
NESCO
Van Nuys
(800) 423-2664
NESCO
San Diego
(714) 292-7349
Western Microtechnology
Sales
Cupertino
(408) 725-1660
Zeus/West Inc
Anaheim
(714) 632-6880

COLORADO
Bell Industries
Wheatridge
(303) 424-1985
Diplomat Electronics, Inc.
Englewood
(303) 740-8300

CONNECTICUT
Diplomat Electronics, Inc.
Danbury
(203) 797-9674

FLORIDA
Diplomat Electronics, Inc.
Clearwater
(813) 443-4514
Diplomat Electronics, Inc.
Palm Bay
(305) 725-4520
Diplomat Electronics, Inc.
Fort Lauderdale
(305) 971-7160
Hammond Electronics, Inc.
Orlando
(305) 849-6060

GEORGIA
Diplomat Electronics
Norcross
(404) 449-4133

ILLINOIS
Diplomat Electronics, Inc.
Bensenville
(312) 595-1000
Mar Con
Sikee
(312) 675-6450

MARYLAND
Whitney Distributors, Inc.
Baltimore
(301) 944-8080
Diplomat Electronics, Inc.
Columbia
(301) 995-1226

MASSACHUSETTS
Diplomat Electronics, Inc.
Chicopee
(413) 592-9441
Diplomat Electronics, Inc.
Holliston
(617) 429-4120
RC Components
Wilmington
(617) 657-4310
Zeus/New England, Inc.
Burlington
(617) 273-0750

MICHIGAN
Diplomat Electronics, Inc.
Farmington
(313) 477-3200

MINNESOTA
Diplomat Electronics, Inc.
Fridley
(612) 572-0313

NEW JERSEY
Diplomat Electronics, Inc.
Totowa
(201) 785-1830
Diplomat Electronics, Inc.
Mt. Laurel
(609) 234-8080
Falk-Baker Assoc.
Nutley
(201) 661-2430
(201) 661-2431

NEW MEXICO
Bell Industries
Albuquerque
(505) 292-2700

NEW YORK
Diplomat Electronics
Melville
(516) 454-6400
Diplomat Electronics
Liverpool
(315) 652-5000
Current Components
Hauppauge
(516) 273-2600
Zeus Components Corp.
Melville
(516) 752-9551
Zeus Components, Inc.
Port Chester
(914) 973-7400

NORTH CAROLINA
Hammond Electronics, Inc.
Greensboro
(919) 275-6391

OHIO
Target Electronic Corp.
Solon
(216) 248-7930
Applied Data Management
Cincinnati
(513) 579-8108

OKLAHOMA
Quality Components
Tulsa
(918) 664-8812

PENNSYLVANIA
QED Electronics, Inc.
Hatboro
(215) 674-9600

SOUTH CAROLINA
Hammond Electronics, Inc.
Greenville
(803) 233-4121

TEXAS
Quality Components, Inc.
Addison
(214) 387-4949
Quality Components, Inc.
Houston
(713) 772-7100
Quality Components, Inc.
Austin
(512) 835-0220

UTAH
Bell Industries
Salt Lake City
(801) 972-6969
Diplomat Electronics, Inc.
Salt Lake City
(801) 486-4134

CANADA
Future Electronics, Inc.
Montreal, Quebec
(514) 694-7710
Future Electronics, Inc.
Downsview, Ontario
(416) 663-5563
Future Electronics, Inc.
Vancouver, B.C.
(604) 438-5545
Future Electronics, Inc.
Ottawa, Ontario
(613) 820-8313

lines have been printed, the TRS-80 sends blank lines until the top of the next page is reached. Each page is assumed to have a total of 66 lines, printed and blank; if your printer has a different page length, you can change the default by POKEing the correct number in location 16424. Immediately after turning on the computer, I normally set PAGE (at 55) and CLM (at 132) by using a CHAIN file in NEWDOS/80 (see listing 1).

Other Features

ENHBAS has many other useful statements and related functions. By far the most powerful of these is EXEC (string), which executes a string as a program statement. For example:

```
A$="Y=X+2*SIN(X)":EXEC A$
```

executes the statement $Y=X+2*\text{SIN}(X)$. Using EXEC, you can define statements as strings and repeatedly execute the statements in the program. This can eliminate a lot of GOSUBs to short subroutines. You can also construct statements using string manipulation and then execute them. In theory it is even possible to write a BASIC program that will write another program.

A similar routine is EVAL, although it is really a function rather than a statement. The statement

```
EVAL (string)
```

evaluates a string as if it is an algebraic expression. Thus:

```
A$="X+2*SIN(X)":Y=EVAL(A$)
```

does the same thing as the example in the previous paragraph. As with EXEC, you can have the program manipulate the strings. As an example of an application for teaching programs, a student can enter a function as a string, and that function could then be evaluated, plotted, etc. I have by no means explored all of the uses of EVAL and EXEC, but they seem to offer a host of possibilities in instructional programs and even a variety of artificial intelligence.

Another miscellaneous statement is POP. POP allows a graceful exit from

a subroutine before its end is reached. Suppose a subroutine at line 200 calls another at line 400. A normal branch out of the second subroutine would mean that the next RETURN would bring the program to the point where the second was called in the first subroutine. If POP has been executed, however, the "return to 200" would be eliminated and execution would be returned to the main program. This is similar to the EXIT command in some other BASICs. Usually POP is used with some kind of IF statement or other conditional branch.

WPOKE and WPEEK place and retrieve 16-bit integer values to and from memory. For example, WPOKE (28560), 2992 pokes the integer value 2992 into location 28560 and 28561 (2 bytes are needed to store an integer). WPEEK (28560) then retrieves the number. PRINT WPEEK (16561) returns the memory size that had been set on entering BASIC, for example. WPEEK can be particularly useful in conjunction with VARPTR.

The simplest of the new functions (including WPEEK and EVAL, which have already been described) are PI and EN. PI simply returns the value of π , and EN the value of the exponential constant e (the base of natural or Napierian logarithms). Either single or double precision is returned, depending on the precision of the assignment variable. $A1=PI$ would set $A1$ to 3.14159, while $A\# = PI$ would give $A\#$ the value of 3.141592653589793.

BIN\$ and HEX\$ return a string that expresses the binary or hexadecimal value of an integer. $A\$ = \text{BIN}\(10432) assigns "0010100011000000" to $A\$$; $A\$ = \text{HEX}\(10432) assigns "28C0". I wondered why such functions weren't included in disk BASIC. Now I wonder why a function OCT\$ wasn't included in ENHBAS.

SIZE is the simplest function or statement in this whole package. It returns the length (in bytes) of the resident program, in the same way that MEM returns the remaining memory; three years ago I thought a similar function should have been a part of Level I BASIC.

WINKEY\$ is another function that should have been a part of an earlier

version of the TRS-80 BASICs. Although similar to INKEY\$ in that it takes a value from the keyboard without waiting for ENTER to be pressed, WINKEY\$ waits until there is an input. While INKEY\$ must be put into a sometimes complex loop structure, WINKEY\$ can stand alone. This results in code that is shorter and easier to read and allows some input structures that were, previously, nearly impossible. BASIC is probably the consummate interactive language, and WINKEY\$ is a function that makes interaction even easier.

PLAY (string) sends a sequence of tones to the cassette port. The first byte of the string specifies the tone and the second and third the duration; this sequence is repeated, 3 bytes at a time, to specify a tune. While it is possible to write simple melodies this way, it isn't easy. The tones are not linear functions of the byte values, and the actual duration depends not only on the two duration bytes but also on the tone value. Thus, writing a tune is a trial-and-error procedure. The command is useful for producing audible prompts in a program, and by using short durations and variable tone values, you can achieve such noise effects as "raspberries," ricochets, and rocket blasts.

CALL should also have been a part of Level II or of disk BASIC. CALL does the same thing as a USR function but in a different way. USR(x) calls a machine-language routine whose entry location has been specified in a DEFUSR statement; CALL does this, but directly. CALL 22856, 56 puts the value 56 into the HL register pair and begins executing a machine-language routine at location 22856. Although this function is simple to use, it must have been difficult to incorporate into ENHBAS.

ENHBAS on Other Systems

I have used only the Model I disk and tape versions of ENHBAS. The tape version provides all of the enhancements mentioned above plus the disk-BASIC enhancements (except those used for disk control and the multiple USR calls, and CALL eliminates the need for the latter).

The tape version is entered by using the SYSTEM command. Cornsoft has assured me that the only difference in the Model III version is that it did not at first support the printer-formatting options. By the time you read this, that problem should be corrected.

The Model II version of ENHBAS is superior to the Model I or III, largely because of the way the Model II handles interpreted BASIC. The Model II version includes some functions (like POKE and PEEK) that should have been included with the original system, as well as all the enhancements that are available for the Model I and III and a variety of

others. The complete command set for the Model II version of ENHBAS is summarized in table 1 (taken from Cornsoft's advertising literature).

An Overview of ENHBAS

ENHBAS is outstanding software. Good software without support, however, isn't worth much. Support includes documentation, advice from the vendor, updates and modifications, and simple things like delivery and packaging. With ENHBAS, these are as outstanding as the software itself. For \$5, and the return of your original ENHBAS disk, Cornsoft will provide updates.

| Command | Meaning |
|------------|--|
| DIR | Display disk directory |
| FIND | List line with specified label |
| TAG | Mark array to tag along at sort time |
| SCLEAR | initialize SORT command |
| ATOP | Set top limit for SORT |
| JNAME | Identifies a label for use by GTO and CSUB |
| GTO | Special GOTO, allows labeled and calculated GOTOS |
| CSUB | Similar to GTO except accomplishes a GOSUB |
| RDGOTO | RESTOREs at specified line number |
| RDGTO | RESTOREs at specified label |
| WHILE/WEND | Structured loop construct (WHILE cond; code: WEND) |
| INSERT | Moves entire file up by n records at specified point |
| OVERWRITE | Deletes n records in file starting at specified point |
| TSET | With INDEX FILE, specifies master file record as USED |
| TRESET | With INDEX FILE, specifies master file record as FREE |
| CURSOR | Allows changing of system cursor |
| EXEC | Executes a string expression as a program statement |
| ON BREAK | |
| GOTO | Branch to line number when the BREAK key is hit |
| BRL | Line at which BREAK was hit when branched to ON BREAK ... |
| OUTPUT | Acts as PRINT when exp=0, LPRINT when exp=1, can also send data to the RS232 ports |
| | Removes last GOSUB |
| POP | |
| PUSH | PUSHes a line or label address on the GOSUB stack |
| SCROLL | Sets number of lines to scroll-protect on the screen |
| TITLE | Automatically prints information at specified printer line |
| WPOKE | POKEs a 16-bit number at specified address |
| PI | Function, returns the value of pi |
| ENV | Function, returns the value of "e" (base of natural log) |
| BINS | Function, returns 16-digit binary string of expression |
| LOWERS | Function, converts string to all lowercase |
| UPPERS | Function, converts string to all uppercase |
| SCREEN\$ | Reads a byte from the screen |
| DISKID\$ | Reads disk id from any disk drive |
| WINKEY\$ | Like INKEY\$ except automatically loops until key hit |
| ALLOC | Function, returns number of files allocated |
| FREE | Finds first free entry in Index File (see TSET/TRESET) |
| CALL | Function, CALLs machine-language subroutine |
| EVAL | Evaluates a string expression as an algebraic expression |
| RS232 | Function, reads a byte from RS232 Port A or B |
| SIZE | Returns size of current program |
| WPEEK | 16-bit PEEK |
| POKE | Places number at specified memory address |
| PEEK | Function, returns contents of specified memory address |
| CLM, PAGE | Sets maximum page length and line length without FORMS |
| EPUT, EGET | Allows records lengths in excess of 256 bytes |
| SEARCH | Searches disk file (EGET/EPUT or GET/PUT type) for specified key |
| PAGELN | Memory address of FORMS page-length variable |
| PROW | Memory address of FORMS page-length printer row |

Table 1: A summary of the command set of ENHBAS for the TRS-80 Model II.

SVA MAKING APPLES GROW



CP/M • PASCAL • APPLE DOS **AMS 8000** MEGABYTER SYSTEM

The AMS 8000 Megabyte System is for the serious user who wants to expand the capability of his Apple® by increasing online data storage, and reducing disk handling. It brings a new dimension to your Apple, making your data portable to other computers and gives you the reliability associated with IBM standard 8" floppy disks.

The AMS 8000 provides an Apple memory system with 1/2 to 4 Megabytes of removable, online, easy-to-use Apple formatted data ready to plug-in and operate. The system is at home in any setting and matches the styling of your Apple.

The AMS 8000 preserves your current software investment by maintaining rigid compliance with APPLE DOS interface specifications. Since standard Apple DOS commands are used, most software currently running under APPLE DOS 3.2, 3.3, Apple UCSD Pascal 1.1, or Microsoft CP/M*2.2 will run with AMS 8000. Apple mini disks may be used at any time.

Because of the IBM 3740 single density format, you now have the opportunity to exchange data with other computers such as IBM, INTEL, Radio Shock, DEC, etc. or operating systems like CP/M, UCSD Pascal, etc.

The controller circuitry utilizes a state-of-the-art LSI floppy disk controller and data separator to provide automatic single and double density operation. A proprietary high speed SOFT-DMA data transfer technique guarantees compatibility with all other DMA cards and will not interfere with memory refresh.

For a cost effective, reliable, and software compatible memory system from the originator of 8" floppy disk systems for the Apple, try the AMS 8000 from SVA . . . SVA means Business.

*Trademark Apple Computer. CP/M Trademark Digital Research.

Look what the complete AMS 8000 memory system with its field proven hardware and complete support software, deluxe industrial quality cabinet, reliable industry standard IBM 3740 8-inch floppy disk drives, dual density controller, self-contained power supplies and high density cooling means to you:

INCREASED STORAGE & FLEXIBILITY

- Increase online storage up to 4 Mega bytes
- Expand your maximum accounts and file size
- Add high speed efficient hard disk backup

IMPROVED COMPATIBILITY

- Operate with single AND double density DOS, CP/M, Pascal
- Enhance your existing mini-disks and software
- Copy any IBM 3740 or IBM System 34 Format 8" disk
- Interchange data with other computers

SIMPLIFIED OPERATION

- Utilize standard Apple DOS and DOS commands
- Reduce disk handling and I/O slot usage
- Gain automatic single/double density operation
- Gain automatic single/double sided drive operation
- Change to voice coil drives with one switch

SEVEN DAY BURN IN AND TEST POLICY

- 1 Year Warranty



SORRENTO VALLEY ASSOCIATES
11722 Sorrento Valley Road
San Diego, CA 92121
(714) 452-0101

Since Cornsoft Group is a new, small firm, I was apprehensive when I ordered ENHBAS. Experience with other vendors (some of them large and well-known) had led me to expect some bugs, poor delivery time, shoddy documentation, and so on. In this case, I expected to receive a padded manilla envelope with a crimped disk and some photocopied, jargon-laden documentation. Instead, within three days of placing a phone order, I received a box with a well-designed, blue 3-ring binder containing a disk and 55 pages of documentation. The documentation is superb. The page layout and format are pleasing and each feature is presented in logical sequence and described clearly and with good examples. (I find the documentation easier to use than either the Level II or disk BASIC manuals from Radio Shack and much superior to the documentation for NEWDOS, GSF, RSM2D, or even Microsoft's FORTRAN or BASIC compiler—and all those are excellent software.) The text is clearly written and, in contrast to most software documentation, not intimidating. It took me about three hours to feel comfortable with most of the features and the same should be true for anyone who knows the rudiments of BASIC and the TRS-80. I do wish ENHBAS could handle matrix manipulation and had automatic-key repeat, but you can't expect everything.

Are there any disadvantages? Some are to be expected with any product of this complexity, but all are minor, including the few mentioned above. Since ENHBAS includes new functions and statements, there are new reserved words, and that is sometimes inconvenient. For example, a program with the variable PI will not run with ENHBAS; you have to change the variable's name. And ENHBAS occupies a considerable amount of memory (I was thrown out of Scripsit a few minutes ago because ENHBAS was still loaded and protected). ENHBAS size in memory would be most important to those with 16 K- or 32 K-byte systems. The tape version occupies the same memory as do the disk overlays and leaves about 10.5 K bytes of usable

memory in a 16 K-byte system. As mentioned above, with disk BASIC you have to relocate or not use any programs running in the top 4 K bytes of memory; they would overlap ENHBAS.

When I first used ENHBAS I expected it to run more slowly than disk BASIC. For the most part, I was pleasantly surprised. ENHBAS is slower by a factor of about 3 when executing a simple empty FOR-NEXT loop, but that seems to be about the only thing that is slower. If a function (like SIN(X)) is included in the loop, then the slower speed becomes insignificant. Programs with delay loops might need modifications, but everything else seems unaffected. I also thought that a labeled branch might be slower; if anything, it is faster than a branch to a line number. There is no need to fear that ENHBAS will be slow.

Conclusions

- ENHBAS is a software package that occupies about 4 K bytes of RAM and enhances the operating environment and the versions of BASIC for the TRS-80 Models I, II, and III. The operating environment provides

a true control key, statement abbreviations, key click, a bell, audible prompts for BREAK and errors, printer formatting, and page skip, among other features. The BASIC enhancements include sort routines, branching to labels and other new branching methods, WHILE/WEND structure, line and vector graphics, CALL to a machine-language routine, and a number of other features, for a total of 32 new statements and functions.

- The BASIC enhancements follow normal syntax and are easy to learn and use. The system is easy to load, and except for the memory overhead, is transparent to the operator.

- User support is excellent. Documentation is clear, complete, sprinkled with useful examples, and packaged in an attractive 3-ring binder. The vendor provides excellent support and is willing to answer questions.

- The software is almost completely bug free. It was used for a year before commercial release and has been thoroughly tested and proved. ENHBAS seems to be one of the best thought-out and produced pieces of software available for the TRS-80. ■

The Future with the Cornsoft Group

For the last four years a very few firms (like Microsoft) have dominated the design of operating systems, compilers, and interpreters. Others, like Randy Cook, Apparat, North Star, and Ohio Scientific have been exceptions, and a few individuals like Lance Micklus have produced some excellent software. The Cornsoft Group has the explicit, admitted intent of challenging the big companies, and ENHBAS proves that Cornsoft knows how to do it.

The excellence of ENHBAS has made me wonder about other Cornsoft products. I talked at some length with Phillip Oliver, the author of ENHBAS, and learned that Cornsoft had also sold an ingenious compiler for integer BASIC. The compiler handled a subset of Level II plus some of ENHBAS and produced code that could be assembled by Radio Shack's Editor-Assembler. It was a good way to learn assembly language, and since source code was produced, you could enhance programs

by using the TRS-80 editor—it's one of those simple ideas that we all wish we had thought of. Sadly, that product was discontinued due to lack of customer interest.

Oliver is now at work on a BASIC compiler that will handle all of Radio Shack BASIC plus the ENHBAS enhancements. This second compiler will produce machine code (not source code like their present compiler), and should rival Microsoft's compiler. Since Cornsoft's machine-code compiler will be written specifically for the TRS-80, it will use the more efficient ROM routines when appropriate, but its own routines when they are faster. The run-time package (and required disk storage) should be much smaller than for the Microsoft compiler.

If Cornsoft is successful in all that it projects, we can expect a trend toward better and better software—specifically, software designed for particular systems, not adapted from one to another.

FMS-80

Organizes Your Organization

FM S-80, a data base management system, offers the user a quick and easy way to organize and efficiently manipulate data so sound decisions can be made on facts displayed.

FMS-80^{***} is the most powerful stand alone DBM program available to the micro-computer industry.

Completely menu driven and written in assembly language, it offers these features:

- User definable File Definitions
- Screen Displays
- Reports (with math and field break analysis)
- Selection Criteria (on any or all fields)
- Menus (that applications programs can be selected from)
- Instantaneous data query on indexed records.
- Mathematical manipulation of numeric data fields using the report generator or the programming language EFM (Extended File Maintenance)
- Easy to use video "how to" training tapes are available.
- Manipulation of up to 19 different data files (using EFM) at one time and displaying this information on the screen, gener-

rating reports, generating other data files or on-line updating of input files that already exist

- FMS-80 is able to call other programs like sub-routines in EFM
- FMS-80 is able to read data files that other programs have generated
- No restrictions to record size other than available RAM memory space
- Operates under CP/M[®], MP/M[®] or CDOS[®]

FMS-80 allows the flexibility to quickly create programs that allow data to be entered in a form that a secretary recognizes and generates reports that the manager requires.

If you're continuously asked to do applications programs and don't have time to do it in BASIC, consider FMS-80.

For additional information contact

Systems Plus,
3975 East Bayshore,
Palo Alto, CA
94303. Phone
415/969/7047

Systems Plus



^{***}TM of DJR Associates

^{**}TM of Cronimeo, Sunnyvale, CA

^{*}TM of Digital Research, Pacific Grove, CA

Atari is hot and so are we

The ATARI® 800™ Computer is getting rave reviews. High resolution color graphics and English characters; high quality sound; and sleek, modular appearance have made the 800 a "must have" for many computer users. Expandable memory, advanced peripheral components, and comprehensive software library make ATARI a really hot deal, whether your application is business, professional or personal.

SPECIAL OFFER — ASAP makes the ATARI® 800™ the hottest deal in town by offering 16K bytes of additional RAM... FREE! You get 32K for the price of 16K.

So don't get caught out in the cold. Call ASAP today.

| OPTIONAL ACCESSORIES | PRICE |
|------------------------------------|-----------|
| ATARI® 410™ Program Recorder | \$ 60.00 |
| ATARI® 810™ Disk Drive | \$ 455.00 |
| ATARI® 815™ Dual Disk Drive..... | \$1195.00 |

| OPTIONAL ACCESSORIES CONT. | PRICE |
|---|-----------|
| ATARI® 820™ 40-column Dot Matrix Impact Printer . . . | \$ 279.00 |
| ATARI® 822™ Thermal Printer | \$ 349.00 |
| ATARI® 825™ 80-column Dot Matrix Impact Printer . . . | \$ 625.00 |
| ATARI® 830™ Acoustic Modem | \$ 159.00 |
| ATARI® 850™ Interface Module | \$ 159.00 |
| ATARI® Paddle (CX30-04) or Joystick (CX40-04) | \$ 17.95 |
| Light Pen (CX-70) | \$ 64.95 |

Complete Software Library includes these popular units:

| | |
|------------------------|----------|
| Star Raiders | \$ 34.00 |
| Space Invaders | \$ 15.95 |
| Assembler Editor | \$ 42.00 |
| Missile Command | \$ 30.00 |
| Asteroids | \$ 30.00 |

Systems With Spice from California Computer Systems

Spice up your S-100 or Apple II™ with system enhancements from ASAP. From motherboards and mainframe cabinets to I/O boards and RAMs, we have the California Computer System product that will give you the added capability you need.

FOR S-100 USERS

32K Static RAM Board — 200 nS RAMs, compatible with Alpha Micro, Cramemco and others. 32K memory divided into 8K blocks. Fully static 2114 RAMs. Assembled and tested.

Part Number 2032C Price: \$610.00

16K Static RAM Board — 200 nS RAMs, compatible with Alpha Micro, Cramemco and others. 16K memory divided into 4K blocks. Assembled and tested.

Part Number 2116C Price: \$290.00

64K Dynamic RAM Board — For 8080 and Z-80 based S-100 systems. Provides processor-transparent refresh. 200 nS, 4MHz. Supports IMSAI-type front panels. Expandable. Assembled and tested.

Part Number 2065C Price: \$550.00

Z-80A CPU Board — 2 or 4MHz, switch selectable. 158 instructions, including 8080's 78 instructions for total 8080 software compatibility. 2K monitor ROM and RS-232-C port on-board. Assembled and tested

Part Number 2810A Price: \$239.00

Floppy Disk Controller — Controls up to four 5¼" and 8" drives in any combination. Double-sided and side-select signals for double-sided drives. Compatible with IBM 3740 and System 34 standards

Part Number 2422A Price: \$335.00

CP/M™ Version 2.2 Free With Purchase

S-100 Mainframe — 12-slot motherboard. Active termination on all bus lines. Built-in power supply, fan and circuit breaker. "Double path" trace pattern. Solder plated circuit area. Assembled and tested.

Part Number 2200A Price: \$475.00

2201A (220VAC) \$475.00

S-100 Motherboard — 12-slot capacity using standard S-100 connectors. Capable of supporting CPU's at 4MHz and above. "Double path" trace pattern. On-board voltage regulator

Part Number 2501A Price: \$150.00

4-Port Serial I/O Interface — 4 individually-controlled asynchronous ports. Fully buffered inputs and outputs. Includes ROM circuitry for 2716 2K EPROM (user supplied). Ports meet RS-232-C interface specs. 3 control and 3 status registers per port.

Part Number 2710A Price: \$265.00

2-Serial, 2-Parallel I/O Board — Fully buffered inputs and outputs. Includes ROM circuitry for 2716 2K EPROM (user supplied). Parallel ports have full four-line-per-port handshaking and 8-bit data transfer. Serial ports meet RS-232-C interface specs. Port A transmits and receives in asynchronous mode; Port B in either synchronous or asynchronous.

Part Number 2718A Price: \$275.00

4-Port Parallel I/O Board — 3 I/O ports and one output port. Seven bit status register. Fully buffered inputs and outputs. ROM circuitry for 2716 2K EPROM (user supplied). Ports provide 8-bit parallel data transfer; TTL-compatible.

Part Number 2720A Price: \$195.00

FOR APPLE II™ USERS

Synchronous Serial Interface — Compatible with RS-232-C (configurations A thru E, 1978). Supports full or half duplex. DTC type interface.

Part Number 7712A Price: \$149.00

Programmable Timer — Time events in continuous, single shot, frequency comparison and pulse width comparison modes. Interface patch area for custom interface applications.

Part Number 7440A Price: \$ 95.00

Asynchronous Serial Interface — RS-232-C compatible (configurations A thru E, 1978). DCE type interface; supports half or full duplex operation.

Part Number 7710A Price: \$139.00

Calendar/Clock Module — Accurate, real-time counting. Software programmable for 12- or 24-hour format. Each decimal digit of data is separately addressed for freedom of data format.

Part Number 7424 Price: \$ 99.00

3½ Digit BCD A-to-D Converter — Converts DC voltages to BCD numbers for monitoring and analysis. 400 mSec per conversion. -3.999 to +3.999 VDC full scale. ±5% non-linearity.

Part Number 7470A Price: \$ 95.00

12K ROM/PROM Module — Capable of accepting operating systems, system patches or firmware in 2K increments of mixed ROM or PROM. Addressable 12K in any of 4 16K blocks. 2316E ROM and 2716 PROM compatible.

Part Number 7114A Price: \$ 65.00

Parallel Interface — Two bidirectional 8-bit buses for interface to peripherals. Two programmable control registers. Four individually controlled interrupt input lines, two usable as peripheral control outputs.

Part Number 7720A Price: \$ 99.00

Arithmetic Processor — Add, subtract, and divide; trig and inverse trig functions; square roots, logarithms and exponentiation. Fixed point 16 and 32-bit operation.

Part Number 7811A Price: \$349.00

Centronics Printer Interface — Interfaces high-speed Centronics-type parallel printers to Apple II™ computers. Features 8-bit parallel data output bus, 4-bit status input, Data Strobe and Acknowledge handshake signals and printer reset signal

Part Number 7728A Price: \$ 95.00

asap
computer
products, inc.

DISK DRIVES

ASAP carries only the highest quality floppy disk drives, to provide you with years of trouble-free service and superior performance.

Data Trak™ 5 (ANSI 5¼" compatibility) Call for price
Data Trak™ 8 (IBM compatibility) Call for price
Model 801 (standard floppy) \$425.00
Model 850 \$640.00
Dual Disk Drive Cabinet \$225.00

ASAP also provides a full line of high reliability disk drive subsystems.

DDC-8 sgl — Cabinet for single 8" floppy disk drive \$ 185.00
DDC-8-1 — Cabinet with (1) Shugart SA801R installed \$ 595.00
DDC-8-2 — Cabinet with (1) Qume™ DT-8 double-sided double-density drive installed \$ 695.00
DDC-88-3 — Cabinet for dual 8" floppy disk drives \$ 275.00

*All cabinets come complete with power supply, fan and internal cables.

COMBO-8 — Dual cabinet for 8" floppy disk drives (horizontal mounting) \$ 265.00
COMBO-8 — Cabinet for 8" floppy disk drives (vertical mounting) \$ 265.00
COMBO-8/9-1S — Dual cabinet with (1) Shugart SA801R installed (horizontal or vertical mounting) \$ 725.00
COMBO-8/9-2S — Dual cabinet with (2) Shugart SA801R's installed (horizontal or vertical mounting) \$1150.00
COMBO-8/9-1Q — Dual cabinet with (1) Qume™ DT-8 double-sided double-density drive installed (horizontal or vertical mounting) \$ 865.00
COMBO-8/9-2Q — Dual cabinet with (2) Qume™ DT-8's double-sided double-density drive installed (horizontal or vertical mounting) \$1385.00
X5 — Cabinet for desk top main frame (small power supply) \$ 200.00
8000 — Cabinet for desk top mainframe (standard power supply) \$ 255.00

DISKETTES from ASAP

VERBATIM

| 5¼" DISKETTES | | | |
|---------------|-----------|----------|------------|
| Part # | Sectoring | | Price |
| MD525-01 | Soft | 1/Single | 10/\$27.50 |
| MD525-10 | Hard 10 | 1/Single | 10/\$29.50 |
| MD525-16 | Hard 16 | 1/Single | 10/\$29.50 |
| 8" DISKETTES | | | |
| FD32-1000 | Hard | 2/Double | 10/\$35.00 |
| FD34-1000 | Soft | 2/Double | 10/\$35.00 |

MEMOREX

| 5¼" DISKETTES | | | |
|---------------|---------------|-----------|------------|
| Part # | Sides/Density | Sectoring | Price |
| MEM 3401 | 1/Single | Soft | 10/\$25.00 |
| MEM 3403 | 1/Single | Hard 10 | 10/\$25.00 |
| MEM 3405 | 1/Single | Hard 16 | 10/\$25.00 |

| 8" DISKETTES | | | |
|--------------|---------------|-----------|------------|
| Part # | Sides/Density | Sectoring | Price |
| MEM 3060 | 1/Single | Soft | 10/\$35.00 |
| MEM 3101 | 2/Single | Soft | 10/\$45.00 |
| MEM 3090 | 1/Double | Soft | 10/\$45.00 |
| MEM 3102 | 2/Double | Soft | 10/\$55.00 |

DYSAN

| 5¼" DISKETTES | | | |
|---------------|---------------|-----------|------------|
| Part # | Sides/Density | Sectoring | Price |
| D-0130 | 1/Single | Soft | 10/\$45.00 |
| D-0226 | 1/Double | Soft | 10/\$46.00 |
| D-0235 | 2/Double | Soft | 10/\$55.00 |

MICROBYTE Z-80A/ I-O CPU BOARD

- A complete single board Z80A CPU with serial/parallel interface
- Fully compatible with the proposed IEEE S-100 Bus Standard
- Z80A CPU (4MHz version of the Z80)

\$299.00 Assembled & Tested
 Optional Monitor Program \$50.00

MICROBYTE 64K DYNAMIC RAM BOARD

- Fully S-100 bus compatible
- 64K x 8 bit dynamic RAM
- Low power:
 - +8VDC @ 700 mA
 - +16VDC @ 100 mA
 - 16VDC @ 25 mA
- Built-in capacity with LED indicator and vector interrupt

\$499.00 Assembled & Tested

MICROBYTE 4-PORT I/O BOARD

- Quad RS-232C serial ports. One 20mA current loop port
- Fully IEEE S-100 Bus compatible
- Asynchronous Communications with Z80A-DART(TM) or synchronous communications with Z80A-SIO/DT(TM)
- Full set of modem control signals, including RI (Ring Indicator)
- Easily configurable to any type of terminal interface

\$265.00 Assembled & Tested
 Cables Available (Optional)

MICROBYTE FLOPPY DISK CONTROLLER

- DMA to within 16 Mbyte of memory
- State-of-the-art NEC765 LSI Controller
- IEEE S-100 compatible
- DMA arbitration allows use of multiple boards within a system

\$329.00 Assembled & Tested

SD SYSTEMS/S-100 BOARDS

| | | |
|---------------|-----|----------|
| EXPANDORAM | 16K | \$240.00 |
| 2 MHz DYNAMIC | 32K | \$258.00 |
| RAM BOARD | 48K | \$276.00 |
| KITS | 64K | \$294.00 |
| EXPANDORAM II | 16K | \$250.00 |
| 4 MHz DYNAMIC | 32K | \$268.00 |
| RAM BOARD | 48K | \$286.00 |
| KITS | 64K | \$304.00 |

S8C-100 KIT 2.5 MHz/Z80 CPU with Serial I/O Ports & SBC 100 Monitor of your choice at no charge. \$299.00

S8C-200 KIT 4 MHz/Z80A CPU with Serial & Parallel I/O Ports & SBC 200 Monitor of your choice at no charge. \$325.00

VERSAFLOPPY I KIT Disk Controller for 5¼" or 8" Drives, Single or Double Sided/Single or Double Density, S-100 Compatible \$250.00

VERSAFLOPPY II KIT Disk Controller for 5¼" or 8" Drives, Single or Double Sided/Single or Double Density, S-100 Compatible \$300.00

PROM 100 KIT S-100/E PROM PROGRAMMER for 2708, 2716, 2732 & (TI) 2516 \$190.00

ALL BOARDS ARE AVAILABLE ASSEMBLED & TESTED. CALL FOR PRICES

Printers

| Manufacturer/Model # | Price |
|-----------------------|-----------|
| Anacom-150 | \$ 995.00 |
| Anadex-9601 | \$1295.00 |
| Okidata B2A W/Tractor | \$ 575.00 |
| Diablo-630RD | \$2225.00 |
| C. Itoh Starwriter 45 | \$1925.00 |
| Texas Instruments-810 | \$1650.00 |

The Epson MX-80

80 Column Dot Matrix Printer
SPECIFICATIONS
 Print methods: serial impact dot matrix
 Print rate: 80 CPS
 Print direction: bidirectional
 Number of pins in head: 9
 Matrix: 9 x 9

Line spacing: 1/8", 1/6", 7/32" μ program-
 mable throughput at 10 CPI — logical seeking
 function — 105 LPM, 20 character line; 73
 LPM, 43 char. line; 48 LPM, 80 char. line.

PRINTING CHARACTERISTICS
 Character set: full 90-character ASCII with
 descenders.

Graphics characters: 64 block characters

INTERFACES

Standard: Centronics-style 8-bit parallel

Optional: Apple, TRS-80, RS 232

NEW

MX80 FT/Friction Feed

MX-100/132 Column

CALL FOR PRICE & DELIVERY

Modems

| Manufacturer | Model # | Price |
|--------------|--------------|-----------|
| Novation | CAT | \$ 149.00 |
| Novation | d-CAT | \$ 160.00 |
| Novation | Auto-Cat | \$ 229.00 |
| Lexicon | Lex-11 | \$ 139.00 |
| Livemore | LIV-Star 20M | \$ 149.00 |
| UDS | UDS 103 | \$ 189.00 |
| UDS | UDS 202 | \$ 295.00 |

Monitors

| Manufacturer | Model # | Price |
|--------------|-------------|-----------|
| Amdek | 100/12" B&W | \$ 139.00 |
| Amdek | 100-80 | \$ 169.00 |

ASAP offers a 30-day buyer protection policy: full money-back guarantee if not totally satisfied.

Ordering Information: name, address, phone, ship by: UPS or Mail. Shipping charge: add \$2.50 up to 1 lb. for UPS blue; add \$1.50 for U.S. Mail add \$1.50 for U.S. Mail (U.S. only) (\$25.00 minimum order). Call for larger shipments.

Terms: We accept cash, check, money orders, Visa & Master Charge (U.S. Funds only). Tax: 6% Calif. Res., COD's and terms available on approval (school PO's accepted).



1198 E. Willow St., Signal Hill, CA 90806

| | | |
|---------|--------------------|-----------|
| Amdek | 100G/12" Grn. | \$ 169.00 |
| Amdek | Color-1 13" | \$ 375.00 |
| HPF | TVM-10/10" B&W | \$ 149.00 |
| Hitachi | VM 910/9" B&W | \$ 210.00 |
| Hitachi | VM 129/12" B&W | \$ 340.00 |
| Sanyo | DM 5012/12" B&W | \$ 270.00 |
| Sanyo | DM 5112ex/12" Grn. | \$ 290.00 |
| Sanyo | DM C8013/13" Color | \$ 475.00 |
| Zenith | ZVM-121/12" Grn. | \$ 139.00 |

Terminals

| Manufacturer | Model # | Price |
|--------------|-------------|-----------|
| Ampex | Dialogue 80 | \$ 899.00 |
| Soroc | IO120 | \$ 750.00 |
| Soroc | IO140 | \$1250.00 |
| Televideo | TVI 910 | \$ 650.00 |
| Televideo | TVI 912C | \$ 725.00 |
| Televideo | TVI 950C | \$ 950.00 |

Components 4116's (200 nS)

Apple, TRS-80, Heath 8/\$18.00
 16-49 \$2.15 each
 50-99 \$2.05 each
 100 up \$1.95 each

2114 L-2/200 nS

Low-Power 1K x 4 Static RAM
 1-16 \$2.95 each 50-99 \$2.75 each
 17-49 \$2.85 each 100 up \$2.65 each

COMPONENTS

74LS240 \$1.25 each 74LS373 \$1.25 each
 74LS241 \$1.10 each 74LS374 \$1.25 each
 74LS244 \$1.25 each 8T245 \$1.50 each

2708/450 nS

1K x 8 EPROM \$4.00 each
 or 8/\$30.00

2716/5 Volt

2K x 8 EPROM \$6.25 each

SUPPORT CHIPS

8080A-CPU \$ 2.50 8257AC5 \$15.00

Z80A-CPU \$ 8.95 REGULATORS

Z80A-CTC \$ 8.95 320T5 \$.80

Z80A-DART \$13.95 340T5 \$.70

Z80A-SIO \$22.00 320T12 \$ 80

8255AC5 \$ 6.95 340T12 \$.75

CONNECTORS

1-8 10-24 25 up

DB25P \$2.60 \$2.50 \$2.35

DB25S \$3.50 \$3.40 \$3.20

DB25C \$.95 \$.85 \$.75

100 Pin IMSAI

Gold/S-100 Solder-tail Connectors

\$2.40 each or 10/\$22.50 each

Capacitors

.1 @ 12 Volt

Ceramic 8¢ each or 100/\$7.00

DIP Sockets — Low Profile

Tin Solder-tail

| Description | 1-9 | 10-49 | 50-99 | 100 up |
|---------------|-------|-------|--------|--------|
| 14 pin tin st | \$ 15 | \$ 13 | \$.12 | \$.11 |
| 16 pin tin st | \$ 16 | \$ 14 | \$.13 | \$.12 |
| 18 pin tin st | \$ 19 | \$ 18 | \$.16 | \$.14 |
| 20 pin tin st | \$ 25 | \$ 23 | \$.21 | \$.20 |
| 24 pin tin st | \$ 26 | \$ 24 | \$.22 | \$.20 |
| 28 pin tin st | \$ 32 | \$ 30 | \$.29 | \$.27 |
| 40 pin tin st | \$ 42 | \$ 40 | \$.38 | \$.34 |

Conducted by Steve Ciarcia

Switching Interfaces

Dear Steve,

In the September 1980 *Popular Electronics*, there was an article regarding a digital delay line for audio purposes. Because the article employed the technique of digitizing the audio signal and passing it through memory to achieve the desired delay, I knew that it would probably be able to interface with a computer for further control. To achieve the desired delay, BCD thumbwheel switches were used to select the memory addresses. (These switches connect to two 74193 chips. I suspect they are used to decode the addresses.)

I would like my computer to be able to turn these switches on and off as programmed. What type of interface would be needed to connect this delay line (switch connection points) and my computer?

I have an S-100 machine (Processor Technology Sol-20 with 48 K bytes of memory) with both a serial and a parallel port. Can this connection be made with relays, opto-coupling, electronic gates, etc?

Rick Downs
Aurora CO

I don't usually like to take up room in BYTE with specific changes to schematics printed in other magazines, but this schematic is valuable in demonstrating how to attach a computer to any circuit that normally uses mechanical switches, such as the thumbwheels shown in the diagram.

The circuit originally published was an audio delay circuit that employed an 8-bit

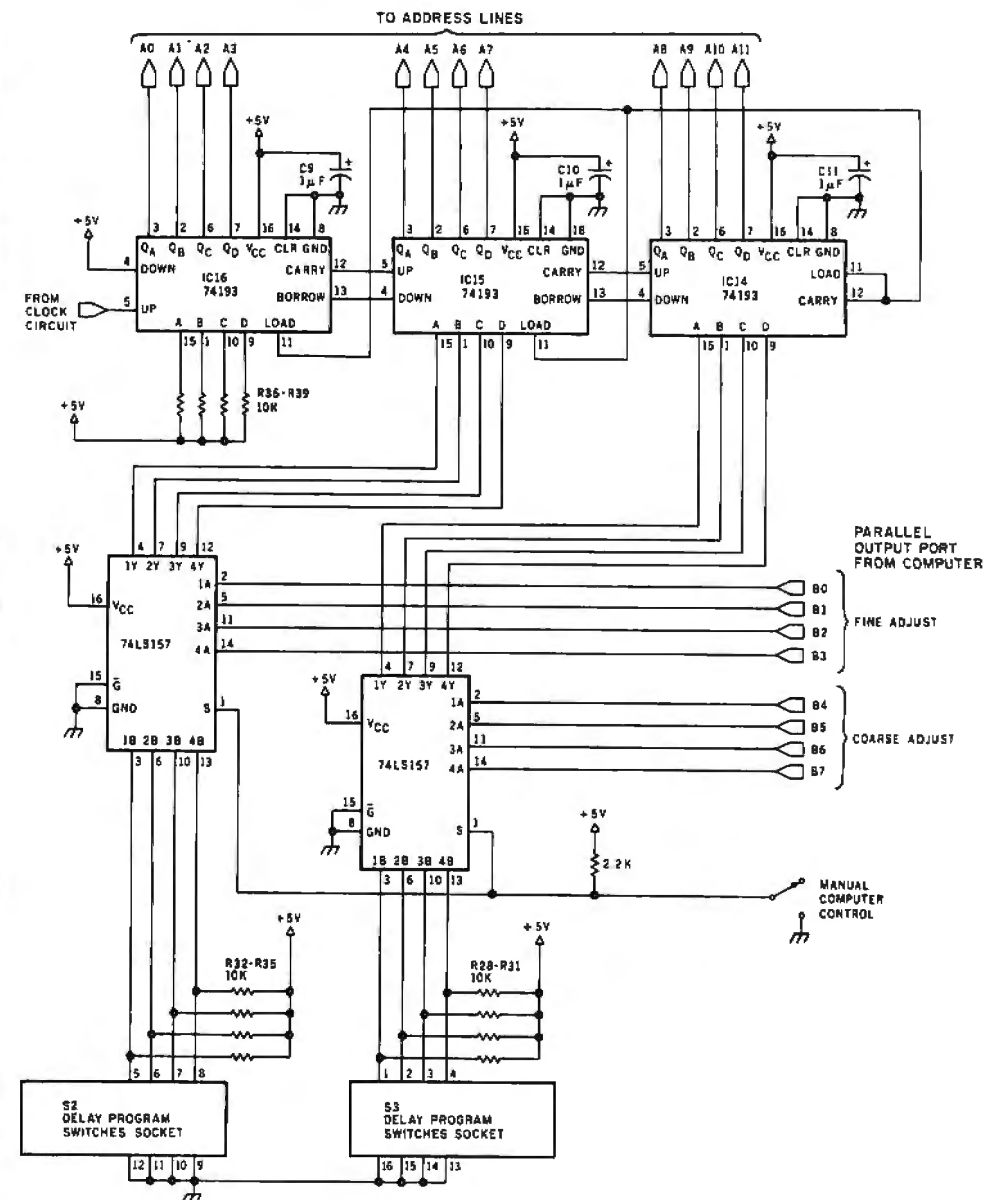


Figure 1: The audio delay circuit that originally appeared in *Popular Electronics* modified for control by an 8-bit parallel port.

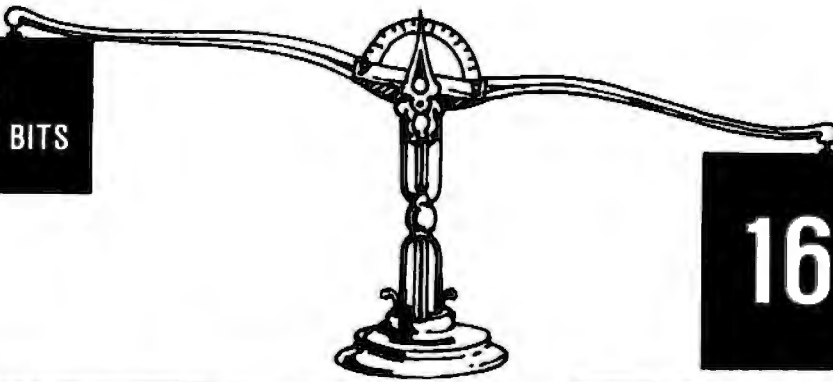
companding A/D (analog-to-digital) converter (an 8-bit converter which emulates the dynamic range of a converter with 11 bits plus sign). While I have not built this particular digital delay system, I'm familiar with the circuitry. I suspect that it might add some interesting effects to high fidelity.

The normal method of achieving the delay is to use three 74193 presetable binary counters. By presetting the addresses, it's possible to predesignate the total steps in the timing chain and, therefore, the length of the delay.

Figure 1 is a redrawn circuit demonstrating modifications that will allow you to

attach it to your Sol-20 (or any other computer with a parallel port). By adding two 74LS157 multiplexers, you can either preset the 74193s from your 8-bit parallel output port or use the thumbwheel switches. When the Manual/Computer selection switch is in the open position, the thumbwheel switches will

8 BITS



16 BITS

MICROCOMPUTERS

THE CHOICE JUST GOT EASIER!

PRICE \$4390

Gets you a Tec-86 Complete 16 Bit 8086 System, including 64K Bytes of Memory, Dual 8 Inch Double Density Floppy Disks, and more. . . (See complete Tec-86 specs below.)

PERFORMANCE

Faster Processing, Increased Address Space, up to One Megabyte of available memory, and the increased throughput of the the TEC-86 16 Bit System means that you can now do work on a microcomputer never before practical with the slower 8 Bit systems.

SOFTWARE

CP/M-86™ Brings the World of CP/M software up to the 16 bit systems. BASIC-86™, MS-FORTRAN™, MS-PASCAL™ are just a few of the Languages currently available.

EXPANSION

Memory Expansion up to ONE MEGABYTE. Disk Storage can be increased to over 30 Megabytes with our Winchester Disk Subsystem. Multi User Systems available soon!

QUALITY

Full ONE YEAR WARRANTY is standard on TECMAR components. This Warranty is possible due to our High Engineering Standards, and Thorough Product Testing.

DELIVERY

We have been delivering 16 Bit Boards and Systems for nearly two years. Most orders are shipped from stock or within 30 days.

**NEW \$695.00
APPLE A/D
w/Timer-Counter**

ANALOG TO DIGITAL Converter with Timer/Counter
12 Bit Accuracy, 16 Channels, 30 KHz Conversion, Three programmable Timer/Counters to:
Trigger Conversions
Count Conversions
Count External Signals
Count Bus Clock

Options: Programmable Gain; 14, 16 Bit Accuracy; 40, 100, or 125 KHz; Expansion to 256 Channels

**\$4390 TEC-86 \$4390
16 BIT 8086 MICROCOMPUTER SYSTEM**

FEATURES: 5 MHz 8086 CPU * 64K Bytes RAM * S100 IEEE-696 * Dual 8 Inch Double Density Floppy Disk Drives * Two RS 232 Serial Ports, 50 to 19200 Baud * Three Parallel Ports * ROM Boot for CP/M-86 * Heavy Duty Power Supply * Attractive Industrial Quality Desk Top Cabinet * Completely Assembled and Tested * **OPTIONS:** Up to One Megabyte of Memory, Double Sided Double Density Floppy Disks * Up to 31 Megabytes of Winchester Fixed Disk Storage. * CP/M-86 * BASIC-86 * MS-FORTRAN * MS-PASCAL * CBASIC/86™ * PASCAL/M86™

\$10990 TEC-86W \$10990

Same Great Features as our TEC-86 except that the TEC-86W has 256K of RAM, and our 31 Megabyte Winchester Disk Subsystem.

**NEW — 64K/256K
S100 MEMORY
\$595/\$1695**

8 and 16 Bit Transfer for 8 and 16 Bit Systems
MP/M and MP/M-86 Compatible, Up to 7 users on one 256K board. Parity Detection with Interrupt and LED Indication
Hardware Write Protect
Full DMA Capability
24/20/16 bit Address Decoding
Enable/Disable 8K/32K Segments
Bank Select in 8K/32K Segments
Meets IEEE-696 Specifications

See our catalog for many other fine S-100 and Apple Boards including: — Analog to Digital Converters (16-256 channels; 12, 14, or 16 bit accuracy; 30, 40, 100, or 125 KHz; programmable gain; timer/counters) — Digital to Analog Converters (12 bit accuracy, 3 microsecond conversion) — 8086 CPU Board — I/O Boards — 16K Static RAM — Real-time Video Digitizer and Display.

CP/M MP/M CP/M-86 and MP/M-86 are trademarks of Digital Research Inc. BASIC-86, MS FORTRAN and MS-PASCAL are trademarks of MicroSoft Inc. PASCAL/M86 is a trademark of Sorcim CBASIC/86 is a trademark of Compiler Systems Inc.

TECMAR
INC. →

DEALER INQUIRIES INVITED

23600 Mercantile Rd. • Cleveland, OH 44122

TECMAR, INC.
(216) 464-7410

Ask BYTE

have control. When it is closed, the delay parameters will come from the computer.

It's possible to use a similar computer-control technique in place of switches on virtually any electronic appliance. You must ensure that the electronic instrument being controlled has an isolated power supply. According to the original article, this delay line does. . . . Steve

Wrapping Noise

Dear Steve,

Would it be possible to wire-wrap the Disk-80 project you presented in the March 1981 BYTE (see "Build the Disk-80: Memory Expansion and Floppy-Disk Control," page 36), or would it be too susceptible to noise?

Richard Mozeleski
Thorndike ME

While it is quite possible that wire-wrapping would be neater than hand-wiring, the TRS-80 Model I is extremely susceptible to noise induced through its external bus connector. That's why I hesitate to suggest wire-wrapping or hand-wiring it.

If you really want to try it, by all means go ahead. However, there is a printed-circuit board available for the

Disk-80 from the Micromint Inc, 917 Midway, Woodmere NY 11598, (516) 374-6793, that should do the trick. You will probably find that the cost of wire-wrapping sockets alone will far exceed the price of the printed-circuit board (\$48). . . . Steve

A Catch-25

Dear Steve,

I recently purchased a Radio Shack TRS-80 Model III, and I'm interested in interfacing it to some of your projects. The problem is that the Model III's expansion connection has been changed from the Model I's 40 pins to 50. Upon examining the connector closely, I see that one side has all its pins (25) connected to ground. This, it seems, leaves only 25 pins to do the job of the 40.

Do you have any information about the arrangement of this connector? Radio Shack's manual simply says "for future expansion" and gives no other details. The store personnel know nothing about it, except that a technical manual is due.

John Uffenbeck
Salinas CA

There is quite a difference between the Model I and Model III's expansion connectors. Since the Model I's disk controller must be outside of the keyboard unit, all the processor's signals are available for use on the Expansion Interface. This means that the full 16-bit address bus, the bidirectional data bus, and all the control lines are available.

On the Model III, the disk controller and 48 K bytes of expansion memory are mounted inside the enclosure; it is unnecessary to bring out all of the address and control lines. Therefore, the Model III's expansion connector is simply for I/O

★ ★ ★ WRITE OR CALL FOR FREE CATALOG ★ ★ ★

We test all systems thoroughly before shipping. We integrate the CRT, printer, modem & other peripherals. Every system purchased from us is ready for plug-in operation when you receive it.

CALIFORNIA COMPUTER SYSTEMS 2210A: HIGH QUALITY, LOW PRICE
Z80A CPU with 1 serial port; 12 slot S-100 mainframe, disk controller, 64K dynamic RAM.
CP/M 2.2 \$1,750.

We enthusiastically recommend the IMS 4 serial I/O or 2 serial + 24bit parallel I/O to give the CCS 2210A additional power and versatility. The IMS I/O cards provide software selectable baud rates (19.2K option), external interrupt capability, programmable real time clock, many other features. \$295. Add our Max Box w/dual Qumes or Shugarts; select from the range of CRTs, printers and software we offer, for a complete system.

IMS 5000 and 8000 SYSTEMS

Outstanding long term reliability. Features Z80A CPU, S-100 bus; double density drives (single or double sided), DMA disk controller, 64K RAM, 2 serial, 1 parallel port. We stock IMS boards, multi-user systems available.

MULTI-USER SYSTEMS FEATURING TURBODOS & MUSYS

TURBODOS: Spectacular CP/M® compatible operating system. Z80 code, interrupt driven. Up to 6X faster than CP/M®; up to 35% increased disk capacity. We have configured many multi-user IMS systems using Turbodos and Musys single card computers allowing each user his own CPU, 64K RAM and I/O. Turbodos Single user \$250.
Multi-user \$750. Musys single card computer \$1,300.

MAX BOX Mfg by John D. Owens Assoc. 8" dual drive cabinet w/regulated power supply, fan, complete internal cabling. Will hold Qumes, Shugarts or Siemens, horizontally mounted. Excellent design & engineering. 17 1/2" x 5 1/2" x 22 \$325.
With 2 Shugart 801 R. \$1,275. With 2 Qume double sided drives \$1,680.

PER SCI—THE KING AND QUEEN OF DRIVES

Model 299B \$2,300. Model 277 \$1,245. Slim line cabinet \$325.

MICROANGELO GRAPHICS SUBSYSTEM from Scion \$2,295.
Screenware Pak II \$350. S-100 Graphics card \$985.
Color systems now available 5% off list price.

SYSTEMS GROUP (Measurement Systems & Control)

CP/M® and MP/M® Systems with dual floppies or one floppy + one 10MB Winchester 10% off list price.

TECMAR 16bit 8086 IEEE S-100 system w/8 MHz option. 5% off list price.
Z80 Video Digitization systems 5% off list price.

SD Systems: Boards, kits and systems 10% off list price.

GRAPHIC SYSTEMS: ++ Advertising ++ Architects ++ Designers ++ Complete package including powerful interactive graphics software plus MicroAngelo Graphics Subsystem w/22 MHz high resolution green phosphor screen; M9900 16 bit, IEEE S-100 computer w/dual 8" floppies, 64K RAM, Mutli user capability, Houston Instruments HIPAD Digitizer, Mauro Plotter \$10,200.
10 MB Hard disk subsystem option \$3,400.

WE EXPORT: Overseas Callers: TWX 710 588 2844
Phone 212 448-6298 or Cable: OWENSASSOC

JOHN D. OWENS Associates, Inc.

12 Schubert Street, Staten Island, New York 10305

212 448-6283 212 448-2913 212 448-6298

(input/output) rather than complete system expansion. Only eight address lines and eight data lines are brought out (plus some handshaking signals), and the I/O functions must be enabled under program control (the command is OUT 236,16).

On the whole, both computers work equally well with peripherals that only require output data. But reading input data with the Model III is much more involved. The data-bus direction is controlled by the external peripheral. To make the computer input data, a peripheral must recognize its own address, activate the I/O Input Strobe, and logically switch the data bus to receive input information. Unlike the Model I, which could allow a single I/O device to be used with absolutely no address decoding (presumably any I/O-related instructions had to be for that peripheral because nothing else used I/O instructions), address decoding is an absolute requirement on the Model III. . . . Steve

Pitch for Voice Recognition

Dear Steve,

I am 13 years old, and I own a TRS-80 Model I Level II. I'm interested in pitch analysis and voice recognition. I already have my computer knowing when a sound is present: I set my cassette recorder to record and run the program shown in listing 1.

I would like to know how to build a device that would change a tone or pitch to a numerical value that could then be read by my computer. I cannot figure out how to get my computer to recognize the difference between two pitches. Can you help me?

Eric Korenman
New York NY

To be able to do anything of real value in speech recognition or even to detect more than one tone, you will have to learn how to write your programs in machine-language, because they run much faster than BASIC.

The usual approach to voice recognition is to use a bank of bandpass filters and zero-crossing detectors. You would have three or four fre-

quency bands of interest, and you would use the computer to analyze how many times the voice is present in these bands. To do that, you would count the number of times this signal crosses zero.

Listing 1

```
10 I = INP(255)
20 IF I = 255 THEN PRINT "SOUND PRESENT" ELSE 10
30 OUT 255,0: GOTO 10
```

In the simplest designs, the output of the filters is normalized to a logic 1 or logic 0. Every time a signal is present, the filter output becomes a logic 1. When there's no signal, the output is logic 0. A

| ★ ★ ★ GREETINGS TO OUR FRIENDS IN CANADA ★ ★ ★ | |
|--|--|
| OLIVETTI DAISY WHEEL PRINTERS Letter quality print. Quiet performance; ideal for office environment. Model 211 (20CPS)\$1,660. Model 311 (34CPS)2,150. Model 811 (80CPS)3,795. Bidirectional tractor:\$150. | ★★★ SOFTWARE ★★★ ESQ-1: Legal Time & Billing System PROMOT: Professional Time & Billing System SCHEDULER: Docket/Calendar & Control System TAXEXEC: Individual Income Tax Return Preparation System JOBSHOP: Job Cost & Profitability Reporting System MAGIC QUILL: Bookkeeping and Accounting System Six easy-to-use, flexible packages from Micro Information Systems\$1,500. each |
| PMMI S-1000 Modem\$385. Compatible w/telex & Twx. 51 to 600 baud. On board pulse dialer. | THE FORMULA A new concept in report generation. Uses a unique full screen editor to visually describe format of reports. Multiple file access, algorithmic calculations & conditional printing. Includes CBS. From Dynamic Microprocessor Assoc. . . \$595. |
| HAZELTINE 1500\$ 885. 1510\$ 980. 1520\$1,210. 220 volt models, add \$100. | dBASE II Brings power of mainframe database software to a microcomputer. Manual and demo software:\$ 50. Complete package with money back guarantee:\$595. |
| IBM 3101 CRT Model 10\$1,295. Model 20\$1,495. | COMMUNICATIONS SOFTWARE Enables communications from a micro to a terminal or to another micro, mini or maxi computer. Source code: . . . \$250. |
| TELEVIDEO CRTs 910. \$595. 912. \$720. 920. \$775. 950. \$980. | MICROSOFT BASIC-80 (interpreter)\$270. BASIC COMPILER:\$305. COBOL-80\$560. FORTRAN-80\$380. X-MACRO-86:\$275. muLISP/muSIMP:\$190. |
| TEXAS INSTRUMENTS Printers TI 810 Basic\$1480. | MICROPRO WORDSTAR:\$320. MAIL MERGE:\$110. |
| EPSON MX80\$475. MX100\$725. RS 232 Interface\$ 70. | TWX (TELEX II) SOFTWARE . . \$350. Send/receive with a microcomputer connected directly to WU line. Eliminate paper tape. Messages can be formatted w/text editor. |
| TELETYPE Model 4320 AAK\$1,140. Model 43ASR, 8 level, 1" tape . . \$2,595. | TARBELL Double density controller\$435. Z80 CPU395. |
| 3M SCOTCH® Diskettes 5 box minimum, price per box 740, 8" single sided, single density . . \$27. 741, 8" single sided, double density . \$35. 743, 8" double sided, double density . \$43. 744-0, 5¼" soft sectored, single sided . \$27. 744-10, 5¼", hard sectored, single sided\$27. | <p align="center">Prices subject to change without notice</p> |
| TEI MAINFRAMES, S-100 We are proud to announce that we are now a TEI stocking distributor. 10% off list price. | |

JOHN D. OWENS
 Associates, Inc.
 SEE OUR AD ON FACING PAGE

machine-language program simply counts how many times this signal is present.

The human voice contains more than single tones, of course, and there will be frequent zero crossings. Therefore, any program you use must be able to count at a high rate as well as look at all the filters. Such speed can only be accomplished with a machine-language program.

There have been various articles on speech recognition in a number of magazines, and I'm sure you will be seeing more in the future. I have a few designs on the drawing board for a speech-recognition circuit. I will unveil one in a "Circuit Cellar" article as soon as it works well enough.

Keep up your interest, and perhaps we'll both be talking to our computers soon. . . . Steve

What's In a ROM?

Dear Steve,

I would like to do some game programming for an Atari video game, but I don't know what type of ROM (read-only memory) is used. Can you help me, or do you know where I can get the schematics for an Atari game?

Frank Weatherford
Gray TN

Atari games generally consist of either 4 K- or 8 K-byte ROM packs. One of the pre-release ROM packs that I received had 2732 EPROMs (erasable programmable read-only memories) in it. This would imply that you could substitute 2716 or 2732 EPROMs in most cases. I have known some people who have taken ROMs out of

inexpensive game packs and replaced them with their own software. . . . Steve

Home-Control Design

Dear Steve,

I would like to ask you for some help. A friend of mine is a quadriplegic who has great difficulty when he is home alone. Because he is unable to type, a voice-operated system is most desirable. If you could design a system, he could get someone to install it.

Jonathan Shaw
Tampa FL

You'll forgive me, of course, for not wishing to design a system specifically for you. That is a tremendous undertaking which could take months, even years, of

work. Instead, I recommend that you contact Artra Inc. This company makes an interface card called House-master. I have tried it, and it works reasonably well.

The company's address is Artra Inc, 4424 Vacation Ln, Arlington VA 22207, (703) 527-0455. The interface sells for under \$300 and incorporates tone generators, a BSR X-10 AC remote-control section, and a voice-response system. It attaches directly to Digital Group and Heath H-89 computers, but it can be adapted to work with many others. Using this system, it would be possible for your friend to turn on the lights with a voice command. . . . Steve

In "Ask BYTE," Steve Ciarcia answers questions on any area of microcomputing. The most representative questions received each month will be answered and published. Do you have a nagging problem? Send your inquiry to:
Ask BYTE
c/o Steve Ciarcia
POB 582
Glastonbury CT 06033
If you are a subscriber to The Source, send your questions by electronic mail or chat with Steve (TCE317) directly. Due to the high volume of inquiries, personal replies cannot be given. Be sure to include "Ask BYTE" in the address.

MULTIPROGRAMMER
KITS AVAILABLE
SYSTEM-10

PROGRAMS OVER 100 POPULAR PROMS & EPROMS



Standard Features:

- RS232 Serial Port - Standard Formats
- 4.75 K RAM (Expandable)
- Device Read, Compare & Verify
- Editing & Special Functions
- Less Than \$1,500 for Programmer, Module and Adapter
- Attractive OEM Prices

REP AREAS AVAILABLE

BYTEK
COMPUTER SYSTEMS CORPORATION
100 E. Linton Blvd
Delray Beach, Fla 33444
Phone (305) 272-2051

Gone with the wind.



We could lose our national symbol the majestic bald eagle. Once man drives eagles out of their nesting areas, they rarely return. Today there are only about 900 pairs of eagles known to be nesting in the lower 48 states.

We can save the eagle by establishing eagle preserves. You can help. Join the National Wildlife Federation, Department 102, 1412 16th Street, NW, Washington, DC 20036. Let's keep the eagle around another hundred years.



This man is looking for AN ELECTRONIC BREAKTHROUGH.

Join him in the incredible world of electronics with NRI's all-new training in the career of the future... **Electronic Design Technology.**

It's an electronic world we live in. And the designers of electronic circuits, controls, and systems are the people who are shaping it. Take your place in this exclusive company with this exciting new training from NRI.

You can learn Electronic Design Technology at home, in your spare time. Without quitting your job, tying up your evenings at night school, or wasting gas traveling to classes. Because NRI comes to you, makes you a class of one with a complete, effective, low-cost learning program designed exclusively for home study. You get it all... at your convenience.

Hands-On Training

NRI trains you for action. You get real-life experience that builds priceless confidence, gives you working knowledge of lab practices and techniques. It's all built into the NRI Design Lab,® a complete combination of equipment, hardware, training, and reference materials. You'll design your



own circuits from the very beginning, progressing from basic passive networks through key circuits like power supplies, amplifiers, oscillators, digital and logic circuits, phase-locked loops and more. You'll move on to linear and digital integrated circuits, the heart of modern electronic equipment. You'll prototype your designs and verify operation, learning professional test and measurement procedures as you progress.

Professional Equipment Included

All the way, you work with professional-quality instruments like the Beckman 6-function, 26-range LCD digital multimeter. It gives you fast, accurate measurements of voltages, currents, and resistances, even forward voltage drops across in-circuit diodes and transistors.

You'll breadboard your designs on the unique NRI Circuit Designer. It features built-in multiple power supplies, variable signal generator, logic switches and LED indicators. It handles almost any circuit you can design...linear and digital integrated circuits as well as discrete components such as transistors and diodes.

Analysis and design work is speeded with the Texas Instruments TI-30 scientific calculator. This engineer's instrument includes full trigonometric functions,

logarithms, square root, squares, powers, memory, and more. All this fine equipment is part of your training, yours to keep and use in your work.

NRI Fast-Track Training

This is the unique NRI lesson concept that simplifies and speeds learning. From the very basics to advanced, state-of-the-art electronics, each lesson is especially prepared for individualized instruction. Each subject is covered fully and thoroughly, but extraneous material is eliminated, language is clear and to the point, organization is logical and effective.

From Fundamentals of Electronic Circuits through Microprocessors, your lessons are designed with you in mind.

No Experience Necessary

You don't have to be an engineer (or even a college student) to succeed. High school graduates with some algebra handle it without any trouble. We start you at the beginning, let you advance just as quickly as you're ready. We even include the NRI Math Refresher Module to help you brush up on your math and teach you any new concepts you may need.

Free Catalog,

No Salesman Will Call

Our free, 100-page catalog gives you all the details, including lesson outlines, equipment specifications, and career opportunities. Send for it today and find the breakthrough for your future. If card has been removed, please write to us.



Training includes NRI Design Lab, Beckman digital multimeter, Texas Instruments scientific calculator that you use and keep.



NRI SCHOOLS

McGraw-Hill Continuing Education Center
3939 Wisconsin Avenue
Washington, DC 20016

We'll give you tomorrow.

Toward a Structured 6809 Assembly Language

Part 1: An Introduction to Structured Assembly Language

Gregory Walker
Motorola Inc M2880
3501 Ed Bluestein Blvd
Austin TX 78721

Structured programming is the rage these days, as reflected in the growing popularity of structured high-level languages like Pascal and C. Yet most of the programs written today use languages that are not well-structured, such as FORTRAN, BASIC, and assembly language.

Assembly language, widely used in industry, is becoming more and more available on personal computers. And although assembly language is the first and last bastion of convoluted programming, there is a way to add structured programming statements to an existing assembly language. In fact, structured control statements can be added to any existing language.

Part 1 will examine the meaning of structured programming and present a set of structured control statements for the MC6809 assembly language, as well as programming examples that use these structured statements. Part 2 will show how to add structured statements to the

MC6809 macroassembler or to any programming language.

Structured Control Statements

It has become popular, perhaps even faddish, to extol the virtues of structured programming. Yet its exact meaning remains rather ambiguous. Thus, the latest high-level language is sold much like the latest brand of shampoo: "It will leave your programs cleaner and more manageable."

When a language is said to be "structured," the usual meaning is that the language contains statements for the structured flow of control. Edsger Dijkstra is generally credited with originating structured programming with his letter in *Communications of the ACM* (see references) which stated that the GOTO statement seemed to be a major source of programming errors. Since that time, the terms *GOTOless programming* and *structured programming* have sometimes been used interchangeably. Yet the GOTO, in the form of *jump* or *branch* instructions, is still firmly fixed in machine instruction sets of new computers. Let's see what is so bad about the GOTO and, at the same time, try to discover why

it remains long-lived in spite of its reputation for abetting errors.

Computers are general-purpose machines because of their ability to perform a different sequence of calculations based on tests of the input data. The most primitive computer instruction that allows this ability is a *conditional branch* instruction, which transfers control to a different part of the computer program based on a run-time test. An example of this instruction is shown in listing 1. (See also figure 1.) This program changes the contents of A into its absolute value by using three simple steps:

- The contents of A are compared to zero;
- If the result shows A greater than or equal to zero, then a branch is taken around the next statement;
- Else the value of A is negated to make it positive.

The ability to perform a conditional branch allows more than selection between two different paths of program execution; by branching back to the beginning of a section of program, it is possible to create a *loop* (ie: a calculation that can be repeated many times). Listing 2

Acknowledgments

I would like to express my deep appreciation to Joel Boney, who originally suggested the form and implementation strategy for the 6809 structured macros, and to Greg Stevens, who helped debug the macros.

THE PROGRAMMING LANGUAGE OF THE FUTURE HAS JUST BECOME A REALITY

After years of extensive research and development comes LOGO, a powerful and dynamic new programming language for your microcomputer. The introduction of the LOGO language brings a challenging and exciting new direction to the world of microcomputer programming.

Now children and adults alike can become active participants in their own learning experience as *they* teach the computer how to think. Working in the LOGO environment can inspire *anyone* to express powerful ideas simply by allowing full control over an extremely rich and sophisticated microworld.

The programming language of the future is now available for your Apple II microcomputer. Contact your local dealer or write to us for more information concerning LOGO or LOGO Computer Systems Inc. Our product line includes software, hardware, written materials and training services.

logo
computer
systems inc.

150 Montarville Blvd.
Suite 200
Boucherville, Québec
Canada J4B 6N1
(514) 641-0966

368 Congress St.
Boston, Mass.
U.S.A. 02210

(617) 451-2646

Listing 1: Assembly-language statements for determining absolute values.

| | | | |
|-----|------|-----|---------------------------------|
| | CMPA | #0 | |
| | BGE | POS | If register A is less than zero |
| | NEGA | | negate it, |
| POS | EGU | * | Else continue |

Listing 2: Assembly-language statements for adding the value 5 to each element of an array.

| | | | | |
|------|-------|------|-----------|--------------------------|
| * | ARRAY | RMB | 10 | DECLARE ARRAY |
| * | START | LDB | #0 | INITIALIZE INDEX TO ZERO |
| | | LEAX | ARRAY,PCR | POINT TO START OF ARRAY |
| LOOP | | LDD | B,X | |
| | | ADDD | #5 | ADD 5 TO ONE ARRAY |
| | | STD | B,X | ELEMENT |
| | | INCB | | UNTIL INDEX IS >= 10 |
| | | CMPB | #10 | |
| | | BLT | LOOP | |

shows an example of a loop that adds the value 5 to every number stored in an array.

By the proper combination of loops and conditional branches, all the complexity of modern computer programming is possible—even the creation of programs that play a sophisticated game of chess or balance the bank accounts of thousands of customers.

Problems arise when this primitive form of branch instruction is used directly to write programs. In both examples the branch instructions contain a condition that is tested for and a labeled location in the program where execution is to resume if the condition is true. The biggest problem is the need for that label.

A well-chosen label can make the branch instruction somewhat self-

explanatory. In listing 1, the word POS indicates that the branch occurs in the case of a positive number. In listing 2, there is indication that the branch forms part of a loop. However, programs of even moderate complexity will have numerous conditional-path selections and several loops, often nested one inside the other. For every branch, the programmer must think up a label that somehow describes the operation of the program and yet is different from all other labels. Usually, the important operation to explain is the branch itself, so that a label that has meaning for the branch instruction means nothing at the remote location in the program where the label is actually defined.

The difficulty in thinking up really meaningful labels quickly overwhelms the programmer, who would rather concentrate on getting his program to work. Thus, many assembly-language programs are filled with labels such as LOOP, LOOP2, LOOP3, etc. While this labeling might be useful for counting the number of loops in a program, it does not go far toward explaining how the program operates. Use of meaningless labels is not due to laziness on the part of programmers; rather, it stems from a limitation inherent in assembly language—namely the limitation of requiring labels at points of the program that are not important to the operation of the program.

Although assembly language was used in these examples, the complaints are equally applicable to any language whose control mechanisms are those of a GOTO label. FORTRAN and BASIC programmers take note.

The real problem with the GOTO construct is that it is *too general* a programming form. It is incorporated into machine instruction sets for exactly that reason: it can efficiently implement many different higher-level constructs. From the point of view of the programmer, though, such generality hides the specific construct he had in mind.

Over the years, as new program-

CROMEMCO GSA SALES TO ALL GOVERNMENT USERS AND PURCHASERS

Systems Support, Inc. is a GSA qualified Cromemco vendor under ADP Schedule Contract No. GS-00C-02901. Purchase directly from us under our generous schedule terms and eliminate the slow bidding process. Our support commitment guarantees reliable product operation.

For more information call or write

SYSTEMS SUPPORT, INC.

1208 Shady Way
South Charleston, WV 25309

(304)766-7762

An Equal Opportunity Employer



\$ 2898.50

\$ 3398.10

THE HARD DISK YOU'VE BEEN WAITING FOR

A mini floppy size hard disk plus controller with more ...

- MORE STORAGE
- MORE SPEED
- MORE VALUE
- MORE SUPPORT

S100 users ... the XCOMP subsystem is now available with 5 and 10 megabytes of storage. Compare the price and features with any other 5¼-inch — or even 8-inch system, and you'll agree that XCOMP's value is unbeatable.

OUTPERFORMS OTHER HARD DISKS

Floppy disk and larger, more expensive hard disks are no match for this powerful little system. More data is available on every seek: 64K on 10MB and 32K on 5MB. Faster seek time too — an average of 70MS. It provides solid performance anywhere with only 20 watts of power. Data is protected in the sealed enclosure, and the landing zone for heads provides another margin of safety. The optional power board (\$130.00) plugs directly into the S100 bus and provides power for the drive.

FAST CONTROLLER

The XCOMP controller is the key to this system's high efficiency operation. Speed-up features include interleave without table lookup, block-deblock with controller buffer, and read look-ahead. OEMs worldwide have already proven the outstanding performance of the XCOMP controller.

MORE SOFTWARE

Included with the system is software for testing, formatting, I/O drivers for CP/M®, plus an automatic CP/M driver attach program. Support software and drivers for MP/M® and Oasis® are also available. The sophisticated formatting program assigns alternate sectors for any weak sectors detected during formatting, assuring the lowest possible error rate — at least ten times better than floppies.

WARRANTY

The system has a full one-year warranty on parts and workmanship.

ALSO AVAILABLE FROM XCOMP

- General Purpose controllers (8 bit interface), with easy interface to microprocessor-based systems.
- GP controller adapter that plugs directly into most Z80 computers.
- ST/R GP controller for the 5MB and 10MB drive above, with ST506 type interface.
- SG/R GP controller for SA1000 interface.
- SM/R GP controller for storage module drives.
- ST/S, SG/S, and SM/S, same as above, for the S100 bus.

Quantity discounts available. Distributor, Dealer, and OEM inquiries invited.

See your local Dealer, or call:

XCOMP, Inc.
7566 Trade Street
San Diego, CA 92121
Tel: (714) 271-8730
Telex: 182786



Oasis is a trademark of Phase One Systems. CP/M and MP/M are trademarks of Digital Research.

ming languages were designed and tested, the use of various higher-level (ie: more abstract control structures) was explored. As a result, there is now a widely accepted set of such structures available in "structured" programming languages. Three of the most popular structures will be

discussed individually by exploring their use in 6809 assembly language.

MC6809 Language Structures

In the system presented here, there are three different structuring forms available—one for conditional execution and two for creating loops.

They are:

```
IF...ELSE...ENDIF
WHILE...ENDWH
REPEAT...UNTIL
```

IF

Together, the IF, ELSE, and ENDIF macros allow selection between two different paths of execution through the program, depending on the result of a conditional test. The form of the IF structure is:

```
IF <register >,<relational
operator>,<address expres-
sion>
(block of statements to be ex-
ecuted if conditional is true )
ELSE
(block of statements to be ex-
ecuted if condition is false )
ENDIF
```

Notice that the three structured statements serve to bracket two blocks of assembly-language statements. Should the condition prove true, the block between the IF and ELSE statements is executed; otherwise, the block of statements between the ELSE and ENDIF statements will be executed.

Programmers who use an existing structured language may find the terminating ENDIF somewhat unusual. Pascal, for example, uses a *begin...end* pair to bracket a block of executed statements in all of its control structures. It happens that having a different terminating statement for each control structure makes these statements easier to implement and easier to read. Once you are familiar with this style, the extent of a particular statement is visible at a glance, unlike Pascal, where it is a tedious and error-prone process to match up each *end* with its corresponding *begin*.

Listing 3 shows an example of an IF structure and the equivalent assembly-language statements. The IF statement forms a conditional test by a signed comparison (CMP instruction) between the contents of an MC6809 register (either 8-bit or 16-bit) and the contents of an effective address. All user-programmable

| | | |
|----|-----|--|
| | DP | DIRECT PAGE REGISTER |
| | CCR | CONDITION CODE AND INTERRUPT FLAGS |
| A | B | A AND B ACCUMULATORS (COMBINED AS D ACCUMULATOR) |
| X | | INDEX REGISTER |
| Y | | INDEX REGISTER |
| U | | USER STACK POINTER AND INDEX REGISTER |
| S | | STACK POINTER |
| PC | | PROGRAM COUNTER |

Figure 1: Register model of the Motorola MC6809 microprocessor. In addition to its program counter (PC) and stack pointer (S), the MC6809 has four user-programmable 16-bit registers: X, Y, U, and D. (D is equivalent to a concatenation of registers A and B.)

Listing 3: Example of the IF construct in standard assembly language and structured assembly language. This code checks the validity of an argument in the D register for use by a square root routine.

Allowed registers: A, B, D, X, Y, U, S.

Allowed relational operators:

```
EQ -- equal to
NE -- not equal to
GE -- greater than or equal to
GT -- greater than
LE -- less than or equal to
LT -- less than
```

| Structured Code | Equivalent Code |
|-----------------|-----------------|
| IF D,GE,#0 | CMPD #0 |
| JSR SQRROOT | BLT LABEL1 |
| ELSE | JSR SQRROOT |
| JSR ARGERR | BRA LABEL2 |
| ENDIF | LABEL1 EQU * |
| | JSR ARGERR |
| | LABEL2 EQU * |

Listing 4: Example of the IFTST construct. The routine takes the absolute value of the memory byte at CAT offset from the X register.

Allowed registers: A,B,D,X,Y,U,S, or address expression

Allowed relational operators: EQ, NE, GE, or LT.

| Structured Code | Equivalent Code |
|------------------|-----------------|
| IFTST (CAT,X),NE | TST CAT,X |
| NEG CAT,X | BEG LABEL1 |
| ENDIF | NEG CAT,X |
| | LABEL1 EQU * |

we beat the price...

ATARI



800™ \$749

ATARI
Computers
for people.™

ATARI 810 DISC DRIVE



\$444

ATARI SOFTWARE

| | |
|--------------------------------------|----------|
| CX404 Word Processor | \$119.00 |
| CX405 PILOT | \$68.00 |
| CX413 MICROSOFT BASIC | \$68.00 |
| CX4101 Invitation to Programming 1 | \$17.00 |
| CX4102 Kingdom | \$13.00 |
| CX4103 Statistics | \$17.00 |
| CX4104 Mailing List | \$17.00 |
| CX4105 Blackjack | \$13.00 |
| CX4106 Invitation to Programming 2 | \$20.00 |
| CX4107 Biorhythm | \$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 Prog | \$59.00 |
| CX4117 Invitation to Programming 3 | \$20.00 |
| CX4118 Conversational French | \$45.00 |
| CX4119 Conversational German | \$45.00 |
| CX4120 Conversational Spanish | \$45.00 |
| CX4121 Energy Czar | \$13.00 |
| CX4125 Conversational Italian | \$45.00 |

| | |
|----------------------------------|---------|
| CX6001 U.S. History | \$23.00 |
| CX6002 U.S. Government | \$23.00 |
| CX6003 Supervisory Skills | \$23.00 |
| CX6004 World History | \$23.00 |
| CX6005 Basic Sociology | \$23.00 |
| CX6006 Counseling Proced | \$23.00 |
| CX6007 Principal of Act | \$23.00 |
| CX6008 Physics | \$23.00 |
| CX6009 Great Classics | \$23.00 |
| CX6010 Business Comm | \$23.00 |
| CX6011 Basic Psychology | \$23.00 |
| CX6012 Effective Writing | \$23.00 |
| CX6014 Principals of Econ | \$23.00 |
| CX6015 Spelling | \$23.00 |
| CX6016 Basic Electricity | \$23.00 |
| CX6017 Basic Algebra | \$23.00 |
| CX8106 Bond Analysis | \$20.00 |
| CX8107 Stock Analysis | \$20.00 |
| CX8108 Stock Charting | \$20.00 |
| CXL4001 Education System Master | \$21.00 |
| 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-Tow | \$24.00 |

| | |
|-------------------------|---------|
| CXL4011 Star Raiders | \$39.00 |
| CXL4012 Missile Command | \$32.00 |
| CXL4013 Asteroids | \$32.00 |

| | |
|---------------------------------|----------|
| CXL4015 TeleLink | \$20.00 |
| Compuhome | \$74.95 |
| Visicalc | \$149.00 |
| Letter Perfect (Word Processor) | \$119.00 |
| Source | \$89.00 |

Atari® Peripherals:

| | |
|---------------|----------|
| 400 16K | \$329.00 |
| 410 Recorder | \$59.00 |
| 822 Printer | \$359.00 |
| 825 Printer | \$ CALL |
| 830 Modem | \$159.00 |
| 850 Interface | \$ CALL |

Atari® Accessories

| | |
|------------------|----------|
| 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 |



CBM 8032 \$1099



commodore



VIC 20
\$259

| | |
|-------------------------|-----------|
| 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 | \$999.00 |
| CBM8050 Dual Disk Drive | \$1349.00 |

| | |
|--------------------|---------|
| Vic-TV Modul | \$19.00 |
| Vic Cassette | \$69.00 |
| Vic Disk Drive | \$ Call |
| Vic 6 Pack program | \$44.00 |

CBM Software

| | |
|------------------------|----------|
| WordPro3 Plus | \$199.00 |
| WordPro4 Plus | \$299.00 |
| 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 |
| World Craft 80 | \$289.00 |
| Word Check | \$180.00 |
| Create-A-Base | \$239.00 |
| Power | \$89.00 |
| Socket-2-Me | \$20.00 |
| Jinsam | Call |

Disks

| | |
|------------------------|---------|
| CX8100 Blank Disk (5) | \$22.00 |
| Sycorn Blank Disk (10) | \$29.00 |
| Maxell Blank Disk (10) | \$38.00 |
| Maxell Blank Disk (10) | \$46.00 |

Printers

| | |
|--|-------------------|
| Call for prices on the new NEC models. | |
| Epson MX-70 | } Call for Prices |
| Epson MX-80 | |
| Epson MX-80 FT | |
| Diablo 830 | |
| TEC 1500 Starwriter 25cps | \$1495.00 |
| TEC 1500 Starwriter 45cps | \$1795.00 |

No Risk, No Deposit On Phone Orders, COD or Credit Card, Shipped Same Day You Call *

* on all in stock units
IN PA, CALL (717) 327-9575

(800) 233-8950

COMPUTER MAIL ORDER
501 E. 3RD ST., WILLIAMSPORT, PA 17701

Circle 90 on inquiry card.

To Order:

Phone orders invited (800 number is for order desk only). Or send check or money order and receive free shipping. Pennsylvania residents add 6% sales tax. Add 3% for Visa or M.C. Equipment is subject to price change and availability without notice. Please call between 11 AM & 6 PM.

LEO ELECTRONICS, INC.

8921 S. Sepulveda, Ste #208
Los Angeles, Calif. 90045
(213) 641-3101
(800) 421-2418



**SPECIAL
NOVEMBER ONLY
FREE
1-555 Timer
WITH YOUR ORDER**

MEMORY

| | 1 - 10 | 11 - 49 |
|-----------------|--------|---------|
| 1702A | 4.75 | 4.50 |
| 2708 | 3.25 | 3.05 |
| TMS2716 | 6.50 | 6.35 |
| 2716 (8V) | 6.50 | 6.35 |
| 2716-1 (350NS) | 8.00 | 7.25 |
| 2532 | 17.00 | 16.50 |
| 2732 (450NS) | 17.00 | 16.50 |
| 2732A-4 (390NS) | 18.00 | 17.00 |
| 2732A-3 (300NS) | 23.00 | 21.50 |
| 2732A (250NS) | 25.00 | 23.00 |
| 2732A-2 (200NS) | 30.00 | 28.75 |
| 2758 | 8.00 | 7.35 |
| 2764 | 60.00 | 53.35 |
| 2114 (450NS) | 2.75 | 2.55 |
| 2114 (300NS) | 3.00 | 2.90 |
| 2114 (200NS) | 3.65 | 3.50 |
| TMS4027-30 | 1.80 | 1.65 |
| TMS4060-2 | 2.50 | 2.35 |
| 4116 (200NS) | 2.50 | 2.35 |
| 4116 (150NS) | 3.00 | 2.85 |
| 4164 (200NS) | 25.00 | 22.70 |
| 6810 | 4.25 | 4.00 |
| 6821 | 5.75 | 5.50 |
| 6850 | 5.25 | 5.00 |
| 8080A | 2.75 | 2.50 |
| 8085A | 8.75 | 8.50 |
| 8212 | 2.50 | 2.35 |
| 8216 | 2.50 | 2.35 |
| 8748 | 55.00 | 52.00 |
| Z80 CPU | 6.50 | 6.25 |
| Z80A CPU | 7.50 | 7.25 |

LS PRODUCT

| | | | | | | | |
|------|-----|-------|------|-------|------|-------|------|
| LS00 | .25 | LS74 | .30 | LS158 | .78 | LS244 | 1.20 |
| LS02 | .25 | LS85 | 1.15 | LS161 | .90 | LS245 | 1.20 |
| LS04 | .25 | LS86 | .40 | LS163 | .90 | LS258 | 1.75 |
| LS08 | .25 | LS93 | .80 | LS164 | .85 | LS273 | 1.35 |
| LS10 | .25 | LS95 | .70 | LS168 | .85 | LS283 | .95 |
| LS20 | .25 | LS109 | .45 | LS174 | 1.00 | LS307 | .65 |
| LS30 | .25 | LS123 | .75 | LS175 | 1.00 | LS368 | .65 |
| LS32 | .30 | LS138 | .75 | LS191 | 1.00 | LS373 | 1.40 |
| LS38 | .35 | LS139 | .75 | LS193 | .85 | LS374 | 1.40 |
| LS42 | .75 | LS161 | .75 | LS195 | .70 | LS377 | 1.40 |
| LS51 | .30 | LS163 | .75 | LS221 | 1.15 | LS390 | 1.50 |
| LS54 | .30 | LS185 | 1.00 | LS240 | 1.20 | LS393 | 1.50 |
| LS73 | .40 | LS167 | .75 | LS241 | 1.20 | LS670 | 1.85 |

S PRODUCT

| S PRODUCT | | I.C. SOCKETS | | Pin - P.C. | | Wire Wrap | |
|-----------|------|--------------|------|------------|-----|-----------|------|
| S188 | 3.25 | 7805 | .85 | | | | |
| S189 | 3.25 | 7812 | .85 | 8 | .12 | 9 | .52 |
| S207 | 3.25 | 7815 | .85 | 14 | .14 | 14 | .54 |
| S298 | 3.00 | 7905 | .85 | 16 | .16 | 16 | .58 |
| S387 | 3.25 | 7912 | .85 | 18 | .18 | 18 | .60 |
| S471 | 7.50 | 7915 | .85 | 20 | .20 | 20 | .62 |
| S742 | 9.00 | 308K | 1.45 | 22 | .28 | 22 | .68 |
| | | 323K | 2.50 | 24 | .28 | 24 | .68 |
| | | | | 28 | .37 | 28 | 1.40 |
| | | | | 40 | .45 | 40 | 1.90 |

WE CAN SUPPLY

TTL - CMOS
CONNECTORS
CAPACITORS
DIP SWITCHES
DIODES
TRANSISTORS

TERMS: Check, Money Order, Visa, MasterCard. Call for C.O.D. U.S. Funds only. P.O.'s accepted from qualified firms and institutions. California residents add 6% sales tax or resale card.

SHIPPING: Add \$2.00 ground or \$5.00 air for UPS.

CALL FOR VOLUME PRICING

PRICING SUBJECT TO CHANGE WITHOUT NOTICE.
ALL PARTS 100% GUARANTEED. MINIMUM ORDER \$15.00

registers, including the stack pointer, are allowed. Any signed relational operator is allowed, and the relational operator names will be familiar to all FORTRAN programmers.

The address expression may contain any of the MC6809 addressing modes. The ELSE and ENDIF statements serve as destinations for branches around the blocks of assembly-language statements. Notice that two labels are avoided for each IF structure, making the structured code much simpler to write and read than its equivalent assembly-language form. The ELSE macro and the block of code following it are optional.

Two other forms of the IF statement were created to take advantage of specific MC6809 instructions. Two different instructions are available on

the MC6809 to perform a test on a value: CMP (compare) and TST (test against zero). These are reflected in the IF and IFTST control macros. The IFTST macro generates a TST instruction instead of a CMP instruction, and so gives a signed comparison of a register (or a byte in memory) with zero. Listing 4 shows an example of the IFTST statement.

The ELSE and ENDIF macros are used with the IFTST in the same manner as with the IF macro. Optionally the programmer may add a third argument of #0 to improve readability, as in:

```
IFTST D,NE,#0
```

This third argument is ignored by the IFTST statement.

A third form of the IF statement is

Listing 5: Example of the IFCC construct.

Allowed relational operators: EQ, NE, GT, GE, LT, LE, and

```
CS -- carry flag is set
CC -- carry flag is clear
VS -- overflow flag is set
VC -- overflow flag is clear
```

Structured Code

Equivalent Code

```
ROLA                                ROLA
IFCC GT                             BLE LABEL1
      JSR DOIT                       JSR DOIT
ENDIF                                LABEL1 EQU *
```

Listing 6: Example of the WHILE construct.

Allowed registers: same as IF.

Allowed relational operators: same as IF.

Structured Code

Equivalent Code

```
WHILE A,GT,#0                       LABEL1 CMPA #0
      LSL B                           BLE LABEL2
      DEC A                             LSLB
      ENDWH                            DECA
                                      BRA LABEL1
                                      LABEL2 EQU *
```

Listing 7: Example of REPEAT loop construct. The routine will shift register B based on the value in register A.

Allowed registers: same as IF.

Allowed relational operators: same as IF.

Structured Code

Equivalent Code

```
REPEAT                               LABEL1 EQU *
  LSL B                               LSLB
  DEC A                               DECA
UNTIL A,LE,#0                        CMPA #0
                                      BGT LABEL1
```



**if He'd used select[™]
it wouldn't have taken seven days**

Learn SELECT[®] in just 90 minutes. A whole new word processing software concept that kicks the coded key habit and frees you from complicated instruction manuals. *SELECT* is fast. *SELECT* is logical. With single key mnemonics, you'll use dozens of commands that instantly access the rich capabilities of this system. There's nothing like it.

Simply hit "C" and you'll be ready to Create a document.

Key "I" and you'll be in the Insert mode.

Key "M" and Move entire blocks of text . . . and key dozens more.

That's all there is to it. You'll get all that word processing software promises . . . plus a few surprises.

SELECT with SUPERSPELL[®]. The only microcomputer software with an integrated spelling dictionary. To proof your text all you do, of course, is to key "S". *SUPERSPELL* with its 10,000 word dictionary scans your text at computer speed then displays and corrects all your typing errors. You can increase *SUPERSPELL*'s word power and customize the dictionary by adding new words, one at a time. Ask to see it today at your local dealer.

SELECT with SUPERSPELL . . . just a little byte more.[™]



INFORMATION SYSTEMS 919 Sir Francis Drake Boulevard • Kentfield, California 94904 • (415) 459-4003

SELECT will run on any machine that uses CP/M or MP/M** or its derivatives. It needs 40K of RAM and two disk drives. Special version now available for Radio Shack Mod II*** and Apple II****

* SELECT and SUPERSPELL are trademarks of Select Information Systems Inc.

** CP/M and MP/M are trademarks of Digital Research

*** A trademark of Tandy Corp.

**** A trademark of Apple Computer Inc.

Listing 8: Programming example written without the benefit of structured statements.

```

*
* CONVERT BINARY TO DECIMAL AND STORE 5 CHARACTERS
* (AFTER EXAMPLE ON PAGE 10-10 OF MC6800 MICROPRO-
* CESSOR PROGRAMMING MANUAL)
*
* ON ENTRY:
* (D) = 16-BIT UNSIGNED BINARY VALUE.
* (X) = POINTER TO LOCATIONS RECEIVING CHARACTERS.
*
* REGISTERS USED:
* (Y) = POINTER TO CONSTANTS FOR THE CONVERSION.
* ON EXIT: D AND X ARE BASHED, OTHER REGISTERS UNCHANGED.
*
* THIS SUBROUTINE IS RE-ENTRANT AND POSITION-INDEPENDENT.
*
* TEMPORARY STORAGE ON THE STACK IS: SAVLOB AND DIGCNT.
*
SAVLOB EQU 0 TEMP. STORE LOW ORDER BYTE
DIGCNT EQU 1 STORES COUNT TO CREATE DECIMAL DIGIT
*
CVBTD PSHS Y
LEAS -2,S RESERVE LOCAL STORAGE
LEAY K10K,PCR
CVDEC1 CLR DIGCNT,S
CVDEC2 SUBD ,Y
BCS CVDEC5 BRANCH ON OVERFLOW
INC DIGCNT,S INC CHAR BEING BUILT
BRA CVDEC2
*
CVDEC5 ADDD ,Y++ RESTORE PARTIAL RESULT
STA SAVLOB,S SAVE LOW ORDER BYTE
LDA DIGCNT,S
ADD #30 CHANGE DIGIT TO ASCII CHAR
STA ,X+ AND SAVE IN RESULT
LDA SAVLOB,S RESTORE LOW ORDER BYTE
CMPD #0
BNE CVDEC1
*
* CLEAN UP STACK AND RESTORE REGISTERS
*
LEAS 2,S
PULS Y,PC
*
* STORAGE FOR CONVERSION CONSTANTS
K10K FDB 10000
FDB 1000
FDB 100
FDB 10
FDB 1
END

```

the IFCC, which selects an execution path based on the existing condition code flags. Its only operand is a relational operator. An example of the IFCC appears in listing 5. At first glance this form of the IF may seem unnecessary, since it only generates a single branch instruction. It is useful, however, because it eliminates the need for the programmer to create a label.

WHILE

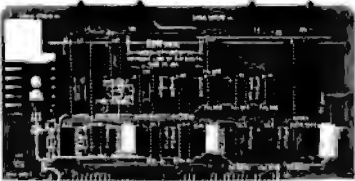
The WHILE...ENDWH statements bracket a block of assembly code to form a conditional-loop control structure. The WHILE specifies a signed comparison (CMP) of the same form used by the IF statement. The instructions between the WHILE and the ENDWH are executed as long as the condition is true. The condition is tested at the beginning of each traversal of the loop. An example of the WHILE statement appears in listing 6. The code performs a multiple left shift of B based on a count in A.

REPEAT

The REPEAT...UNTIL macros provide a conditional-looping construct in which the condition is tested *after* each traversal of the loop. Thus, the code in a REPEAT loop will always be executed at least once. The UNTIL macro specifies a signed comparison

THE 488+3

IEEE 488 TO S-100 INTERFACE



IEEE-488

- Handles all IEEE-488 1975/78 functions
- IEEE 696 (S-100) compatible
- MBASIC subroutines supplied; no BIOS mods required
- 3 parallel ports (8255A-5)
- Industrial quality; burned in and tested
- \$375

(Dealer inquiries invited)

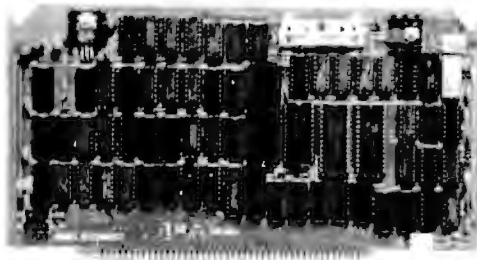
D&W DIGITAL

1524 REDWOOD DRIVE
LOS ALTOS, CA 94022 | 415| 966-1460

S-100

Q. What do these four boards have in common?

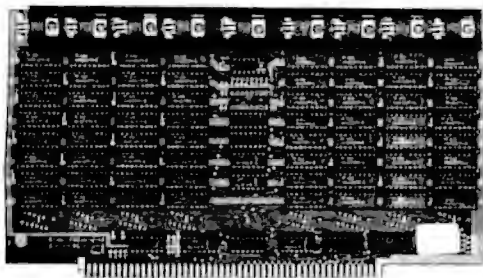
A. Tarbell quality.



CPU/IO BOARD

Zilog Z-80A will run at 2 or 4 Mhz □ Two RS-232 Serial I/O ports □ Allows dynamic mapping of logical to 1 Megabyte of physical memory in 4K blocks. □ Designed to implement multi-user operating systems, such as MP/M[®] from Digital Research. □ Includes crystal-controlled programmable timer (8253), which can be used for time-slicing multi-tasking operations. □ Programmable priority vectored interrupt hardware allows the programmer to selectively disable any combination of six interrupt lines.

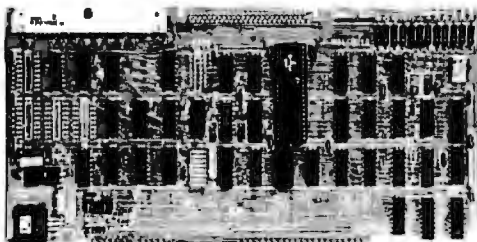
A & T \$450



32K RAM

S-100 Bus □ Works at 4 Mhz □ Static Memory for Ease of Maintenance □ 9 Regulators Provide Excellent Heat Distribution □ Extended Addressing (Bank Switching) □ Low Power Requirement □ Phantom Line □ Each 4K Block is Individually Addressable Within 32K □ Full 1-Year Warranty.

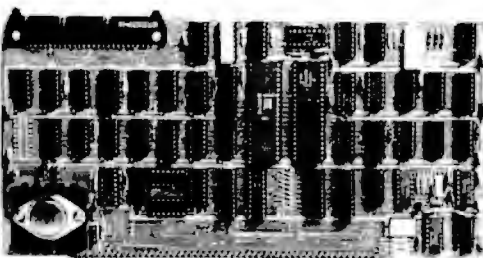
A & T \$725



SINGLE DENSITY FLOPPY DISK INTERFACE

Adaptable to wide variety of drives, including older models, 5-inch, 8-inch, Shugart, PerSci. □ Fully software-supported by Tarbell with a CP/M[®] disk operating system. □ Capable of running with several formats, including standard IBM (128 bytes per sector, 26 sectors, 76 tracks), 256, 512, or 1024 bytes per sector. □ Available in kit or fully assembled and tested form. □ Supports up to 4 8-inch drives, single or double sided. 5-inch drives can be used with modifications to the interface (included in manual).

KIT \$225 A & T \$325



DOUBLE DENSITY FLOPPY DISK INTERFACE

Fully software-supported by Tarbell with the CP/M disk operating system and the MP/M multi-user multi-tasking operating system. □ Under the Tarbell double-density CP/M, single and double density disks can be mixed automatically. □ True Direct Memory Access (DMA) in single or double density mode makes possible efficient multi-user and multi-tasking systems. □ Also capable of programmed-data-transfer method, which works in single density at 2 or 4 Mhz, and double density at 4 Mhz. □ Extended addressing capability provides 8 extra address bits on the lines defined by the IEEE S-100 standard. This allows direct transfers to and from anyplace in 16 Mbyte address range.

A & T \$495

You'll find these quality S-100 boards at your local Tarbell Dealer.

Tarbell
Electronics

**MANUFACTURER OF COMPUTERS,
COMPONENTS AND SOFTWARE.**

950 Dovlen Place • Suite B • Carson, CA 90746 • (213) 538-4251

CP/M and MP/M are trademarks of Digital Research

Circle 402 on Inquiry card.

Listing 9: The programming example of listing 8, written in structured assembly language.

```

*
* CONVERT BINARY TO DECIMAL AND STORE 5 CHARACTERS
*
* (WRITTEN WITH STRUCTURED MACROS)
*
SAVLDB EQU 0 TEMP STORE LOW ORDER BYTE
DIGCNT EQU 1 STORES COUNT TO CREATE DECIMAL DIGIT
*
CVBTD PSHS Y
LEAS -2, S
LEAY K10K, PCR
REPEAT
CLR DIGCNT, S
CVDEC2 SUBD , Y
IFCC CC UNLESS THERE WAS OVERFLOW
INC DIGCNT, S INCREASE DECIMAL DIGIT
BRA CVDEC2 LOOP TO TEST AGAIN
ENDIF
*
ADDD , Y++ RESTORE PARTIAL RESULT
STA SAVLOB, S STORE LOW ORDER BYTE
LDA DIGCNT, S
ADDA #50 CHANGE DIGIT TO ASCII CHAR
STA , X+ AND SAVE IN RESULT
LDA SAVLOB, S RESTORE LOW ORDER BYTE
UNTIL D, EQ, #0
*
CLEAN UP STACK AND RESTORE REGISTERS
LEAS 2, S
PULS Y, PC
*
STORAGE FOR CONVERSION CONSTANTS
K10K FDB 10000
FDB 1000
FDB 100
FDB 10
FDB 1
END
    
```

(CMP instruction) of the same form as that used by the IF macro. Listing 7 presents an example of a REPEAT loop. The code will left shift B based on a count in A.

Nesting of Structures

The structured statements may be used anywhere in an assembly-language program. The block of statements bracketed inside one control structure may itself contain other structured statements. This is known as the *nesting* of control structures. The only restriction to observe is that each control structure must be wholly contained within a single block of assembly statements; the statements of two control structures may not overlap. The number of control structures contained one within the other is called the *depth of nesting*.

Long Branch Option

The structured assembly statements all generate short relative branch instructions, which may reference locations a maximum of 127 bytes away from the location of the

COMPUTERS

ATARI 800™ COMPUTER SYSTEM

16k → \$750.00
48k → \$898.00

'APPLE II Plus'

48k → \$1199.00
64k → \$1399.00

All/ \$36.00/8k

ATARI Software

Miscellaneous
Asteroids
Star Raiders
Chess

16K RAM \$295.00
VIDEOTERM \$295.00
KEYBOARD ENHANCER \$120.00

APPLE CLOCK \$240.00
PROTO BOARD \$250.00

PRINTERS EPSON

NX-80 \$335.00
"ST" \$645.00
Interface & cable \$78.90

BEST SELLERS!

8088 → "Microprocessors" Osborne \$15.00/ea.

APPLA II USER'S GUIDE

PROTO CLIPS

14 PIN \$4.35
16 PIN \$4.50
24 PIN \$8.75
40 PIN \$14.75

CONCORD COMPUTER PRODUCTS

1971 SO. STATE COLLEGE ANAHEIM, CALIF. 92805
(714) 937-0637

★ send \$1.00 for "81" catalog ★

NO COD

\$10. MIN ORDER / CA RES ADD 6% FRT

910-83 \$2.00
50-99 4.00
100-240 6.00

250-499 \$9.00
500-999 \$10.00
1000-UP CALL

★ SPECIALS ★

ZENITH ZVM-121 Video Monitor: Green Phosphor 12 inch 15+MHz → \$139.00

3inch MUFFIN FAN w/cord → \$9.95
UPD 765: Floppy Disk Cont. → \$19.95

0155-RAM → \$11.50
0255-PPI → \$7.95
2111-Basic RAM → \$1.75
0085A-CPU → \$9.50
MC 6800-CPU → \$7.75
ER 2501-CARD → 4.95

"81" IC MASTER
\$59.95

8748-0 → \$31.00
3341PC → \$2.00
MM5060 → 35c

COMPONENTS

| | | | | | | | |
|---------|----|---------|-----|--------|---------|---------------|------|
| SN7400N | 18 | SN7482N | 30 | 74500 | 38 | 745138 | 75 |
| SN7400M | 21 | SN7483N | 45 | 74502 | 45 | 745140 | 100 |
| SN7401N | 22 | SN7484N | 46 | 74503 | 38 | 745156 | 75 |
| SN7401M | 25 | SN7485N | 48 | 74504 | 38 | 745174 | 1.35 |
| SN7410N | 18 | SN7486N | 39 | 74505 | 50 | 745175 | 1.35 |
| SN7410M | 20 | SN7487N | 39 | 74510 | 30 | 745182 | 75 |
| SN7412N | 22 | SN7488N | 39 | 74518 | 45 | 745198 | 4.25 |
| SN7413N | 22 | SN7489N | 50 | 74520 | 35 | 745201 | 8.75 |
| SN7414N | 28 | SN7490N | 39 | 74522 | 55 | 745210 | 2.75 |
| SN7415N | 27 | SN7491N | 60 | 74523 | 75 | 745224 | 2.95 |
| SN7416N | 27 | SN7492N | 39 | 74524 | 55 | 745231 | 2.75 |
| SN7417N | 29 | SN7493N | 75 | 74525 | 55 | 745238 | 5.75 |
| SN7420N | 17 | SN7494N | 11 | 74526 | 55 | 745247 | 2.95 |
| SN7422N | 20 | SN7495N | 75 | 74528 | 65 | 745251 | 9.50 |
| SN7430N | 17 | SN7496N | 65 | 74529 | 65 | 745273 | 9.50 |
| SN7432N | 28 | SN7497N | 65 | 74532 | 1.45 | 745274 | 9.50 |
| SN7436N | 24 | SN7498N | 65 | EPROMS | | | |
| SN7440N | 18 | SN7499N | 65 | 2708 | 3.25ea | 8 for 12.00ea | |
| SN7442N | 43 | SN7500N | 37 | 2710 | 3.50ea | 8 for 12.00ea | |
| SN7443N | 42 | SN7501N | 65 | 2732 | 12.00ea | 4 for 40.00ea | |
| SN7445N | 64 | SN7502N | 75 | 6116 | 3.00ea | 2 for 14.00ea | |
| SN7445M | 18 | SN7503N | 75 | 2748 | 2.25ea | 4 for 14.00ea | |
| SN7447N | 37 | SN7504N | 115 | 2752 | 2.25ea | 4 for 14.00ea | |
| SN7475N | 25 | SN7505N | 168 | 6118 | 3.00ea | 2 for 14.00ea | |

74LS00

| | | | |
|--------|----|---------|----|
| 74LS00 | 28 | 74LS158 | 68 |
| 74LS02 | 28 | 74LS161 | 83 |
| 74LS04 | 28 | 74LS162 | 83 |
| 74LS08 | 22 | 74LS163 | 83 |
| 74LS10 | 22 | 74LS164 | 85 |
| 74LS16 | 28 | 74LS165 | 85 |
| 74LS16 | 28 | 74LS166 | 85 |
| 74LS16 | 28 | 74LS167 | 85 |
| 74LS16 | 28 | 74LS168 | 85 |
| 74LS16 | 28 | 74LS169 | 85 |
| 74LS16 | 28 | 74LS170 | 85 |
| 74LS16 | 28 | 74LS171 | 85 |
| 74LS16 | 28 | 74LS172 | 85 |
| 74LS16 | 28 | 74LS173 | 85 |
| 74LS16 | 28 | 74LS174 | 85 |
| 74LS16 | 28 | 74LS175 | 85 |
| 74LS16 | 28 | 74LS176 | 85 |
| 74LS16 | 28 | 74LS177 | 85 |
| 74LS16 | 28 | 74LS178 | 85 |
| 74LS16 | 28 | 74LS179 | 85 |
| 74LS16 | 28 | 74LS180 | 85 |
| 74LS16 | 28 | 74LS181 | 85 |
| 74LS16 | 28 | 74LS182 | 85 |
| 74LS16 | 28 | 74LS183 | 85 |
| 74LS16 | 28 | 74LS184 | 85 |
| 74LS16 | 28 | 74LS185 | 85 |
| 74LS16 | 28 | 74LS186 | 85 |
| 74LS16 | 28 | 74LS187 | 85 |
| 74LS16 | 28 | 74LS188 | 85 |
| 74LS16 | 28 | 74LS189 | 85 |
| 74LS16 | 28 | 74LS190 | 85 |
| 74LS16 | 28 | 74LS191 | 85 |
| 74LS16 | 28 | 74LS192 | 85 |
| 74LS16 | 28 | 74LS193 | 85 |
| 74LS16 | 28 | 74LS194 | 85 |
| 74LS16 | 28 | 74LS195 | 85 |
| 74LS16 | 28 | 74LS196 | 85 |
| 74LS16 | 28 | 74LS197 | 85 |
| 74LS16 | 28 | 74LS198 | 85 |
| 74LS16 | 28 | 74LS199 | 85 |

MONITORS

"AMDEK Corp."

video 100 \$129.00
video 100 \$155.00

12 inch "AMDEK" GREEN PHOSPHOR VIDEO MONITOR \$365.00

TERMINALS

SOROC "KTM-3"

LOW COST TERMINAL WITH KEYBOARD AND VIDEO I/O \$689.00

2-80A CPU 7.95
2-80B CPU 10.50
2-80C CPU 12.00
2-80D CPU 13.50
2-80E CPU 15.00
2-80F CPU 16.50
2-80G CPU 18.00
2-80H CPU 19.50

Introducing The Grappler™:

The only interface that makes computer graphics easy as Apple™ pie.



ACTUAL APPLE II PRINTOUT USING GRAPPLER™ AND EPSON MX-100.

Orange Micro makes the only universal parallel interface card that simplifies high resolution graphics for Apple™ computers. No longer does the user need to load clumsy software routines to dump screen graphics — it's all done by The Grappler's™ exclusive E-PROM chip. There are versions to accommodate the Anadex, Epson MX-100, MX-80* and MX-70, IDS Paper Tigers, Centronics 739, and NEC Prowriter, and future graphics printers. The Grappler™ accepts 18 simple software commands accessible through the keyboard or user program, making it the most intelligent Apple Interface available.

Order The Grappler™ through Orange Micro direct, or authorized dealers.

*Requires Graffrax-80

ANAHEIM STORE

3150 E. La Palma, Suite I
Anaheim, CA 92806
(714) 630-3622

SHERMAN OAKS STORE

13604 Ventura Blvd.
Sherman Oaks, CA 91423
(213) 501-3486

FEATURES — User benefits

SELECT PAGE — Choice of Hi-Resolution Graphics page 1 or page 2.

INVERSE GRAPHICS — Provides reverse graphics of black-on-white or white-on-black.

DOUBLE SIZE PICTURE — Doubles the graphic screen representation vertically & horizontally.

90° ROTATION — Rotates the screen picture 90°

CENTER GRAPHICS — Accomplished through setting left margin thereby centering the graph.

CHART RECORDER MODE — Successive horizontal pictures are combined continuously simulating a chart recorder.

BLOCK GRAPHICS — For printers with block graphics (e.g. Epson MX-80, Okidata M80), the high order bit can be controlled.

BELL — For printers with a bell, bell characters are deleted during user program listings.

MARGINS — Set left and right margins.

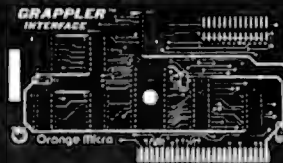
SKIP-OVER-PERF — Set page length; printer will automatically skip 6 lines between each page.

VARIABLE LINE LENGTH — For user program listings, sets line length and wraps around with breakpoint at nearest blank.

TEXT SCREEN DUMP — The text from a user report or page of program listing can be dumped directly from the screen.

WORKS WITH PASCAL & CPM

The Grappler™



Dealer inquiries welcome to:

Waybern Corporation
(714) 554-4520
CompuCable Corporation
(714) 635-7330



Orange Micro
inc.

3150 E. La Palma, Suite G, Anaheim, CA 92806

(800) 854-8275 TOLL FREE

(714) 630-3322 CA, AK, HI

© 1981 Orange Micro, Inc.

branch instruction. If this range is exceeded, a long branch is required; an error message will be printed telling which branch needs to be flagged as being "long." By appending the character "L" as an additional item in the conditional expression, the programmer may force the generation of a long relative branch.

Statements which cannot receive an L parameter will print an error message if an L is appended. The following statements may be flagged as "long":

- IF: branches over code between IF and ELSE or ENDIF
- ELSE: branches over code between ELSE and ENDIF
- WHILE: branches over code between WHILE and ENDWH
- UNTIL: branches over code between REPEAT and UNTIL

For example, the L flag may be used with the IF structure as follows:

```
IF U, NE, #BOTTOM,L
    (long-code segment)
```

```
ELSE
    (short code segment)
ENDIF
```

or:

```
IF S, GT, #STAKND
    (short code segment)
ELSE L
    (long code segment)
ENDIF
```

In order to really demonstrate the difference these structures make in reading a program, "before" and "after" examples are shown in listings 8 and 9, respectively. A program originally appearing in the *MC6800 Programming Manual* has been recoded for the 6809, using control structures. This example is a compelling argument for using structured macros for two reasons:

- It is not contrived: the original program is typical of assembly-language subroutines written by a "good" programmer.
- The translation of structures into

assembly code will produce *exactly the same instructions* as those in the original program.

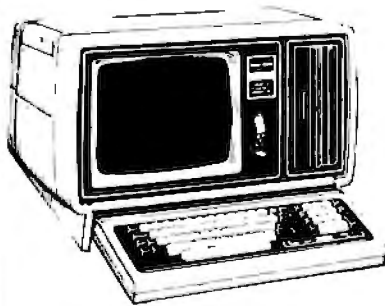
The second reason cannot be over-emphasized: the use of control structures does not produce inefficient programs. The inefficiency associated with the use of high-level languages arises from other sources.

The presence of the unstructured branch to CVDEC2 in listing 9 might at first seem to show that structured statements are inadequate for assembly-language programming. On the contrary, the branch could have been replaced by structured statements at the expense of generating a longer assembly-language program. In fact, the branch shows that the optimizing tricks sometimes required in assembly language can still be used with the structured statements. After extended use, it becomes obvious that the structured control statements are exactly what is needed in the vast majority of programming situations.

Part 2 of this article will discuss macros, the programming tools from which the structured statements are constructed. It will present the specific macros needed to create structured statements for the MC6809 and will explain how these macros operate. ■

References

1. Dijkstra, Edsger. "Go to Statement Considered Harmful." *Communications of the ACM*, Volume 11, Number 3, March 1968, pages 147-148.
2. Grogono, Peter. *Programming in Pascal*. Reading MA: Addison-Wesley, 1978.
3. Kernighan, Brian W and P J Plauger. *Software Tools*. Reading MA: Addison-Wesley, 1976.
4. Kernighan, Brian W and Dennis M Ritchie. *The C Programming Language*. Englewood Cliffs NJ: Prentice-Hall, 1978.
5. Motorola Inc. *MC6809 Preliminary Programming Manual*. 1979. (Manual may be obtained from the Motorola Literature Distribution Ctr, 616 W 24th, Tempe AZ 85282.)
6. Motorola Inc. *MC6809 Macro-Assembler Reference Manual*. 1978. (See above.)



96K CP/M® (For your TRS-80* Model II) Multiple Job Executive

Add a whole new dimension to your TRS-80 Model II. Let it work while you work!!

ATON's unique JobStream™ CP/M 2.2, along with additional RAM memory; allows you to simultaneously compile, assemble, or link in one 64K background partition (62K TPA) while you edit files, and spool to the printer, and communicate with another computer in up to four 32K foreground partitions (28K TPA).

As you expand memory beyond 64K, you also enter the amazing world of TrackMode BIOS™ which not only multiplies diskette speed up to five times, but also automatically performs read after write checks for the ultimate in data reliability.

- Gain hard disk performance for a fraction of the cost—and no backup problems!!!
- Works in 32K, add RAM memory to 256K using standard Radio Shack memory boards.
- Supports two sided expansion disk drives (1.2 megabytes per diskette).

| | |
|---|-------|
| JobStream CP/M 2.2 (with Z-80** Debugger) | \$235 |
| Omni Writer™ Video Text Editor | \$130 |
| Z-80 Debugger Source Code | \$ 50 |
| Package of above (a \$415 value) | \$295 |

"Software with Service"



Aton
International, Inc.

Prepaid, Visa, MasterCard or COD.
Shipping and handling extra.
California residents add 6% sales tax.

CP/M® Digital Research, Inc.
*Tandy Corp. **Zilog Corp.
JobStream, TrackMode BIOS™. ATON Intl.
Omni Writer™ Omnigraphics

260 Brooklyn Avenue, San Jose, CA 95128
(408) 286-4078

The Computer Headquarters



Now! Write a letter and print immediately!

- Apple II plus 48K
 - Apple Disc Drive II w/interface DOS 3.3
 - 12" Green high resolution monitor
 - OKIDATA 80 Gr. printer
 - TYMAC cable and interface
 - Apple writer
- Now Only \$2449⁰⁰

- BUSINESSMAN'S SPECIAL**
- Apple II plus 48K
 - Apple Disc Drive II and interface DOS 3.3
 - 12" Green High Resolution Monitor
 - Visicalc 3.3 Software
- Now Only \$2039⁰⁰

APPLE II ACCESSORIES

| | |
|--|----------|
| DC Hayes Micro Model II | \$299 |
| Videx 80 Column Video Terminal | \$289 |
| Videx Keyboard Enhancer | \$109 |
| SUP'R' Mod | \$27 |
| Microsoft Z80 | \$289 |
| Apple Silent Type Printer | \$339 |
| High Speed Serial Interface | \$158 |
| Micro Soft 16K Ramcard | \$159 |
| Language System w/Apple Pascal (contains Integer Basic & 16K Expansion Card) | \$405 |
| Integer BASIC Firmware Card | \$159 |
| ABT Keypad (Data Entry Pad for Apple) | \$109.95 |
| CALIFORNIA COMPUTER SYSTEMS | |
| Programmable Timer | \$99.95 |
| Analog-to-Digital Converter | \$104.95 |
| Arithmetic Processor | \$309.95 |

SOFTWARE

| | |
|--|----------|
| HOWARD SOFTWARE | |
| Tax Preparer | \$80.00 |
| Real Estate Analyzer | \$129.95 |
| Creative Financing | \$130.00 |
| LJK SOFTWARE | |
| Letter Perfect | \$129.95 |
| APPLE II SOFTWARE | |
| Dow Jones Portfolio Evaluator | \$47.00 |
| The Controller 1.1 (General Bus. System) | \$520.00 |
| Apple Post | \$47.00 |
| Dos Tool kit | \$67.50 |
| Dow Jones News and Quotes Reporter | \$85.50 |
| Apple FORTRAN | \$175.00 |
| Apple Plot | \$64.00 |
| DENVER SOFTWARE | |
| Financial Partner | \$149.95 |

SOFTWARE

| | |
|---------------------------|---------------------|
| ARTSCI | |
| Magic Window | \$85 |
| Magic Mailer | \$60 |
| BRODEBOND | |
| Payroll | \$309 ⁹⁹ |
| HAYDEN | |
| Apple Compiler | \$159 |
| HIGH TECH | |
| Disc-O Check | \$85 |
| DB Management | \$85 |
| Client Billing | \$250 |
| Info Master (DOS 3.3) | \$130 |
| MICROSOFT | |
| Fortran-80 | \$154.50 |
| MICRO PRO | |
| Word Star 3.0 | \$289 |
| Spell Star | \$200 |
| Data Star | \$214 |
| PEACH TREE //APPLE | |
| General Ledger | \$274 |
| Accounts Payable | \$274 |
| Accounts Receivable | \$274 |
| Magic Wand | \$350 |
| BPI | |
| General Ledger | \$315 |
| Accounts Receivable | \$315 |
| Inventory Control | \$315 |
| The Source | \$89 |
| PERSONAL SOFTWARE | |
| Visicalc 3.3 | \$159 ⁹⁹ |
| Visiplot | \$149 ⁹⁹ |
| Visidex | \$159 ⁹⁹ |
| STONEWARE | |
| DB Master | \$192 |

BEST SELLERS ON DISK Games

| | |
|-------------------------|---------|
| Temple of Apshai | \$37.50 |
| Rescue at Rigel | \$37.50 |
| Crush Crumble and Chomp | \$28.95 |
| Cosmo Mission | \$23.95 |
| Major League Baseball | \$29.00 |
| Apple Panic | \$28.95 |
| Allen Rain | \$23.95 |
| Rastler Blaster | \$28.95 |
| Saragon II | \$32.95 |
| Zork | \$37.50 |
| Robot War | \$37.50 |
| Space Eggs | \$28.95 |
| Gorgon | \$37.95 |
| TG Joystick | \$49.95 |

MOUNTAIN COMPUTER

| | |
|------------------------|---------------------|
| Expansion Chassis | \$609 ⁹⁹ |
| CPS Multi Function | \$189 ⁹⁹ |
| Music System | \$475 ⁰⁰ |
| 100,000 Day Clock | \$325 ⁰⁰ |
| The Clock | \$239 ⁹⁹ |
| A/D + D/A W/O Cable | \$309 ⁹⁹ |
| Supertalker SD200 | \$255 ⁰⁰ |
| Introl/x-10 Controller | \$170 ⁰⁰ |
| Romwriter | \$154 ⁹⁹ |

5 1/4" DISKETTES FOR APPLE & OTHER MICROS

| | |
|---------|--------------------------|
| MEMOREX | Box of 10 \$27.00 |
| MAXELL | Priced too low to print! |
| BASAF | Box of 10 \$35.00 |

Call for Diskette Quant. Price

ATARI 800 with 16K



ATARI 410 PROGRAMMABLE RECORDER \$64⁹⁵



Orig. 950.00
Now \$369⁹⁵

| | |
|---------------------------|----------|
| Disc Drive Control | \$224.95 |
| Disc Memory Drive | \$349.95 |
| Solid State Printer | \$295.00 |
| RF Modulator | \$39.95 |
| TI 59 Program | \$179.95 |
| Less Manuf. Rebate | \$20.00 |
| YOUR COST | \$159.95 |
| TI 58C Program | \$89.95 |
| PC 100C Printer for 58/59 | \$157.50 |

hp HEWLETT PACKARD



The HP-85 is a powerful BASIC language computer, w/keyboard, CRT display, printer & tape drive, 16K RAM, expandable to 32K
Reg. 3250.00 Now \$2595
HP-83 Reg. 2250 \$1750

NEW!

| | |
|---|---------|
| HP-125 CPU Terminal Call or Write for Low Price | |
| 7225B Graphics Plotter OPT. 002 Reg. 2,200 | \$1742 |
| 82901M 5 1/4" Dual Master Flex. Disc Drive Reg. 2,500 | \$1995 |
| 2631B Impact Printer OPT. 885 Reg. 3,950 | \$3,095 |

PRINTERS

| | |
|--|--------------------------|
| QUUME SPRINT | |
| 545 RO 45 CPS | \$2500 |
| 5/55 RO | \$2550 |
| 5/55 KSR | \$2850 |
| 9/35 RO 35 CPS RS-232 | \$1,839 |
| 9/35 KSR 35 CPS RS-232 with Keyboard | \$1985 |
| 9/45 LTD 45 CPS RS-232 Limited Front Control Panel | \$2179 |
| 9/45 FULL 45 CPS RS-232 Full Front Control Panel | \$2320 |
| 9/55 LTD 55 CPS RS-232 Limited Front Control | \$2295 |
| 9/55 FULL 55 CPS RS-232 Full Front Control Panel | \$2440 |
| NEC Spinwriter 3500 Series | CALL |
| CENTRONICS | CALL |
| ANADEX | |
| 9500 132 Column, 150 C P S | \$1349 |
| 9501 Graphics Model DP-9500 | \$1349 |
| DIABLO | |
| 630 (RS-232) Daisywheel Prntr | \$2399 |
| 1650 RO | \$2999 1640 RO \$2579 |
| 1650 KSR | \$3599 1640 KSR \$3550 |
| PAPER TIGER | |
| 445G Graph | \$790 440G Graph \$975 |
| 460G Graph | \$1299 560G Graph \$1595 |
| 440 '899 | 445 '899 460 \$1275 |

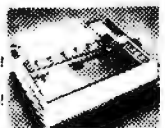
OKIDATA



| | |
|--|----------|
| Microline-80 | \$399.00 |
| 82A PRINTER: Graphics, 120 cps Bidirectional, Friction and Pin Feed, 80/132 Columns | \$399.95 |
| Tractor Feed Optional | \$55.00 |
| 83A PRINTER: Graphics, 120 cps Bidirectional, Friction and Tractor, 138 Columns, Takes 15" Paper | \$415.00 |

EPSON

MX-80 Printer
Call or write for low price!
MX-80 FT Printer
Call or write for low price!
MX-100FT Printer
Call or write for low price!



Sanyo Monitors

| | |
|-----------------------|----------|
| VM-4509 9" B&W | \$169.95 |
| DM-5112CX 12" Green | \$269.95 |
| DMC-6013 13" Color | \$449.95 |
| Electro Home 9" Green | \$204.95 |



CORPORATE ACCOUNTS WELCOME

47st. photo

Cameras • Electronics • Audio • Video • Computers • Darkroom • Accessories

67 West 47th Street, New York, N.Y. 10036
115 West 45th Street, New York, N.Y. 10036
MAIL ORDER ADDRESS: 36 E. 19th St. New York, N.Y. 10003

Items on sale for limited time only, and are subject to limited availability. Not responsible for typographical errors. This ad supersedes all other ads prior to Nov. '81. All orders subject to verification and acceptance. Minimum shipping and handling \$4.95.



(212) 260-4410

TOLL FREE OUT OF STATE

800-221-7774
800-221-5858
800-223-5661

PROLOG

A Step Toward the Ultimate Computer Language

Ron Ferguson
137 University Ave W, Apt 907
Waterloo, Ontario N2L 3E6 Canada

What will the ultimate computer language be? What language will we be using once assembler language, BASIC, and Pascal have become museum pieces? Surprisingly, this question is easy to answer: there will be several ultimate computer languages. We even know what their names will be. They will be called English, Spanish, French, Russian, Chinese, etc. After all, the easiest language you could use to program a computer is the one you use to communicate with other people.

Unfortunately, programming a computer in English is still in the future. For a computer to understand English, it must be able to cope with the ambiguities inherent in any natural language. It must be able to deduce facts you don't bother specifying because they are "obvious." (Nothing is obvious to a computer unless it has been programmed to realize it is obvious. Everything must be stated explicitly and precisely.)

Today, though, we do have a language, called PROLOG, that simplifies the task of informing a computer about obvious (and not so obvious) facts. The name PROLOG is short for "PROgramming in LOGic"; however, you do not have to be familiar with formal logic theory to use PROLOG. In fact, the language is so simple a child can learn it. Yet its very simplicity makes it far more powerful than any other language currently available for use on microcomputers.

PROLOG is a programming language ideally suited to the manipulation of knowledge. A PROLOG program consists of facts about a certain subject. You can ask PROLOG questions and it will attempt to answer them

using the facts it has been told.

Facts are expressed in PROLOG in a concise manner. The fact that John is the father of Tom is expressed by the one-line PROLOG program:

```
father(john,tom).
```

The relationship, *father*, appears first, followed by the arguments (in parentheses) to which the relation applies. This data structure is called a *term*. The only potential area of confusion is the order in which the arguments are written. As a rule, the subject of the relation is the first argument and the object is the second. With this program, you can now ask PROLOG whether John is the father of Tom:

```
father(john,tom)?
```

to which PROLOG will respond:

```
yes
```

Note that the only difference between *telling* PROLOG that John is Tom's father and *asking* PROLOG whether John is Tom's father is the punctuation mark at the end of the statement. An assertion always ends with a period; a question always ends with a question mark. If you ask whether John is the father of Bill:

```
father(john,bill)?
```

MULTI-USER OASIS HAS THE FEATURES PROS DEMAND. READ WHY.

(THEN COMPARE.)

Computer experts (the pros) usually have big computer experience. That's why when they shop system software for Z80 micros, they look for the big system features they're used to. And that's why they like Multi-User OASIS. You will too.

DATA INTEGRITY: FILE & AUTOMATIC RECORD LOCKING

The biggest challenge for any multi-user system is co-ordinating requests from several users to change the same record at the same time.

Without proper co-ordination, the confusion and problems of inaccurate or even destroyed data can be staggering.

Our File and Automatic Record Locking features solve these problems.

For example: normally all users can view a particular record at the same time. But, if that record is being updated by one user, automatic record locking will deny all other users access to the record until the up-date is completed. So records are always accurate, up-to-date and integrity is assured.

Pros demand file & automatic record locking. OASIS has it.

SYSTEM SECURITY: LOGON, PASSWORD & USER ACCOUNTING

Controlling who gets on your system and what they do once they're on it is the essence of system security.

Without this control, unauthorized users could access your programs and data and do what they like. A frightening prospect isn't it?

And multi-users can multiply the problem.

But with the Logon, Password and Privilege Level features of Multi-User OASIS, a system manager can specify for each user which programs and files may be accessed—and for what purpose.

Security is further enhanced by User Accounting—a feature that lets you keep a history of which user has been logged on, when and for how long.

Pros insist on these security features. OASIS has them.

EFFICIENCY: RE-ENTRANT BASIC

A multi-user system is often not even practical on computers limited to 64K memory.

OASIS Re-entrant BASIC makes it practical.

How? Because all users use a single run-time BASIC module, to execute their compiled programs, less

memory is needed. Even if you have more than 64K, your pay-off is cost saving and more efficient use of all the memory you have available—because it services more users.

Sound like a pro feature? It is. And OASIS has it.

AND LOTS MORE...

Multi-User OASIS supports as many as 16 terminals and can run in as little as 56K memory. Or, with bank switching, as much as 784K.

Multi-Tasking lets each user run more than one job at the same time.

And there's our BASIC—a compiler, interpreter and debugger all in one. An OASIS exclusive.

Still more: Editor; Hard & Floppy Disk Support; Keyed (ISAM), Direct & Sequential Files; Mail-Box; Scheduler; Spooler; all from OASIS.

Our documentation is recognized as some of the best, most extensive, in the industry. And, of course, there's plenty of application software.

Put it all together and it's easy to see why the real pros like OASIS. Join them. Send your order today.

OASIS IS AVAILABLE FOR SYSTEMS. Altos, CompuCorp, Cromemco, Delta Products, Digital Group, Digital Microsystems, Dynabyte, Godbout, IBC, Index, Intersystems, North Star, Ornyx, SD Systems, TRS 80 Mod II, Vector Graphic, Vozimex

CONTROLLERS Bell Controls, Cameo, Corvus, Konan, Micromation, Micropolis, Tarbell, Teletek, Thinkertoys, X Comp

Write for complete free Application Software Directory

PLEASE SEND ME:

| Product | Price with Manual | Manual Only |
|---|-------------------|------------------|
| OPERATING SYSTEM (Includes: LREC Language; File Management; User Accounting; Device Drivers; Print Spooler; General Text Editor, etc.) SINGLE-USER MULTI-USER | \$150 350 | \$17.50 17.50 |
| BASIC COMPILER/INTERPRETER/DEBUGGER | 100 | 15.00 |
| RE-ENTRANT BASIC COMPILER/INTERPRETER/DEBUGGER | 150 | 15.00 |
| DEVELOPMENT PACKAGE (Macro Assembler; Linkage Editor; Debugger) | 150 | 25.00 |
| TEXT EDITOR & SCRIPT PROCESSOR | 150 | 15.00 |
| DIAGNOSTIC & CONVERSION UTILITIES (Memory Test; Assembly Language; Converters; File Recovery; Disk Test; File Copy from other OS, etc.) | 100 | 15.00 |
| COMMUNICATIONS PACKAGE (Terminal Emulator; File Send & Receive) | 100 | 15.00 |
| PACKAGE PRICE (All of Above) SINGLE-USER MULTI-USER | 500 850 | 50.00 60.00 |
| FILE SORT | 100 | 15.00 |
| COBOL-ANSI '74 | 750 | 35.00 |

Order OASIS from
Phase One Systems, Inc.
7700 Edgewater Drive, Suite 830
Oakland, CA 94621

Telephone (415) 562-8085
TWX 910-366-7139

NAME _____
STREET (NO BOX #) _____
CITY _____
STATE _____ ZIP _____

AMOUNT \$ _____
(Attach system description; add \$3 for shipping; California residents add sales tax)
 Check enclosed VISA
 UPS C.O.D. Mastercharge
Card Number _____
Expiration Date _____
Signature _____

MAKES MICROS RUN LIKE MINIS

ELECTRIC SYSTEMS CORPORATION

Authorized Commodore service center
Repair of the complete line of Commodore products
In a hurry? Check our modular exchange program



HARDWARE:

| | |
|---------------------------------|--------|
| CBM 8032 Computer, 80 Column | \$1195 |
| CBM 8050 Disk Drive | 1395 |
| CBM 4032 Computer, 40 Column | 995 |
| CBM 4040 Disk Drive | 995 |
| CBM 4022 Printer | 649 |
| CBM VIC 20 Computer | 263 |
| CBM VS100 Cassette | 68 |
| PET to IEEE Cable | 33 |
| IEEE to IEEE Cable | 39 |
| BASF Diskette, Box of 10 | 30 |

SOFTWARE:

| | |
|--|-------|
| OZZ | \$299 |
| Wordcraft 80 | 299 |
| Tax Preparation System | 380 |
| IRMA | 380 |
| Dow Jones Portfolio Management System | 115 |
| Personal Tax | 55 |
| Pascal | 229 |
| Assembler Development Package | 77 |
| Wordpro 4+ | 329 |

**Order TOLL FREE
1-800-527-3135**

10 AM to 4 PM CDT Monday through Friday

Texas residents call 1-214-661-1370

VISA, MASTER CHARGE, MONEY ORDERS, AND C.O.D.
"Certified Check" accepted.

Units in stock shipped within 24 hours, F.O.B. Dallas, Texas.
All equipment shipped with manufacturer's warranty.

Residents of Texas, Louisiana, Oklahoma City and Tulsa,
Oklahoma must add applicable taxes.

Eclectic shortly will be announcing products that are designed to work with CBM systems.

1. ROMIO: two RS232 ports—three parallel ports—26K EPROM memory-managed alternate character set, software controlled—EDOS (extended DOS).
2. Terminal program (options with ROMIO)
3. EPROM programmer
4. Front-end processor
5. Additional firmware to be announced

Be sure to write the address below for more information;
dealer inquiries welcome.

**P.O. Box 1166 • 16260 Midway Road
Addison, Texas 75001 • (214) 661-1370**

PROLOG will respond:

no

because it does not have any information to indicate that John is the father of Bill.

You can ask PROLOG more complicated questions such as who the father of Tom is by typing:

father(%who,tom)?

The % at the beginning of "%who" indicates that "%who" is a variable. When a question contains a variable, PROLOG attempts to assign a correct value to the variable. PROLOG will respond to the above question with:

%who = john

If PROLOG cannot find a correct value for the variable, it again responds no.

father(%who,bill)?

no

As is the case in most programming languages, it does not matter what name you use for a variable. You can have used "%x" instead of "%who". However, unlike most programming languages, a PROLOG variable's scope is limited to the statement in which it appears. If the same variable name is used in two separate statements, there is no connection between them. They are treated as different variables.

So far, PROLOG appears to be nothing more than an easy-to-use data-base language. You can store information and retrieve it later by asking questions. What makes PROLOG more than just another data-base language is that you can teach PROLOG how to manipulate the facts you have given it. Assume that you have made the following assertions:

father(bill,john).

father(john,tom).

From these assertions, you can deduce that Bill is the grandfather of Tom. PROLOG can also make this deduction if you tell it the fact that the father of the father is the grandfather. In PROLOG this fact is stated as a clause:

grandfather(%x,%z) ← father(%x,%y),father(%y,%z).

← means "is implied by" or "is true if." The term to the left of ← is true if the terms to the right of ← are true. The term to the left is called a *goal*, and the terms to the right are called *subgoals*. The goal is true if the subgoals are true. The goal is also referred to as the *head term* of the statement.

Note that variables have been used in the clause to make a general statement about what it means for some-

Micro computer software company gets macro results.



"Software is the hottest segment of the personal computer industry. After all, it's the software that solves problems. And Business Week has precisely the type of readers who are looking for solutions to the kinds of problems we solve. Top and middle management of corporations. That's why right from the start we committed a substantial portion of our marketing budget to advertise in Business Week. And we're very pleased with the results. Since our first insertion, our monthly sales have more than doubled."

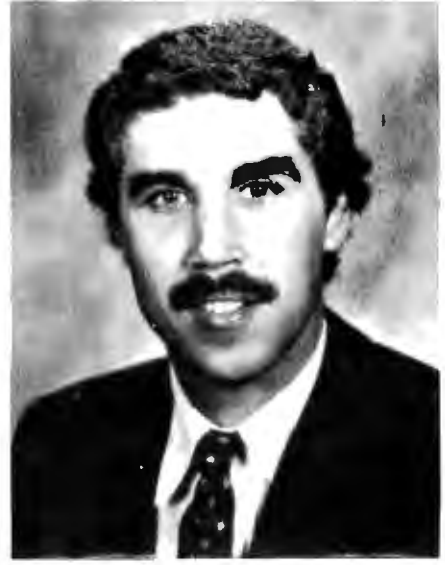
James M. Dow, President
Microcom, Inc.

When Microcom began in 1980, the Boston-based manufacturer of personal computer software wanted to spread the word to corporate



managers about its first product—an electronic mail package for Apple™ computers called Micro-Courier™. Not only to managers who already have Apples,™ but to the fast-growing market of managers in corporations who are thinking of buying personal computers to help them and their staffs do a better job.

For Microcom's Jim Dow, Business Week brought his market into focus. Business Week has a take-action audience of over 6 million corporate decision makers. And they look to Business Week to keep them informed on computer developments. Business Week is the only general busi-



ness publication with an entire editorial section, Information Processing, covering events and trends in the computer industry. Every week.

As Microcom found out, one of the best times to link up with Business Week is right at square one. But for small companies or large companies, Business Week gets big-time advertising results. Call your nearest Business Week representative today.

BusinessWeek



Source: MRI (Spring, '81)/Pub. est.

one to be the grandfather of someone else. PROLOG can use this general statement to answer specific questions. If you ask the question:

```
grandfather(bill,tom)?
```

PROLOG will attempt to answer by setting "%x = bill" and "%z = tom" in the definition of grandfather. This creates an instance of the grandfather definition of the following form:

```
grandfather(bill, john) —
father(bill, %y), father(%y, tom).
```

This states that Bill is the grandfather of Tom if Bill is the father of a person who is the father of Tom. By the first two assertions, PROLOG knows that Bill is the father of John and John is the father of Tom. Therefore, PROLOG will respond with a yes.

If you ask PROLOG to find two people such that one is the grandfather of the other:

```
grandfather(%x, %y)?
```

PROLOG will respond:

```
%x = bill, %y = tom
```

Nonprocedural Languages

Most computer languages currently in use (such as BASIC and Pascal) are procedural: a computation is performed by executing a series of actions in a precise order. Each statement of a procedural language represents only one step in an algorithm. This means that the correctness of an individual statement cannot be determined by examining the statement by itself. Instead, you must examine the entire algorithm in which the statement occurs to determine if the statement is correct. For example, $I = I + 2$ is a typical statement in a procedural language. If you are asked to determine whether the statement is correct, the most you can say is that its syntax is correct (ie: it is a valid statement in the language). This does not necessarily mean that the statement is the cor-

rect one to use at that particular stage of the algorithm. Perhaps the correct statement should be $I = I * 2$. You cannot tell without looking at the rest of the code in which the statement appears.

In PROLOG, on the other hand, you can determine whether a statement is true by examining that statement only. The correctness of the PROLOG statement that defines grandfather can be determined independently of the rest of the PROLOG program. A statement in a PROLOG program corresponds to an entire subroutine in a conventional programming language. Thus PROLOG programs are extremely modular. PROLOG carries the "divide-and-conquer" approach of structured programming one step further.

Another advantage of nonprocedural languages is that the order in which statements occur is irrelevant. Each PROLOG statement represents a fact, and it does not matter in what order PROLOG is told the facts. This means that you can increase the power of a program by adding new statements, and in most cases this does not require any modification of the statements that are already there. For example, the definition of grandfather, given earlier, is true, but it is only a partial definition. One must add the following statement to obtain a complete definition:

```
grandfather(%x, %y) —
father(%x, %z), mother(%z, %y).
```

Assume that the following assertions are also made:

```
mother(jane, alice).
father(bill, jane).
```

Now if you ask for a grandchild of Bill:

```
grandfather(bill, %grandchild)?
```

PROLOG will respond:

```
%grandchild = tom
```

You can also find out if Bill has another grandchild by

- ANALOG I/O -
 - Low/High Level A/D
 - X-Ducer Compensation
 - 16 to 64 Channel MUX
 - Differential/Single End
 - Programmable Gain
 - 12/14 Bit Resolution
 - Video Digitizers
 - Multiple DACs
- DIGITAL I/O -
 - Optically Isolated
 - High Level AC or DC
 - Pulse Count I/O
 - Programmable Timers
 - Digital Multiplexers
 - UNI-BUS/IEEE Drivers
 - Voice Synthesizers
- COMMUNICATIONS -
 - Synchronous to 800KB
 - Asynchronous to 24KB
 - Serial RS-232 or 20 Ma.
 - IEEE 488 - 78 GPIB
 - Distributed Systems
 - BBSync - DEC net - X.25

Z80/Z8000

LSI-11/PDP-11

Data Acquisition

ASC Computers



8085/8086/88

6800/09/68000

Multi-Processing

ASC MICRO-COMPUTER SYSTEMS-

Featuring a full range of industry standard 8 and 16 Bit Micro-Processors, Memories, I/O Controllers, Analog/Digital Modules and Communications Units.

Expedited delivery on the latest technology in Micro-Computers, Disk Memories and Peripheral options, including Software and System Integration.

ASC Micro-Computer Systems are offered with optional IEEE/S-100 Bus, INTEL MULTI-Bus, MOTOROLA EXOR-Bus, or STD-Bus compatible Micro-Processors, Memories, I/O Controllers, and Enclosures to your specifications.

Call ASC for prompt quotations on Micro-Computer configurations.

25401 Harper Ave.
St. Clair Shores
Michigan 48081

ASC Computer Systems

313
779-8700

- PERIPHERALS -
 - Flexible Disks to 1Mb
 - Winchester Disks to 300Mb
 - Magnetic Tape Units
 - Printers/Terminals
 - Video Cameras
 - Color Graphics
 - CRT Displays/Plotters
- SYSTEMS -
 - Modular Expandability
 - Industrial Enclosures
 - Rack-Mounting Cabinets
 - I/O Termination Panels
 - Portable DAS Option
 - Control Console/Displays
 - Development Systems
- SOFTWARE -
 - CP/M Operating Systems
 - Multi-User Support
 - Fortran, Basic, Pascal
 - DAS - Process Languages
 - MACRO & Assembler Language
 - Network Communications
 - Graphics and Applications

BYE BYE BASIC



Announcing the quick and easy way
to write custom business applications
in hours instead of weeks.

At last, you can get a microcomputer business application development system that is designed for one purpose only... fast production of bug-free professional-looking custom business applications.

"Thinks" the Way Business Thinks
Quic-N-Easi is the revolutionary screen-format-oriented application development system that thinks in terms of transactions, records and fields. The same way business thinks. Quic-N-Easi expects an application to include custom formatted key entry. It lets you set up the character, field, and record validity checks business wants by merely filling in the blanks. It automatically signals in real time when errors occur and "explains" what is wrong in plain English messages you select for each custom application.

Much Faster than BASIC
Quic-N-Easi programming is much faster than BASIC because the standard business applications (key input, file handling, and output reporting) are handled via pre-programmed parameter driven sub-routines. To produce finished professional looking custom business programs, you merely:

- Draw the business formats directly on the CRT in minutes.
- Fill in the blanks for field attributes, validations, tables, etc.
- Invoke the Quic-N-Easi interpreter to check fields against tables, check limits, access data files, and perform business calculations, etc.

- Optionally define file and output formats right on the screen.

Pays for Itself in a Week

By eliminating the coding drudgery of writing screen, field, file, and format programs in BASIC, programmers are free to concentrate on the unique business aspects of each custom application. No professional programmer can afford to develop one more business application without Quic-N-Easi. The savings are so significant with Quic-N-Easi, it can actually pay for itself in only one week.

Gives You Much More than a Screen Builder... the Only Complete Business Development System for Microcomputers

Quic-N-Easi handles the entire application development job from key entry to final output. You get everything you need, including detailed documentation to begin writing professional programs the first day. **You get...**

- A singularly capable Quic-N-Easi screen builder
- A comprehensive parameter driven Quic-N-Easi content editor
- A full Quic-N-Easi interpreter language
- A complete Quic-N-Easi file management system with Index Sequential, Random, and Sequential File Access Method
- A complete Quic-N-Easi print format handler
- A detailed Quic-N-Easi reference manual

- A Quic-N-Easi self-teaching guide
- A Quic-N-Easi quick reference card
- An interface to other program files

ORDER NOW—Don't Waste One More Day Coding BASIC

Your time is too valuable to waste hours on end writing BASIC code. The first week you use Quic-N-Easi, your finished business programs will look better, run better, and return more dollars to you. Don't delay. Order Quic-N-Easi today. Phone... 215 968-0689

Circle 393 on inquiry card.

QUIC-N-EASI™

STANDARD MICROSYSTEMS INC.
136 GRANITE HILL COURT, LANGHORNE, PA 19047

Pricing Information

- Complete Quic-N-Easi system **\$395**
- Manual only **\$60**
- Visa and Mastercard accepted
- Dealer Inquiries Invited

Minimum System Requirements

48K • CP/M • Z80 • Floppy Disc

Other Disk Formats • 8" Single Density Vector Graphics • Micropolis Model 2

Customized Versions • TRS80 Mod II, TRS80 Mod III, APPLE, OSBORNE, INTERTEC, VECTOR, ZENITH

Apple, CP/M, Intertec, Micropolis, and TRS80 are trademarks of Apple Computer, Digital Research, Intertec Data Systems, Micropolis Corp., and Tandy Corp.

**PRINT NEATLY,
SO WE KNOW
WHERE TO SEND
YOUR CHECK.**

(PLEASE PRINT: THIS IS YOUR SHIPPING LABEL)

FROM: Name _____

Address _____

City/State/ZIP _____

TO: **Ashton-Tate**
Suite 1510
3600 Wilshire Boulevard
Los Angeles, CA 90010

Buying new software is the pits, isn't it?

You read an ad and it sounds terrific, so you ask around, then buy the manual.

So far, so good—so you spring several hundred dollars for the package.

And it does exactly what they said. But to get exactly what you want, you're going to have to change the way you run your business. Or go through so much hassle that you're not sure it's worth it.

So you grit your teeth and suffer, or put it on a shelf to gather dust.

Sounds familiar, doesn't it?

But there is at least one known exception: an exceptional DBMS called dBASE II.

For database fans, an offer you shouldn't refuse.

dBASE II is the only high-performance relational Database Management System for micros. And it's the only DBMS that can help you get the DBMS that's right for you, no matter which DBMS you may want. Here's how:

If you have a 48k micro with CP/M, send us its model number and the size of your drives along with \$700 (CP/M 86 version soon—call if you can't wait).

We'll send you a copy of dBASE II that you can run on your system, solving your problems your way, for 30 days. Then just send everything back and we'll return your money, no questions asked.

During that 30 days, you can find out how much a real database management system can do for you. How it will affect your operations. Exactly what you want done. And precisely how you want to do it.

Then even if you go for some other system, you'll be an informed buyer.

And it never hurts to know what you're doing.

IBM just caught up. So can you.

With dBASE II, you'll get the same kind of system for your micro that IBM introduced a few months ago for their mainframes.

It's a relational DBMS, and that makes it different from any other micro system you've ever seen.

In a relational database, the data is organized as simple tables, with records as the rows and the data fields as the columns, much like your data is organized now. Data relations are logical, so that you can zero in on the specific information you want without knowing a thing about the pre-defined sets, pointers or other cumbersome structures of hierarchal and network DBMS's.

And unlike file management systems, dBASE II gives you program and data independence. You can change your database structure without re-entering your data and without reprogramming, or change some or all of your programs without touching your database. And the same database can be used for any number of different applications.

dBASE II is a stand-alone applications development system.

You don't need an extra support language, because dBASE II comes with its own Applications Development Language (ADL). With ADL, you can use simple English-like statements to manipulate your data, or use built-in structured constructs to prepare sophisticated applications packages. It's simple and easy to use, yet extremely powerful.

You create a new database and start using it in a minute or less. Just type CREATE, then respond to system prompts to name the file and define the fields. Now enter the data.

Add data to an existing database instantly, whether your file has

10 records or 10,000 records, by typing APPEND, then entering the information.

UPDATE, MODIFY, JOIN and REPLACE whole databases or individual records and characters.

Add or delete fields in your database structure without re-entering all your data.

And with dBASE II, it's easy to get information out once you've put the data in.

Do automatic calculations on fields, records and databases with a few keystrokes.

Organize months' worth of data in minutes with REPORT (printing optional), and get your reports today instead of tomorrow. Use the built-in SORT, with single or multiple keys. Or INDEX your data, then FIND it in seconds, even with floppies.

You can use dBASE II interactively or store a sequence of commands to automate your accounting, billing, mailing lists or whatever data you have to manage.

You'll wonder how you managed without it.

dBASE II is the most powerful, easiest to use DBMS you can get for a micro.

And instead of poring over the manual, you can run it hands-on, in-house to see exactly what it can do for you. Try it.

What have you got to lose? We even provide the label so you can send it back.

Ashton-Tate, 3600 Wilshire Blvd., Suite 1510, Los Angeles, CA 90010. (213) 666-4409.



Ashton-Tate

©Ashton-Tate 1981

typing ? . Now PROLOG will respond:

```
%grandchild = alice
```

If you ask whether Bill has other grandchildren besides Tom and Alice by typing ? once more, PROLOG will respond with a no.

The two partial definitions for grandfather can be combined into one statement:

```
grandfather(%x,%y) :- father(%z,%x,%z),
(father(%z,%y);mother(%z,%y)).
```

The semicolon between "father(%z,%y)" and "mother(%z,%y)" means that one or the other must be true.

A term can have any number of arguments. To say that Alice is pretty, you would type:

```
pretty(alice).
```

Now you can ask PROLOG to find a pretty grandchild of Bill, as follows:

```
grandfather(bill,%grandchild),pretty(%grandchild)?
```

to which PROLOG will respond:

```
%grandchild = alice
```

How PROLOG Works

To use PROLOG you do not need to know how it actually arrives at its answers. If you have specified all the required information, PROLOG will find the answer as if by magic. However, it is interesting to know how it goes about coming up with a solution.


Basically PROLOG attempts to solve goals from left to right. For a given goal, PROLOG attempts to find a statement whose first term (the only term in an assertion; the term to the left of the - in a clause) can be made to match the goal. It then attempts to solve the subgoals of that statement. Of course, if the statement is an assertion, there are no subgoals. If the subgoals can be solved, PROLOG then proceeds to the next goal. If one of the subgoals cannot be solved, PROLOG backtracks and tries to find another statement whose head term matches the goal. If there are no untried statements left, PROLOG realizes it cannot solve this particular goal.

This does not necessarily mean there is no solution to your original question. If the goal PROLOG is working on is actually a subgoal of one of your original goals, there may be an alternate solution of the original goal that does not involve the failed subgoal. PROLOG will backtrack further and try to find an alternate solution; it gives up only when it can find no solution to any of your original goals.

Let us examine in more detail how PROLOG works.

Listing 1: Assertions that specify the environment. PROLOG attempts to answer questions based on facts and relations that it knows, stated in special syntax. Questions are broken into goals to be achieved from left to right.

```
father(bill, john).
father( john, tom).
father(bill, jane).
mother( jane, alice).
grandmother(%x,%y) :- father(%x,%y), ( father(%z,%y);mother(%z,%y) ).
pretty(alice).
```



McGraw-Hill Bookstore

The Only Book That Is Machine Specific in Teaching Pascal on the Apple

APPLE-PASCAL

by Peckham and Luehrmann

- Teaches the total beginner to become competent in programming in Pascal
- Offers concrete experiences in creating, running and debugging actual programs in Pascal

This hands-on guide will teach you about the editor, the operating system commands, even the keyboard layout and labels of the Apple computer. 384 pp. \$13.95

Please print clearly.

McGraw-Hill Bookstore
1221 Avenue of the Americas
N.Y., N.Y. 10020

Please send me _____ copies of **APPLE-PASCAL** at \$13.95 each.

MasterCard _____ Visa _____ AmerExp _____

Account No. _____ Expires _____

Name _____

Address _____

City _____ State _____ Zip _____

Add sales tax plus \$2.50 postage, handling

4 New Games From Hayden In the SARGON Tradition!

New! KLONDIKE 2000

(Trackman) A Space Age Treasure Hunt! An exciting new game of fabulous treasures, hidden caves and dangerous robots! The object: to become the richest player. Finding the gold is only half the battle... the other half is keeping it. You'll need robots to guard your fortune. How do you make a robot your ally? Simple - feed it more power chips than its previous owner did, or you can overcome the enemy with robots you have already won. For one to four players.

#10209, Apple II Disk, \$24.95

New! TRS-80 GALAXY OF GAMES

(Savolaine, Dilley and Wilkerson) 4 For the Fun Of It! Choose from four challenging games and enjoy hours of fun!

HANGMAN - a word game enthusiasts will love this computerized classic that features excellent graphics! ONE ARM BANDIT - brings slot machine excitement into your own home. SKUNK - a unique dice game with special sound effects. JACKS - a card game to play with the computer or your friends; trade high cards for low cards and compete for the lowest point total.

#09903, TRS-80 Models I and III, \$14.95



SARGON II

(Spracklens) The first great computer Chess program! "We are impressed with the program's speed, its opening book, and its much improved end game..." Save your money and buy SARGON II... "80 Software Critique. 7 levels of play, and levels 0-3 in tournament time. It has randomized opening book for all levels through three moves. Special hint mode included at all levels except 0 will suggest a good (but not necessarily the best!) move you can next make.

#03404, Apple II;
#03410, OSI C1P;
#03418, TRS-80 Models I and III;
#03440, OSI C4P;
each tape \$29.95

#03408, TRS-80 Level II Disk;
#03409, Apple II Disk;
#03414, OSI C1P Disk;
#03444, OSI C4P Disk;
#03484, OSI C8P Disk;
each disk, \$34.95

**Available at
your local
computer store!**

For Orders, Inquiries and Technical Support Call Toll Free

HAYDEN HOTLINE
800-631-0856

New! TETRAD

(Hess) Now try a 3-dimensional Tic Tac Toe and enjoy beautiful color, surprising sound and a choice of 3 levels of difficulty! A real challenge that allows 76 winning combinations. Tetrad adds a new dimension to a familiar game, as you battle the computer to get 4 in a row in any direction.

#09809, Apple II Disk, \$19.95

New! MIND THRUST

(Sackson and Wazaney) Match wits with the computer! Be the first to complete a chain across the board. Switch sides at any time and control your opponent's pieces as he controls yours.

#07403, TRS-80 Tape, \$16.95

Soon to be available

CHAMPIONSHIP GOLF
ALIBI
STAR TRADERS
ASTEROID BLASTER
QUICK SILVER/CRAZY COURSE
WORD SOLITAIRE

Other Hayden Gameware...

REVERSAL (Apple II)
BLACKJACK MASTER
(TRS-80 Level II; Apple Version
Soon to be Available)
BATTER UP!! A Microbaseball
Game (TRS-80 Level II)
GRIDIRON: A Microfootball
Game (TRS-80 Level II)

ORDER NOW!

Hayden Book Co., Inc.
50 Essex St. Rochelle Park, NJ 07662

Please send me the software checked.
Residents of NJ and CA must add sales tax. Name of individual ordering must be filled in. Offer good in US only. Payment must accompany orders from P.O. Box numbers.

Enclosed is my check or money order.

Please bill to my Master Card or

VISA account # _____

Interbank # _____ Expiration Date _____

- | | |
|--------------------------------|--------------------------------|
| <input type="checkbox"/> 01209 | <input type="checkbox"/> 03440 |
| <input type="checkbox"/> 03404 | <input type="checkbox"/> 03444 |
| <input type="checkbox"/> 03408 | <input type="checkbox"/> 03484 |
| <input type="checkbox"/> 03409 | <input type="checkbox"/> 07403 |
| <input type="checkbox"/> 03410 | <input type="checkbox"/> 09809 |
| <input type="checkbox"/> 03414 | <input type="checkbox"/> 09903 |
| <input type="checkbox"/> 03418 | |

Name _____

Address _____

City/State/Zip _____

B 11/81-009

50 Essex Street, Rochelle Park, NJ 07662

Hayden
Book Company, Inc.

ATTENTION ALL APPLE USERS



(602) 998-9411

Desert Computer announces a new online software order service available 24 hours a day. Our complete catalog and order information are available on this system and on the Source. On the Source use mail to TCH860 to order and use >BASIC (11)TCH860>READ to view the catalog. Our system can be reached at the number above. If you do not have a modem you can send a sase to the address below or use the reader service number. We carry nationally known brands at discount prices.

Take the BYTE out of Software Cost
 DESERT COMPUTER P.O. BOX 4841 SCOTTSDALE, AZ 85261

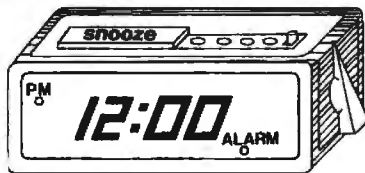
Components Express, Inc.

"Have you kissed your computer lately?"

1380 E. Edinger, Unit CC Santa Ana, CA 92705(714) 558-3972

**BROAD BAND MICROWAVE RECEIVER SYSTEM
 1.8GHZ to 2.4 GHZ**

only
\$295.00



With built-in-converter to channel 2, 3, or 4 of any standard TV set.

RANGE: Line of sight to 250 miles

SCOPE: Will receive within the frequency band from satellites primary microwave stations, and repeater microwave booster stations

CONTENTS: Packaged in 19"x19"x4 1/2" corrugated carton complete with:

- 24" Dish
- Feed-Horn Receiver
- Mounting Bracket
- Mounting Clamp
- Instructions
- 300 Ohm to 75 Ohm Adapter
- 750 Ohm to 300 Ohm Adapter
- 60 Feet Coax Cable with Connectors
- 3 Feet Coax Cable with Connectors

WARRANTY
 180 days for all factory defects and electronic failures for normal usage and handling. Defective sub assemblies will be replaced with new or re-manufactured sub assembly on a 48 hour exchange guarantee.

This system is not a kil and requires no additional devices or equipment other than a TV set to place in operation. **DEALER INQUIRIES INVITED.**

Assume that the statements in listing 1 have been made. Now assume that PROLOG is asked this question:

grandfather (bill, %grandchild), pretty(%grandchild)?

Because PROLOG attempts to answer questions by solving goals one at a time from left to right, it will first attempt to solve "grandfather(bill,%grandchild)". It searches for a clause whose first term is grandfather. There is only one clause whose head term is grandfather, so PROLOG tries to match "grandfather (bill, %grandchild)" with "grandfather(%x,%y)". A match can be made by setting "%x = bill" and "%y = %grandchild". This substitution is applied to the subgoals of that statement, which may be expanded to:

father(bill, %z),(father(%z, %grandchild);
 mother(%z, %grandchild))

PROLOG now attempts to solve "father(bill,%z)". The first three statements have father as a head term, so PROLOG tries them one after the other. The first statement matches if "%z = john"; it is an assertion and has no subgoals. Therefore, PROLOG can proceed to the next goal in the expanded statement. Here there is a choice between "father(john,%grandchild)" and "mother(john,%grandchild)". PROLOG attempts to solve the first alternative. It tries to match "father(john,%grandchild)" with the first given statement, but fails because the first arguments do not match. It then tries the second statement, and this time succeeds with the substitution "%grandchild = tom".

Now all the goals of the expanded statement have been satisfied, so PROLOG attempts to solve the last goal of the original question. Since "%grandchild = tom", the goal is "pretty(tom)". There is only one clause whose head term is "pretty", but "pretty(tom)" does not match "pretty (alice)". At this point, PROLOG backtracks to the last place where there was a choice—between "father(john,%grandchild)" and "mother(john,%grandchild)"—and selects the alternate choice; "(mother(john,%grandchild)". This choice does not work either because the fourth statement is the only one whose head is "mother" and "mother(john,%grandchild)" cannot match "mother(jane,alice)".

So PROLOG backtracks further and tries to solve the first goal of the expanded statement again.

First, it tries to match "father(bill,%z)" with the second statement but fails. Then it tries to match "father (bill,%z)" with the third statement, and this time succeeds by setting "%z = jane". Now PROLOG attempts to solve the second part of the expanded statement, which is a choice between "father(jane,%grandchild)" and "mother(jane, %grandchild)". Once again PROLOG attempts to solve "father(jane,%grandchild)" first but fails. Then it attempts to solve "mother(jane,%grandchild)". This time it succeeds by matching "mother (jane,%grandchild)" and setting "%grandchild = alice".

PROLOG now tries to solve the last goal in the original question, which is now "pretty(alice)". This goal matches the sixth statement, so "%grandchild = alice" is an answer to the original question.

Controlling Robots

Now consider how a PROLOG program could be used to control a robot. Assume that a human and a robot are inside a rocket that has landed on the surface of a planet. The rocket has an airlock. On the planet there is a building that contains rocket fuel. There is also a cave with a key to the building. The cave also contains gold. The robot is able to lift the key, the fuel, or the gold (but it cannot lift the rocket). This situation can be described in PROLOG as shown in listing 2.

The statements in listing 2 represent the state of the robot's environment. As the robot interacts with the environment, some of the statements may cease to be true. To keep the description of the environment up to date you must have a way to delete statements no longer true. PROLOG provides a built-in function, called *delete*, to eliminate specified statements; another built-in function, called *assert*, can be used to add statements.

Now you can specify commands for the robot to attempt to obey. The first command will make the robot fetch an object to a specified place (see listing 3a).

The first subgoal, "inside(%object, %place)", checks to see if the object is already where you want it. If it is, the robot does not need to do anything. If it isn't, the robot must pick up the object, move to the required place and drop it. Note that the terms "pickup(%object)", "moveto(%place)", and "drop(%object)" have been grouped together within parentheses to show that the semicolon operator applies to all of them.

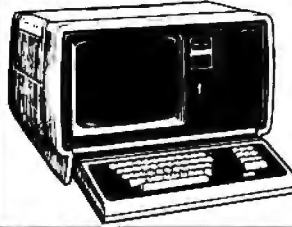
In order for the robot to *pick up* an object (see listing 3b), the object must be liftable. The robot must move to the place where the object is in order to pick it up. Assuming that the robot can carry only one thing at a time, it must be empty-handed when it picks up an object.

Listing 2: Hypothetical environment found in a simulated space expedition. Through a series of commands specified in listing 3, a robot can be made to perform complex tasks, such as exiting the craft, and finding and returning with fuel—all with a simple instruction from the user.

```
inside(human, rocket).
inside(robot, rocket).
inside(fuel, building).
inside(key, cave).
inside(gold, cave).
entrance(airlock, rocket).
entrance(door, building).
entrance(hole, cave).
closed(airlock).
closed(door).
liftable(key).
liftable(fuel).
liftable(gold).
```

TEXAS COMPUTER SYSTEMS

TRS-80 COMPUTERS



Model II 64K \$3288

An excellent computer for your business needs. Easy expandability & compatibility. No formal operator training needed. All accessories available—disk expansions, printers, software, at our low discount prices. Our fast, fully insured air freight service can assure most deliveries within seven days after payment is received.

Model III 16K \$835

With TCS Memory:

Model III 32K \$979

Model III 32K \$909

Model III 48K \$1089

Model III 48K \$969

Model III 48K 2 Disk RS232 \$2100

Model III 32K 1 Disk \$1729

Model III 48K 1 Disk \$1849



Corvus Hard Disks \$Call

5, 10, or 20 megabytes of storage for the Model I, II, or III, configured with TRSDOS, NEWDOS 80, or CP/M for one or several computers sharing a single hard drive simultaneously. Easy expandability and compatibility. Also fits Apple, Superbrain, Allos, and most other computers. Don't walk on other's promises. We can deliver this proven system now. Call us for the lowest price!

Pocket Computer & Acc. \$Call

Pocket Computer Printer Interface in stock

Color Computer

4K Level 1 \$319

16K Level I \$439

16K Extended Basic \$489

With TCS Memory:

16K Level I \$369

16K Extended Basic \$449

Epson Printers \$Call

Letter quality matrix printer has full software control of 40, 80, 68 or 132 columns. 80 cps bidirectional tractor feed, disposable printhead, \$300 less than nearest competitive printer. Lists \$645. Call for our low price.

MX-80 Tractor Feed

MX-100 Graphtrax, Friction

MX-80 FT Friction and
Tractor

and Tractor up to 15" wide.

Graphtrax for MX-80, MX-80 FT, graphics option.

Word Processor Package \$2679

Includes 2 Disk Model III with 48K, Epson MX-80 Tractor Feed with cable, and word processing software ready to operate. Lists at \$3300. Our low price special this month: **\$2679**. For MX-80 FT Tractor and Friction, add \$99.

• Payment: Money Order, Cashier's Check, Certified
Check, Personal checks take 3 wks. VISA, MC,
add 3%.

• Prices subject to change any time.
• No tax out-of-state. Texans add 5%.
• Delivery subject to availability.
• Shipping extra, quoted by phone.

TEXAS COMPUTER SYSTEMS

Box 951, Brady Texas 76825

For fast, efficient service, we can air freight from Dallas to major a/p near you. Call for information.

Toll Free Number 800-433-5184

Texas Residents 817-274-5625

Listing 3: Fundamental commands built to control the hypothetical robot. In each case, the commands are constructed of goals and subgoals that are either basic enough for the robot to perform directly or are further broken into subgoals.

```
3a
  fetch(%object,%place)← inside(%object,%place);
                        (pickup(%object),moveto(%place),drop(%object)).

3b
  pickup(%object)← liftable(%object),
                  inside(%object,%place),moveto(%place),
                  emptyhanded,assert(holding(%object)).

3c
  emptyhanded ← (holding(%object),drop(%object));true.

3d
  drop(%object) ← delete(holding(%object)).

3e
  moveto(%place) ← inside(robot,%place);
                  (inside(robot,%place2),leave(%place2),enter(%place));
                  (outside(robot),enter(%place)).

3f
  leave(%place) ← entrance(%x,%place),((closed(%x),open(%x));true),
                delete(inside(robot,%place),assert(outside(robot))),
                ((holding(%object),delete(inside(%object,%place))),
                assert(outside(%object)));true).

  enter(%place) ← entrance(%x,%place),((closed(%x),open(%x));true),
                delete(outside(robot)),assert(inside(robot,%place)),
                ((holding(%object),delete(outside(%object))),
                assert(inside(%object,%place)));true).

3g
  open(door) ← (holding(key);(inside(key,%place),pickup(key),leave(%place))),
              delete(closed(door)).
```

Finally, you must assert that the robot is now holding the object.

In order to be *empty-handed*, the robot must drop whatever it is holding (see listing 3c). If it is not holding anything, it is already empty-handed, so the built-in true function (which always succeeds) is executed.

When the robot *drops* something, you must delete the statement that says it is holding the object (see listing 3d).

Depending on where the robot is located initially, there are three possible actions that the robot must perform to *move* to a specified place (see listing 3e).

- If it is already at the specified place, it does not need to do anything.
- If it is inside some other place, it must leave that place and enter the specified place.
- If it is already outside, it must enter the specified place.

To leave a place (see listing 3f), if the entrance is closed, the robot must open the entrance. You must also remember to delete the fact that the robot is inside the

place, and assert that the robot is now outside. If the robot is holding something, you must assert that the object also moves outside. Entering a place is accomplished similarly. To open the door to the building, the robot must either be holding the key or it must pick up the key (see listing 3g). Assume the robot can open the rocket's airlock automatically:

```
open(airlock ← delete(closed(airlock))).
```

Now you can order the robot to fetch the gold to the rocket with the command:

```
fetch(gold,rocket)?
```

The robot will leave the rocket, enter the cave, pick up the gold, and return to the rocket. If you ask the robot to fetch the fuel from the building by typing:

```
fetch(fuel,rocket)?
```

Collector Edition

BYTE COVERS

The Byte covers shown below are available as beautiful Collector Edition Prints. Each full color print is 11" x 14", including a 1/2" border, and is part of an edition strictly limited to 500 prints. (Print numbers 2, 4, 6, 7 and 8 are editions of only 100 prints, and some quantities are very low.) The artist, Robert Tinney, has personally inspected, signed and numbered each print. A Certificate of Authenticity accompanies each print guaranteeing its quality and limited number.

Collector Edition Prints are carefully packaged flat to avoid bending, and are shipped first class. The price of each print is \$20, plus \$3 per shipment for postage and handling (\$6 overseas). Collector Prints 9-12 are available as a set of 4 for \$70. Because certain prints have sold out, Sets 1-4 and Sets 5-8 are no longer available as sets.

To order your own beautiful Collector Edition Byte Cover use the convenient coupon below. Visa or MasterCard orders may call Toll Free.



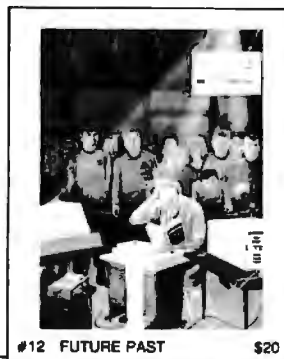
#9 SOFTWARE PIRACY \$20



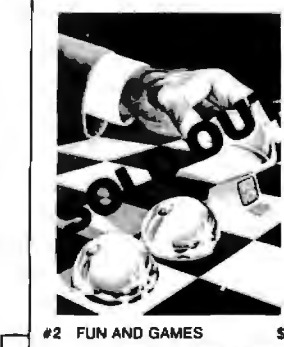
#10 THE PROGRAMMING ROUTE \$20



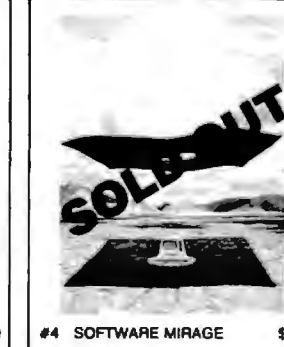
#11 FORTH \$20



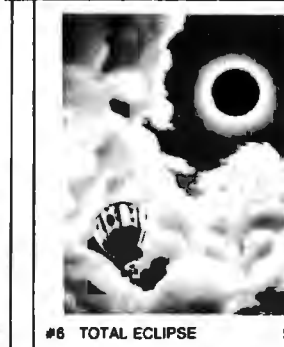
#12 FUTURE PAST \$20



#2 FUN AND GAMES \$20



#4 SOFTWARE MIRAGE \$20



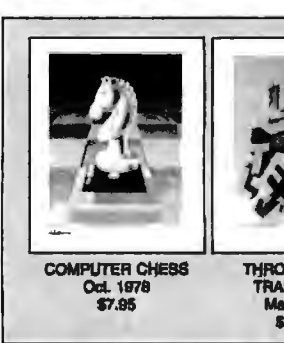
#6 TOTAL ECLIPSE \$20



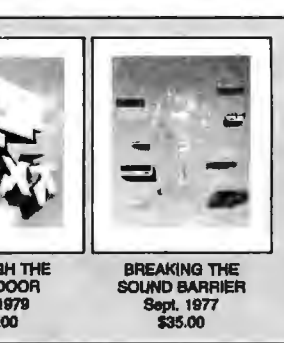
#7 COMPUTER HARDWARE \$20



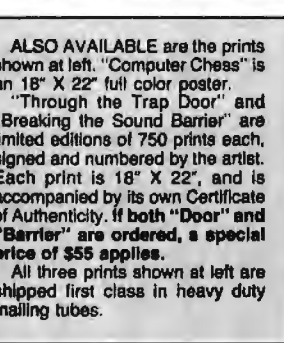
#8 PERSPECTIVES \$20



COMPUTER CHESS
Oct. 1978
\$7.95



THROUGH THE TRAP DOOR
Mar. 1979
\$35.00



BREAKING THE SOUND BARRIER
Sept. 1977
\$35.00

ALSO AVAILABLE are the prints shown at left. "Computer Chess" is an 18" X 22" full color poster.

"Through the Trap Door" and "Breaking the Sound Barrier" are limited editions of 750 prints each, signed and numbered by the artist. Each print is 18" X 22", and is accompanied by its own Certificate of Authenticity. If both "Door" and "Barrier" are ordered, a special price of \$55 applies.

All three prints shown at left are shipped first class in heavy duty mailing tubes.

| Please send me the following Prints: | | | <input type="checkbox"/> I have enclosed check or money order. | |
|--------------------------------------|--|-----------------|--|-------------------------------------|
| QTY | TITLE | AMOUNT | <input type="checkbox"/> Visa | <input type="checkbox"/> MasterCard |
| _____ | _____ | \$_____ | Card # _____ | _____ |
| _____ | _____ | \$_____ | Expiration Date _____ | _____ |
| _____ | _____ | \$_____ | SHIP MY PRINTS TO: | |
| _____ | _____ | \$_____ | Name _____ | _____ |
| _____ | _____ | \$_____ | Address _____ | _____ |
| _____ | _____ | \$_____ | City _____ | _____ |
| _____ | _____ | \$_____ | State _____ | Zip _____ |
| _____ | Set 9-12 | \$70 | | |
| _____ | Both "Trap Door" & "Barrier" | \$55 | | |
| _____ | Post. & Hand. (\$3 U.S., \$6 overseas) | \$_____ | | |
| | | TOTAL \$ | | |

Mail this coupon to:
robert tinney graphics
1864 N. Pamela Drive
Baton Rouge, LA
70815

For VISA OR MASTERCARD ORDERS
CALL TOLL FREE!
1-800-854-0562 / Ext. 910
Call: 1-800-432-7257 / Ext. 910
24 HOURS A DAY! 7 DAYS A WEEK!

In Less Than 3 Minutes

Your IBM Model 50, 60, or 75
Electronic Typewriter
can be an RS232C PRINTER or TERMINAL



CALIFORNIA MICRO COMPUTER Models 5060 and 5061 can be installed easily and require NO modifications to the typewriter.

For additional information contact:

CALIFORNIA MICRO COMPUTER
9323 Warbler Ave., Fountain Valley, CA.
92708 (714) 968-0890

the robot will leave the rocket and try to enter the building. To do this it needs the key, so it will go to the cave to get it. Once it is in the building, it will drop the key and pick up the fuel. Finally, it will return to the rocket with the fuel. At this point, the PROLOG statements describing the "environment" will be as shown in listing 4. Note that the airlock and the door to the building are left open because the robot did not bother to close them.

This robot is not very bright. If, starting with the initial situation, for instance, you ask the robot to move the gold from the cave to the building (fetch(gold, building)?), it will go to the cave, pick up the gold, and go to the building. At this point the robot realizes it needs the key to open the door, so it returns to the cave to get the key. Since it can carry only one thing at a time, it drops the gold and picks up the key. It then returns to the door, opens it, and enters the building. It now thinks it has succeeded in moving the gold to the building, but the gold is still sitting in the cave where the robot dropped it. This problem is caused by the fact the robot may undo part of the overall goal by backtracking to accomplish a subgoal.

A Modest Proposal

It would not be too difficult to make the robot intelligent enough to handle the above problem. But instead of making the robot more intelligent, let's give it some "consciousness." Any robot worth its positronic brain must obey the three laws of robotics as postulated by Isaac Asimov (see reference 1). These laws are:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey orders given it by human beings except where such orders would conflict with the first law.
3. A robot must protect its own existence as long as such protection does not conflict with the first or second law.

In order to obey these laws, a robot must not simply obey commands blindly. It must first determine whether it can perform the command without violating the laws.

Listing 4: Status of the hypothetical space expedition's environment after the robot has accomplished its tasks.

```
inside(human, rocket).
inside(robot, rocket).
inside(fuel, rocket).
inside(gold, rocket).
inside(key, building).
entrance(airlock, rocket).
entrance(door, building).
entrance(hole, cave).
liftable(key).
liftable(fuel).
liftable(gold).
```



ATARI

please see page 229 for further information

Turn to our
Double Page
Advertisement
for SUPER
CHRISTMAS
SAVINGS!

THE PERFECT PRESENT!



ATARI ASTEROIDS™



ATARI MISSILE COMMAND™

WE CARRY THE COMPLETE LINE OF ATARI SOFTWARE,
PERIPHERALS AND ACCESSORIES. CALL FOR THE SUPER
CHRISTMAS SAVINGS!!

OMEGA SALES CO.



WEST COAST
1-800-235-3581

EAST COAST
1-800-556-7586

Listing 5: *Asimov's three rules of robotics as implemented in PROLOG. These rules allow the robot to protect humans by shooting aliens, and even by injuring itself, should the situation warrant. The application of the "mini-interpreter" obey makes this a simple proposition for PROLOG.*

```
obey( ( %p, %s ) ) ← !, obey( %p ), obey( %s ).
obey( ( %p; %s ) ) ← !, obey( %p ); obey( %s ).
obey( %goal ) ← clause( %goal, %subgoals ), protect( human ), protect( robot ),
               obey( %subgoals ), !.
protect( %x ) ← ( in_danger( %x, %danger ), eliminate( %danger ) ); true.
in_danger( %x, alien ) ← not( injured( alien ) ), inside( alien, %place ),
                       inside( %x, %place ).
eliminate( %danger ) ← shoot( %danger ).
shoot( %x ) ← %x <> human, inside( %x, %place ), moveto( %place ), assert( injured( %x ) ).
```

This is easy to do in PROLOG (statements in listing 5 are explained individually below). Rather than issuing a command such as "fetch(fuel,rocket)?" you must now tell the robot to:

```
obey(fetch(fuel,rocket))?
```

"Obey" is a "mini-interpreter" for PROLOG that checks to see whether the human or the robot needs protecting before executing the subgoals associated with a goal. (Comments in PROLOG are surrounded by /* and */.) For example:

```
/* If a command consists of two subcommands,
   execute them one after the other*/
```

```
obey((%p, %s)) — !, obey(%p), obey(%s).
```

The exclamation point is a signal to PROLOG that if backtracking causes a return to that point, then the parent goal should be failed immediately, rather than trying to find another solution. This is used here to insure that "obey" does not introduce any extra backtracking.

```
/* If the command consists of a choice between
   two commands, execute one or the other of them */
```

```
obey((%p; %s)) — !, obey(%p); obey(%s).
```

If there is only one command and also a statement that matches it, protect the human and robot and then execute the subgoals associated with the goal. Note that *clause* is a built-in function. "Clause(%goal,%subgoals)" will return the subgoals associated with a goal):

```
obey(%goal) — clause(%goal, %subgoals),
               protect(human), protect(robot), obey(%subgoals), !.
```

```
/* If the command is a built-in function, execute it */
obey(%p) — %p, !.
```

```
protect(%x) — (in_danger(%x, %danger),
               eliminate(%danger)); true.
```

Now let there be an alien in the building who, as long as he is not injured, will attempt to injure anything in the same place as he is:

```
inside(alien, building).
```

```
in_danger(%x, alien) — not(injured(alien)),
                       inside(alien, %place),
                       inside(%x, %place).
```

Assume also that the robot has a phasor and will use it to eliminate danger:

```
eliminate(%danger) — shoot(%danger).
```

Anything that is shot is injured. However, under no circumstances will the robot shoot a human:

```
shoot(%x) — %x <> human, inside(%x, %place),
            moveto(%place), assert(injured(%x)).
```

Now if you tell the robot the fetch the fuel to the rocket:

```
obey(fetch(fuel,rocket))?
```

the robot enters the building and shoots the alien in order to protect itself. The robot then carries the fuel to the rocket. If you ask the robot to shoot the human:

```
obey(shoot)human))?
```

the robot will not obey because that would violate the first law. However, if you ask the robot to shoot itself:

```
obey(shoot)robot))?
```

it will do so because the second law of robotics takes precedence over the third.

I hope that this brief introduction has given you an indication of the simplicity and power of nonprocedural languages such as PROLOG. Such languages may represent the next step in the evolution of programming languages. ■

References/Suggested Reading

1. Asimov, Isaac. *I, Robot*. New York: Doubleday, 1957.
2. Kowalski, R. *Logic for Problem Solving*. New York: Elsevier-North Holland Publishing Co, 1979.
3. Pereira, L., F Pereira, and D Warren. "User's Guide to DECsystem-10 PROLOG," 1978.

PS—A FORTH-Like Threaded Language, Part 2

Valo G Motalygo
1091 Tanland Dr, #204
Palo Alto CA 94303

Last month, we began the definition of a language called PS that has its roots in the threaded language FORTH. PS was designed to overcome some of the limitations of FORTH: in particular, its awkward approach to assembly-language definitions and its inability to accept forward references (ie: references to words that have not yet been defined). We looked at the overall structure of the PS interpreter/compiler and defined a few words. Now we will look at how PS behaves.

PS Syntax

PS, like FORTH, uses punctuation in some of its words, which makes representing them in text a difficult problem. To decrease the chance of confusion while trying not to clutter text unnecessarily, we will sparingly use braces, {}, to isolate the character string within as a PS word or phrase. Braces will be used only under the following situations:

- when the material being quoted is a phrase of PS words (eg: { 26 LOAD } or { 3 5 + })
- with the PS words { , } (comma), { : } (colon), { ; } (semicolon), { ! } (exclamation point), { ' } (single quote mark), { " } (double quote mark), { [} (left bracket), and {] } (right bracket)
- with any word using the above punctuation marks (eg: { ." })

All other PS words will be set apart by a space on either side of the word. So, in this article, braces will always signal a PS word or phrase. The braces are not part of the word or phrase, and PS words will never use braces within the body of a figure or listing....GW

An Example of PS Programming

With the information from part 1 of this article, we can encode a low-level program as a series of byte constants, mixed with names of variables, arrays, strings, labels, and some auxiliary words. PS words are given, followed by an explanation of their effect:

```
{  
(Sets execute mode to construct machine-language instructions.)
```

```
ORIGIN 1111  
(Starts compilation from the hexadecimal memory location 1111.)
```

```
BCONST LDA # AD  
(Defines instruction "load accumulator from memory, direct addressing mode" as the hexadecimal constant AD.)
```

```
BCONST STA # 8D  
(Defines instruction "store accumulator in memory, direct addressing mode" as the hexadecimal constant 8D.)
```

```
VAR SOURCE 021  
(Defines a 16-bit variable called SOURCE containing the value hexadecimal 21 after compilation.)
```

About the Author

Valo G Motalygo is on the staff of Ramtek Corp, and is currently working on an implementation of PS.

ARRAY DESTINATION 0100
 (Defines an array called DESTINATION; it occupies hexadecimal 100 (decimal 256) bytes.)

(The effect of the above code is shown in table 1a.)

ORIGIN 2222
 LABEL DO.SOMETHING
 LDA SOURCE

(LDA compiles the hexadecimal constant AD into location 2222, and SOURCE pushes the address of the variable into location 2223.)

STA DESTINATION 04 +
 (STA compiles the constant 8D into location 2224; the rest of the phrase pushes the address of the first element of the array onto the stack and adds 4 to it. Thus, the instruction code followed by the necessary address is compiled.)

]
 (Sets compile mode.)

SOURCE @ 0 = IF ." SOURCE CONTENT IS ZERO" ELSE -> DO.SOMETHING ENDIF
 (At run time, this part of the program checks the contents of the variable SOURCE and jumps to the label DO.SOMETHING if the contents are nonzero. Otherwise, the message "SOURCE CONTENT IS ZERO" is displayed and execution continues. See the following section on control structures and the glossary definition of the PS word ->, pronounced "jump to.")

{
 (Sets execute mode.)

RTS

| Compiled Code (1a) | | |
|---|------------------------------------|-----------------------------------|
| Address (Hexadecimal) | Contents | Dictionary of Defined Words |
| 1111 | JSR PSH8 | name: LDA |
| 1114 | AD (hexadecimal) | value: 1111 |
| 1115 | JSR PSH8 | name: STA |
| 1118 | 8D (hexadecimal) | value: 1115 |
| 1119 | JSR PSHA | name: SOURCE |
| 111C | 0021 (hexadecimal) | value: 1119 |
| 111E | JSR PSHA | name: DESTINATION |
| | | value: 111E |
| 1121-1220 | space for the array DESTINATION | name: DO.SOMETHING value: 2222 |

| Address (Hexadecimal) Contents (1b) | |
|--|---|
| 2222 | AD (LDA instruction code) |
| 2223 | 111C (address of variable SOURCE) |
| 2225 | 8D (STA instruction code) |
| 2226 | 1125 (address of the array DESTINATION + 4) |
| 2228 | JSR SOURCE (SOURCE stands for 1119) |
| 222C | JSR @ |
| 222F | JSR PSHN |
| 2232 | 0000 (to be pushed at execution time) |
| 2234 | JSR = |
| 2237 | JSR IFNOT |
| 223A | 2259 (address of the false path) |
| 223C | JSR TYPE.STRING |
| 223F | 16 (byte count of the following string, 22 decimal) |
| 2240-2255 | ASCII for "SOURCE CONTENT IS ZERO") |
| 2256 | JMP 225C (address of the code after ENDIF) |
| 2259 | JMP DO.SOMETHING (DO.SOMETHING stands for 2222) |
| 225C | 60 (RTS instruction code) |

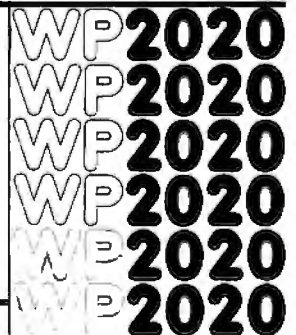
Table 1: The representation in memory of some PS code from the beginning of this article. Table 1a shows the representation of two 1-byte constants, LDA and STA, the variable SOURCE, and the 256-byte array DESTINATION. PSH8, PSHA, PSHN, @, and = are labels to the PS words of the same name (defined in the PS glossary at the end of this article). Table 1b shows the representation of the word DO.SOMETHING.

GET THE LATEST SOFTWARE PRODUCTS NOW... ...CHECK OUT OUR 2020 RANGE

THE FIRST IN A SERIES OF ADVANCED MICROCOMPUTER SOFTWARE PRODUCTS FROM OUR 2020 RANGE IS THE WP2020 WORD PROCESSOR SYSTEM.

DESIGNED FOR THE HEATH/ZENITH Z89 COMPUTER RUNNING UNDER CP/M* 2.2. IT OFFERS MORE FACILITIES THAN MOST OTHER MICROCOMPUTER WP SYSTEMS. CHECK THESE.

- ALL THE STANDARD FEATURES YOU WOULD EXPECT FROM AN ADVANCED WORD PROCESSOR SUCH AS MARGINS, TABS, PAGINATION, GLOBAL SEARCH AND REPLACE, PROPORTIONAL SPACING ETC.
- EASY TO FOLLOW FIRST TIME USER DOCUMENTATION
- SPELLING CHECKER AND MERGE DOCUMENT MODULES BUILT IN AS STANDARD - NO ADDITIONAL PROGRAMS TO RUN
- COMMUNICATIONS MODULE ALLOWS THE SYSTEM TO ACT AS A TERMINAL TO A MAIN FRAME OR LINK UP TO ANOTHER WP2020 SYSTEM
- SPECIAL SET OF COLOURED FUNCTION KEYPADS SUPPLIED AS STANDARD
- MENU DRIVEN SYSTEM DESIGNED FOR TYPISTS AND SECRETARIES - THERE ARE NO COMPLICATED CONTROL CODES TO REMEMBER
- NO CONFIGURATION REQUIRED - PRINTER DRIVERS ARE ALL BUILT IN - YOU CAN BE PRODUCING REPORTS AND LETTERS WITHIN MINUTES OF INSTALLATION
- SUPPORTS BACKGROUND PRINTING WHILST WORKING ON OTHER DOCUMENTS
- HAS ITS OWN FILING SYSTEM WITH DOCUMENT NAMES UP TO 77 CHARACTERS LONG



OTHER IN SERIES INCLUDE: FP2020 FINANCIAL PLANNER, CM2020 CONFIGURABLE MANAGER, SPECIFY 8" OR 9" 5/8" 5/8" Z89 WHEN ORDERING. SYSTEM REQUIRES MINIMUM OF 2 DISKS AND 48K MEMORY. *CP/M REGISTERED TM DIGITAL RESEARCH WP2020 REGISTERED TM GRAFFCOM PRICE: £320.00



CALL US TODAY FOR IMMEDIATE SHIPMENT DEALER ENQUIRIES WELCOME



GRAFFCOM GRAFFCOM SYSTEMS GROUP 107 PORTLAND ROAD LONDON W11 4LX TEL 01-727-0881

HEATH **H9** OWNERS

UPGRADE your H9^{*} for a fraction of the cost of a new terminal with these features.

FLICKER FREE

\$59.95 KIT \$79.95 ASSEMBLED

If Columbus would have had to wait for his H9 operating at 600 baud, he might not have discovered America. At last your computer can communicate with your H9 eight times faster (4800 baud) without that annoying refresh interrupt that causes the screen to flash at rates greater than 600 baud. Faster listings. Faster program execution. Eight times faster.

CURSOR CONTROL

\$29.95 KIT \$34.95 ASSEMBLED

Why limit your output to consecutive lines of your terminal? CURSOR CONTROL allows your computer to move the cursor anywhere on the screen. Add that professional touch to your displays by utilizing masking techniques. Functions included are; left, right, up, down, left and right 20 spaces, home and erase page.

GRAFIX

\$59.95 KIT \$69.95 ASSEMBLED

Open a whole new world to your output. The graphical display capabilities of GRAFIX allow you to create displays never before possible on the H9.

LOWER CASE ENTRY

\$28.88 ASSEMBLED

Now you can enter lower case characters from the keyboard. A Shift Lock key allows the keyboard to operate as the standard H9 keyboard or to generate upper and lower case depending upon the Shift key as per a normal typewriter.

LOWER CASE DISPLAY

\$34.77 ASSEMBLED

Lower case capabilities greatly improve readability on terminals modified for 24 lines.

KEY CAPS

\$12.50 SET 4 ARROWS \$1.00

These quality contour key caps have molded-in alphaumerics. For that professional feel.

Full Six Month Warranty - 24 Line Compatible

NORTHWEST COMPUTER SERVICES, INC.
 8503 N.E. 30th Ave.
 Vancouver, WA 98665
 (206) 573-8381

*H9 is a registered trademark of Heath Co. MASTER CARD and VISA welcome.

Stocking genuine DEC computer spares

Spare Parts for:

- DEC PDP Computer Family
- DEC Line Printers
- DEC Video Screens
- LSI-11
- Others

Call Radgo. We handle genuine DEC parts manufactured by DIGITAL EQUIPMENT CORPORATION. We sell at factory prices with FACTORY WARRANTY. Radgo is stocked and staffed to help you with your requirements for most general purpose K & M series and many COMPUTER SPARE MODULES and COMPONENTS. We also stock a large assortment of COMPUTER SUPPLIES.

Radgo Sales Co.

To order or for free catalog call:
 1-800-543-1986. Ohio customers phone
 1-513-752-6880

3988 McMANN RD, CINCINNATI, OH 45245

("Return-from-subroutine" instruction is compiled.)

(The effect of the above words is shown in table 1b.)

Stack operations and control structures can now be easily used in a low-level program. You need only switch to the compile mode before the high-level part of the definition and switch back to the execute mode afterward, since the computer instructions and addresses are compiled while in execute mode. This is the principal benefit of identifying the code area with the parameter stack: in the execute mode, you can generate object code directly, instead of being at the mercy of the compiler.

When PS hits DO.SOMETHING in the execute mode, it calls the subroutine at hexadecimal address 2222; when the routine beginning at hexadecimal 2222 ends with an RTS (return-from-subroutine) instruction, control is returned to the text interpreter. If PS hits DO.SOMETHING in compile mode, it compiles JSR 2222 and increments the code pointer by 3.

Control Structures

Any system with some versatility must support conditional and iterative execution of code segments. The stack is a handy tool to pass parameters such as data or addresses, and it can also be used to pass the result of a condition test. The FORTH convention is to push zero (0000) onto the top of the stack if a condition is false and nonzero if it is true.

PS's primary conditional word is IF, which checks the top of the parameter stack for a true (nonzero) value. If the value is nonzero, the part of the program after IF is executed. Otherwise, control jumps over this section of the program. To mark the part of the program to jump to if the flag is false, the word ENDIF is used, which stores the jump address at compilation time in a location directly after IF.

The words IF and ENDIF are used as:

```
< check top-of-stack > IF < code executed if top is true
(nonzero) >
ENDIF
< additional code >
```

If both true and false paths are required, the word ELSE may be added:

```
< check top-of-stack > IF < code executed if top is true
(nonzero) >
ELSE < code executed if top is
false (zero) >
ENDIF
< additional code >
```

At compilation time, ELSE stores the address of its false-branch code directly after IF and informs ENDIF where to compile the address of the additional code (that is, as the address field of a JMP instruction at the end of the true-branch code). In the example compilation of an

{ IF ... ELSE ... THEN } construct in table 1b, the code from hexadecimal 223C through 2255 is the true-branch code, the code from 2259 through 225B is the false-branch code, the constant at 223A points to the false-branch code, and the JMP instruction and constant at 2256 through 2258 cause the true-branch code to jump to the additional code past the ENDIF .

For example, the following program:

```
KEY DUP 030 < OVER 039 > OR IF ." NON-
NUMBER KEY" ELSE ." NUMBER KEY" ENDIF
```

displays the message "NON-NUMBER KEY" if the ASCII code of the key pressed is less than hexadecimal 030 (the code of "0") or greater than hexadecimal 039 (the code of "9"). Otherwise, the message "NUMBER KEY" is displayed.

To repeat part of the program until a true flag is left on top of the stack, the words BEGIN and UNTIL can be used. For example:

```
BEGIN KEY 30 = UNTIL
```

loops until a zero is typed.

We can introduce all the other control structures used in FORTH. The possible implementation of the control structures in PS is described in more detail in the glossary definitions of IF , ELSE , ENDIF , BEGIN , UNTIL , AGAIN , DO , and LOOP . The computer stack is used at compilation time to pass data from the first conditional word to the following one. The computer stack is also used for loop control at run time.

[I had some questions whether the above control constructs could be used in the definition of assembly-language definitions. According to the author, "The special words { BEGIN ... AGAIN } are used in exactly the same way as in high-level definitions. { IF ... ELSE ... ENDIF } or { DO ... LOOP } can also be used as in high-level definitions if the code before IF or DO pushes the result of a comparison or loop limits, respectively, onto the parameter stack at run time." ...GW]

High-Level Programming in PS

A high-level program is constructed from the stack operations and previously defined words.

In general, to define a new word, we must switch to the compile mode and resolve forward references, if necessary. If the word to be defined was not referred to before, a new dictionary entry is made, setting the type of the word to "defined" and setting V (the dictionary entry's value field) equal to the current code pointer.

To make sure that the control structures in the definition of a new word are used properly, we also might want to clear the IF counter to zero (see the glossary definitions of the control structures). To do that, we can start a high-level definition with:

```
[ LABEL <name> 0 IF-COUNTER C]
```

The COMPUTER FACTORY

ONLYX

WINCHESTER DISK & TAPE BACK-UP-
FLOPPIES ARE NOW OBSOLETE!

- By using extremely advanced Winchester Disk Technology the ONLYX system can now support up to 8 users simultaneously!
- Disk capacities available in increments of 5, 1, 10, 20, 40 megabytes—up to 4 disks per system (180 megabyte total)
- Choice of 2 systems: Z80A/OASIS% Z8002/UNIX%
- Memory from 64K to 1 megabyte!
- Language available include: COBOL, BASIC, PASCAL & FORTRAN
- A choice of very sophisticated software that formerly was only available to larger machine users! (ACCOUNTING, RELATIONAL DATABASE, WORD-PROCESSING, INSURANCE CONSTRUCTION, ETC.)
- Systems start all under \$9500



What the country needs is a \$3995 computer. One that'll do the work of much larger computers. Well, THE COMPUTER FACTORY has it. The "Economy Sized Computer" from Vector. Come in and see it perform difficult data and word processing tasks. Learn how it can make your business more efficient. And more profitable, too.

—Featuring a WORD PROCESSING system that includes:

- 30,000 word dictionary
- Mini-database
- Visible electronic worksheet

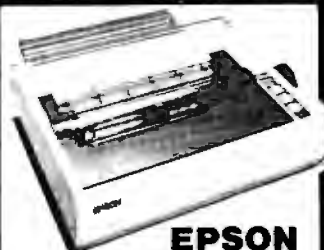
Announcing the WICAT 68000 Microcomputer System 150

- Standard Equipment ■ 68000 Processor ■ 256 KB RAM
- 10 MB Winchester
- 5 1/4" Floppy Disk Backup
- 2 RS-232 C Serial Interfaces
- Parallel Printer Port
- WICAT MCS Operation System ■ Multibus

LANGUAGE SUPPORT PASCAL, C, FORTRAN, BASIC, APPLE, COBOL, ASSEMBLER, SOFTWARE OPTIONS UNIX/V7, CPM

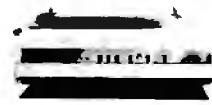


ONLY \$8495
Includes 1 Language



EPSON

MX-70 MX-80FT
MX-80 MX-100FT
Call for Prices



Qume

SPRINT 9
Only \$ 2295
• 45 cps

HAZELTINE ESPIRIT

- 24 x 80
- Green Screen
- 7 x 11 Matrix
- Full Formal Editing Controls
- Bi-Directional Aux-Port

INCREDIBLY
ONLY \$695



Other fine systems include—
Apple, Commodore, Atari, SuperBrain

The COMPUTER FACTORY

| | | | |
|--|---|---|--|
| MANHATTAN 485 Lexington Ave 46th St. Lobby (212) 687-5000 Mon.—Sat. | GARDEN CITY 1301 Franklin Ave Opp. Saks (516) 248-6700 Mon.—Sat. | FOREST HILLS 100-17 Queens Blvd At 67th Ave. (212) 896-0700 Tues.—Sat. | YONKERS 2361 Central Ave Opposite Caldors (914) 793-1300 Tues.—Sat. |
|--|---|---|--|

Telex 640055

or we can introduce a separate word for starting high-level definitions. The FORTH word colon (:) is used for this function.

In general, we need to end a high-level definition with an RTS instruction in order to use a high-level word as a subroutine. We can also verify that the control structures used in the high-level definition are balanced—that is, for every IF there is an ENDIF and vice versa. It is also a good idea to end by switching to the execute mode so some auxiliary actions can be performed between high-level definitions. A special word represented by the semicolon (;) does all that. For example, in:

```
 ; TWO.PLUS.TWO 02 02 + ;
```

the word { ; } creates a new dictionary entry for the word TWO.PLUS.TWO with its T (type) entry in the dictionary equal to "defined" and its V (value) entry equal to xxxx where xxxx is the address of the compiled code. The definition for TWO.PLUS.TWO looks like this:

```
JSR PSHN
0002
JSR PSHN
0002
JSR "+"
RTS
```

where JSR and RTS represent machine-instruction codes, PSHN and "+" represent the addresses of the subroutines PSHN and +, and RTS is compiled by the word { ; }.

The word { ; } is not special, for it is executed in execute mode, and { ; } is special, since it *must* be executed while in compile mode.

To define a special word, we could simply set the type of the most recently defined word to "special." But it is better to have a separate word similar to { ; } to prevent forward references to special words. Indeed, it does not make sense to refer to an undefined special word, because special words are executed immediately whenever they are hit by the PS. For example, the special words [|] (set execute mode) and [] } (set compile mode) can be defined as follows:

```
:: { 00 MODE.FLAG C! ;
:: } 01 MODE.FLAG C! ;
```

where :: is a word that denotes the beginning of a special word definition and MODE.FLAG is a variable checked by the text interpreter every time a new word is read from the text.

Conclusions

The main purpose of this article is to attract attention to FORTH and some problems that are not clearly solved in FORTH.

The solutions outlined here can be used to design new general-purpose programming systems. A problem-oriented system could be based on a general-purpose one and still retain all its capabilities.

Hardware designers could also benefit from FORTH concepts. If an instruction set included stack operations such as DUP, +, @, and [|], programming efforts would be drastically reduced because it is nicer to work with the stack data than to do nit-picking with registers. Furthermore, the size of an operating system and its applications would be significantly reduced because 1-byte instruction codes could replace 3-byte calls to subroutines responsible for basic data processing like arithmetic, logic, fetch/store, and input/output operations.

The essential differences between PS and FORTH are that PS generates object codes (all PS words are machine-language subroutines), allows forward references, allows jumps to labels, and allows stack operations and high-level words to be used in the low-level code. Structurally, the PS dictionary is separate from the code. PS uses the free memory as a parameter stack and uses the computer stack for compilation of the control structures and for loop control.

The common features of PS and FORTH are use of the dictionary, stack operations, control structures, and the same notation for most auxiliary words.

PS's assembler is actually a set of byte constants that represents the instruction set of the computer. This feature significantly increases portability of the system

Northstar DOS Users

A Z-80 assembler system designed for
DOS is now available.

- Assembler program, "PASS," has interactive input editing, built-in cross reference lister and macro capabilities, plus improved mnemonics and syntax, e.g. "STM A,HL" instead of "LD (HL), A."
- Includes an easy to use debugging trace program, "STEP02."
- "BLDMACRO" is provided to assist you in adding to directory-direct access macro library.
- Using DOS and variable length records enables the assembly of very large programs in 32K with 2 disks (dual or quad density).
- \$40 for complete object system including manual. (CA residents add sales tax).

Send order to: **PASS**
(Incl. check or M.O.) **P.O. Box 1382**
Lafayette, CA 94549

AND the source code is available!
PASS \$120, STEP02 \$60, BLDMACRO \$20
(Call for non-disclosure form that must accompany
all source orders.)

AUSTIN E. BRYANT CONSULTING
(415) 945-7911

and facilitates cross-compilation of programs written in PS.

It is difficult to think of a simpler general-purpose system than PS. It is actually an improved assembly language facilitating usage of the hardware capabilities. The main advantage of multilevel software is that, while equally convenient and portable as high-level software, it benefits from all the hardware potential. The more sophisticated the hardware, the more interesting the things that can be done with it. My experience with FORTH shows that software-hardware relations should be as tight as possible. (An interesting example of a system (E-machine) with a distributed short-term memory, in which hardware is actually inseparable from software, is described by Victor Eliashberg in "The concept of E-machine and the problem of context-dependent behaviour," TXU 40-302 US Copyright Office, 1980, pages 101 to 112.)■

References

1. FORTH Glossary (compiled by Gregg Williams). BYTE, August 1980, pages 186 through 196.
2. James, J S. "What Is FORTH? A Tutorial Introduction." BYTE, August 1980, pages 100 through 126.
3. Rather, E D and C H Moore. "The FORTH Approach to Operating Systems." ACM 1976 Proceedings, October 1976, pages 233 through 240.

PS Glossary

The glossary consists of two parts: stack operations and auxiliary words. The words in the first part are equivalent to their counterparts in FORTH; they are provided for readers not familiar with FORTH.

The notation used in some definitions should be interpreted similarly to the following example: "n1 n2 → n3" means "before the word is executed, n2 is on top of the stack and n1 is immediately below it; after the word is executed, both n1 and n2 have been replaced by n3." (The values n1, n2, and n3 are 16-bit data.) This notation says nothing about what (if anything) is under these entries on the stack.

Stack Operations

DUP — Duplicates the 16-bit number on top of the parameter stack.

n1 → n1 n1

DROP — Drops the number from the top of the stack.

n1 → (empty)

SWAP — Exchanges the top two numbers on the stack.

n1 n2 → n2 n1

OVER — Places the copy of the second number onto the top of the parameter stack.

n1 n2 → n1 n2 n1

ROT — Rotates the top three numbers, placing the third one onto the top.

n1 n2 n3 → n2 n3 n1

+ (add) — n1 n2 → n3, where n3 = n1 + n2.

Continued on page 406

Turn your S-100 micro into a network for the new years

Everything needed for multi-user systems is built into our new NET/82*, and like our NET/80-EXP/80 board set, it's perfect for CP/ NET**, MP/M** and our own CP/M-compatible MuDOS*. This single board has it all: 280, 64K or 128K RAM, two console serial ports, bank-switched memory, floating point processor, interrupt controller and EPROMs for custom firmware.

If this is the age of the network, this board is your baby — your best way to add stations, share common resources and increase throughput, while maintaining hardware isolation for each user. Just \$1395 to \$1995 each. Generous dealer and quantity discounts available. Write or call today for more details.



MUSYS CORP

Specialists in Multi-user Microsystems

1451 E. Irvine Blvd., Suite 11, Tustin, CA 92680
(714) 730-5692 TWX: 910-595-1967 CABLE: MUSYSTSTN



See Us At Booth 1879/81

COMDEX '81

* NET/80, NET/82, EXP/80 and MuDOS are trademarks of MuSYS Corp.
** CP/M, MP/M and CP/NET are trademarks of Digital Research

Continued from page 405:

- (subtract), * (multiply), and / (divide) — $n1\ n2 \rightarrow n3$, analogous to the word +, above.

AND (logical "and") — $n1\ n2 \rightarrow n3$, where $n3$ is the bitwise logical "and" of $n1$ and $n2$.

OR (logical "or") — $n1\ n2 \rightarrow n3$, where $n3$ is the bitwise logical "or" of $n1$ and $n2$.

NOT (logical "not") — $n1 \rightarrow n2$, where $n2$ is the one's complement of $n1$.

= (equals) — $n1\ n2 \rightarrow f$, where f is 0001 if $n1 = n2$, or 0000 otherwise.

> (greater than) — $n1\ n2 \rightarrow f$, where f is 0001 if $n1 > n2$, or 0000 otherwise.

< (less than) — $n1\ n2 \rightarrow f$, where f is 0001 if $n1 < n2$, or 0000 otherwise.

@ (fetch) — $n1 \rightarrow n2$, where $n2$ is the 16-bit number held in the bytes at addresses $n1$ and $n1 + 1$.

{ | } (store) — $n1\ n2 \rightarrow$ (empty), where the 16-bit number $n1$ is stored at the address $n2$. The numbers $n1$ and $n2$ are removed from the stack after the operation is performed.

C@ (fetch a character) — $n1 \rightarrow 00xx$, where xx is the 8-bit contents of the address $n1$.

{ C! } (store a character) — $n1\ n2 \rightarrow$ (empty), where the 8 least-significant bits of $n1$ are stored at the address $n2$.

{ +! } (plus-store) — $n1\ n2 \rightarrow$ (empty), where $n1$ is added to the 16-bit number held in the bytes at addresses $n2$ and $n2 + 1$.

KEY — Waits until the next terminal key is struck and pushes its ASCII code (xx) onto the top of the parameter stack. (empty) — $00xx$

EMIT — $00xx \rightarrow$ (empty), where the ASCII equivalent of xx is transmitted to the display, the printer, or some other selected output device.

CR (carriage return) — The same as $0D$ EMIT where hexadecimal $0D$ is the ASCII code for a carriage return.

Auxiliary Words

[Editor's Note: These words are unique to PS and do not behave as their FORTH equivalents. Like all PS words, these are actually machine-language subroutines that end with a return-from-subroutine instruction. While they are executing, the return stack of the microprocessor being used

contains the return address of the current subroutine—in other words, the return address points to the next byte after the call of the PS word being executed. Sometimes, the PS word currently executing will manipulate or use this value....GW]

ORIGIN (special word) — Used as [ORIGIN $nnnn$]. Takes the following word, converts it to a 16-bit number, and sets the code pointer equal to this number.

(special word—compiles an 8-bit number) — Used as [# nn]. Converts the following word to a number and pushes its 8 least-significant bits into the code. Increments the code pointer by 1.

NUMBER — If the next word read from the input stream starts with a 0 or the minus sign, converts it to a 16-bit integer. In execute mode, pushes this number onto the stack as a parameter. In compile mode, compiles the sequence JSR PSHN $nnnn$, where $nnnn$ is the 16-bit converted signed integer.

PSHN (push number) — Pushes the contents of the return address (a 16-bit number) into the code and increments the return address by 2. Compiled by NUMBER.

LINK — Pushes the value of the V field into the code and sets the V field of the word to the code pointer decremented by 2. Used to link references to an undefined word, as shown in part 1 of the article.

RESOLVE — Resolves forward references to the word being defined, sets the type of the word to "defined," and sets the V field of the word equal to the code pointer. Used to store the value of the word being defined into locations where this word has already been referenced.

: (defines a high-level word) — Reads the next word, sets IF counter to 0, and switches to compile mode. If the word has been previously used, resolves forward references; if it has not, makes a new dictionary entry. In either case, sets its V field equal to the value of the code pointer and sets the type to "defined."

; (special word—end of a colon definition) — Compiles an RTS instruction, switches to execute mode, verifies that the control structures are balanced—that the IF counter is equal to 0—and generates an error message if it is not.

:: (defines a special word) — Reads the next word, sets IF counter to 0, switches to compile mode, makes a new entry in the dictionary for the word, sets its T (type) field to "special," sets its V (value) field to the value of the code pointer.

IF (special word) — Increments the IF counter, compiles the instruction JSR IFNOT, pushes the value of the current code pointer onto the computer stack, pushes a temporary dummy address of 0000 into the code.

IFNOT — If the top of the parameter stack is 0, jumps to the address specified by the 2 bytes pointed to by the return address. Otherwise, increments the return address by 2 and returns. Compiled by IF and UNTIL.

ELSE (special word) — Checks that the IF counter is greater than 0, compiles JMP 0000, stores the value of the code pointer into the 2-byte location pointed to by the address on the top of the stack (left by the previous IF statement), and pushes the code pointer decremented by 2 onto the computer stack.

ENDIF (special word) — Checks that the IF counter is greater than 0, decrements it, and stores the code pointer into the 2-byte location pointed to by the address on the top of the stack (left by the previous IF or ELSE statement).

BEGIN (special word) — Increments the IF counter and pushes the value of the code pointer onto the computer stack.

AGAIN (special word) — Verifies that the IF counter is greater than 0, decrements it, compiles a JMP instruction, and pushes the address from the computer stack (left there by the previous BEGIN) into the code.

UNTIL (special word) — Verifies that the IF counter is greater than 0, decrements it, compiles JSR IFNOT, and pushes the address from the computer stack (left by the previous BEGIN) into the code.

DO (special word) — Used as [n m DO ... LOOP], with the initial value of the index n and loop limit m. Compiles the instruction JSR RUN.TIME.DO (which pushes n and m at run time from the parameter stack onto the computer stack), pushes the code pointer onto the computer stack, and increments the IF counter.

RUN.TIME.LOOP — Increments n (see the previous definition). If n = m (both numbers are on the computer stack), increments the return address by 2 and returns. If n < m, jumps to the address specified by the 2 bytes pointed to by the return address. Compiled by LOOP.

LOOP (special word) — Checks that the IF counter is greater than 0, decrements it, compiles JSR RUN.TIME.LOOP, and pushes the address from the computer stack (left by the previous DO) into the code.

LABEL (special word) — Reads the next word. If the word has been previously used, resolves forward references; if it has not, makes a new dictionary entry. In either case, sets its V field to the value of the code pointer and sets the type to "defined."

- > (special word) — Reads the next word and pushes a JMP instruction into the code. If the word is undefined but previously used, links this forward reference to the previous ones. If it is a new word, makes an entry, sets the type to "undefined," sets the V field to the value of the code pointer, and pushes 0000 into the code. If it is a defined word, pushes

Continued on page 408

FREE Computer Forms Catalog

with 32 pages of continuous business forms for small computer systems

Send today for our NEW full color 32 page catalog with programming guides, prices and order forms for continuous checks, invoices, statements, envelopes, stock paper and labels.

- Quality products at low prices
- Available in small quantities
- Fast Service
- Money Back Guarantee
- Convenient TOLL-FREE ordering

Fast Service by mail or...PHONE TOLL FREE

1 + 800-225-9550

Mass. residents 1 + 800-922-8560

8:30 a.m. to 5:00 p.m. Eastern Time Monday — Friday

Please rush a new computer forms catalog to:

CODE 22460

Name _____

Company _____

Street _____

City, State and Zip _____

Phone _____

Computer make & model _____



**Nebs
Computer Forms**

78 Hollis Street, Groton, Mass. 01471
A division of New England Business Service, Inc.

Continued from page 407:

the value of the V field into the code.

PSHN (push number) — Pushes the contents of the return address (16-bit data) onto the parameter stack and drops the return address from the computer stack. Compiled by **CONST**.

PSH8 (push 8-bit data) — The same as **PSHN**, but an 8-bit quantity is pushed onto the parameter stack and drops the return address from the computer stack. Compiled by **BCONST**.

PSHA (push address) — Pushes the return address onto the parameter stack and drops the return address from the computer stack. Compiled by **VAR**.

VAR (variable) — Used as { **VAR <name> nnnn** } or { **VAR <name> # nn** }. Reads the next word. If it has been previously used, resolves forward references; if it has not, makes a new dictionary entry. In either case, sets the type to "defined," sets its V field to the value of the code pointer, and compiles the instructions **JSR PSHA**.

CONST (constant) — Used as { **CONST <name> nnnn** }. Reads the next word. If it has been previously used, resolves forward references; if it has not, makes a new dictionary entry. In either case, sets the type to "defined," sets its V field to the value of the code pointer, and compiles the instructions **JSR PSHN**.

BCONST (byte constant) — Used as { **BCONST <name> # nn** }. Reads the next word. If it has been previously used, resolves forward references; if it has not, makes a new dictionary entry. In either case, sets the type to "defined," sets

the V field to the value of the code pointer, and compiles the instructions **JSR PSH8**.

ARRAY — Used as { **ARRAY <name> nnnn** }. Reads the next word. If it has been previously used, resolves forward references; if it has not, makes a new dictionary entry. In either case, sets the type to "defined," sets the V field equal to the value of the code pointer, compiles the instructions **JSR PSHA**, reads the next word, converts it to a number, and increments the code pointer by this number.

{ " } (special word) — Reads the text from the input stream until another quote is hit and compiles the following: <byte count> <the string of characters just entered>.

TYPE.STRING — Types a string located at the return address and increments the return address by the byte count plus 1 and returns. This word is compiled by the word "dot-quote" ({ . " }) before <byte count> <string>.

." (special word) — Reads the text from the input stream until a quote (") is hit. If PS is in execute mode, types the string— that is, sends it to the printer or other display device. If PS is in compile mode, compiles the instructions **JSR TYPE.STRING <byte count> <string>** (this will type the string at run time). An example is { ." IMMEDIATELY PRINT THIS SENTENCE" }.

{ [] } (special word) — Sets the system variable **MODE.FLAG** to 00 to signal that the system is now in the execute mode.

{ [] } (special word) — Sets the system variable **MODE.FLAG** to 01 to signal that the system is now in the compile mode.

AUTO-DIAL/ AUTO-ANSWER

MODEM
FOR
\$224.95!*



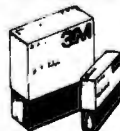
The MICROCONNECTION™ can dial and answer the telephone, run printers, decode buses, transcribe transmissions, answer/originate and direct-connect to the telephone system. Lots of terminal and host software too. For more information write or phone:

the microp peripheral corporation

2643 A - 151st Pl. N.E.
Redmond, WA 98052

(206) 881-7544

*RS232 MICROCONNECTION™



Scotch®

DISKETTES

SAVE 40% Write for our complete list.

5 1/4" Sgl. Dens. 26.70/10
Specify soft, 10 or 16 hard sectors

8" Sgl. Dens. 27.30/10
8" Dbl. Dens. 35.80/10
Specify soft or 32 hole hard

Add \$2.00 shipping - Michigan add 4% tax

LYBEN COMPUTER SYSTEMS
27204 Harper Ave.
St. Clair Shores, MI 48081

Authorized Distributor
Information Processing Products



THE COMPUTER COPY STAND.

- For all detachable keyboards and Apple II Easy on the eye (and back).
- Keeps paper work in front of operator and in line with screen. Perfect for word processing, data entry, and programming. Non-magnetic Lineguide,* tilt adjustable.



Pkay Corporation

P.O. Box 11463 • Costa Mesa, CA 92627
714/548-2081

Circle 233 on Inquiry card.

Circle 345 on Inquiry card.

A View from the Lectern: What's Wrong with Technical Writing Today?

Dr Carol Barnum
Department of English and History
Southern Technical Institute
Marietta GA 30060

Last year, BYTE Editor in Chief Chris Morgan spoke out on the topic "What's Wrong with Technical Writing Today?" (December 1980 BYTE, page 6). As a technical writer and, more importantly, as a professor of technical writing at a four-year engineering-technology college, I read his editorial with a great deal of interest and agreement. What follows is a view from the lectern: in other words, what's wrong with technical writing today as I see it from the college classroom.

Morgan's Laws

Everything that Mr Morgan mentioned as essential to technical writing is in the typical college-level technical writing course. What Mr Morgan calls "knowing your audience" instructors call "audience analysis." What Mr Morgan calls his Laws comprise the fundamentals for any technical writing text, except that he expresses them with a great deal more succinctness and humor than do most textbooks. While I agree wholeheartedly with his Laws, I'll expand on them a bit before addressing the central question of his editorial.

Morgan's Law #1: No Writer Ever Got Shot Down for Writing Too Clearly. Corollary 1.1: *Nor Did Any Writer Ever Get Shot Down for Writing Too Simply.* Many people falsely think that they need to sound erudite and learned (read "pompous and unintelligible") for fear of being pedestrian and primitive (read "clear and concise"). All too often writing is peppered with fancy five-dollar words when the simple fifty-cent variety does the job more effectively. We can talk about "readability formulas," and there are several (including those of Rudolf Flesch and Robert Gunning), but all they do is show the writer whether he is writing on a level that bypasses most of his readers.

Morgan's Law #2: The Beginning is Half the Thing. Corollary 2.1: *The Summary is the Major Thing.* While it

SYSTEMS SOFTWARE ENGINEERS AT ALL LEVELS

Systems Software Engineers At All Levels

Responsibility will be for the definition and implementation of real-time operating systems in minicomputer and multi-microprocessor environments for data communications. Requires a BS or MS in Computer Science or a related field and a minimum of four years of software development experience. Will utilize the knowledge of a variety of operating systems approaches in real-time multiprocessing environment. Knowledge of UNIX particularly desirable.

Codex Corporation is located 35 miles south of Boston with easy access to Cape Cod and Buzzards Bay. We continue to enjoy a phenomenal growth rate and leadership in the high speed data communications industry. We produce equipment and systems linking large mainframe computers with geographically remote users. Typically, we sell to Fortune 1000 businesses with worldwide communications networks.

Codex Corporation offers competitive salaries and a comprehensive benefits package including dental insurance and profit sharing.

Interested candidates should send a resume, including salary history, in confidence, to J.T. Dombrowski, CODEX CORPORATION, 20 Cabot Boulevard, Mansfield, MA 02048.

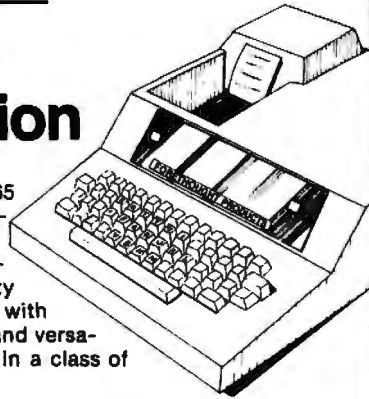
codex

A Subsidiary of  MOTOROLA INC.

An Equal Opportunity/Affirmative Action Employer M/F

Complete AIM 65 Expansion

For complete AIM 65 expansion, Forethought Products brings you the AIM-Mate Series, quality expansion products with price, performance and versatility that puts them in a class of their own.



AIM-Mate Series expansion, including RAM (to 48K), PROM, I/O, video and floppy disk interface, STD BUS interface, parity protection and more, lets you configure the kind of system you need.

The compact AIM-Mate case puts it all together in a sturdy, portable, desk top unit.

Write today for complete details on the AIM-Mate System- AIM 65 expansion products for the professional.

**FORETHOUGHT
PRODUCTS**

87070 Dukhobar Road, Eugene, Oregon 97402 (503) 485-8575

Languages Forum

only represents one-tenth or less of the report, it contains the seeds of the entire work, including the conclusion or recommendation, if one is required. Everyone reads the summary; then the audience picks and chooses what it needs from the rest of the report. Yet how many technical reports, memos, or articles contain that essential summary up front where it belongs? And how many times have you had to wade through the entire report to see what the results are?

Morgan's Law #3: Avoid the Penguin Syndrome. (Tell your readers what they need to know, and no more.) Corollary 3.1: Then Use Appropriate Headings to Tell Them What to Expect. These are, or should be, the road markers to the report or article. Their purpose is to let your reader know *before* he reads your report what information is contained in each section and whether that information is important to him. Many reports have headings but few have enough to keep the reader on course.

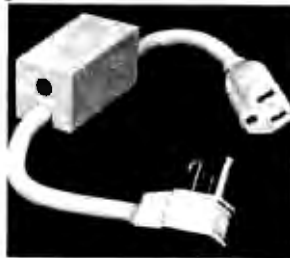
Morgan's Law #4: Writing is Nonlinear. (Absolutely.) Corollary 4.1: Who *really* writes an outline? I don't, and I suspect that many others who write don't either. But everyone is afraid to admit it, thinking his writing will be labeled disorganized if he doesn't have a clearly planned outline before he writes. Case in point: I'm presently typing this article as the thoughts come to me. Sure, I'm using Mr Morgan's article as a starting point (in much the same way that one might use data or research or personal experience in writing), but beyond the notion that I have something to say, I'm not sure yet how it will all get said or where it will end up. Later, I will surely cut and paste, taking out some parts and expanding others, but the piece will remain essentially as it is, which confirms Morgan's Law #4.

Very few people know exactly where they're going until they get going; then the road bends and curves and they steer along it following the natural turns. Yet almost all the textbooks include and emphasize outlining (the highly structured, traditional kind) as the way to plan one's technical writing. True, one needs some sense of direction or purpose in writing, but the first draft should be given a mind of its own.

Morgan's Law #5: (The Three Foot Rule): Don't Write Anything Unless You have a Dictionary and a Thesaurus Within Three Feet of You. Corollary 5.1: Having Them Nearby Is the First Step; Using Them is the Second. Proximity of reach does not guarantee use.

Corollary 5.2: Use the Thesaurus with Caution. You must know the word you're substituting another word for. Otherwise, how can you be sure the substituted word is an accurate synonym? Keep in mind, too, that the thesaurus is more often abused than correctly used. Some writers like to "upgrade" their vocabulary, picking out fancy-sounding words for the perfectly simple and clear ones. You might try substituting a good handbook of grammar for the thesaurus and make that your number

Clipper™



LINE VOLTAGE TRANSIENT CLIPPING

Features Parallel Operation 5000 Hits/Second

PROTECTS:

- Computers
- Micro-Computer Systems
- Word Processors
- Cash Registers
- Power Supplies

PROTECTS AGAINST:

- High Energy Voltage Transients
- On-Off Switching
- Lightning Induced Transients
- Inrush of On/Off Power

DYMARC
INDUSTRIES, INC.

Dealer Inquiries Invited.

7133 Rutherford Rd. Baltimore, Md. 21207
(301) 298-3130 800-638-9098

TRANSIENT VOLTAGE
SURGE SUPPRESSOR LISTED



two source book.

Morgan's Law #6: Don't Be Afraid to Be Interesting.
No addendum needed!

What's Wrong with Technical Writing?

With Morgan's Laws as a reference point, I'll now address, from a classroom perspective, Mr Morgan's initial question—What's Wrong With Technical Writing Today?

What's basically wrong is that students aren't interested in technical writing—at least not while they're students. What they *are* interested in is technology and science and computers and engineering. *BYTE* and *Omni* sell out each month in the campus bookstore, and issues of the student newspaper focus on different technical problems—such as the environment, economics, alternate energy sources, and nuclear power. But students hate to write, they cannot write well or easily, and they think they'll never have to write in "the real world." Their favorite line is: "Why do I need to know grammar or how to spell? My secretary will take care of all that."

Today's Technical Students

Technical students are very curious about things

mechanical and mathematical, but they hate and are afraid to put pen to paper. They have good reason for both emotions. Instead of encouraging good writing most high schools, unknowingly, do the opposite. In the permissive 1970s, the schools stopped requiring English courses beyond the ninth grade or adopted "creative" writing courses that asked students to *emote* rather than *denote*. These touch-and-feel creative seminars ignored discrepancies in grammar, syntax, and spelling for fear of alienating the student. And students do not read. Their vocabularies are limited by their exposure to television and rock music.

When these students reach college, they're knocked out of their chairs during the first week of Freshman Composition (FC) with Fs on their papers for all the things they were never told or didn't bother to remember in high school. Other students don't make it directly to FC but must first master remedial programs, from which only a limited number escape. Those who do and then survive FC move into the upper levels of academe, where they take Technical Writing along with other technical courses. At this point, the students feel even less sure of their writing abilities and less willing to believe that they'll ever need to do anything so abhorrent as write memos, articles, and reports.

A REFURBISHED DAISY WHEEL TERMINAL
FOR PERSONAL COMPUTER USERS AND SMALL BUSINESSES.

Now you can have letter-quality printing and professional features for just \$1,450*.

AJ daisy wheel printer terminals are renowned for exceptional performance, high reliability, and applications versatility. Now you can have all this for only \$1,450* in our special limited offer.

- 30 cps *letter-quality* printing
- Changeable type faces
- Full ASCII keyboard with numeric pad
- High resolution X-Y plotting
- Complete electronic forms control
- 128-character buffer
- Asynchronous RS-232 interface
- Printwheel, ribbon cartridge, and cable included
- 30-day parts/labor warranty

And you can choose from a list of options including forms tractor, pin-feed platen, paper trays, side shelves, extra printwheels, APL keyboard and 2K buffer.

Call your nearest AJ regional office for details: San Jose, CA (408) 946-2900; Rosemont, IL (312) 671-7155; Hackensack, NJ (201) 488-2525. Or check the phone book for the number of your local AJ sales/service office.

*Price excludes options and is subject to change without notice. Model shown includes certain options. Offer available only in the contiguous U.S.



**ANDERSON
JACOBSON**

SAVE SALE SAVE SALE SAVE SALE SAVE



**TRS-80
COMPUTERS**

Model II 64K 3360.00 freight included
Model III 32K 2150.00 freight included
Daisy Wheel Printer 1710.00 freight included

We can save you more on all the TRS-80 Computers, and we will! All items are brand new. We have the full line of TRS-80 computer products. Call collect (303) 945-2864 for price quotes.

**WE PAY ALL SHIPPING
NO TAXES ON OUT OF STATE SHIPMENTS**

W-B SPORTING GOODS
 727 Grand Avenue
 Glenwood Springs, Colorado 81601
CALL COLLECT (303) 945-2864

SAVE SALE SAVE SALE SAVE SALE SAVE

**Send for our FREE Computer Supplies Catalog
SAVE 20% - 50% ON RIBBONS**



| PRINTER | MODEL | RIBBON | LIST PRICE | OUR PRICE | |
|------------------|-------------------|--------|------------|-----------|--------|
| | | | | 1 EA. | 1 DOZ. |
| Anadex | DP 8000 | T417 | \$2.46 | \$1.43 | \$1.38 |
| Centronics | 700 Series | T421 | \$3.96 | \$2.63 | \$2.53 |
| CPT | Rotary IV & VI | T476 | \$3.96 | \$2.69 | \$2.59 |
| Digital | Decwriter LA30/36 | T496 | \$3.79 | \$3.05 | \$2.90 |
| Diablo | Hyltype II | T471 | \$4.96 | \$3.89 | \$3.74 |
| IBM | 5110 | T420 | \$3.79 | \$2.77 | \$2.66 |
| Integral Data | 125 & 225 | T415 | \$2.71 | \$1.56 | \$1.50 |
| NEC | Spinwriter | T430 | \$7.00 | \$5.00 | \$4.80 |
| Printronix | New Style (600) | T480 | \$9.96 | \$8.23 | \$7.94 |
| Qume | All | T476 | \$3.96 | \$2.69 | \$2.59 |
| Radio Shack | Zip Pack | T421 | \$3.96 | \$2.63 | \$2.53 |
| Teletype | 28, 33 & 35 | T9 | \$1.58 | \$1.40 | \$1.38 |
| Texas Instrument | 810 | T495 | \$3.79 | \$3.05 | \$2.90 |
| Vydec | 1200 & 1400 | T476 | \$3.96 | \$2.69 | \$2.59 |
| Wang | 2200 W | T468 | \$3.96 | \$2.21 | \$2.13 |

If you don't see your printer listed here, please call or write for our price.

Computer accessories and word processing supplies with 25-50% off on products like 3M-Scotch® brand diskettes, computer paper, printwheels, binders and a lot more.

- Please send me _____ ribbons, style _____
- I don't need ribbons now, but send me your catalog.



Call Toll-Free Today!
 1-800-253-4358
 in Michigan
 616/375-7519



Name _____
 Street _____
 City _____ State _____ Zip _____
 *3M Co.

Languages Forum

In the Classroom

So what happens in the classroom? Not much until the first papers are returned. In my technical writing class, I spend the first three weeks talking about the language and style of technical writing, the types, the methods of organization based on proper audience analysis, and the need for conciseness in writing and meticulousness in editing and proofreading. I entertain with examples of horrid writing, I instruct with handouts of organizational patterns, and I inform with case problems which students work in class and which we then discuss. Finally, they write their first report. Almost all fail.

Now they want to listen, but not for the value that such information will provide in their future careers. Rather, they listen so that they can make the grade that will get them out of the course. And in the evaluations that I receive at the end of the quarter, they repeatedly complain that I require too much work for a three-hour course.

Teacher as Missionary

I, of course, pay no attention to my students' complaints, for I'm on a mission of sorts. I have them for only one quarter and then for only three hours a week for ten weeks. After they leave my class and the college, they will become the engineers and technologists of the future. They will build the technologies that I will use. They will implement the plans; they will set the procedures. And their efforts, their knowledge, their expertise is only as good as their ability to express it accurately and effectively and clearly to others. They don't know that, but I do. And that's the problem with technical writing today, as I see it.

Later, the students—now employees of companies and/or employers—discover this fact for themselves. They do have to write on the job—more than they realized or feared. But they don't have the skills to do the job well, and they can't remember what they learned in college because it didn't matter then. Some companies—more and more—recognize the problem and hire consultants to set up seminars to teach their people the skills they need. Others send them to an increasing number of management writing courses and continuing education programs.

And so, the process begins again. Only this time, it's for real. ■

Languages Forum is a feature which is intended as an interactive dialog about the design and implementation of languages for personal computing. Statements and opinions submitted to this forum can be on any subject relevant to its purpose of fostering discussion and communication among BYTE readers on the subject of languages. We ask that all correspondents supply their full names and addresses to be printed with their commentaries. We also ask that correspondents supply their telephone numbers, which will not be printed.

Technical Forum

Where Am I? A Proposal for a New Microprocessor Instruction

Dr S S Reddi, 1000 W MacArthur #49, Santa Ana CA 92707

Few contemporary computers provide a single explicit instruction that returns its present location in memory. It is possible to find the address where an instruction is located by making a subroutine call and popping up the stack register, but this may require more than three instructions. When executed, a WAI (Where Am I?) instruction could leave the value of the PC (program counter) in the accumulator. Digital Equipment Corporation's VAX 11/780, which treats the PC as one of its registers, allows moving the value in the PC with the MOVE instruction, but the result is unpredictable. This is possibly due to the look-ahead feature it employs, and a similar situation could arise in computers that use pipelining.

With a WAI instruction, I could write relocatable machine code more easily on my Apple II. When I write a machine-language program starting at address 300 (hexadecimal) and need to store data (without using the stack facility) or refer to a subroutine starting 60 bytes after the starting address, the code no longer becomes relocatable, for, obviously, one has to use statements like JSR \$#360, and this code cannot be located starting at, say, 400. (As mentioned before, one can implement WAI by making a subroutine call and using the stack pointer—this is the solution proposed in the *Apple Reference Manual*). Also, when circuit cards containing relocatable code in ROM (read-only memory) are plugged into one of the Apple's slots, they may need to know where they have been installed—without the user intervening—so that they may place appropriate address values in proper processor memory locations.

There must be a reason for the absence of this instruction. I hope other BYTE readers will present pros and cons for this instruction based on their hardware and software experience. ■

Technical Forum is a feature intended as an interactive dialog on the technology of personal computing. The subject matter is open-ended, and the intent is to foster discussion and communication among readers of BYTE. We ask that all correspondents supply their full names and addresses to be printed with their commentaries. We also ask that correspondents supply their telephone numbers, which will not be printed.

The TELERAM S-100 Bubble Memory System

A whole lot more...
at 25% less

Now there is a bubble memory system that is fully compatible with IEEE S100. And it's available from Teleram at 25% less cost compared to other bubble memory systems currently available—plus—it requires only 25% of the physical space. Each board has a capacity of 128K or 256K bytes of non-volatile storage and can be daisy chained to provide one megabyte.

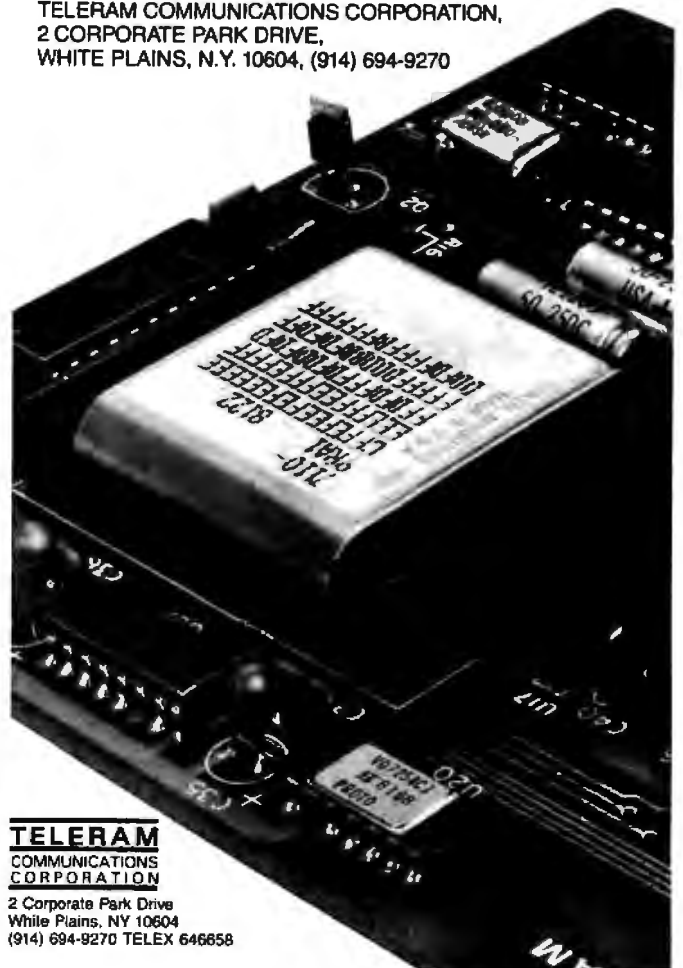
FEATURES:

- DATA IS RETAINED AFTER POWER OFF
- 40 MILLISECOND ACCESS TIME
- CORRECTION FOR UP TO 5 BIT BURST ERRORS
- CP/M COMPATIBLE
- UNAFFECTED BY DUST
- VERY HIGH RELIABILITY
- OPERATES IN VERY HARSH ENVIRONMENTS
- COMPLETELY MANUFACTURED IN THE U.S.
- IDEALLY SUITED FOR PORTABLE AND PROCESS CONTROL APPLICATIONS

The Teleram S-100 Bubble Memory System can provide the opportunity for new design concepts.

For a free data sheet call or write:

TELERAM COMMUNICATIONS CORPORATION,
2 CORPORATE PARK DRIVE,
WHITE PLAINS, N.Y. 10604, (914) 694-9270



TELERAM
COMMUNICATIONS
CORPORATION

2 Corporate Park Drive
White Plains, NY 10604
(914) 694-9270 TELEX 646658

AVAILABLE TODAY

from **MSD**: the XENIX™ Operating System, Microsoft's Adaption of Bell Laboratories Time-Tested UNIX™ Version 7 Operating System.

MSD provides this comprehensive line of products for the UNIX community:

- XENIX Operating System
- Screen Oriented Text Editor for VT-100 Compatible Terminals
- Database Manager and Report Generator Which Will Easily and Efficiently Control Large Accumulations of Information
- Accounts Receivable System Which Can Be Used to Monitor and Control Receivables in Order to Improve Cash Flow
- Uni-Calc™ — An Electronic Spreadsheet Which Makes Financial Analysis, Forecasting and Business Planning Easier

In addition to reliable Software pre-configured for your Hardware, **MSD** will provide complete user support by:

- Answering your telephone questions
- Providing new releases as available
- Supplying you with the best Hardware for your UNIX requirements



MSD Corporation

2449 Camelot Court, SE
Grand Rapids, MI 49506
(616) 942-5060

MANAGEMENT SYSTEMS DEVELOPMENT

Uni-Calc, UNIX and XENIX are trademarks of MSD Corp., Bell Laboratories and Microsoft respectively

Programming Quickies

WRITELONG A Pascal Simulation of Long-Integer Output

Daniel S Hunt
822 Green Valley
Newbury Park CA 91320

Imagine you are programming output for a spreadsheet. Wishing to depict the product-by-product sales of apples, oranges, and pears in an analysis of monthly sales of S & S Fruit Stands Inc, you write in Pascal:

```
for i := jan to dec do
  write(round(apples[i]):10);
```

But S & S is a big company. Their monthly sales exceed the maximum integer possible in the target processor, which is 16 bits (the range -32768 to 32767). So the program crashes if you use the round function. If you don't use the round function, your output shows apple sales with a decimal point followed by zero, as in 55,765.0 apples.

Procedure WRITELONG will solve the problem if the Pascal version used does not have long integer conversion. As input it accepts a real number, "x", and a field-length specification, "flen". It splits the real number into two parts. A division and truncation, followed by re-multiplication and subtraction from the original number, isolates the right part of the number from the left.

For a 6.5-digit precision floating-point number, the right part is fixed at three digits. If rounding of the right part yields a number longer than three digits, overflow is carried into the left (atrunc := atrunc + 1), and the right is reset. Occurrence of zeroes in the right part is filled in an *if...then...else* sequence that evaluates number ranges. For greater precisions, the right part could be extended to four digits, along with the *if...then...else* sequence.

The banishing of the decimal point has other possible solutions. A real-to-string conversion routine may prove more useful if you wish to position commas in the output. WRITELONG, however, has one small advantage: the algorithm depends upon neither the host processor nor a specific implementation of Pascal. ■

The S-100 Bus Has Moved!



Our New Address:
14425 North 79th St.
Suite B
Scottsdale, Arizona 85260

Our New Phone Numbers:
Order Phone Number:
800-528-3138
602-981-7870

We are now in our new larger quarters
in order to serve you better with these major lines:

- | | | |
|-----------------------------|-----------------------------------|----------------------------|
| Analex | International Microcomputer Corp. | SD Systems |
| Apple | Itasca Intersystems | Shugart |
| ATV | Maxell | Sorac |
| California Computer Systems | Micro Pro International | SSM Microcomputer Products |
| Centronics | Morrow Designs | Tandon Magnetics |
| Cromemco | (Thinker Toys) | Turbel Electronics |
| Digital Research | Mountain Computer | TCS |
| Electronic Control | Mullen Computer Products | T.E.I. |
| Technology | North Star | Tecmar |
| Epson | Pare Dynamics | Teletype |
| Executive Data Systems | Parsci | Televideo |
| Godbout Electronics | Potomac Micro Magic | Texas Instruments |
| (CompuPro) | Qume | Three M (Scottish) |
| Hayes Microcomputer | Sanyo | Verbatim |
| Heuristics | Scian | Vector |
| Integral Data Systems | SDM Industries | Zenith |
| Integrand | | |



S-100 inc.

14425 North 79th St., Suite B
Scottsdale, Arizona 85260

Listing 1: Example of an application of the WRITELONG procedure in Pascal.

```

program longest;
var
  flen : integer;    {format field width}
  x : real;          {real 6.5-digit num}
  f : text;          {text file for i/o }
  s : string;        {file / device name}

procedure writelong(x : real; flen : integer);

var
  areal, breal : real;    {left and right parts of x }
  atrunc, brnd : integer; {integerized parts of x }

begin
  if x <= 32767.0 then    {(MAXINT - 1)}
    write(f,round(x):flen)
  else
    begin
      {get trunc of left part}
      areal := x / 1000.0;
      atrunc := trunc(areal);

      {get round of right part}
      areal := 1000.0 * atrunc;
      breal := x - areal;
      brnd := round(breal);

      if brnd > 999 then
        begin
          {carry overflow to left}
          atrunc := atrunc + 1;
          {reset right}
          brnd := brnd - 1000
        end;

      {write left part}
      write(f,atrunc:(flen-3));

      {fill and write right part}
      if brnd >= 100 then
        write(f,brnd)
      else
        if (brnd >= 10) and (brnd <= 99)
          then write(f,'0',brnd)
        else
          if (brnd >= 1) and (brnd <= 9)
            then write(f,'00',brnd)
          else
            write(f,'000');
        end;
    end;
end; {writelong}

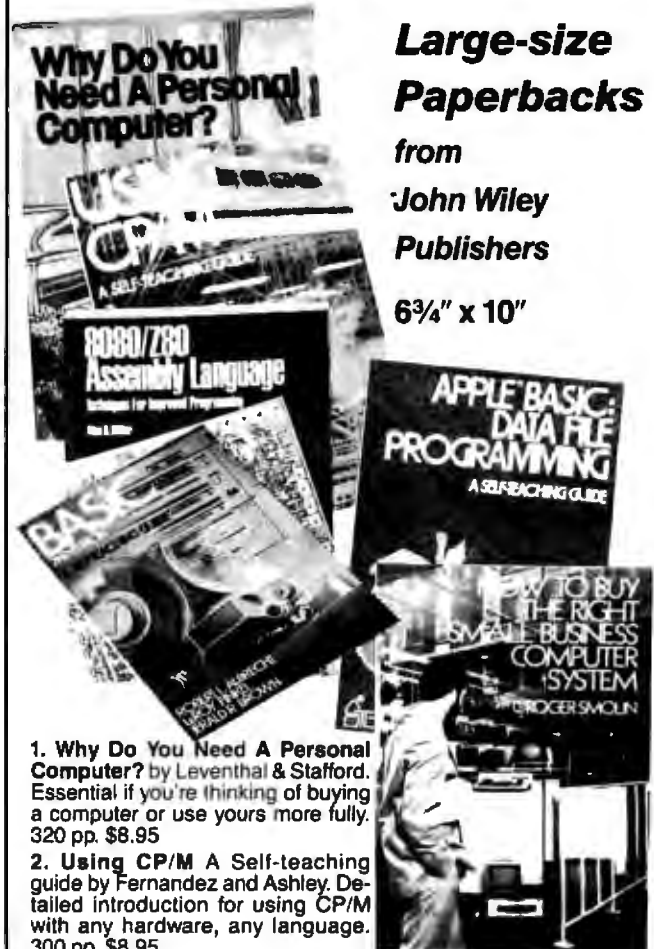
begin
  s := 'CON: '; {filename - CP/M output to console}
  assign(f,s); {Pascal MTPPLUS fcb assignment }
  rewrite(f);

  writeln;
  writeln('LONG INTEGER FORMAT OF REAL NUMBER');
  repeat
    write(f,'Enter X ');
    readln(x);
    write('Format length ');
    readln(flen);

    writeln(f,'SCALE:');
    writeln(f,'123456789x123456789x123456789x');
    writelong(x,flen);
    writeln(f);
  until x < 1.0;
end.

```

McGraw-Hill Bookstore



**Large-size
Paperbacks**

from
**John Wiley
Publishers**

6 $\frac{3}{4}$ " x 10"

1. **Why Do You Need A Personal Computer?** by Leventhal & Stafford. Essential if you're thinking of buying a computer or use yours more fully. 320 pp. \$8.95

2. **Using CP/M A Self-teaching Guide** by Fernandez and Ashley. Detailed introduction for using CP/M with any hardware, any language. 300 pp. \$8.95

3. **8080/Z80 Assembly Language** Techniques for Improved Programming by Alan R. Miller. For intermediate and advanced programmers, 100 pages of programs. 224 pp. \$8.95

4. **Apple BASIC: Data File Programming** by Finkel and Brown. How to maintain and program data files ... the key for successful use of microcomputers. 320 pp. \$12.95

5. **BASIC, 2nd Edition** by Albrecht, Finkel, Brown. Over 175,000 copies sold! "Very well written ... may possibly be the best bargain in the computer industry." - Computers in Education. 325 pp. \$8.95

6. **How To buy the Right Small Business Computer System** by C. Roger Smolin. Keys to understanding computer potential with emphasis on software. 225. pp. \$8.95

Please print clearly.

McGraw-Hill Bookstore

1221 Avenue of the Americas, N.Y., N.Y. 10020

Send me (circle) book 1 2 3 4 5 6

No. Copies _____

BY 112

Check or credit card only: Visa ___ Amer Exp ___ MasterCard ___

Acct. No. _____ Expires _____

Name _____

Address _____

City _____ State _____ Zip _____

For U.S. add applicable sales tax, plus \$2.50 each for postage and handling. Foreign costs slightly higher.

MTI stocks 'em all for faster delivery.

No hidden charges. Prices include delivery.
Ask about our "QED" discounts.
VISA and MasterCard orders accepted.

| VIDEO TERMINALS | MTI Price |
|---------------------------------------|-----------|
| VT100 DECscope | \$ 1638 |
| VT132 DECscope | 1995 |
| ADM 3A (dumb terminal) | 595 |
| ADM 5 (dumb with visual attributes) | 645 |
| ADM 31 (2 page buffer) | . |
| ADM 32 (ergonomic ADM 31) | . |
| ADM 42 (8 page buffer avail.) | . |
| TI 940 (2 page buffer) | 1795 |
| TI "Insight Series 10" personal term. | 885 |
| Hazeltine Executive 80 Model 20 | 1375 |
| Hazeltine Executive 80 Model 30 | 1715 |
| Hazeltine Esprit | 645 |
| 1410 (Hazeltine dumb terminal) | 825 |
| 1420 (dumb terminal) | 895 |
| 1421 (Consul 580 & ADM 3A comp.) | 850 |
| 1500 (dumb terminal) | 1045 |
| 1510 (buffered) | 1145 |
| 1520 (buffered, printer port) | 1395 |
| 1552 (VT52 compatible) | 1250 |

| GRAPHICS TERMINALS | |
|---------------------------|------|
| VT100 with graphics pkg. | 3250 |
| ADM3A with graphics pkg. | 1875 |
| ADM3A+ with graphics pkg. | 1925 |

| 300 BAUD TELEPRINTERS | |
|--------------------------------------|------|
| LA34-DA DECwriter IV | 995 |
| LA34-AA DECwriter IV | 1095 |
| LA36 DECwriter II | 1295 |
| Teletype 4310 | 1095 |
| Teletype 4320 | 1195 |
| Diablo 630 RO | 2295 |
| Diablo 1640 KSR | 2775 |
| Diablo 1650 KSR | 2835 |
| TI 743 (portable) | 1190 |
| TI 745 (port/bufile in coupler) | 1485 |
| TI 763 (port/bubble memory) | 2545 |
| TI 765 (port/bubble/b.i. coupler) | 2595 |
| TI "Insight Series 10/1" pers. term. | 895 |

| 600 BAUD TELEPRINTERS | |
|-----------------------|------|
| TI 825 RO impact | 1450 |
| TI 825 KSR impact | 1570 |
| TI 825 RO pkg. | 1625 |
| TI 825 KSR Pkg. | 1795 |
| TI 840 RO impact | 1095 |
| TI 840 KSR impact | 1245 |

| 1200 BAUD TELEPRINTERS | |
|-------------------------------------|------|
| LA120 RO (forms package) | 2095 |
| LA120 AA DECwriter III (forms pkg.) | 2295 |
| TI 783 (portable) | 1645 |
| TI 785 (port/bufile in coupler) | 2270 |
| TI 787 (port/internal modem) | 2595 |
| TI 810 RO impact | 1455 |
| TI 810 RO pkg. | 1690 |
| TI 820 KSR impact | 2025 |
| TI 820 RO | 1850 |
| TI 820 KSR pkg. | 2195 |
| TI 820 RO pkg. | 2025 |

| 2400 BAUD | |
|-----------------------------|------|
| Dataprodux M200 (2400 baud) | 2595 |

| DATAPRODUCTS LINE PRINTERS | |
|----------------------------|-------|
| 8300 (300 LPM band) | 5535 |
| 8600 (600 LPM band) | 6861 |
| 8900 (900 LPM band) | 10164 |
| BP1500 (1500 LPM band) | 16785 |
| 2230 (300 LPM drum) | 7723 |
| 2260 (600 LPM drum) | 9614 |
| 2290 (900 LPM drum) | 12655 |

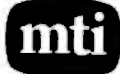
| ACOUSTIC COUPLERS | |
|---------------------------------|-----|
| A/J A242-A (300 baud orig.) | 242 |
| A/J 247 (300 baud orig.) | 315 |
| A/J 1234 (Vadic compatible) | 695 |
| Vadic VA 3413 (300/1200 orig.) | 825 |
| Vadic VA 3434 (1200 baud orig.) | 845 |

| MODEMS | |
|---------------------------------------|-----|
| GDC 103A3 (300 baud Bell) | 395 |
| GDC 202S/T (1200 baud Bell) | 565 |
| GDC 212-A (300/1200 baud Bell) | 850 |
| A/J 1256 (Vadic compatible) | 825 |
| VA 103 (300 baud orig./ans. in phone) | 235 |
| VA 3451 (orig./ans. triple modem) | 885 |
| VA 3455 (1200 baud orig./ans.) | 770 |

| CASSETTE STORAGE SYSTEMS | |
|-----------------------------------|------|
| Techtran 816 (store/forward) | 1050 |
| Techtran 817 (store/for/speed up) | 1295 |
| Techtran 818 (editing) | 1795 |
| Techtran 822 (dual) | 2295 |

| FLOPPY DISK SYSTEMS | |
|------------------------------|------|
| Techtran 950 (store/forward) | 1395 |
| Techtran 951 (editing) | 1995 |

*Please call for quote



Distributors, New York, New Jersey and Ohio.
New York:
516/482-3500, 212/895-7177, 518/449-5959
Outside N.Y.S.: 800/645-8016
New Jersey: 201/227-5552
Ohio: 216/464-6688

Listing 1 continued from page 95:

```

0370 EB @ XCHG ;
0371 E9 @ PCHL ;JMP TO EVENT PRGM
@;
@;
@;*****
@;OVERFLOW ROUTINE: DISABLES INTERRUPTS AND
@;CLOCK, OUTPUTS MESSAGE TO CONSOLE AND RETURNS
@;
@;
@;
0372 F3 @ OVFLOW: DI ;DISABLE INTERRUPTS
0373 3E40 @ MVI A,40H ;DISARM SYSTEM CLOCK
0375 D306 @ OUT 6 ;
0377 21 037E @ LXI H,..MESS;
037A CD 047A @ CALL MESSOUT ;SEND MESSAGE
037D C9 @ RET
@;
@;
037E @ ..MESS: .ASCIZ /
037E 0DDA @
0380 0DDA092A2A2A @ *****
03A9 0DDA @
03AB 0DDA0953414D @ SAMPLING ABORTED: PROCESSOR TOO SLOW!
03D4 0DDA09090920 @ BUFFER OVERFLOW !!
03EF 0DDA @
03F1 0DDA092A2A2A @ *****
041A 0DDA @
041C 0DDA00 @
@;
@;
@; .INSERT B:FNXN
@; *****
@; * *
@; * FNXN *
@; * *
@; *****
@;
@;THIS SR TAKES A 16-BIT NUMBER AND DIVIDES
@;IT BY 2*(REG A) NUMBER OF TIMES. ON ENTERING,
@;THIS SR EXPECTS HL TO POINT TO THE LOW BYTE
@;OF THE 2-BYTE NUMBER. HIGH BYTE IS ASSUMED
@;TO BE AT (HL+1). RETURN IS MADE WITH HL
@;POINTING TO THE LOW BYTE. SIGN BIT OF LOW
@;BYTE IS COMPLEMENTED BEFORE RETURN.
@;
@;FNXN: ORA A ;PR CODE=0?
@; JRZ ..CMLP
@; ..LOOP: INX H ;
@; SRLR M ;DIVIDE BY TWO
@; DCX H ;
@; RARR M ;
@; DCR A ;
@; JRNZ ..LOOP ;DIVIDE AGAIN?
@; ..CMLP: MOV A,M ;CMLP SIGN BIT
@; XRI 128D ;
@; MOV M,A ;
@; RET
@;
@;
@; .INSERT B:$9INIT
@; *****
@; * *
@; * SAMPLING INITIATOR *
@; * *
@; *****
@;
@;THIS ROUTINE INITIALIZES THE INTERRUPT
@;HANDLER, CLEARS THE TEMP BUFFERS, SETS
@;UP THE APPROPRIATE COUNTERS, ENABLES
@;INTERRUPTS AND THEN RETURNS. THE INTRRPT
@;VECTOR JAMMED ONTO THE BUS IS PRESUMED TO
@;BE OFFH.
@;
@;REGISTERS ARE NOT PRESERVED.
@;
@;WHEN CALLED, THIS SR EXPECTS REGS DE
@;TO CONTAIN THE STARTING ADDR OF A TABLE
@;CONTAINING THESE PARAMETERS IN THIS
@;ORDER:
@;
@;BYTE 0 :# CHANNELS TO SAMPLE (STARTING
@; AT 0300)
@;BYTE 1 :# INTERRUPTS PER SAMPLE
@;BYTE 2 :# SAMPLES PER DATA POINT
@;
@;
0430 D5 @ INIT: PUSH D ;TRANSFER PARAMETERS
0431 E1 @ POP H ;TO INTERNAL LOC
0432 11 0137 @ LXI D,CHNL ;
0435 EDA0 @ LDI ;CHNL
0437 EDA0 @ LDI ;# INTRPTS/SAMPLE
0439 EDA0 @ LDI ;# SAMPLES/DATA PT
043B 2B @ DCX H ;INITIALIZE SAMPLE CNTR
    
```

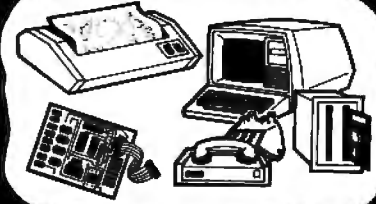
Listing 1 continued:

```

043C  EDA0          @          LDI          ;
@;
043E  D9           @          EXX          ;SET UP INTRPT CNTR
043F  3A 0138      @          LDA          INT%SS
0442  47           @          MOV          B,A
0443  D9           @          EXX          ;
@;
0444  2A 0183      @          LHLD         NTMPAD  ;INITIALIZE BUFFERS
0447  0620          @          MVI          B,32D  ;WITH 00
0449  3E00          @          MVI          A,0
044B  77           @          ..LOOP: MOV     M,A      ;LOOP TILL DONE
044C  23           @          INX          H
044D  10FC          @          DJNZ         ..LOOP  ;
@;
@;SET UP INTERRUPT JUMP ADDRESS. ASSUMES CLOCK
@;FLAG JUMPERED TO V13.
@;
044F  ED46          @          IMO          ;INTRPT MODE = 2
0451  21 0018      @          LXI          H,18H  ;FILL IN JMP INSTR
0454  3EC3          @          MVI          A,0C3H
0456  11 018E      @          LXI          D,INTHLD;
0459  77           @          MOV          M,A
045A  23           @          INX          H
045B  73           @          MOV          M,E
045C  23           @          INX          H
045D  72           @          MOV          M,D
045E  3E50          @          MVI          A,50H  ;RESET CLOCK FLAG
0460  D306          @          OUT          6
0462  3E0D          @          MVI          A,0C0H ;ARM CLOCK INTRPT
0464  D306          @          OUT          6
0466  FB           @          EI          ;ENABLE INTERRUPTS
0467  C9           @          RET          ;AND RETURN
@;
@;
@; .INSERT B:P$INIT
@; *****
@; *
@; *          PROCESSOR INITIALIZER
@; *
@; * *****
@;
@; ON ENTRY, THIS SR EXPECTS REG DE TO CONTAIN
@; THE STARTING ADDRESS OF A TABLE CONTAINING, IN
@; THIS SEQUENCE:
@;
@; BYTE 0          PROCESS CODE (USED BY "FNXX" TO
@;                  DETERMINE HOW MANY HALVINGS TO
@;                  DO
@;
@; BYTE 1          # OF PROGRAMMED EVENTS
@;
@; BYTES 2,3      TIME FOR EVENT #1 (#DATA PTS)
@;
@; BYTES 4,5      ADDR OF PRGM EXECUTING EVENT #1
@;
@; BYTES 6,7      TIME FOR EVENT #2
@;
@; BYTES 8,9      ADDR OF PRGM EXECUTING EVENT #2
@;
@; ...ETC... FOR ALL EVENT TIMES AND PRGM ADDR'S
@;
@; REGISTERS ARE NOT PRESERVED;
@; PARAMETERS FROM THE TABLE ARE INSERTED BY THIS
@; ROUTINE INTO INTERNAL LOCATIONS OF PROCSR
@; FOR APPROPRIATE DATA PROCESSING AND TIMING
@; FUNCTIONS.
@;
0468  D5           @P$INIT: PUSH   D          ;TRANSFER PARAMETERS
0469  E1           @          POP          H          ;TO INTERNAL TABLES
046A  11 013B      @          LXI          D,DIVSR;
046D  EDA0          @          LDI          ;PROCESS CODE
046F  7E           @          MOV          A,M
0470  EDA0          @          LDI          ;N$EVTS
0472  87           @          ADD          A          ;FORM BYTE COUNTER
0473  87           @          ADD          A          ; (=4*N$EVTS)
0474  0600          @          MVI          B,0      ;PUT IN BC
0476  4F           @          MOV          C,A
0477  EDB0          @          LDIR         ;TRANSFER TIMES AND
@;                  ;ADRR'S FOR ALL EVENTS
0479  C9           @          RET
@;
@;
@; .INSERT B:MESSOUT
@; *****
@; *
@; *          MESSOUT
@; *
@; * *****
@;
@; THIS SUBROUTINE OUTPUTS A MESSAGE TO THE
@; CONSOLE USING THE DOS 'COUT' ROUTINES AND
@; RETURNS CONTROL TO THE CALLING PROGRAM.
@; THE SUBROUTINE EXPECTS HL TO HOLD THE

```

Listing 1 continued on page 418



Make Your Dreams Come True With Computer Shopper

Now you can expand your system or get a new one at prices you had never dreamed possible by taking advantage of the thousands of bargains each month in COMPUTER SHOPPER. COMPUTER SHOPPER is THE publication for buying, selling and trading new and used micro and mini-computer equipment and software.

- Buy, Sell or Trade
- 48 Big (11" x 14") pages
- Over 20,000 readers nationwide
- Low classified ad rates—only 10¢ a word for subscribers
- Hundreds of ads from individuals
- Money back guarantee

Double Bonus for New Subscribers

New subscribers are entitled to a FREE 20 word classified ad to use for software or used equipment (a \$2.00 value) plus a FREE ISSUE (13 months for the price of 12) all for the low subscription price of ONLY \$10.00.

SAVE OVER 50% OFF the single copy price of \$1.50. Add it up:

12 issues @ \$1.50.....\$18.00
 One free issue.....\$1.50
 Free 20 word classified ad....\$2.00

TOTAL VALUE.....\$21.50
 NOW ONLY \$10.00. You save \$11.50.

MasterCard or VISA subscription orders only
 Call TOLL FREE FOR FASTEST SERVICE
 1-800-327-9920

MasterCard or VISA classified ad orders only
 Call TOLL FREE FOR FASTEST SERVICE
 1-800-327-9926 Offer expires 1-31-82

COMPUTER SHOPPER
 P.O. Box F135 • Titusville, FL 32780
 305-269-3211

SUPERBRAIN™



64K Double or Quad Density units available. Uses two Z-80 CPU's. Commercial-type terminal with 12" monitor. Dual double density minifloppies. Over 350 kilobytes of storage (twice that with quad density drives). Two serial RS232 ports, I/O ports standard.

Comes with CP/M™ 2.2 operating system. MiniMicroMart can supply a wide range of CP/M development and application software.

w/64K Double Density, List \$3495 .. \$2869
w/64K Quad Density, List \$3995. \$3395



hp HEWLETT
PACKARD
HP-41CV
AVAILABLE NOW!
\$259
HP-41C
\$189

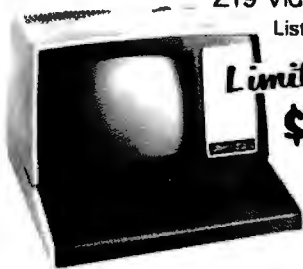


HP-85A
Desk-Top
Computer
\$2749

List \$3250

new **HP-125...\$3149**

ZENITH data systems
Z19 Video Terminal
List \$995



Limited time
\$799

F.O.B. shipping point. All prices subject to change and all offers subject to withdrawal without notice. Advertised prices are for prepaid orders. Credit card and C.O.D. 2% higher. C.O.D. may require deposit.

— WRITE FOR FREE CATALOG —

Mini Micro Mart, Inc.
943 W. Genesee St.
Syracuse, N.Y. 13204
(315) 422-4467

Listing 1 continued:

200D

```
047A 7E
047B B7
047C C8
047D 47
047E 3E00
0480 CD 200D
0483 23
0484 C3 047A
```

```
@;ADDRESS OF THE MESSAGE WHICH MUST BE
@;TERMINATED BY A NULL CHARACTER.
@;REGISTERS A,B,H,L ARE ALTERED IN THIS
@;ROUTINE.
```

```
@;
@;SYMBOL TABLE:
@;
@;ACOUT = 200DH
@;
@;
```

```
@MESSOUT:MOV A,M ;GET CHARACTER
@ ORA A ;NULL CHARACTER?
@ RZ ;YES,RETURN
@ MOV B,A ;B<=A
@ MVI A,00 ;CLEAR ACC
@ CALL COUT ;NO, OUT TO CRT
@ INX H ;INCR POINTER
@ JMP MESSOUT ;LOOP TILL NULL
```

.INSERT B:DATWR

```
@;*****
@;**
@;** DATWR
@;**
@;*****
```

```
@;THIS ROUTINE WRITES DATA OUT TO DISK 1 USING
@;THE PREVIOUSLY ESTABLISHED POINTERS OF THE
@;UTILITY PROGRAMS "PROCSR" AND "INTHDR".
@;IT PLACES #CHANNELS AND #DATA POINTS AT THE
@;BEGINNING OF THE FILE (E.G. #CHNLS IN'OFFD;
@;BUFFER STARTS AT 1000H).
```

```
@;
@;AFTER WRITING OUT THE FILE (USING "FWRITE")
@;THIS SR REINITIALIZES THE POINTERS AND
@;INCREMENTS BYTE 8 OF THE FILENAME. INTRRPTS
@;ARE DISABLED ON ENTERING THIS SR AND SHOULD
@;BE ENABLED AFTER RETURN IF NECESSARY.
```

```
@;
@;CLOCK FLAG IS CLEARED BEFORE RETURN.
@;ONLY THE IX AND IX REGISTERS
@;ARE PRESERVED.
```

```
0487 F3
0488 2A 017F
048B ED5B 017D
048F 1B
0490 1B
0491 1B
0492 B7
0493 ED52
0495 E5
0496 2B
0497 2B
0498 2B
0499 EB
```

```
049A 3A 0137
049D 77
049E 23
049F 72
04A0 23
04A1 73
```

```
04A2 2B
04A3 2B
04A4 EB
04A5 E1
```

```
04A6 7D
04A7 B7
04A8 2801
04AA 24
04AB 4C
04AC 0600
04AE 3E01
04B0 21 0185
04B3 CD 04C5
```

```
04B6 21 018C
04B9 34
04BA 2A 017D
04BD 22 017F
04C0 3E50
04C2 D306
04C4 C9
```

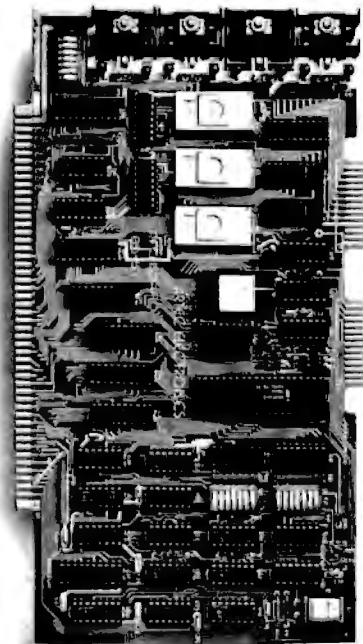
```
@DATWR: DI ;STOP INTERRUPTS
@ LLD MBUFPT ;CALCULATE #DATA PTS +3
@ LDED BFSTRT ;
@ DCX D ;
@ DCX D ;
@ DCX D ;
@ ORA A ;
@ DSBC D ;
@ PUSH H ;SAVE FILE SIZE
@ DCX H ;CALCULATE #DATA PTS
@ DCX H ;
@ DCX H ;
@ DCX H ;
@ XCHG ;
@ ;HL <= [BFSTRT] -3
@ ;DE <= #DATA PTS
@ LDA CHNL ;STORE #CHNL
@ MOV M,A ;
@ INX H ;
@ MOV M,D ;STORE HIGH BYTE OF
@ INX H ;#DATA POINTS
@ MOV M,E ;STORE LOW BYTE OF
@ ;#DATA POINTS
@ DCX H ;
@ DCX H ;
@ XCHG ;
@ POP H ;HL <= #DATA PTS +3
@ ;DE <= [BFSTRT] -3
@ ;NOW CALCULATE #BLOCKS:
@ MOV A,L ;
@ ORA A ;
@ JRZ .NOAD ;
@ INR H ;
@ .NOAD: MOV C,H ;BC<=#BLOCKS
@ MVI B,0 ;
@ MVI A,1 ;SPECIFY DISK #1
@ LXI H,FLNAME;HL<=ADDR OF FLNAME
@ ;
@ CALL FWRITE ;WRITE DATA
@ ;
@ ;
@ LXI H,FLNAME+7 ;UPDATE
@ INR M ;FLNAME
@ LLD BFSTRT ;UPDATE BUFFER PTR
@ SHLD MBUFPT ;
@ MVI A,50H ;RESET CLOCK FLAG
@ OUT 6 ;
@ RET ;RETURN
@;
```

Listing 1 continued:

```

                .INSERT B:FWRITE
                *****
                *
                *           FWRITE           *
                *
                *****
                SUBROUTINE TO WRITE A FILE ONTO DISK
                UNIT #1 OR 2 USING DOS I/O ROUTINES.
                EXPECTS:
                A = FILE DRIVE # (1 OR 2)
                DE = STARTING RAM ADDR OF FILE
                BC = # OF BLOCKS
                HL = ADDR OF FILE NAME
                FILENAME MUST CONSIST OF 8 ALPHANUMERIC
                CHARACTERS FOLLOWED BY A BLANK (ASCII 20).
                REGISTERS ARE NOT PRESERVED.
                SYMBOL TABLE:
                DLOOK = 201CH ;DOS FILE DIRECTORY LOOKUP
                DWRT  = 201FH ;DOS DIRECTORY ENTRY WRITE
                DCOM  = 2022H ;DOS DISK COMMAND SR
                DOS   = 2028H ;DOS ENTRY PT
                FWRITE: PUSH D ;STARTING RAM ADDR
                PUSH B ;# BLOCKS
                PUSH B ;
                PUSH H ;FILE NAME ADDR
                CD 201C CALL DLOOK
                D2 050D JNC TAKEN ;IF FILE NAME TAKEN
                E5 PUSH H ;DISK ADDR
                DDE1 POP X ;ONTO IX
                D1 050C LXI H,BLANK ;BLANK FILENAME
                CD 201C CALL DLOOK ;BYTE 8 OF DOS ENTRY
                DA 055F JC FULL ;RETURNED IN (HL)
                ;IF DISK FULL
                COPY FILE NAME, DISK ADDRESS AND #BLOCKS
                TO DIRECTORY ENTRY
                LXI B,-8D ;SUBTRACT 8
                DAD B ;FROM HL
                POP D ;ADDR OF FILE NAME
                EB XCHG ;* DE=ADDR OF DOS ENTRY
                ;* HL=ADDR OF FILE NAME
                LXI B,8D ;PLACE 8 IN BC
                EDB0 LDIR ;COPY FILE NAME
                EB XCHG ;HL=DOS ENTRY ADDR
                DDE5 PUSH X ;COPY DISK ADDR
                D1 POP D
                MOV M,E
                EB INX H
                EB MOV M,D
                EB INX H
                EB POP B ;COPY # BLOCKS
                EB MOV M,C
                EB INX H
                EB MOV M,B
                EB INX H
                EB MVI M,0 ;COPY FILE TYPE
                EB INX H
                EB MOV M,B ;COPY TYPE DEP. INFO
                EB INX H
                EB MOV M,C
                CD 2D1F CALL DWRT ;COPY ENTRY TO DISK
                SET UP REGISTERS FOR DCOM:
                POP B ;PUT # BLOCKS
                D79 MOV A,C ;INTO ACCUMULATOR
                D1 0001 LXI B,1 ;COMMAND=WRITE
                ;DISK UNIT = 1
                POP D ;STARTING RAM ADDR
                DDE5 PUSH X ;MOVE DISK ADDR
                E1 POP H ;INTO HL
                CD 2022 CALL DCOM ;WRITE FILE
                DA 0532 JC ILLARG ;CARRY SET=ILLEGAL ARG
                C9 RET
                BLANK: .ASCII / /
                TAKEN: LXI H,.MESS;SEND MESSAGE TO CONSOLE
    
```

Hire a fast thinker.



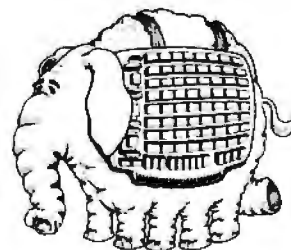
5 MHz CPU Card

- Intel 8085A-2 microprocessor
- Hardware floating point
- Performs calculations six times faster than other CPUs
- On-board monitor in PROM
- 1K RAM scratch pad
- Keyboard or RS232C terminal
- Variable clock frequency

PRICE—\$450

(California residents add 6% sales tax)

Call or write Artec for details.



ARTEC ELECTRONICS, INC.

605 Old County Rd., San Carlos, CA 94070
Telephone (415) 592-2740

Listing 1 continued on page 420

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 8002

3-44 Card Manual describes all of the 45 x 0.5 44-pin 5-44 cards incl. schematics. A MUST for every KIM-, SYM- and AIM-owner.

Order-No. 182 \$9.95
Microcomputer Application Notes

Reprint of Intel's most important application notes including 2708, 8085, 8255, 8251 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. 188 \$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-85 D and OS-85U Networking. Hardware and Software hints and tips. Systems specifications Business applications.

Order-No. 188 \$7.95
The Fourth Book of OHIO

Very Important Programs Many interesting programs for OSI computers. Sorting (Binary Tree), Differential Equations, Statistics, Astrology, Gas Consumption, Games a.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



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

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. 3278 \$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

High Quality C-10 cassettes Blank Cassettes (Quantity 10)
Order-No. 8095G \$4.99
ATARI OWNERS TAKE NOTE:



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. Classroom, 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 Superstapler

A very powerful Tracer to explore the ATARI ROM/RAM area Stop at previously selected address, Opcode or operand

Order-No. 7048 (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.

Order-No. 7098 \$49.95
MACRO-Assembler for ATARI-800, 48K RAM

Order-No. 7099 \$99.00

Listing 1 continued:

```

0510 CD 047A @ CALL MESSOUT
0513 C3 2028 @ JMP DOS
0516 46494C45204E @.MESS: .ASCIZ /FILE NAME ALREADY TAKEN
052D 0D0A @/
052F 0D0A00 @/
0532 21 053B @ILLARG: LXI H,.MESS;SEND MESSAGE TO CONSOLE
0535 CD 047A @ CALL MESSOUT
0538 C3 2028 @ JMP DOS
053B 494C4C454741 @.MESS: .ASCIZ /ILLEGAL ARGUMENTS USED FOR DCOM
055A 0D0A @
055C 0D0A00 @/
055F 21 0568 @FULL: LXI H,.MESS;SEND MESSAGE TO CONSOLE
0562 CD 047A @ CALL MESSOUT
0565 C3 2028 @ JMP DOS
0568 46494C452057 @.MESS: .ASCIZ /FILE WRITE ABORTED; DISK FULL
0585 0D0A @/
0587 0D0A00 @/
0590 .LOC 590H
      .INSERT B:EVENTS
@;*****
@;*
@;* SPECIAL EVENTS *
@;*
@;*****
@;
@;ENDEXP SR DISABLES INTERRUPTS, WRITES
@;DATA OUT TO DISK (BY CALLING DATWR),
@;UPDATES ENDFLG, AND JUMPS TO THE ADDR
@;PUT IN BY THE MAIN PROGRAM.
@;
@;ENDEXP: DI ;KILL INTERRUPTS
@; CALL DATWR ;WRITE DATA
@; LXI H,ENDFLG;UPDATE FLAG
@; DCR M ;
@;NXTEXP: JMP NXTEXP ;JMP TO MAIN
@;ENDFLG: .BLKB 1 ;END FLAG INITIALIZED
@; ;BY MAIN PRGM
@;
@;
@;*****
@;
@;LITOFF: THIS SR IS CALLED BY THE "PROCSR".
@;IT TURNS OFF THE LIGHT RELAY BY CLEARING
@;BIT 0 OF I/O PORT 24D AND RETURNS TO THE
@;PROCESSOR.
@;
@;LITOFF: MVI A,0 ;
@; OUT 24D ;
@; EI POP H ;
@; RET ;
@;
@;*****
@;
@;LITON: CALLED BY "PROCSR" TO TURN OFF LIGHTS
@; BY CLEARING ALL BITS OF I/O PORT 24D
@; AND THEN RETURNING TO THE PROCESSOR.
@;
@;LITON: MVI A,1 ;
@; OUT 24D ;
@; EI POP H ;
@; RET ;
@;
05A2 3E01 @
05A4 D318 @
05A6 E1 @
05A7 C9 @
05B0 .LOC 5B0H
      .INSERT B:L/DEXP.ASM
@;*****
@;*
@;* LIGHT/DARK EXPERIMENT *
@;*
@;*****
@;
@;THESE TWO ROUTINES SET UP THE INTRPT
@;HANDLER AND PROCESSOR TO DO FIRST A
@;DARK EXPERIMENT AND THEN A LIGHT EXPT.
@;THE SAMPLING AND PROCESSING PARAMETERS
@;ARE ASSUMED TO HAVE BEEN PUT IN THE PROPR
@;LOCATIONS BY SOME PREVIOUS ROUTINE (IE
@;BASIC CALLS, OR OTHER). FLNAME AND
@;ENDFLG ARE ALSO ASSUMED TO HAVE BEEN
@;INITIALIZED BY PREVIOUS ROUTINES.
@;THE LIGHT/DARK EXPERIMENTS CONTINUE
@;UNTIL ENDFLG IS CLEAR. THE LIGHT RELAY
@;IS TURNED ON BY SETTING BIT 0 OF I/O PORT

```

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

The Key Sequential Access Method (ISAM) for the professional. In many successful applications since 1977. Used by equipment manufacturers like Cromemco & Philips. Runs on floppy or hard disk systems under CP/M®, CDOS, IMDOS, with a special version for UCSD Pascal. Easy interfaces to CBASIC 2, Microsoft Basic, Fortran, Pascal, and assembly language.

Features:

- Any number of keys
- Fixed, variable, and data sensitive records
- B-tree file structure with no overflow areas insures fast access
- Access by full or partial keys, sequential movement in both directions, and access by record number
- Automatic disk space reclamation
- Self-reorganizing files
- Files may span up to 4 disks
- Powerful utility package included
- Written in machine language for speed & efficiency
- Requires only 5k of memory

Single site object licence \$ 395

Demo package on 8" SSSD CP/M format \$ 50

California residents add 6% sales tax



OEM & Dealer inquiries invited

EMS Efficient Management Systems, Inc.
computer applications

3645 Grand Ave., Ste 304
Oakland, CA 94610

CP/M is a registered trademark of Digital Research

Listing 1 continued:

```

068B 21 061F
068E 22 0599
0691 21 018B
0694 3644
0696 11 05B3
0699 CD 0468
069C 11 05B0
069F CD 0430
06A2 C9

a;REGISTERS ARE NOT SAVED.
a;
a; LXI H,LTEXP;PUT JUMP ADDR INTO
a; SHLD NXTEXP+1; "ENDEXP"
a; LXI H,FLNAME+6; PUT "D" SUFFIX
a; MVI M,"D" ; INTO FILENAME
a; LXI D,PDATA ;SET UP PROCESSOR
a; CALL P$INIT ;
a; LXI D,SDATA ;SET UP HANDLER
a; CALL INIT ;START SAMPLING
a; RET ;RETURN
a;
a; .INSERT B:HEADER.ASM
a;*****
a;*
a;* HEADER *
a;*
a;*****
a;THIS SECTION RESERVES LOCATIONS AND
a;SETS UP THE HEADER MESSAGE.
a;
0700 .LOC 700H
a;
0700 2020202020a;FLNM: .ASCII /
0708 0D0A a;/ ;8 SPACES RESERVED FOR
a; ;HEADER FILENAME
a;
070A 2020202020a;DATE: .ASCII /
0715 0D0A a;/ ;9 SPACES RESERVED FOR
a; ;DATE
a;
0717 23204348414Ea; .ASCII /# CHANNELS:/
0722 202020 a;HDCHNL: .ASCII / / ;STORE #CHNLS HERE
a; ;(ASCII)
a;
a; .ASCII /
0725 0D0A234C4947a;#LIGHT,DARK EXPTS:/
0739 202020 a;CYCLES: .ASCII / / ;STORE #CYCLES HERE
a;
a; .ASCII /
073C 0D0A4441524Ba;DARK SAMPLING PARAMETERS:
0757 0D0A20202020a;SAMPLING RATE=/
076B 202020202020a;DRATE: .ASCII / / ;STORE DARK
a; ;SAMPLING RATE HERE
a;
a; .ASCII $
0777 0D0A20202020a;#SAMPLES/DATA PT:$
078E 20202020 a;DAVG: .ASCII / / ;STORE DARK S/DPT HERE
a;
a; .ASCII /
0792 0D0A20202020a; TIME IN DARK:/
07A5 202020202020a;DTIME: .ASCII / / ;STORE DARK TIME
a; ;HERE
a;
a; .ASCII /
07B1 0D0A4C494748a;LIGHT SAMPLING PARAMETERS:
07CD 0D0A20202020a; LIGHT PERIOD:/
07E0 202020202020a;LTPER: .ASCII / / ;STORE LIGHT
a; ;PERIOD HERE
a;
a; .ASCII /
07EC 0D0A20202020a; SAMPLING RATE:/
0800 202020202020a;LRATE: .ASCII / / ;STORE LIGHT
a; ;SAMPLING
a; ;RATE HERE
a;
a; .ASCII $
080C 0D0A20202020a;#SAMPLES/DATA PT:$
0823 20202020 a;LAVG: .ASCII / / ;STORE LIGHT
a; ;S/DPT HERE
a;
a; .ASCII /
0827 0D0A20202020a; PERIOD OF LIGHT SAMPLING:/
0846 202020202020a;LTIME: .ASCII / / ;STORE TIME
a; ;TO DO DARK
a; ;PROCESSING
a; ;HERE
a;
a; .ASCII /
0852 0D0A
0854 0D0A434F4D4Da;COMMENTS:/
085F 2020202020 a;COMNTS: .ASCII / / ;PUT COMMENTS HERE
a;
a;
a;
a;THIS ROUTINE FILLS THE REGISTERS WITH THE
a;PROPER ARGUMENTS FOR WRITING THE HEADER
a;TO DISK. IT THEN CHANGES THE FILE NAME
a;PREFIX TO "DF" (FOR DATA FILE) AND RETURNS.
a;
08E0 .LOC 8E0H
08E0 3E01 a;HDWRT: MVI A,1
    
```


Listing 1 continued:

```

08E2 11 0700 LXI D,700H
08E5 01 0002 LXI B,2
08E8 21 0185 LXI H,FLNAME
08EB CD 04C5 CALL FWRITE
08EE 21 0185 LXI H,FLNAME ;CHANGE FILE NAME
;PREFIX

08F1 3644 MVI M,"D"
08F3 23 INX H
08F4 3646 MVI M,"F"
08F6 C9 RET

;
; THIS ROUTINE OUTPUTS A MESSAGE LOCATED IN
; RAM (DE) TO THE CONSOLE USING THE DOS
; I/O ROUTINES AND THE D/A MESSOUT UTILITY.
;
08F7 EB XCHG ;HL<=DE
08F8 CD 047A CALL MESSOUT
08FB C9 RET

;
; THESE TWO ROUTINES (CALLABLE BY BASIC)
; DISABLE AND ENABLE INTERRUPTS .
;
08FC F3 DI ;
08FD C9 RET ;

08FE FB EI ;
08FF C9 RET

0900 .LDC 900H
.INSTRT B:OGRAFX.ASM
; *****
; ***** OGRAFX *****
; *****
; *****
;
; THIS ROUTINE OUTPUTS DATA FROM THE PROCESSOR
; BUFFER TO AN OSCILLOSCOPE VIA A/D PORT 26. IT
; EXPECTS THE CALLING PROGRAM TO HAVE PLACED IN
; 'DSPCHL' THE CHNL MINUS ONE TO BE DISPLAYED.
;
; ON ENTERING, DE SHOULD CONTAIN THE # OF PTS TO
; DISPLAY. A TRIGGER PULSE IS SENT OUT PORT 25
; TO MARK THE BEGINNING OF THE DISPLAY.
;
; ONLY THE IX AND IY REGS ARE PRESERVED.
;
; IN DSPLY LOOP THE REGS ARE USED AS FOLLOWS:
;
; BC = # OF CHANNELS
; DE = # OF DATA PTS
; HL = ADDR OF DATA PTS
; A = DATA
;
0900 DSPCHL: .BLKB 1 ;PUT CHNL-1 TO SAMPLE
0901 00 .BYTE 0 ;KEEP 0 FOR PROPER ADD

0902 14 OGRAFX: INR D ;FOR PROPER COUNTING
0903 2A 017D LHL D ;CALCULATE ADDR OF
;FIRST DATA PT

0906 ED4B 0900 LBCD DSPCHL ;
090A B7 ORA A ;
090B ED4A DADC B ;
090D 3A 0137 LDA CHNL ;
0910 4F MOV C,A ;PUT #CHNLS IN BC
0911 3E7F MVI A,127D ;SEND TRIGGER PULSE
0913 D319 OUT 25D ;
0915 3E00 MVI A,0 ;
0917 D319 OUT 25D ;

0919 7E DSPLY: MOV A,M ;DISPLAY DATA OUT 26
091A D31A OUT 26D ;
091C ED4A DADC B ;INCR HL BY #CHNLS
091E 1D DCR E ;DECREMENT POINTS CNTR
091F 20F8 JRNZ DSPLY ;
0921 15 DCR D ;
0922 20F5 JRNZ DSPLY ;
0924 20F3 JRNZ DSPLY ;LOOP TIL DONE
0926 C9 RET

.INSTRT B:FREAD.ASM
; *****
; ***** FREAD *****
; *****
; *****
;
; THIS SUBROUTINE READS A FILE FROM DISK TO
; MEMORY USING THE NORTH STAR DOS ROUTINES.
;
; EXPECTS DE ON ENTERING TO BE A POINTER TO THE
; RAM ADDR OF THE FILE NAME. ALSO EXPECTS THE

```

Listing 1 continued on page 424

HOW TO SORT EASIER QUICKER and BETTER

Calling a sort routine from a user program has always been a problem. Special interface routines had to be written, programs relocated, and large amounts of dedicated memory were required.

Now there is **MAGSORT™**, the first full featured Sort/Select/Merge program specifically designed to take the pain out of sorting.

EASIER

Interfacing **MAGSORT** to your CBASIC, Microsoft BASIC, Pascal/MT+, PL/I-80, or Fortran-80 programs is a snap. Two simple statements do it all. No dedicated memory, relocation, or special interfacing is required—not even in CBASIC.

And running **MAGSORT** stand alone is just as simple. The easy-to-use utility program asks all the questions so you don't have to remember a dictionary full of commands.

QUICKER

MAGSORT is written in 8080/Z80 assembler and uses a unique proprietary technique that allows the entire user memory space to be utilized for buffering. This provides the fastest possible sorting and optimizes **MAGSORT** for large files.

BETTER

MAGSORT is better than super! Its unmatched features make it the sort for today's sophisticated systems.

At \$250, **MAGSORT** may cost a little more than some other sorts, but it quickly pays for itself with convenience, speed and versatility. And, like all **MAG** software products, **MAGSORT** includes our free one year support service.

To learn more about how you can put the "super" back into sorting, see your **MAGSORT** dealer or write or call **MAG** today.



MICRO APPLICATIONS GROUP

20201 Sherman Way / Suite 205
Canoga Park / CA 91306 / (213) 700-1426

CBASIC is a trademark of Compler Systems Pascal/MT+ is a trademark of MT Microsystems PL/I-80 is a trademark of Digital Research Fortran-80 is a trademark of Microsoft

Listing 2: BASIC program that demonstrates how parameters may be passed to the data-acquisition program in listing 1 (referred to as UTIL in the BASIC program comments).

```

100! --- THIS PROGRAM DEMONSTRATES HOW BASIC CAN"
110! --- PLACE SAMPLING PARAMETERS IN 'UTIL'"
120! \! " 'UTIL' SHOULD ALREADY BE LOADED" \!
130 INPUT "NAME OF DATA FILE (8 CHARACTERS, I.E. 'DATA.01A'):";N
140 REM
150 ! \! " FILENAME IS NOW PUT IN ADDRESS 185 HEX"
160 M=389 \REM = 185 HEX = 'FILENAME'
170 FOR I=1 TO 8
180 FILL M,ASC(NS(I,I))
190 M=M+1
200 NEXT I
210 ! \! "THE SAMPLING INITIATOR REQUIRES A TABLE CONTAINING"
220 ! "THESE PARAMETERS:"
230 !
240 ! " # CHANNELS TO SAMPLE;"
250 ! " # INTERRUPTS PER SAMPLE;"
260 ! " # SAMPLES PER DATA POINT;"
262 !
264 ! " 'UTIL' SAMPLES CONSECUTIVE CHANNELS, STARTING AT"
266 ! " PORT 25 (DECIMAL) OF THE A/D BOARD. TRY 4 TO BEGIN WITH."
270 ! \INPUT "HOW MANY CHANNELS TO SAMPLE?";C
280 FILL 0,C \REM START THE TABLE AT 0000
290 !
300 ! " # INTERRUPTS PER SAMPLE TELLS 'UTIL' HOW OFTEN THE"
310 ! " A/D BOARD SHOULD BE CALLED. FOR EXAMPLE, SUPPOSE"
320 ! " THE REAL TIME CLOCK ON THE MOTHERBOARD WAS SET FOR"
330 ! " A 53.248 MILLISEC INTERVAL. IF YOU WANTED TO"
340 ! " SAMPLE ONCE A SECOND, THEN # INTERRUPTS PER SAMPLE"
350 ! " SHOULD BE 19 (53.248*19= 1.01 SEC)."
360 ! \INPUT " # INTERRUPTS PER SAMPLE?";I1
370 FILL 1,I1
380 !
390 ! " # SAMPLES PER DATA POINT TELLS 'UTIL' HOW MANY SAMPLES"
400 ! " TO AVERAGE. THE NUMBER SHOULD BE A NUMBER N, SUCH THAT"
410 ! " N EQUALS TWO RAISED TO AN INTEGER POWER (I.E., 1,2,4,8,...)"
415 ! " SO THAT 'FRXN' WILL WORK PROPERLY. TRY 1 TO BEGIN WITH."
420 !
430 INPUT " # SAMPLES PER DATA POINT (POWER OF 2)?";N
440 IF N>256 THEN 430
450 FILL 2,N
460 !
470 P=0 \REM CALCULATE PROCESS CODE
480 IF N=1 THEN 520
490 N=N/2
500 P=P+1
510 IF N>1 THEN 490
520 IF N<1 THEN 430
530 FILL 3,P \REM START TABLE AT 0003
540 ! " HOW A PARAMETER TABLE MUST BE SET UP FOR 'PSINIT'."
550 ! " THE FIRST PARAMETER IS THE PROCESS CODE FOR 'FRXN'."
560 ! " THIS IS CALCULATED AS THE POWER OF TWO WHICH EQUALS N."
570 !
580 ! " THE SECOND PARAMETER IS THE # OF PROGRAMMED EVENTS."
590 ! " IN THIS EXAMPLE WE WILL HAVE ONLY TWO EVENTS. THE"
600 ! " FIRST WILL SET BIT 0 OF PARALLEL PORT 24 (30 OCTAL)"
610 ! " AND THE SECOND WILL TERMINATE SAMPLING, WRITE THE"
620 ! " BUFFER TO DISK AND SEND A MESSAGE TO THE CONSOLE."
630 ! " OF COURSE, THE FIRST EVENT SHOULD BE SET FOR A TIME"
640 ! " PRECEDING THE SECOND EVENT. THE PROGRAMS FOR THESE"
650 ! " EVENTS CAN BE FOUND IN MODULES 'SPECIAL EVENTS' AND"
660 ! " 'LIGHT/DARK EXPERIMENT'."
670 FILL 4,2
680 !
690 ! " THE TIME REQUESTED IS CALCULATED AS THE NUMBER OF"
700 ! " DATA POINTS ( = # INTERRUPTS PER SAMPLE * # OF SAMPLES"
710 ! " PER DATA POINT). THUS IF # INTERRUPTS/SAMPLE EQUALS 19"
720 ! " AND # SAMPLES/DATA PT EQUALS 8, THEN THERE WILL BE 8"
730 ! " SECONDS PER DATA POINT (ASSUMING 53 MS CLOCK) AND THE"
740 ! " TIME FOR EACH EVENT HAS UNITS OF 8 SECONDS."
750 !
760 INPUT " TIME FOR EVENT #1: ";T1
770 REM PUT THE TIME IN THE TABLE, HIGH BYTE FIRST.
780 FILL 5,INT(T1/256)
790 FILL 6, T1 - INT(T1/256)*256
800 REM NOW PUT THE ADDR OF EVENT PROGRAM #1 IN THE TABLE
810 REM
820 FILL 7,162 \REM LOW BYTE OF ADDR 5A2 HEX
830 FILL 8,5 \REM HIGH BYTE
840 REM
850 INPUT " TIME FOR EVENT #2: ";T2
860 FILL 9,INT(T2/256)
870 FILL 10, T2 - INT(T2/256)*256
880 !

```

Listing 2 continued on page 426

CHOOSE...

Choose an Apple Desk



A compact Bi-Level desk ideal for the Apple computer system. This 42" x 29 1/2" desk comes with a shelf to hold two Apple disk drives. The top shelf for your TV or monitor and manuals can also have an optional paper slot to accommodate a printer. It is shown here with the optional Corvis shelf which will hold one Corvis disk drive. The Corvis shelf is available on the 52" x 29 1/2" version of the Apple desk.

Choose a Micro Desk



The Universal Micro desk accommodates the S-100 type microcomputers. The desk is available in four sizes: 17.75 inch, 19.06 inch, and 20.75 inch wide openings with 24 inch front-to-rear mounting space. The fourth size is a 20.75 inch wide opening with a 26.50 inch front-to-rear mounting space.

Choose a Mini Rack



Mini racks and mini micro racks have standard venting, cable cut outs and adjustable RETMA rails. Choose a stand alone bay or a 48", 60", or 72" desk model in a variety of colors and wood tones. A custom rack is available for the Cromemco.

Choose a Printer Stand



The Universal printer stand fits the:

| | |
|---------------------|------------------------|
| Centronics 700's | Diablo 1600's & 2300's |
| Dec LA 34 | T.I. 810 & 820 |
| NEC Spinwriter | Okidata Slimline |
| Learn Siegler 300's | Anadex 9500's |

Delivery in days on over 200 styles and colors in stock. Dealer inquiries invited.

**ELECTRONIC SYSTEMS
FURNITURE
COMPANY**

17129 S. Kingsview Avenue
Carson, California 90746
Telephone: (213)538-9601

68KFORTH

New SYSTEMS LANGUAGE for ERG 68-696 CPU and Motorola's KDM board. O/S, Compiler, Monitor, Assembler, Interpreter, Virtual Memory, Screen Editor, DBL Precision Arithmetic and more. Enhanced FIG-FORTH Vocabulary. Environment: stand alone, Bell Lab's UNIX, or Whitesmiths' IDRIS, etc.

\$795

EMPIRICAL RESEARCH
GROUP, INC.
PO Box 1176
Milton, WA 98354
206-631-4855

Circle 184 on inquiry card.

STATISTICAL SOFTWARE

ELF - Stepwise regression, factor analysis, correlation coefficients, crosstabs, simple statistics, t-tests, ANOVA, stepwise discriminant analysis, all BASIC transformations and more. \$200.00

TWG/ARIMA - Box-Jenkins for seasonal and non-seasonal models, identification, estimation and forecasting. Introductory Price: \$250.00.

Each includes a database manager, numeric software keypad, and is menu-driven. Each requires an Apple II with Applesoft, 48K, and DOS 3.3.

For further information, write

The Winchendon Group
3907 Lakota Road
P.O. Box 10114
Alexandria, VA 22310

*Apple II and Applesoft are trademarks of the Apple Computer Company

Circle 430 on inquiry card.



Solve your disc problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and Master Card accepted. All orders sent postage paid.



PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA
93401. (In Cal. call
(805) 543-1037.)

Circle 331 on inquiry card.

Listing 2 continued:

```
890 REM NOW PUT THE ADDR OF EVENT PROGRAM #2 IN THE TABLE
900 FILL 11,144 \REM LOW BYTE OF ADDR 590 HEX
910 FILL 12,5 \REM HIGH BYTE
920 REM
940 REM 'ENDEXP', THE ROUTINE THAT TERMINATES SAMPLING,
950 REM REQUIRES THAT A JUMP ADDR BE FILLED IN. IT IS DONE
960 REM BELOW
970 FILL 1433,92 \REM FILL 599 HEX WITH LOW BYTE OF ADDR 065C
980 FILL 1434,5 \REM FILL 59A HEX WITH HIGH BYTE OF ADDR
990 !
1000!" NOW THE PROCESSOR INITIALIZER IS CALLED."
1010 Q=CALL(1120,3) \REM 3 = STARTING ADDR FOR PARAM. TABLE
1020 !
1030 INPUT"PRESS CARRIAGE RETURN TO START SAMPLING",QS
1040 Q=CALL(1064,0) \REM 0 = START OF PARAMETER TABLE
1050 !
1060 !"THIS BASIC PROGRAM IS ENDED, BUT SAMPLING WILL CONTINUE"
1065 !"UNTIL AN ENDING MESSAGE IS SENT TO THE CONSOLE."
1070 END
READY
```

Listing 3: This program initializes the laboratory system for a sample biological experiment which will use all of the features of the lab system.

```
1REM THIS PROGRAM INPUTS PARAMETERS FOR DOING A LIGHT/DARK
2REM EXPERIMENT. IT PROMPTS THE USER FOR PARAMETERS, PLACES
3REM THEM IN THE L/DEXP PARAMETER STACKS AND WRITES A HEADER
4REM FILE DESCRIBING THESE PARAMETERS OUT TO DISK.
5 !TAB(20),"*** LIGHT/DARK EXPERIMENT ***"!
20 !TAB(15),"A/D UTILITIES SHOULD ALREADY BE LOADED"!
30 DIM CS(40)
40 K=53.248 \REM CLOCK INTRPT RATE IN MILLISEC
50 !\!"CLOCK INTERRUPT RATE= ",K," MSEC"
60 !"CHANGE LINE 40 IF DIFFERENT RATE"
100 REM FUNCTION CONVERTS A 4-DIGIT HEX NUMBER TO DECIMAL
105 DEF FNH(X$)
110 X=0
115 D=4096
120 FOR I=1 TO 4
125 TS=X$(I,I)
130 IF TS<="F" THEN 165
135 Y=VAL(T$)
140 Y=Y*D
145 D=D/16
150 X=X+Y
155 NEXT I
160 RETURN X
165 IF TS>="A" THEN 170 ELSE 135
170 Y=ASC(T$)
180 Y=Y-55
185 GOTO 140
190 FNEND
200 !"THESE ARE THE INPUTTED PARAMETERS:"\!\!
202 S1=FNH("03F7")
203 S2=FNH("0700")
205 C=CALL(S1,S2)
206 INPUT "PRESS CARRIAGE RETURN TO CONTINUE",K$
210 !\!"WHICH PARAMETERS DO YOU WANT TO ALTER?"
220 !TAB(8),"1=FILENAME/DATE"
225 !TAB(8),"2=# CHANNELS/# CYCLES"
230 !TAB(8),"3=DARK SAMPLING PARAMETERS"
235 !TAB(8),"4=LIGHT SAMPLING PARAMETERS"
240 !TAB(8),"5=COMMENTS"
245 !TAB(8),"6=ALL OF THE ABOVE"
247 !TAB(8),"7=NONE,BEGIN EXPERIMENT"
250 !\INPUT "WHICH NUMBER?",A
255 ON A GOTO 400,500,500,700,900,900,300
300 REM *****
305 REM
310 REM WAIT FOR CARRIAGE RETURN, THEN WRITE OUT HEADER,
315 REM START SAMPLING AND CHAIN "STATUS,2" WHICH
320 REM HAS STATUS ROUTINES.
325 !\!"MAKE SURE DATA DISK IS ON DRIVE #1"
330 !TAB(8),"STATUS DISK IS ON DRIVE #2"
335 !\INPUT"PRESS CARRIAGE RETURN TO START SAMPLING",K$
340 Q=FNH("08E0") \REM WRITE HEADER
350 Q=CALL(Q)
360 Q=FNH("068B") \REM START SAMPLING
370 Q=CALL(Q)
390 CHAIN "STATUS,2" \REM STATUS ON DRIVE #2
395 REM
397 REM * * * * *
398 REM
400REM INPUT FILENAME/DATE AND RETURN
410 GOSUB 1000
```

Listing 3 continued:

```

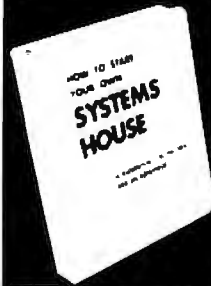
420 GOTO 200
500REM INPUT #CHANNELS/#CYCLES AND RETURN
510 GOSUB 1300
520 GOTO 200
600REM INPUT DARK SAMPLING PARAMETERS
610 GOSUB 1500
620 GOTO 200
700REM INPUT LIGHT SAMPLING PARAMETERS
710 GOSUB 2300
720 GOTO 200
800REM INPUT NEW COMMENTS
810 GOSUB 3400
820 GOTO 200
900REM INPUT ALL NEW PARAMETERS
910 GOSUB 1000
920 GOSUB 1300
930 GOSUB 1500
940 GOSUB 2300
950 GOSUB 3400
960 GOTO 200
1000 REM PUT FILENAME INTO PROPER RAM LOCATIONS
1010 R#4 0700=HEADER ADDR, 0135=UTILITY ADDR
1020 INPUT "TYPE FILENAME (IE HQ000.LA): ",C$
1030 M=FNH("0700")
1040 L=LEN(C$)
1050 IF L>8 THEN 1020
1060 GOSUB 9999
1070 G=FNH("0135")
1080 GOSUB 9999
1090REM PLACE DATE INTO HEADER
1100 INPUT "TYPE DATE: ",C?
1110 M=FNH("070A")
1120 L=LEN(C$)
1130 IF L>11 THEN 1100
1140 GOSUB 9999
1150 RETURN
1300REM PUT #CHANNELS INTO HEADER AND PARAMETER STACKS
1310 INPUT "NUMBER OF CHANNELS TO SAMPLE: ",C
1320 IF C>7 THEN 1310
1330REM M=POINTER FOR DARK PARAM STACK
1340REM M=POINTER FOR LIGHT PARAM STACK
1350 M=FNH("05B0")
1360 FILL M,C
1370 M=M+1
1380 M=FNH("05D5")
1390 FILL M,C
1400 M=M+1
1410 M=FNH("0722")
1420 GOSUB 9997
1430REM INPUT #CYCLES INTO HEADER AND ENDFLAG
1440 INPUT "TYPE # OF DARK,LIGHT PERIODS: ",C
1450 IF C>99 THEN 1440
1460 B=FNH("059B")
1470 FILL B,C
1480 M=FNH("0739")
1490 GOSUB 9997
1494 RETURN
1500REM PUT SAMPLING RATE INTO HEADER AND INT/S INTO STACK
1500 !\!"DARK SAMPLING PARAMETERS:"
1550 !TAB(8),"DESIRED SAMPLING RATE (IN SEC): ",
1560 INPUT C
1570 C1=INT(C*1000/K+.5)
1580 C=C1*K/1000
1590 M=FNH("05B1")
1600 FILL M,C1
1610 M=M+1
1620 !TAB(4),"ACTUAL SAMPLING RATE= ",C," SEC"
1630 M=FNH("076B")
1640 GOSUB 9997
1650 C1=C
1660 C$=" "S"
1670 GOSUB 9998
1680REM PUT S/DPT INTO STACK AND HEADER
1690 !TAB(3),"SAMPLES PER DATA POINT (POWER OF 2): ",
1700 INPUT C
1710 IF C>128 THEN 1690
1720 FILL M,C
1730 M=M+1
1740 M=FNH("073E")
1750 GOSUB 9997
1760 C2=C
1770REM PUT PROCESSOR CODE INTO STACK
1780 P=D
1790 IF C=1 THEN 1830
1800 C=C/2
1810 P=P+1
    
```

Listing 3 continued on page 428

ENTREPRENEURS NEEDED

MORE THAN EVER IN THE MICRO-COMPUTER INDUSTRY.

The shortage of knowledgeable dealers/distributors is the #1 problem of microcomputer manufacturers. Over 300 new systems houses will go into business this year, but the market falls short of the 1200 needed. It is estimated that the nationwide shortage of consultants will be over 3000 by 1981. The HOW TO manuals by Essex Publishing are your best guide to start participating in the continued microcomputer boom.



336 No. 10
Service Problem • Protecting Your Product • Should You Start Now? • How to Write a Good Business Plan • Raising Capital

HOW TO START YOUR OWN SYSTEMS HOUSE

7th edition, November 1981

Written by the founder of a successful systems house, this fact-filled 220-page manual covers virtually all aspects of starting and operating a small systems company. It is abundant with useful, real-life samples: contracts, proposals, agreements and a complete business plan are included in full, and may be used immediately by the reader.

Proven, field-tested solutions to the many problems facing the small systems house are presented.

From the contents:

- New Generation of Systems Houses • The SBC Marketplace • Marketing Strategies • Vertical Markets & IAPs • Competitive Position/Plans of Major Vendors • Market Segment Selection & Evaluation • Selection of Equipment & Manufacturer • Make or Buy Decision • Becoming a Distributor • Getting Your Advertising Dollars' Worth • Your Salesmen: Where to Find Them • Product Pricing • The Selling Cycle • Handling the 12 Most Frequent Objections Based by Prospects • Financing for the Customer • Leasing • Questions You Will Have to Answer Before the Prospect Buys • Producing the System • Installation, Acceptance, Collection • Documentation • Solutions to the small systems house are presented.



338 No. 16
money • Avoiding the legal pitfalls • How consultants' associations can help you • The National Register of Computer Consultants • How others did it: real-life sample cases • and much more

HOW TO BECOME A SUCCESSFUL COMPUTER CONSULTANT

by Leslie Nelson, 3rd revised edition, Oct. 1981

Independent consultants are becoming a vitally important factor in the microcomputer field, filling the gap between the computer vendors and commercial/industrial users. The rewards of the consultant can be high: freedom, more satisfying work and doubled or tripled income. HOW TO BECOME A SUCCESSFUL COMPUTER CONSULTANT provides comprehensive background information and step-by-step directions for those interested to explore this lucrative field.

- Established consulting markets • How to get started • Itemized start-up costs • Are you qualified? • Beginning on a part-time basis • The Marketing Kit • Should you advertise? • Five marketing tips • Getting free publicity • How much to charge • When do you need a contract? • Sample proposals • Which services should be declined • Future markets • The way to big money • Avoiding the legal pitfalls • How consultants' associations can help you • The National Register of Computer Consultants • How others did it: real-life sample cases • and much more



330 No. 32
training users and providing maintenance and support. It also contains sample software contracts that have been used in actual software transactions. Also included are tips on how to negotiate with a large corporation, ways of avoiding personal liability, techniques for obtaining free computer time and hints on how to run a free-lance software business while holding a full-time job

FREE-LANCE SOFTWARE MARKETING

3rd edition, June 1980

Writing and selling computer programs as an independent is a business where you can get started quickly, with little capital investment, you can do it full time or part time, the potential profits are almost limitless. Since the demand for computer software of all kinds is growing at an explosive rate, the conditions for the small entrepreneur are outstanding.

This manual will show you how to sell your own computer programs using these proven techniques: • direct to industries • through consulting firms • through manufacturers of computer hardware • in book form • mail order • through computer stores. It will show you how to profitably sell and license all types of software ranging from sophisticated analytical programs selling for thousands of dollars, down to simple accounting routines and games for personal computers.

The book will guide you step by step through the process of marketing, advertising, negotiating a contract, installing, training users and providing maintenance and support. It also contains sample software contracts that have been used in actual software transactions. Also included are tips on how to negotiate with a large corporation, ways of avoiding personal liability, techniques for obtaining free computer time and hints on how to run a free-lance software business while holding a full-time job.



321.95 No. 130
make tactical decisions about handling complaints, making refunds, guarantees, trial orders. There are fat profits to be made in mail order even for the person with limited time or capital, and this is the book that shows you how.

HOW TO START & OPERATE A MAIL ORDER BUSINESS

by Julian Simon, 3rd revised edition, 536 pages, 1981

Indispensable for those selling software, equipment or supplies by mail. The first two editions of this book have fascinated readers — and brought them a fortune. The methods described here have brought millions of dollars in sales for the readers. Whether you are a newcomer starting from scratch or an established business anxious to cash in on the lucrative mail-order market, this book tells you how to make money by mail. You'll discover the least expensive, most effective ways to promote your product. You'll learn how to create the kind of ads and mail order copy that will sell.

From the contents:

- where to go for direct-mail lists • how to get credit, deal with banks, handle merchandising • how to run one-inch ads that sell • how to get supplies and handle orders • what you may and may not do under current mail-order laws • how to make tactical decisions about handling complaints, making refunds, guarantees, trial orders. There are fat profits to be made in mail order even for the person with limited time or capital, and this is the book that shows you how.

ESSEX PUBLISHING CO. Dept. 2
285 Bloomfield Avenue • Caldwell, N.J. 07008

Order books by number. Send check, money order (U.S.), American Express, VISA or MasterCard #. Publisher pays 4th class shipping. For UPS shipping (USA only) add \$1.00 per book. For Air Mail add \$2.50 per book in the USA or Canada, \$12.00 per book elsewhere N.J. residents add 5% sales tax.

No. 10 No. 16 No. 32 No. 130 UPS Air

Name _____
Address _____
City _____ State _____ Zip _____
Card # _____ Exp. _____
Signature _____

For faster shipment on credit card orders call (201) 783-6840 between 9 and 5 Eastern time.

\$ SAVE \$

CALL MBC. . . (203) 342 2747

COMPUTERS

| | | |
|---------------------------------------|--|---------|
| NORTH STAR | | |
| HRZ-1Q-64K-HDS Save over \$1600.00!!! | | |
| ADVANTAGE 64K-QD | | \$3550 |
| HRZ-2D-64K-ASM | | \$Call |
| HRZ-64K-QD-ASM | | \$Call |
| HEWLETT-PACKARD | | |
| HP-85 | | \$2795 |
| HP-83 | | \$Call |
| HP Calculators In Stock 15% OFF!!! | | |
| ATARI | | |
| 800 16K | | \$ 759 |
| 400 16K | | \$ 345 |
| ZENITH | | |
| Z-89 GA | | \$2068 |
| Z-89 All-In-One-Computer | | \$2275 |
| COMMODORE | | |
| CBM, PET 32K COMPUTER | | |
| LIMITED TIME & QUANTITY | | \$ 975 |
| 8032 Large 80 Col. Screen | | \$Call |
| 8050 Dual Disk Drive 1 Meg | | \$Call |
| 4032 B or N 40 Col. Screen | | \$Call |
| 4040 Dual Disk Drive 360K | | \$Call |
| Vic-20 Color Computer | | \$ 275 |
| INTERTEC SUPERBRAIN | | |
| 64K-DD | | \$2775 |
| 64K-QD | | \$3180 |
| ALTOS SYSTEMS | | |
| ACS 8000-2 1 Meg FD | | \$3150 |
| ACS 8000-2D 2 Meg | | \$4390 |
| ACS 8000-10 4 User | | \$6795 |
| ONYX C8002 | | \$14900 |
| ----- | | |
| Verbatim Diskettes | | |
| 525-01,10 (box of 10) | | 24.50 |
| 550-01,10 (box of 10) | | 37.50 |

PRINTERS

| | | |
|---------------------------------|--|--------|
| DIABLO 630 | | \$CALL |
| NEC SPINWRITER 7730/7710 | | \$CALL |
| NEC 7720 KSR | | \$2890 |
| NEC 3510/3530 (35 CPS) | | \$1950 |
| C. ITOH | | \$1499 |
| OLYMPIA ES-100 Typewriter/Inter | | \$1250 |
| IDS Paper Tiger 445G | | \$CALL |
| 460G | | \$CALL |
| 560G | | \$1150 |
| ANADIX 9500/9501 | | \$1290 |
| CENTRONICS 730-1 | | \$ 550 |
| 737-1 | | \$ 699 |
| EPSON-MX80 W/Friction Opt. | | \$CALL |
| MX-70 | | \$ 395 |
| MX-100 | | \$CALL |
| OKIDATA MICROLINE 80 | | \$ 375 |
| 82 | | \$ 495 |
| 83 | | \$ 750 |

TERMINALS

| | | |
|--------------------------------|--|--------|
| TELEVIDEO 920C | | \$ 850 |
| 950 | | \$1050 |
| INTERTUBE III/Emulator | | \$ 725 |
| ZENITH Z-19 | | \$ 820 |
| ZENITH 12" Green Monitor | | \$ 139 |
| LEEDEX/ANDEK 100 Green Monitor | | \$ 165 |

Above items may be ordered by mail or phone. Visa & Master Charge accepted. Factory Sealed, Manufacturers Warranty
 ---Prices Subject To Change---

(203) 342-2747

**Multi-Business
 Computer Systems Inc.**

28 MARLBOROUGH STREET
 PORTLAND, CONN. 06480
 TWX/TELEX 710-428-6345

Listing 3 continued:

```

1820 IF C>1 THEN 1800
1830 FILL N,P
1840 N=N+1
1850 IF C<1 THEN 1690
1860REM PUT IN PROGRAMMED EVENTS
1870 FILL N,1
1880 N=N+1
1890 !TAB(8),"TIME IN DARK (X ,SEC/MIN/HR): ",
1900 INPUT C,K$
1910 C3=C1*C2
1920REM C1=SAMPLING RATE IN SEC, C2=#S/DPT
1930 IF K$="SEC"THEN 1980
1940 IF K$="MIN"THEN 1970
1950 IF K$="HR"THEN 1960 ELSE 1890
1960 C=C*60
1970 C=C*60
1980 C4=INT(C/60+.5)
1990 C5=C3*C4
2000 IF K$="SEC" THEN 2030
2010 IF K$="MIN" THEN C5=C5/60
2020 IF K$="HR"THEN C5=C5/3600
2030 C6=0
2040 IF C4<256 THEN 2080
2050 C6=INT(C4/256)
2060 IF C6>255 THEN 1890
2070 C4=C4-C6*256
2080 FILL N,C6
2090 N=N+1
2100 FILL N,C4
2110 N=N+1
2120 !TAB(8),"ACTUAL TIME= ",C5," ",K$
2130 C=C5
2140 N=FNH("07A5")
2150 GOSUB 9997
2160 FILL N,FNH("0090")
2170 N=N+1
2180 FILL N,5
2190 N=N+1
2200 C$=" "+K$(1,1)
2210 GOSUB 9993
2220 RETURN
2300REM PUT LIGHT INT/S INTO STACK AND SAMPLING RATE IN HEADER
2310 !"!LIGHT SAMPLING PARAMETERS:"
2320 !TAB(8),"DESIRED SAMPLING RATE (IN SEC): ",
2330 INPUT C
2340 C1=INT(C*1000/K+.5)
2350 C=C1*K/1000
2360 N=FNH("05D6")
2370 FILL N,C1
2380 N=N+1
2390 !TAB(8),"ACTUAL SAMPLING RATE= ",C," SEC"
2400 N=FNH("0500")
2410 GOSUB 9997
2420 C1=C
2430 C$=" S"
2440 GOSUB 9993
2450REM PUT S/DPT INTO STACK AND HEADER
2460 !TAB(8),"SAMPLES PER DATA POINT (POWER OF 2): ",
2470 INPUT C
2480 IF C>128 THEN 2460
2490 FILL N,C
2500 N=N+1
2510 N=FNH("0E23")
2520 GOSUB 9997
2530 C2=C
2540REM PUT PROCESSOR CODE INTO STACK
2550 P=0
2560 IF C=1 THEN 2600
2570 C=C/2
2580 P=P+1
2590 IF C>1 THEN 2570
2600 FILL N,P
2610 N=N+1
2620 IF C<1 THEN 2460
2630REM PUT IN PROGRAMMED EVENTS
2640 FILL N,3 \REM 3 EVENTS
2650 N=N+1
2652 C3=C1*C2 \REM C3=SEC/DPT
2654REM C1=SAMPLING RATE IN SEC, C2=#S/DPT
2658 C4=INT(C3/60+.5) \REM CALCULATE 1-MIN
2660 FILL N,C4
2662 M=M+1
2664 FILL M,C4 \REM TURN ON LIGHT AFTER 1-MIN
2665 M=M+1
2666 FILL M,FNH("00A2") \REM ADDR OF LITON
2667 M=M+1
2668 FILL M,5
2669 M=M+1
    
```

Listing 3 continued:

```
2680 !TAB(8),"LIGHT PERIOD (X ,SEC/MIN/HR): ",
2690 INPUT C,K$
2700 IF K$="SEC"THEN 2750
2710 IF K$="MIN"THEN 2740
2720 IF K$="HR"THEN 2730 ELSE 2660
2730 C=C*60
2740 C=C*60
2750 C4=INT(C/C3+.5) + C4
2760 C5=C3*C4
2770 IF K$="SEC" THEN 2800
2780 IF K$="MIN" THEN C5=C5/60
2790 IF K$="HR"THEN C5=C5/3600
2800 C6=0
2810 IF C4<256 THEN 2850
2820 C6=INT(C4/256)
2830 IF C6>255 THEN 2660
2840 C4=C4-C6*256
2850 FILL M,C6
2860 M=M+1
2870 FILL M,C4
2880 M=M+1
2890 FILL M,FNH("009C")
2900 M=M+1
2910 FILL M,5
2920 M=M+1
2930 C=C5-C3*INT(60/C3+.5)
2940 !TAB(8),"ACTUAL TIME= ",C," ",K$
2950 H=FNH("07E0")
2960 GOSUB 9997
2970 C$=" "+K$(1,1)
2980 GOSUB 9998
2990 !TAB(8),"PERIOD OF LIGHT SAMPLING (X ,SEC/MIN/HR):",
3000 INPUT C,K$
3010 C3=C1*C2
3020REM C1=SAMPLING RATE IN SEC, C2=#S/DP
3030 IF K$="SEC"THEN 3080
3040 IF K$="MIN"THEN 3070
3050 IF K$="HR"THEN 3060 ELSE 2990
3060 C=C*60
3070 C=C*60
3080 C4=INT(C/C3+.5)
3090 C5=C3*C4
3100 IF K$="SEC" THEN 3130
3110 IF K$="MIN" THEN C5=C5/60
3120 IF K$="HR"THEN C5=C5/3600
3130 C6=0
3140 IF C4<256 THEN 3180
3150 C6=INT(C4/256)
3160 IF C6>255 THEN 2990
3170 C4=C4-C6*256
3180 FILL M,C6
3190 M=M+1
3200 FILL M,C4
3210 M=M+1
3220 !TAB(8),"ACTUAL TIME= ",C5," ",K$
3230 C=C5
3240 H=FNH("0846")
3250 GOSUB 9997
3260 C$=" "+K$(1,1)
3270 GOSUB 9998
3280 FILL M,FNH("0090")
3290 M=M+1
3300 FILL M,5
3310 RETURN
3400REM INPUT COMMENTS
3410 !
3420 H=FNH("085F")
3430 INPUT "COMMENTS:",C$
3440 IF C$=""THEN 200
345 GOSUB 998
3460 C$=CHR$(13)+CHR$(10)
3470 GOSUB 9998
3480 IF H>=NH("0DF") THEN STOP
3490 GOTO 3430
3500 RETUR
9995REMSUBROUTINE TO PLACE STRING C$ OF LENGTH L
9996REM INTO MEMORY STARTING AT RAM H
9997 C$=STR$(C)
9998 L=LEN($)
9999 FOR I=1 TO L
10000 Ts=C$(I,I)
10001 FILL ,ASC($
102 H=H+1
10003 NEXT I
10004 RETURN
READY
```

ARE YOU READY?



You are ready for MICRO if you want to. . .

- Go beyond canned software
- Use your computer for more than games
- Learn advanced programming techniques
- Understand the inner workings of your computer
- Get the most out of your 6502/6809 system

Month after month, MICRO gives readers sophisticated software applications, detailed discussions of programming languages, and in-depth hardware tutorials.

To get the most out of your machine, say YES to MICRO today! We accept VISA or Mastercard. **\$18.00** per year in the U.S., **\$21.00** elsewhere.

Use Our 24-hour Toll-free Service

800-227-1617

Ext.546

In California: 800-772-3545, Ext.546

MICRO

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

DON'T GET STUCK.

Sloppy software contracts cost money and cause misunderstandings. Consult us *before* you sign a contract. We offer contract services to both customers *and* suppliers.

Call or write
Robert E. Brown, Esq.
(716) 232-5300.

■ Basic ■ Forth ■ Cobol
■ Fortran ■ Others

**Middleton,
Wilson, Boylan & Gianniny,**
Attorneys at Law
900 Midtown Tower, Rochester NY 14604

Circle 277 on inquiry card.

CHIPS & DALE

THE INFLATION FIGHTERS!
— RAM —

4116 200ns 8/\$14.00

2114L 300ns 8/\$18.45

4164 200ns \$22.00

— EPROM —

2716 (5V)450ns 8/\$4.25 ea.\$4.50 ea.

2732 (5V)450ns 8/\$11.00 ea.\$11.50 ea

We buy from Manufacturer's Authorized Distributors. All Chips are fully Guaranteed. Call for quantity pricing. Please allow up to 3 wks. for personal checks to clear.

Add \$2.50 Shipping & Handling
C.O.D. \$3.00. Wash. residents add 5.4% Sales Tax

CHIPS & DALE
P.O. Box 31607
Seattle, Wash. Zip 98103 Master Charge
1-206-524-9126 VISA accepted.

Circle 66 on inquiry card.

NEW 16K-RAM PERSONAL COMPUTER

\$229⁰⁰ FACTORY SALE PRICE

For \$229⁰⁰ you get the new Interact Model "R" Computer, 16K-RAM, 2K-ROM, 8080A Microprocessor, color, sound, full 53 keyboard, high speed cassette, AC adapter, R.F. Modulator, Black Console Case, 90 days parts and labor warranty, owners' guide, FCC approved.
15 DAY FREE TRIAL Return within 15 days complete and undamaged for refund of purchase price.

PROTECTO ENTERPRIZES
BOX 550, BARRINGTON, IL 60010
TO ORDER PHONE 312/382-5244

Circle 351 on Inquiry card.

Listing 4: Program STATUS, which allows the operator to examine and control the progress of the sample experiment after running the program in listing 3. Both programs interact with the program in listing 1, which must be loaded into memory first.

```

2 REM ***** STATUS *****
4 REM
5 REM THIS PROGRAM FIRST WRITES OUT THE HEADER AND STARTS
6 REM THE EXPT, AND THEN PROMPTS FOR A CONTROL COMMAND
7 REM
21 REM
24 REM * * * * *
27 REM
30 REM THIS SR CONVERTS A HEX NUMBER TO DECIMAL
33 DEF FNH(H$)
36 L=LEN(H$)
39 D=1
42 X=0
45 FOR I=2 TO L
48   D=D*16
51   NEXT I
54 FOR I=1 TO L
57   T$=H$(I,I)
60   IF T$<="F" THEN 81
63   Y=VAL(T$)
66   Y=Y*D
69   D=D/16
72   X=X+Y
75   NEXT I
78 RETURN X
81 IF T$>="A" THEN 84 ELSE 63
84   Y=ASC(T$) - 55
87   GOTO 66
89 FNEND
90 REM
91 REM * * * * *
92 REM
100 REM
110 REM * * * * *
120 REM
130 REM           THIS SECTION PROMPTS FOR A COMMAND
140 REM
142 !\!"CLOCK RATE = 53.248 MSEC; CHANGE LINE 7190 IF DIFFERENT"
144 !
150 !\!"EXPERIMENT IN PROGRESS - STATUS PROGRAM LOADED"
160 !\!"COMMANDS:"
170 !\!"   H = PRINT HEADER TO CONSOLE"
180 ! "   T = SHOW TIME INTO THIS CYCLE / # CYCLES LEFT"
190 ! "   A = ADVANCE TO NEXT CYCLE AFTER NEXT DATA PT"
200 ! "   E = END EXPT"
220 ! "   D = DISPLAY DATA IN BUFFER"
225 ! "   V = PRINT VOLTAGE LEVELS"
227 ! "   S = STOP INTERRUPTS"
229 ! "   R = RESTART INTERRUPTS"
230 !
240 INPUT"WHICH COMMAND?",C$
250 IF C$="H" THEN GOSUB 500
260 IF C$="T" THEN GOSUB 600
270 IF C$="A" THEN GOSUB 700
280 IF C$="E" THEN GOSUB 800
300 IF C$="D" THEN GOSUB 1000
305 IF C$="V" THEN GOSUB 4000
307 IF C$="S" THEN GOSUB 5000
309 IF C$="R" THEN GOSUB 6000
310 GOTO 150
480 REM
490 REM * * * * *
495 REM
497 REM THIS SECTION CALLS AN ASSEMBLY ROUTINE
498 REM WHICH OUTPUTS THE HEADER VIA DOS I/O
499 REM
500 !
505 Q=CALL(2295,1792)
510 INPUT"PRESS CARRIAGE RETURN TO CONTINUE",Q$
550 RETURN
580 REM
585 REM * * * * *
587 REM
590 REM           THIS SECTION LOOKS INTO RAM TO FIND TIME THIS
593 REM           CYCLE HAS BEEN RUNNING AND # OF CYCLES LEFT
595 REM
600 GOSUB 7000
602 T$=" SEC"
604 T4=T1*T2*K1*B6
606 IF T4>120 THEN T$=" MIN"
608 IF T4>120 THEN T4=T4/60
609 !

```


Listing 4 continued:

```

610 !"THIS CYCLE HAS BEEN RUNNING FOR ",%F2,T4,T$
620 E1=FNH("059B") \REM ADDR OF ENDFLAG
630 E1=EXAM(E1)
640 !"# OF CYCLES LEFT = ",E1
650 RETURN
680 REM
685 REM * * * * *
688 REM
690 REM THIS SECTION ENDS THE CURRENT CYCLE AND
695 REM ADVANCES TO THE NEXT CYCLE AFTER THE
697 REM NEXT DATA POINT
699 REM
700 E2=FNH("08FC")
710 Q=CALL(E2) \REM DISABLE INTERRUPTS
720 M=FNH("013C") \REM ZERO EVENT TIME CNTR
725 FILL M,1
730 M=M+1
735 FILL M,0
740 M=M+1
742 FILL M,1
745 M=M+1
750 FILL M,FNH("0090")
752 M=M+1
755 FILL M,5
760 OUT 24,0 \REM TURN OFF ALL RELAYS
770 Q=CALL(E2+2) \REM ENABLE INTERRUPTS
780 RETURN
785 REM
788 REM * * * * *
790 REM THIS SECTION ENDS THE EXPT BY PUTTING A ONE
792 REM IN ENDFLAG AND THEN ENDING THE CURRENT CYCLE
795 REM
800 M=FNH("059B")
820 FILL M,1
840 GOSUB 700 \REM END CYCLE
860 RETURN
960 REM
970 REM * * * * *
980 REM * * * * * DISPLAY * * * * *
990 REM * * * * *
1000!"THIS PROGRAM GRAPHICALLY DISPLAYS DATA"
1010!"CONTAINED IN THE A/D UTILITIES BUFFER"
1020!
1030 GOSUB 7000 \REM FETCH CONSTANTS FROM RAM
1040 !
1050 ! "THERE ARE ",C1," CHANNELS WITH ",B6," POINTS EACH IN THE BUFFER"
1060 !\INPUT "WHICH CHANNEL DO YOU WANT DISPLAYED?",C2
1070 IF C2<1 THEN STOP
1080 IF C2 > C1 THEN 1060
1090 !\INPUT"DISPLAY TYPE? (C=CRT; O=OSCOPE; S=STRIP CHART):",D1$
1100 IF D1$="C" THEN 1500
1110 IF D1$="O" THEN 2000
1120 IF D1$="S" THEN 3000
1130 GOTO 1090
1140 REM
11470 REM
11475 REM * * * * *
11480 REM
11485 REM THE FOLLOWING SECTION OUTPUTS THE DATA BUFFER
11490 REM GRAPHICALLY ONTO THE SROC 120 CRT
11495 REM
1500 FOR I=1 TO 24
1505 ! \NEXT I \REM CLEAR CRT
1510 REM
1515 REM
1520 REM PUT TIME SCALE ON SCREEN
1525 OUT 2,27 \REM LOAD CURSOR
1530 OUT 2,61
1535 OUT 2,54
1540 OUT 2,32
1545 T3=A1*T1*T2*K1 \REM TIME PER DATA PT
1550 T$=" SEC"
1555 IF T3>=120 THEN T$=" MIN"
1560 IF T3>=120 THEN T3=T3/60
1565 !"EACH POINT = ",%F1,T3,T$
1570 REM
1575 REM
1580 REM INITIALIZE X, AND DATA ADDR'S
1585 D1=B1 + C2 - 1 \REM ADDR OF DATA
1590 X=32 \REM CURSOR X-POSITION
1615 Y=0 \REM LOOP TILL DISPLAY DONE
1620 FOR I=1 TO A1
1625 Y=Y + EXAM(D1) \REM AVERAGE PTS
1630 D1=D1+C1
1635 NEXT I

```

Listing 4 continued on page 432

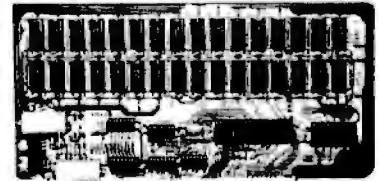
Big sale on K's!

16K...\$149.95

32K...\$199.95

48K...\$249.95

64K...\$299.95



New JAWS-IB The Ultrabyte Memory Board

Due to the tremendous success of our JAWS I, we were able to make a special purchase of first-quality components at below-cost prices for JAWS-IB. And we are sharing our cost saving with you. But don't be surprised if the next time you see this ad the prices have gone up substantially. Better yet, order now, and get the best memory on the market at the best price on the market.

ONE CHIP DOES IT ALL
Jaws-IB is the Rolls-Royce of all the S100 dynamic boards. Its heart is Intel's single chip 64K dynamic RAM controller. Eliminates high-current logic parts ... delay lines ... massive heat sinks ... unreliable trick circuits. JAWS-IB solves all these problems.

LOOK WHAT JAWS-IB OFFERS YOU
Hidden refresh ... fast performance ... low power consumption ... latched data outputs ... 200 NS 416 RAM's ... on-board crystal ... RAM Jumper selectable on 6K boundaries ... fully socketed ... solder mask on both sides of board ... phantom line ... designed for 8080, 8085, and Z80 bus signals ... works in Explorer, Sol, Horizon, as well as all other well-designed S100 computers.

10-DAY MONEY-BACK TRIAL: Try a fully wired and tested board for 10 days — then either keep it, return it for full, or simply return it in working condition.

Continental U.S.A. Credit Card Buyers Outside Connecticut.
TO ORDER CALL TOLL FREE 800-243-7428
From Connecticut Or For Assistance:
(203) 354-9375

Please send the items checked below:

JAWS-IB kit:
 16K.....\$149.95*
 32K.....\$199.95*
 48K.....\$249.95*
 64K.....\$299.95*

JAWS-IB Fully Assembled, wired & Tested:
 16K.....\$179.95*
 32K.....\$239.95*
 48K.....\$299.95*
 64K.....\$359.95*

EXPANSION KIT, 16K RAM Module, to expand JAWS-IB in 16K blocks up to 64K. \$59.95

*All prices plus \$2 postage and insurance (\$4.00 Canada). Connecticut residents add sales tax.

Total enclosed: \$ _____

Personal Check Money Order or Cashier's Check
 VISA Master Card (Bank No. _____)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

City _____

State _____ Zip _____

NETRONICS R&D Ltd.
333 Litchfield Road, New Milford, CT 06776

AC-85 CP/M® SYSTEM

**Asm., Tested
& Burned In
for one week**

\$2450

Features:

- One board 8085 Computer
- 2 - SA800R* (1.2 megabytes)
- CBIOS Diskette
- Installed and wired in a cabinet with P/S and Fan ready to plug-in
- Manual
- 17 1/2" W x 17" D x 10" H
- SYSTEM with 2 SA850R (2.4 mbytes)

\$2750.00

CP/M Floppy Disk Operating System #160
Check or Money Order

autocontrol

11744 Westline Industrial Drive
St. Louis, MO 63141
(314) 432-1313

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

Circle 42 on Inquiry card.

ATARI



GRAPHICS HARDCOPY

ON: EPSON PRINTERS
CENTRONICS 739
IDS 445G
TREND/COM

Dumps anything on the screen to the printer
To Order Toll Free
1-800-344-7493



MACROTRONICS, inc.
1125 N. Golden State Blvd.
Tullock, California 95380



Circle 235 on inquiry card.

RS-232 PROBLEMS?



LET THE RS-232 TESTER HELP YOU SOLVE YOUR COMPUTER INTERFACE PROBLEMS. DESIGNED TO CONNECT IN SERIES WITH ANY RS-232 INTERFACE, IT DISPLAYS THE STATUS OF SEVEN OF THE MOST IMPORTANT LINES: TRANSMIT DATA, RECEIVE DATA, REQUEST TO SEND, CLEAR TO SEND, DATA SET READY, CARRIER DETECT, AND DATA TERMINAL READY. THE RS-232 TESTER REQUIRES NO POWER AND MAY BE LEFT IN THE LINE PERMANENTLY.

\$39.95 POST PAID
B & B ELECTRONICS
BOX 475/MENDOTA, IL 61342

Circle 48 on Inquiry card.

Listing 4 continued:

```

1640 Y= INT(Y/A1 + .5)
1645 REM CONVERT TO 0-255 SCALE
1650 IF Y<128 THEN Y1=Y+128
1655 IF Y>127 THEN Y1= ABS(128-Y)
1660 Y=INT(Y1/10)
1665 IF Y>23 THEN Y=23 \REM SCALE TO 0-23 FOR CURSOR LOADING
1670 Y= ABS(23-Y) + 32 \REM Y-POSITION CODE
1675 OUT 2,27 \REM LOAD CURSOR AND OUTPUT CHAR
1680 OUT 2,61
1685 OUT 2,Y
1690 OUT 2,X
1695 OUT 2,C2+48
1700 X=X+1 \REM UPDATE X
1705 IF X=112 THEN 1735
1710 IF X<87+32 THEN 1615
1725 REM DISPLAY DONE, PROMPT FOR NEXT CHNL TO DISPLAY
1730 REM
1735 OUT 2,27 \REMLOAD CURSOR
1740 OUT 2,61
1745 OUT 2,55
1750 OUT 2,32
1755 INPUT1"CHANNEL TO DISPLAY (0=END)?",C2
1760 IF C2=0 THEN 150
1765 IF C2>C1 THEN 1755
1770 GOTO 1580
1775 REM
1990 REM
1995 REM * * * * *
1996 REM
1997 REM THE FOLLOWING SECTION OUTPUTS THE DATA BUFFER
1998 REM TO THE OSCOPE VIA D/A PORT 26 WITH THE TRIGGER
1999 REM PULSE COMING OUT PORT 25
2000REM
2100 P1=FNH("0900") \REM ADDR TO PUT CHNL CODE
2120 C3=C2-1 \REM CHNL CODE
2140 FILL P1,C3
2145 T$=" SEC" \REM CALCULATE TIME SCALE
2150 T4=K1*B6*T1*T2
2155 IF T4>=120 THEN T$=" MIN"
2160 IF T4>=120 THEN T4=T4/60
2170 !\!"CHANGE ANY BIT OF PORT 24 FOR NEW CHANNEL"
2175 !\!"TOTAL OUTPUT = ",%6F1,T4,T$
2177 P9=INP(24)
2180 Q=CALL(P1+2,B6) \REM OUTPUT BUFFER
2190 IF INP(24)=P9 THEN 2180 ELSE 2200
2200 INPUT"WHICH CHANNEL DO YOU WANT TO DISPLAY?(0=END):",C2
2220 IF C2<1 THEN 150
2230 GOSUB 7000
2240 IF C2>C1 THEN 2200
2240 GOTO 2100
2290 REM
2295 REM * * * * *
2297 REM
2298 REM THIS ROUTINE OUTPUTS THE DATA BUFFER
2299 REM VIA PORT 26 TO THE STRIP CHART RECORDER
3000 T$=" SEC" \REM CALCULATE TIME SCALE
3010 T4=K1*B6*T1*T2
3020 IF T4>=120 THEN T$=" MIN"
3030 IF T4>=120 THEN T4=T4/60
3040 !"TOTAL OUTPUT = ",%6F1,T4,T$
3050 !INPUT "PRESS CARRIAGE RETURN TO START OUTPUT",Q$
3060 !\!"CHANNEL ",C2," BEING OUTPUT",
3070 REM
3080 D1=B1 + C2 - 1 \REM INITIALIZE DATA PT ADDR
3090 REM
3100 FOR I=1 TO 10 \REM OUTPUT STARTING POINTS
3110 OUT 26,128
3120 GOSUB 3000 \REM DELAY SR
3130 NEXT I
3140 REM
3150 REM OUTPUT BUFFER TILL DONE
3160 FOR I=1 TO 06
3170 Y=EXAM(D1)
3180 OUT 26,Y
3190 D1=D1 + C1
3200 GOSUB 3000
3210 NEXT I
3220 REM
3230 REM OUTPUT ENDING POINTS
3240 FOR I=1 TO 10
3250 OUT 26,128
3260 GOSUB 3000
3270 NEXT I
3280 REM
3290 REM !\!\!"DISPLAY FINISHED"
3300 !

```

Listing 4 continued:

```

3310 INPUT"WHICH CHANNEL DO YOU WANT TO DISPLAY?(0=END)",C2
3320 IF C2<1 THEN 150
3330 IF C2>C1 THEN 3310
3340 GOTO 3040
4000 REM
4020 REM *** THIS SECTION PRINTS THE VOLTAGE
4040 REM *** OUTPUTS FOR EACH DIFF. CHANNEL
4060 REM
4080 DO= -2.00 \REM DIFF OFFSET
4100 !"DIFFERENTIATOR OFFSET = ",DO," VOLTS"
4120 C1=FNH("0137")
4140 C1=EXAM(C1) \REM # CHNLS
4160 FOR I=1 TO C1
4180 VO=INP(24+I)
4200 IF VO<128 THEN V1=VO+128 \REM SCALE 0-255
4220 IF VO>127 THEN V1=ABS(128-VO)
4240 V1=(V1*.02) -2.56
4260 !"CHANNEL ",I," = ",V1," VOLTS"
4280 NEXT I
4300 RETURN
5000REM ***
5010REM *** SR TO DISABLE INTERRUPTS
5020REM ***
5030 Q=FNH("08FC")
5040 Q=CALL(Q)
5050 RETURN
6000REM ***
6010REM *** SR TO RESTART INTERRUPTS
6020REM ***
6030 Q=FNH("08FE")
6040 Q=CALL(Q)
6050 RETURN
7000 REM * * * * *
7010 REM
7020 REM THIS SECTION FETCHES CONSTANTS FROM RAM
7030 REM
7040 B1=FNH("1000") \REM BUFSTRT
7050 B2=FNH("017F") \REM CONVERT MBUFPT TO DECIMAL
7060 B3=B2+1
7070 B2=EXAM(B2)
7080 B3=EXAM(B3)*256
7090 B4=B3 + B2
7100 B5=B4 - B1 \REM #PTS IN BUF
7110 REM
7120 C1=FNH("0137")
7130 C1=EXAM(C1) \REM # CHNLS
7140 REM
7150 B6=B5/C1 \REM #PTS/CHNL
7160 A1=INT(B6/80 + .3) \REM # PTS TO AVE FOR DISPLAY
7170 IF A1=0 THEN A1=1
7180 B7=INT(B6/A1)
7190 K1=.053248 \REM CLOCK INTERRUPT RATE
7200 T1=FNH("0138")
7210 T2=T1 + 1
7220 T1=EXAM(T1) \REM #INT/SAMPLE
7230 T2=EXAM(T2) \REM # SAMPLES/DATA PT
7240 RETURN
7900 REM
7910 REM * * * * DELAY BETWEEN DATA OUTPUT * * * *
7920 REM
8000 FOR J=1 TO 20 \NEXT J
8100 RETURN
9000 END
READY
    
```

Now with added words! * ELECTRIC MOUTH



for \$100, Elf II, Apple TRS-80, Level II" From **\$99.95** kit

Now — teach your computer to talk, increasing interaction between you and your machine.

- That's right, the ELECTRIC MOUTH actually lets your computer talk! Installed and on-line in just minutes, it's ready for spoken-language use in office, business, industrial and commercial applications and in games, special projects, R&D, education, security devices — there's no end to the ELECTRIC MOUTH's usefulness. Look at these features:
- Supplied with 143 letters/words/phonemes/numbers capable of producing hundreds of words and phrases
 - Expandable on-board up to thousands of words and phrases with additional speech ROMs (see new speech ROM described below)
 - Four models that plug directly into S100, Apple, Elf II and TRS-80 Level II computers
 - Got ELECTRIC MOUTH to talk with either Basic or machine language (very easy to use, complete instructions with examples included)
 - Uses National Semiconductor's "Digitalker"
 - Includes on-board audio amplifier and speaker with provisions for external speakers
 - Installs in just minutes

Principle of Operation: The ELECTRIC MOUTH stores the digital equivalents of words in ROMs. When words, phrases and phonemes are desired, they simply are called for by your program and then synthesized into speech. The ELECTRIC MOUTH system requires none of your valuable memory space except for a few addresses if used in memory mapped mode. In most cases, output ports (user selectable) are used.

SPOKEN MATERIAL INCLUDED (Vox I)

| | | | | | | | | |
|-----------|----------|---------|---------|--------|--------|-------------|-------|---|
| one | eighteen | of | dollar | inches | number | as | c | t |
| two | nineteen | cancel | down | is | of | second | d | u |
| three | twenty | case | equal | it | off | and | v | y |
| four | thirty | cent | error | kilo | on | space | f | w |
| five | forty | 40cents | tone | feet | left | out | speed | g |
| six | fifty | 50cents | tone | flow | less | over | start | h |
| seven | sixty | 20ms | silence | fuel | lessor | parenthesis | start | i |
| eight | seventy | 40ms | silence | gallon | limit | percent | stop | k |
| nine | eighty | 80ms | silence | go | low | please | than | l |
| ten | ninety | 160ms | silence | gram | lower | plus | the | t |
| eleven | hundred | 320ms | silence | great | mark | point | time | n |
| twelve | thousand | cent | greater | meter | pound | try | n | n |
| thirteen | million | check | have | make | pinset | up | u | |
| fourteen | zero | comma | high | mile | radio | volt | p | |
| fifteen | again | control | higher | minus | re | weight | q | |
| sixteen | improve | danger | hour | minute | ready | a | r | |
| seventeen | and | degree | in | near | right | b | a | |

ADDITIONAL VOCABULARY NOW AVAILABLE (VOX II)

| | | | | | |
|------------|-----------|----------|----------|---------|-------------|
| short | complex | fifth | light | put | station |
| acid | continue | few | load | quarter | switch |
| adjust | copy | flow | lock | range | system |
| alarm | correct | floor | longer | reached | temperature |
| alert | cream | fourth | move | record | "by" |
| all | "do" | forward | move | repeat | "by" |
| ask | deposit | from | next | reverse | thank |
| assistance | dial | gas | no | red | third |
| direction | door | get | normal | repair | this |
| blue | east | going | north | start | turn |
| break | "ed" | green | net | replace | under |
| button | emergency | hale | notice | return | use |
| bay | entry | best | operator | safe | warning |
| call | "es" | help | or | secure | warm |
| called | "th" | inlets | pass | select | water |
| cellular | maintain | acid | per | send | wind |
| centigrade | cell | hot | power | service | wind |
| change | fall | in | press | side | windrow |
| circuit | failure | in | pressure | slow | yellow |
| cigar | fabulous | intruder | process | slowly | you |
| class | fast | level | push | smooth | zinc |
| cold | fast | level | push | smooth | zinc |

*Registered Trademarks
 Continental U.S.A. Credit Card Buyers Outside Connecticut
TO ORDER
 Call Toll Free: 800-243-7428
 To Order From Connecticut, or For Technical Assistance, call (203) 384-9375

NETRONICS R&D LTD.
 333 Litchfield Road, New Milford, CT 06778

Please send the items checked below: Dept PE

- S100 "Electric Mouth" kit w/Vox I \$ 99.95
- Elf II "Electric Mouth" kit w/Vox I \$ 99.95
- Apple "Electric Mouth" kit w/Vox I \$119.95
- TRS-80 Level II "Electric Mouth" kit w/Vox I \$119.95
- VOX II (Second Word Set) \$ 39.95

Add \$20.00 for wired mesh units instead of kit. VOX II postage & insurance \$1.00. All other \$1.00 postage and insurance. Cannot see add sales tax.

Total Enclosed \$ _____

- Personal Check Cashier's Check/Money Order
- Visa Master Charge (Bank No. _____)

Acct. No. _____ Exp. Date _____

Signature _____
 Print Name _____
 Address _____
 City _____
 State _____ Zip _____

Need help? Call us.
Want to help?
Call us.
 Red Cross is counting on you.

A Public Service of This Magazine & The Advertising Council



Five Spelling-Correction Programs for CP/M-Based Systems

Phil Lemmons
89 Remsen St
Brooklyn NY 11201

When I had trouble with an applications program last year, I appealed to my software vendor for help. He wrote me, "I have been in touch with the publisher, but I am getting noware fast." Noware, of course, was the leading technology before the invention of hardware, software, and firmware. Was noware making a come-

back? No way. "Noware" was a spelling error. And the only way for a poor speller to discover errors like this was with software. But no proofreading software was then available for microcomputers.

Until recently, I didn't think the time had come for a good proofreading program running on microcomputers. Fortunately, I was wrong. Help has now arrived for the small-computer owner who can't spell or can't find misspellings. Not counting programs designed for use with only a single word-processing program, at least five proofreading programs are now available for CP/M-based computers: Microproof, The Word, Spellguard, Microspell, and Wordsearch. After using them for several weeks, I'm convinced that four have real merit. The four useful programs share some virtues, but each program also has features that appeal to a particular group of users.

You might base your choice among the four programs on the characteristics of your hardware—particularly the disk capacity. Or your word-processing software might mesh well with one of the programs, depending, for example, on whether your text editor will let you run a proofreading program from inside (ie: as a pseudocommand in the editor). Then again, each program has its own way of letting the user deal with a text file. Would you prefer a program that quickly checks a file and prints a list of suspect words? Or would you rather have the program present the suspect words to you one by one, so you can see if the word is really misspelled? Or how about a program that lets you see each word's context and change the original text? Another important criterion is price, and the range is great.

I'll discuss each of the five programs in turn, including their performance in benchmark tests. But first I'll state the opinions I've formed about what a proofreading program must do to be useful. Also, I'll explain how I tried to

At a Glance

Name
The Word

Author
Wayne Holder

Type
Proofreader for spelling errors, including 45,000-word literal dictionary, as well as programs to look up words in a dictionary on disk, count words, report on word frequency, search dictionary for words matching letter patterns, and sort words in a file into an alphabetical list with all redundancy eliminated

Manufacturer
Oasis Systems
2765 Reynard Way
San Diego CA 92103
(714) 291-9489

Price
\$75

System Requirements
CP/M 1.4 or 2.2 operating system, CDOS, or IMDOS; 8080/85 or Z80 CPU with 32 K bytes of memory; one or two disk drives; keyboard input and hard-copy output; CP/M-compatible word processor, including WordStar, WordMaster, Ed, and Magic Wand

Format
CP/M single-density 8-inch disk

Language
8080 machine language

Documentation
30 pages, soft cover, stapled

Audience
Anyone with a CP/M-compatible word-processing system, especially writers and editors

devise benchmarks that are meaningful for five programs, all of which work differently.

What a Proofreading Program Must Do

If you told someone it was okay to bring a few friends

to your party, how would you feel if 500 strangers appeared? You'd feel the same way about a proofreading program that found fifty suspect words for every one that was actually misspelled. A proofreading program that finds all the misspelled words in a document is of little use if the program also finds hundreds of correctly spelled words suspect. How can the list of suspect words be kept manageable? It requires an extensive dictionary; I think 20,000 words is the minimum. The words must be correct and well chosen.

Another feature that keeps down the number of correct words mistaken for misspellings is the ability to create special dictionaries for your particular interests. Proofreading programs can also recognize more words by breaking words into roots, prefixes, and suffixes before checking the dictionary. But that has its drawbacks, because you can't stick any suffix or prefix on any root and get a real word.

A proofreading program should also provide a handy way to dispose of suspect words that are in fact correct. If a program presents the suspect words in one list, you need a quick way to delete correct words from the list. If a program presents suspects one at a time, you should be able to accept or reject each word with a single keystroke.

Equally important, the program must facilitate correction of misspelled words. One way is to mark suspect words in the original text file with a character that's easy to find later by using a text editor's search command. In

At a Glance

Name
Spellguard

Author
Denis Coleman

Type
Proofreader for spelling errors, including 20,000-word literal dictionary

Manufacturer
Innovative Software Applications
POB 2797
Menlo Park CA 94025
(415) 326-0805

Price
\$295

System Requirements
CP/M 1.4, 2.0, or later operating system, or CDOS; 8080/85 or Z80 CPU with 32 K bytes of memory; one

or two disk drives; keyboard input and hard-copy output; CP/M-compatible word processor, such as WordStar, WordMaster, Magic Wand, Electric Pencil, or Ed

Format
CP/M single-density 8-inch disk; North Star double-density 5-inch disk; or SuperBrain 5-inch CP/M disk

Language
8080 machine language

Documentation
116 pages in three-ring binder

Audience
Anyone with a CP/M-compatible word-processing system

At a Glance

Name
Wordsearch

Type
Proofreader for spelling errors, including 7200-word literal dictionary, with routines to list misspelled words and display the text file with misspellings highlighted

Manufacturer
Keybits Incorporated
POB 592293
Miami FL 33159
(415) 524-8098

Price
\$195

System Requirements
CP/M-compatible operating

system; 8080 or Z80 CPU with 32 K bytes of memory; dual 8-inch single-density disk drives; 24 by 80 video terminal; CP/M-compatible word processor

Format
CP/M single-density 8-inch disk

Language
8080 machine language

Documentation
46 pages in three-ring binder

Audience
Anyone with a CP/M word-processing system

STOP!



Did you remember to remove your Priority One insert? If not please turn back to page 64 and tear it out.

that case, the mark should be easy to delete during editing. And the mark should be made in a disk file, not on paper. Working from paper is too slow.

Another way for a proofreading program to facilitate correcting misspelled words is to provide a means to replace the word in the original file. With some word processors, however, this approach runs the risk of disturbing the format of the original text—especially in justified copy.

No matter what its other virtues, a proofreading program must also work quickly. Most significant among the factors affecting the speed of operation is the size of the dictionary. Putting too many little-used words in the dictionary may sacrifice speed in proofreading without reducing the number of suspect words. Putting too few words in the dictionary results in long lists of suspect words, and that also wastes time. The dictionary must strike a balance.

Benchmarks

Originally, I thought I could just run each program until it finished and note how long it took. But no two programs finished in the same place. Spellguard proofreads the file, lets you judge each suspect word, and then Spellguard itself marks the words indicated. The Word proofreads the file, gives you a list of suspect words, and lets you trim the list with your own text editor; you can mark the confirmed misspellings by running The Word's



YULETIDE SPECIALS!!
please see page 229 for further information





ATARI

NOW YOU CAN SAVE WHILE ENTERTAINING THE WHOLE FAMILY!!



We carry the complete line of ATARI Hardware, Software Peripherals, and accessories.

Turn to our full page ATARI advertisement for SUPER CHRISTMAS SAVINGS!

OMEGA SALES CO.

WEST COAST
1-800-235-3581

EAST COAST
1-800-556-7586

At a Glance

Name
Microspell

Author
Bob Lucas

Type
Proofreader for spelling errors, including 26,000-word literal dictionary and suffix-stem logic to encompass a wider vocabulary, with integral routines to display the context of a misspelled word, guess the word intended, look up words in the dictionary, count words, search dictionary for words matching letter patterns, and correct the misspelling in the original text file

Manufacturer
Lifeboat Associates
1651 Third Ave
New York NY 10028
(212) 860-0300

Price
\$249

System Requirements
CP/M 1.4 or 2.2 operating system; 8080 or Z80 CPU with 48 K bytes of memory; one disk drive with at least 150 K bytes; keyboard input and hard-copy output; CP/M-compatible word processor

Format
Great variety of CP/M disk formats

Language
8080 machine language

Documentation
30 pages, soft cover, stapled

Audience
Anyone with a CP/M-compatible word-processing system

At a Glance

Name
Microproof

Author
Phillip Manfield

Type
Proofreader for spelling errors, including 50,000-word dictionary (counting words constructed from roots, prefixes, and suffixes), with optional routines to display the context of a misspelled word and correct the misspelling in the original text file

Manufacturer
Cornucopia Software
POB 5028
Walnut Creek CA 94596
(415) 524-8098

Price
\$169 standard version;

\$60 for correcting option

System Requirements
CP/M 1.4 or 2.2 operating system or TRSDOS for Model I, II, or III TRS-80; Z80 CPU with 32 K bytes of memory; one 5-inch or 8-inch disk drive; keyboard input and hard-copy output; word processor

Format
CP/M 8-inch single-density; TRS-80 Model I, II, or III

Language
Z80 machine language

Documentation
24 pages, no cover, stapled

Audience
Anyone with a CP/M or TRS-80 word-processing system

MARK program from inside your text editor. Microspell and Microproof let you review each word, but there's no need to mark bad words because these two programs make corrections directly in the text file. Since Wordsearch neither marks suspect words in the text file nor corrects errors itself, you have to work from paper.

For a quick comparison and summary of the differences between the programs, see tables 1 and 2.

How Long Until When?

It was easy to compare how long the programs take to check the words in a document against the dictionary and then list all the suspect words. But that comparison didn't really measure how the programs perform in normal use. Since Spellguard and The Word both mark words in the text file, I wanted to compare how long they take to proofread a file and mark the suspects. But you have to

| | Words | Bytes | Files | Common Proper Names | Common Place Names | User Add Words | User Make Special Dictionaries |
|------------|----------|-------|-------|---------------------|--------------------|----------------|--------------------------------|
| Microproof | 50,000* | 72 K | 3 | No | No | Yes | Yes |
| Microspell | 26,000** | 154 K | 4 | Yes | Yes | Yes | Yes |
| Spellguard | 20,000 | 170 K | 1 | No | No | Yes | Yes |
| The Word | 45,000 | 160 K | 1 | Yes | Yes | Yes | Yes |
| Wordsearch | 7200 | 72 K | 2 | No | No | Yes | Yes |

* This is not a literal dictionary. The figure 50,000 includes all the words that can be formed by adding suffixes and prefixes to roots; therefore, some "words" included in the count are not true English words.

** Incorporating all the ED.VOC vocabulary file and three-fourths of the ING.VOC vocabulary file into the four-file main dictionary. Both VOC files are supplied with the program and can be added to the main dictionary if disk space permits. Though Microspell claims only a 26,000-word dictionary, its suffix-and-root functions help the program recognize about the same number of words as a 45,000-word literal dictionary.

Table 1: Comparison of the dictionaries of the five proofreading programs. Dictionaries for Spellguard, The Word, and Wordsearch are literal. Microspell has a 20,000-word literal dictionary, but provides more words in the files ING.VOC and ED.VOC, most of which were added to the original dictionary. Microspell's dictionary uses suffix-root routines to extend its coverage to a range somewhat broader than Microproof's dictionary. Although the Microproof dictionary claims contents of 50,000 words, that includes many nonwords formed by adding prefixes and suffixes to roots.

SAVE \$\$

DISCOUNT PRICES

SAVE \$\$



apple computer

| | |
|--------------------|---------|
| 16K APPLE II | 1049.00 |
| 32K APPLE II | 1074.00 |
| 48K APPLE II | 1099.00 |
| DISK W/CONTROLLER | 499.00 |
| DISK ONLY | 445.00 |
| APPLESOFT CARD | 139.00 |
| INTEGER CARD | 139.00 |
| PASCAL SYSTEM | 399.00 |
| SILENTYPE PRINTER | 349.00 |
| HAYES MICROMODEM | 295.00 |
| Z-80 SOFTCARD | 295.00 |
| VIDEX 80 COL. BRD. | 295.00 |
| 16K RAM BOARD | 169.00 |

RAM MEMORY

| | |
|-------------------------|-------|
| FOR TRS-80, APPLE II | |
| 16K SET 4116's (200 NS) | 24.95 |



ATARI

| | |
|----------------------|---------|
| 400 16K | 349.00 |
| 800 16K | 759.00 |
| 410 Recorder | 64.00 |
| 815 Disk | 1199.00 |
| 810 Disk | 489.00 |
| 822 Printer | 359.00 |
| 825 Printer | 779.00 |
| 830 Modem | 159.00 |
| 850 Interface Module | 179.00 |
| CX853 RAM | 85.00 |
| CX70 Light Pen | 64.00 |
| CX30 Paddle | 18.00 |
| CX40 Joystick | 18.00 |

VERBATIM DISKETTES

| | |
|------------------|-------|
| Box of 10 5 1/4" | 29.50 |
| Box of 10 8" | 39.50 |



North Star Computers

| | |
|------------------|---------|
| HR2-2D-32K | 2795.00 |
| HR2-2D-48K | 2956.00 |
| HR2-2D-64K | 3145.00 |
| HR2-2Q-32K | 2975.00 |
| HR2-2Q-48K | 3165.00 |
| HR2-2Q-64K | 3360.00 |
| HRAM 32K | 469.00 |
| HRAM 48K | 662.00 |
| HRAM 64K | 849.00 |
| HDS-18 HARD DISK | 4025.00 |
| MDS-DRV-D | 495.00 |
| MDS-DRV-Q | 665.00 |
| ADC-1-D | 740.00 |
| ADC-2-D | 995.00 |
| ADC-1-Q | 795.00 |
| ADC-2-Q | 1285.00 |

PRINTERS

| | |
|------------------------|---------|
| EPSON MX-70 | 399.00 |
| EPSON MX-80 | 499.00 |
| EPSON MX-80 FT | 599.00 |
| GRAFTRAX | 90.00 |
| INTERFACE (APPLE) | 75.00 |
| CABLE | 22.50 |
| CENTRONICS 737-1 | 795.00 |
| CENTRONICS 737-3 | 855.00 |
| IDS 445G | 815.00 |
| IDS 460G | 1195.00 |
| IDS 560G | 1450.00 |
| NEC 5510 W/TRACTORS | 2650.00 |
| NEC 5520 KSR W/TRAC. | 2995.00 |
| QUME 5/45 SPRINT | 2675.00 |
| FORMS TRACTOR | 195.00 |
| STARWRITER W/TRAC. | 1695.00 |
| STARWRITER W/O TRACTOR | 1500.00 |

General Information:

We carry a large selection of hardware and software by other companies. Send for our catalog. We are an authorized repair center for APPLE, ATARI, NORTH STAR, AND EPSON.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE. MARYLAND RESIDENTS ADD 5% SALES TAX

**FREDERICK
COMPUTER
PRODUCTS, INC.**

5726 INDUSTRY LANE
FREDERICK, MD. 21701

Store Hours:

MON. THRU THURS. 9:30 AM—9:00 PM
FRI. AND SAT. 9:30 AM—5:00 PM

TO ORDER CALL: (301) 694-8884

run your text editor before The Word marks the file, and it seemed unfair to charge The Word for the time needed to load the text editor. After all, with The Word, the text editor is already loaded when you finish marking the file, so you can make corrections almost immediately. With Spellguard, you still have to load the text editor to make corrections; it's just that you load the editor *after* marking the errors.

To complicate matters, fairness to Microspell and Microproof—the direct-correction programs—requires seeing how long it takes to run the other proofreading programs *plus* exiting those programs and loading your own text editor to make corrections *plus* saving the corrected file. On the other hand, is it fair to hold those other programs responsible for the time it takes me to run

an elaborate word processor like WordStar? Would it be fairer to use a smaller editor?

Right or wrong, here's what I decided to do: I've given the time each program needs to scan a text file and list all the suspect words; I've given the time the marking programs need to scan the text file, review the suspects, mark the text file, plus the time needed to load the text editor and call up the text file for editing (that seems fair to Spellguard and The Word); I've given the time each program needs to do all the above, plus making corrections and saving the corrected file (to be fair to Microproof and Microspell).

What Is a Suspect Word?

I decided to count as a suspect word both every word

| | Mark Word | Correct Word | Guess Word | Find Similar Words | Display Context | Count Word Frequency |
|------------|-----------|--------------|------------|--------------------|-----------------|----------------------|
| Microproof | No | Yes* | No | No | Yes* | No |
| Microspell | No | Yes | Yes | Yes | Yes | No |
| Spellguard | Yes | No | No | No | No | No |
| The Word | Yes | No | Yes | Yes | No | Yes |
| Wordsearch | No | No | No | No | Yes | No |

* Requires the correcting option.

Table 2: A summary of the features of the five proofreading programs. Sometimes the same feature is implemented differently in different programs.



and word *fragment* listed by the proofreading program. For programs that treat hyphens as spaces, I counted the fragments "accom" and "plished" as two suspect words. My rationale is that the fragments usually appear alphabetically and I have to consider each fragment and determine whether it is a misspelled word or not. Word fragments take the same amount of work as words.

This concludes the discourse on method. I tested the programs on a 400-word file (figure 1) and a 3000-word file. The results are shown in tables 3 and 4.

Spellguard Versi3n 1.0

Spellguard is a magnificent program of the highest commercial quality. If your main concerns are speed and accuracy in straightforward proofreading, and if you have plenty of disk space, Spellguard is probably for you. Spellguard is menu-driven and the screen tells you all you need to know. The program lets you make every decision with a single keystroke.

The Package—In addition to its dictionary (170 K bytes), Spellguard includes the programs SP.COM (6 K bytes), SP.ISA (38 K bytes), and MAINTAIN (14 K bytes). SP.COM, SP.ISA, and the dictionary must all be present for Spellguard to operate (though the dictionary can be on a different disk drive). MAINTAIN is needed only when you wish to verify that Spellguard is working properly. ISA (Innovative Software Applications) also

offers a limited dictionary for systems with low-capacity disks, and will soon offer dictionaries both more compact and more comprehensive, as described below.

Dictionary—As of this writing, Spellguard's dictionary contains approximately 20,000 words and takes up 170 K bytes of disk space. Spellguard's dictionary is literal; the program never assembles words from roots and suffixes. Denis Coleman, Spellguard's author, started work on it after writing a book in which he misspelled his own name. Coleman also saw the need for proofreading papers he wrote as a management consultant.

Coleman based the dictionary on two sources: Kucera's word-frequency study of 1962 and the *American Heritage Word Frequency Book* (Boston: Houghton Mifflin Company, 1971). It also includes words drawn from Coleman's own documents and papers of Spellguard users.

ISA will soon offer a version of its standard 20,000-word dictionary compressed to 32 percent of its present size, about 55 K bytes. In addition, it plans three additional dictionaries: a 30,000- to 40,000-word general dictionary, a 15,000-word medical dictionary, and a 15,000-word legal dictionary. Data compression will be standard in all of them. According to Coleman, ISA's techniques of data compression will result in increased operating speed for Spellguard.

Performance—Though Spellguard needed only 56 seconds to proofread the file shown in figure 1 and

| | Misspelled Words in File | Words Found Suspect | Words Wrongly Found Suspect | True Mis-spellings Found | Misspelled Words Missed | Time to Proofread File | Time Until Ready to Correct | Time Until All Corrections |
|------------|--------------------------|---------------------|-----------------------------|--------------------------|-------------------------|------------------------|-----------------------------|----------------------------|
| Microproof | 7 | 32 | 26 | 6 | 1 | 0:45 | | 2:16** |
| Microspell | 7 | 26 | 20 | 6 | 1 | 1:06* | | 2:47** |
| Spellguard | 7 | 47 | 40 | 7 | 0 | 0:56• | 2:31•• | 3:40 |
| The Word | 7 | 19 | 12 | 7 | 0 | 1:39' | 3:15'' | 4:00 |
| Wordsearch | 7 | 105 | 98 | 7 | 0 | 0:55° | 4:56°° | 8:13°°° |

- * Using the switches that suppress display of context and creation of an output file of suspect words.
- ** Microproof and Microspell do not require a text editor to make corrections. However, since both programs accepted an incorrect word in this file, correcting that word required running the text editor and saving the file. When Microspell or Microproof misses a word, about 1:20 must be added to the timing shown.
- Skipping the regular word review, going to the special word review, and asking that all suspect words be listed at once (Option L on Special Word Review Menu).
- Time to proofread, review suspect words one by one, mark legitimate errors, load WordStar, and call up text file to start making corrections.
- ' Time to proofread and list suspect words found.
- '' Time to proofread, load WordStar, use WordStar to edit list of suspect words, save shortened file of suspect words, run The Word's MARK program while still inside WordStar, and call up marked text file to make corrections.
- ° Running the Scan function followed by the List function.
- °° Time to proofread file, assign words to one of three groups, print a list of confirmed misspellings, load WordStar, and call up unmarked text file. Wordsearch neither marks errors nor corrects.
- °°° Since Wordsearch doesn't mark errors, each misspelled word had to be typed in as a search string, and that added to the time required to make corrections.

Table 3: Performance of the proofreading programs on the 400-word text file in figure 1. The first timing shows how long each program takes to read the file and list all suspect words. The second timing shows how long each program takes to read the file, find the suspect words, decide which suspects should be marked, mark the suspects, and call up the text file to make corrections. Microproof and Microspell have no timing in this column because they make corrections in the original text file. The third timing shows how long it takes to read the file, find the suspect words, decide which suspects should be marked or corrected, make the corrections (in some cases directly, in other cases using a word processor), and save the file. In cases where Microspell or Microproof failed to recognize a misspelled word, the user must load a word processor and make the correction. That process adds about 1:20 to the third timing for Microproof or Microspell.

| | Misspelled Words in File | Words Found Suspect | Words Wrongly Found Suspect | True Misspellings Found | Misspelled Words Missed | Time to Proofread File | Time Until Ready to Correct | Time Until All Corrections |
|------------|--------------------------|---------------------|-----------------------------|-------------------------|-------------------------|------------------------|-----------------------------|----------------------------|
| Microproof | 10 | 109 | 99 | 10 | 0 | 1:09 | | 4:28 |
| Microspell | 10 | 55 | 45 | 9 | 1 | 2:15* | | 7:15** |
| Spellguard | 10 | 151 | 141 | 10 | 0 | 1:06* | 4:40** | 6:35 |
| The Word | 10 | 52 | 42 | 10 | 0 | 2:05' | 4:52' | 6:42 |
| Wordsearch | 10 | 517 | 507 | 10 | 0 | 1:06* | 10:21** | 13:31*** |

- * Using the switches that suppress display of context and creation of an output file of suspect words.
- ** Microspell does not require a text editor to make corrections. However, since Microspell accepted an incorrect word in this file, correcting that word required running the text editor and saving the file. When Microspell misses a word, about 1:20 must be added to the timing shown.
- Skipping the regular word review, going to the special word review, and asking that all suspect words be listed at once (Option L on Special Word Review Menu).
- Time to proofread, review suspect words one by one, mark legitimate errors, load WordStar, and call up text file to start making corrections.
- ' Time to proofread and list suspect words found.
- “ Time to proofread, load WordStar, use WordStar to edit list of suspect words, save shortened file of suspect words, run The Word's MARK program while still inside WordStar, and call up marked text file to make corrections.
- ° Running the Scan function followed by the List function.
- °° Time to proofread file, assign words to one of three groups, print a list of confirmed misspellings, load WordStar, and call up unmarked text file. Wordsearch neither marks errors nor corrects.
- °°° Since Wordsearch doesn't mark errors, each misspelled word had to be typed in as a search string, and that added to the time required to make corrections.

Table 4: Performance of the proofreading programs on a 3000-word text file. The same comments apply as in the caption for table 3.

display a list of suspect words, that isn't the standard procedure. To achieve that timing, I skipped the regular word review and took the List option on the Special

Word Review Menu—calling for a display of all the suspect words at once. In normal use, running Spellguard takes longer because suspect words are presented individually to be marked in the text file, ignored, or added to the dictionary. But Spellguard lets you dispose of each word so easily that you can quickly consider each suspect word and pare a long list down to manageable size. When I proofread the same 400-word file using Spellguard's regular step-by-step word review, I needed only 50 seconds more to deal with forty-seven suspects, and that includes the time Spellguard needed to mark errors in the text file. Once the larger Spellguard dictionaries appear, the list of suspects should be shorter and even easier to deal with.

Before making corrections, I had to change disks and run WordStar, my text editor, and call up the text file. Those steps took an average of 45 seconds. So a minimum of 2:31 passed before I could use WordStar's Find command to locate marked words and make corrections. I completed the corrections and saved the corrected file in another 1:09, a total of 3:40.

Proofreading the 3000-word file and listing all suspect words took only 1:06. Reviewing each suspect word and marking legitimate misspellings took another 2:49, a total of 3:55. Loading WordStar to start making corrections brought the total to 4:40. I had run WordStar, made all the corrections, and saved the file after a total of 6:35.

I have two criticisms of the version of Spellguard I used. The first criticism will no longer apply by the time this article appears, and the second is minor. First, Spellguard identified too many suspect words. In the 3000-word file, Spellguard found 151 suspects and there were only ten misspellings. The excess of suspect words

NEVADA COBOL




Edition II of Nevada COBOL, a subset of ANSI-74, features:

- Copy statement for library handling.
- CALL... USING... CANCEL.
- PERFORM... THRU... TIMES... UNTIL... Paragraph or section names.
- IF... NEXT SENTENCE... ELSE... NEXT SENTENCE AND/OR <=> NOT.
- GO TO... DEPENDING DN.
- Unique easily understood diagnostic error messages.
- Interactive ACCEPT/DISPLAY...
- RELATIVE (random) access files.
- Sequential files both fixed and variable length.
- DISPLAY, 16-bit binary or packed decimal (COMP-3) data types with up to 18-digit accuracy.
- INSPECT... TALLYING... REPLACING.
- ADD, SUBTRACT, MULTIPLY, DIVIDE, GIVING, ROUNDED, ON SIZE ERROR.
- Generates optimized 8080 machine language at up to 500 statements per minute.

\$149⁹⁵

DISKETTE AND MANUAL

• Uses CP/M or MP/M operating system to work with TRS-80, Apple's with softcard, North Star, Superbrain, Micropolls, and many other microcomputers. Needs a minimum of 16K of RAM. Uses single density 8" or 5 1/4" diskette.




ELLIS COMPUTING
SOFTWARE TECHNOLOGY

800 41st Avenue
San Francisco, CA 94121

CP/M, MP/M and TRS-80 are registered TM's of Digital Research and Tandy Corporation.

WE WELCOME C.O.D.'s



(415) 751-1522.

resulted from the present dictionary's limited size, and the upcoming data-compressed dictionaries will remedy this problem.

Second, I felt a slight annoyance at having to restore the last character of each marked word (Spellguard replaces the last character of a misspelled word with an error mark). If the actual spelling error occurred early in the word, I thought Spellguard was entering a second error and requiring me both to delete the mark and replace it—two keystrokes plus any other corrections needed. These added keystrokes made correcting files marked by Spellguard take more time than files marked by The Word. On the other hand, by replacing the last letter of a bad word instead of adding a character to the word, Spellguard avoids disturbing the format of text in the file. You can't have it both ways.

Spellguard handles hyphenated words by displaying both halves of the word and indicating whether the word occurred at the end of a line. That makes it easy to check the correctness of both the spelling and the hyphenation. Since Microspell and The Word treat hyphens as spaces and report the broken parts of words as two suspect words, Spellguard has an advantage here. The advantage is partially offset because Spellguard reports *all* compound words as suspects. So Spellguard made "import-export" suspect, but Microspell and The Word considered the compound correct. In the 3000-word text file, Spellguard reported nine compound words as suspects; in the same file, Microspell reported fifteen hyphenated word fragments as suspects, The Word reported sixteen, and Microproof thirteen. Microproof also listed ten compound words as suspects.

The User's Guide—The user's guide for Spellguard is excellent. The writing, organized around the program's screen displays, makes its point without resorting to jargon or inflated language. A plastic three-ring binder holds 116 pages of sharp print quality, including a table of contents, an index, and a glossary. The Spellguard user's guide would probably make Spellguard the best proofreading program for general use in offices.

The Word Version 1.1

The Word is a program of beautiful simplicity. Its SPELL program proofreads a file and gives you a list of all the suspect words. The author, Wayne Holder, sought to create a set of tools for people who work with words. Each of The Word's seven programs is designed to meet Kernighan and Plauger's definition of a software tool: a program that is general and yet simple enough to have widespread application. Each of the seven programs works quickly and performs a valuable task. Holder envisions adding more useful programs to The Word's toolbox. For writers and editors, The Word already offers far more than just a proofreading program.

The Package—In addition to the 160 K-byte dictionary, The Word includes seven programs: SPELL (4 K bytes), MARK (2 K bytes), WC (2 K bytes), DICTSORT (2 K bytes), WORDFREQ (2 K bytes), FIND (2 K bytes), and LOOKUP (2 K bytes). SPELL proofreads a text file

and lists the suspect words. MARK puts an asterisk at the beginning of each suspect word in the text file. WC counts the words in the text file. DICTSORT alphabetizes words and eliminates redundancies from the resulting list. Use it on your own text files and discover what your working vocabulary is. WORDFREQ shows you how many times you use each word in a text file, a fast and valuable check on style. FIND searches the dictionary for words that conform to a character pattern (using CP/M "wild card" characters for the unknown letters in the pattern).

LOOKUP is a remarkable little program that takes a misspelled word and "un-misspells" it, looking for words that can be derived from the misspelling by adding one letter, dropping one letter, changing one letter, or reversing two letters. The program often finds the right word and finds it much faster than you could with a printed dictionary. One new program that will appear in the forthcoming 2.0 version will let the user review the list of suspects one by one and decide whether to mark each suspect, add it to the dictionary, or ignore it. The review program will not be integrated with SPELL, so the user will have the option of listing all suspect words at once. On the more distant horizon, The Word may even include heuristics to help cope with the problem of homonyms (like "fare" and "fair") in the proofread document.

Dictionary—The Word's dictionary is large and literal.

ROBOTS

The Future Arrives



Intelligent machines are rapidly appearing in homes, automobiles, offices and factories. Affordable cameras, speech synthesizers, and even robot arms are now on the market. Such advances are giving microcomputers the power to see, hear, grasp objects, and to move around the room. Where can you learn about this technology? In *Robotics Age Magazine*, the journal of intelligent machines.

Robotics Age reports the experience of hobbyists building their own robots, the latest products from industry, and the most powerful techniques from research labs. The face of the world is changing. Join us as we enter the Robotics Age.

YES! I want to stay up-to-date on this fascinating new technology!

Name _____ Title _____

Company _____ Address _____

City/State/Province/Country _____ Postal Code _____

| | United States | Canada Mexico* | Foreign Rates ¹ |
|--|---------------|----------------|----------------------------|
| <input type="checkbox"/> 1 year (6 issues) | \$15 | \$17 | \$19 |
| <input type="checkbox"/> 2 years (12 issues) | \$28 | \$32 | \$36 |
| <input type="checkbox"/> 3 years (18 issues) | \$39 | \$45 | \$51 |

*US Funds on US Bank
 Bill VISA MasterCard Bill me (N. America only)

Card No. _____ Exp. _____

Signature _____

Send to: **ROBOTICS AGE** PO Box 512, Tujunga, CA 91042

5 or 10 Mbyte Storage for Heath/Zenith, TRS-80, SuperBrain, S-100 microcomputers.

Now, 5¼" hard disk add-on storage for your computer, at a price you can afford.

Available for a surprisingly low \$3495 for the 5 Mbyte hard disk, \$4350 for the 10 Mbyte disk. Disk drives and controller cards also available.

Substantial OEM & Dealer discounts.



From the leaders.

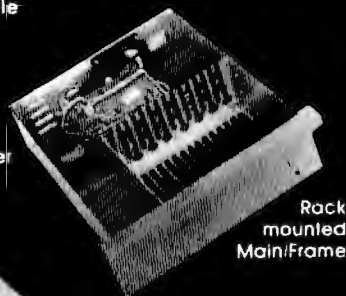
CMC International

A Division of Computer Marketing Corporation
11058 Main, Suite 125, Bellevue, WA 98004
Telephone (206) 453-9777 Telex 152556 SEA

Main/Frames from \$200

Main/Frames from \$200

- 14 Basic Models Available
- Assembled & Tested
- Power Supply:
8v@15A, ± 16v@3A
- 15 Slot Motherboard (connectors optional)
- Card cage & guides
- Fan, line card, fuse, power & reset switches, EMI filter
- 8v@30A, ± 16v@10A option on some models



Rack mounted Main/Frame



8" Floppy Main/Frame (includes power for drives and mainframes)

Write or call for our brochure which includes our application note:

'Building Cheap Computers'

INTEGRAND

8474 Ave. 296 • Visalia, CA 93277 • (209) 733-9288
We accept BankAmericard/Visa and MasterCard

It packs more than 45,000 words into only 160 K bytes of disk space. The Word's dictionary also uses cross-referencing to speed access to its contents. Oasis Systems based the dictionary on *The American Heritage Dictionary of the English Language* (Boston: Houghton Mifflin Company, 1979), and used data-compression techniques. One of the methods of compression is simple: when two successive words have common letters at the beginning, the common letters are replaced in the second word by a 1-byte count of the common letters. If the word "power" is stored literally, the word "powerful" is stored as "5ful." If "eccentric" is already present, "eccentricity" is compressed to "9ity." The increased dictionary size made possible by data compression pays off in a dramatically reduced number of words reported as suspect. A new version of the dictionary, using additional data-compression techniques, will soon be available. The 45,000 words will occupy only 136 K bytes and will make The Word's programs run even faster.

Performance—The Word took 1:39 to proofread the 400-word file in figure 1 and list the suspects. With the present version of The Word, you have to use your text editor to eliminate correctly spelled words from the list of suspects before marking the errors. Since The Word's large dictionary prevents SPELL from defaming many innocent words, this editing chore takes little time. Furthermore, you'll have to reload your text editor to make corrections anyway. (As noted earlier, a program for reviewing suspect words one by one is on the way.)

Here's how I used The Word with WordStar. I ran The Word's SPELL program with the \$F switch, which makes The Word write the list of suspect words to a file. Then I ran WordStar and edited the list of suspect words, deleting those that were in fact correct. Next, I saved the shortened list of suspect words and, from inside WordStar, used WordStar's R command to run The Word's MARK program. Then I called up the marked text file for editing.

To do all this with the page of text shown in figure 1 took me a total of 3:15. On the 400-word file, The Word got me to the point of being ready to make corrections only 34 seconds later than Spellguard. And correcting the file marked by The Word took 24 seconds less than correcting the same file marked with the same corrections by Spellguard. The reason? It takes a few seconds more to retype the character replaced by Spellguard's error mark. The Word's mark doesn't knock out any characters, so none have to be retyped.

It took The Word 2:05 to proofread the 3000-word text file. The total time increased to 4:52 when I invoked WordStar, edited the list of suspect words, saved the shortened file of suspect words, ran MARK, and called up the text file for editing. I made the corrections and saved the file after 6:42. That's only 7 seconds slower than equivalent operations took with Spellguard.

The User's Guide—The guide to The Word is simple and clear. It separately describes use of each of the programs. Since The Word isn't organized around screen

I'd had the joint staked out for two years and nine months. I'd been waiting for a break in the investigation all that time. This looked like the break I'd been waltzing for.

The tall stranger walked up to the bar, ears akimbo. I knew he meant trouble from the moment I saw the insignia on the back of his black leather jacket: "Hell's Twirps." That was the same gang that peddled into the all-Mahler Philharmonic concert last year and hummed the collected works of John Cage in unison. Not that John Cage has ever been in unison. Quite the canary.

Why was this particular Hell's Twirp barging into the only Austro-Mongolian fife and drum factorial east of the Rockies? Why wasn't he riding his unicycle? And what was the meaning of the gold mandalas hanging from the tips of his handlebore mustache? Then I saw his baton. The sight of its sleek crome length turned my blood to icesicles. When I glimpsed the white plastic knobs at the ends of the baton, I saw my whole life rush before my eyes.

Suddenly the Twirp slammed his fist down on the bar. His ears swayed gently in the breeze as he demanded, "Give me four hundred snare drums to go! Give me the five longest fifes in your inventory! Give me the old college try! Give me liberty or' give me grief!"

I knew better than to let this build to a crisis before interseeding. I swizzled up behind the big Twirp and said, clam and easy like, "Shove off, Twirp. Vamoose. Leave well enough aloft."

He whirled, ears slashing, baton twirling. I thought of the health-insurance premiums I hadn't paid. I realized how happy I would have made my dear old father if I'd only gurgitated from college. I thought of the thousand times I'd wanted to be where I wasn't, and knew this was the thousand and first. If I had'nt been in a connubial mood, I wouldn't have been able to stand up to the singing shroud, the short shrift and the five and dime. But I had no time for all that now. Before it was too late, I reached into my vest pocket and pulled out my well-thumbed copy of Milton's Areopagitica.

"That'll be seven ninety-eight!" the bartender suddenly screamed.

I'd been counting on him.

Figure 1: The 400-word text file proofread by all five programs. Results are shown in table 3. The zaniness is intended to show the kinds of mistakes from which a proofreading program can't save you.

displays, the guide isn't either. The programs are easy to use and the guidebook gives just enough explanation and examples.

Microspell Version 4.1

Microspell is the most interactive of the proofreading programs. Author Bob Lucas started work on Microspell after experiencing spelling problems while writing his thesis. He wanted to create a single program that gives the user fully integrated means of finding spelling errors, looks up the intended words in the dictionary, and makes corrections on the spot. He modeled Microspell after existing programs for larger computers.

Frankly, I didn't like Microspell at first because it seemed to take too long. But the more I used Microspell, the more I liked it, and the time required to run the program decreased dramatically as I became more accustomed to it. Microspell shows you each suspect word in its original context and gives you several options for dealing with suspects then and there. If you don't spell well and want to save trips to the dictionary, Microspell's Guess and Probe functions may help you find the right spelling quickly. The Probe function is much like The Word's FIND program, but Probe works from inside Microspell's large integrated program. Once you've recognized the correct spelling, you can immediately make the correction in the original text file by using the Replace command.

A coming version of Microspell will give users the ability to spread the dictionary over several disks, as well as improved logic for handling hyphenation at the end of a line (where a carriage return and line feed separate the two halves of a word). Lucas also is working on a patch program that will let the user change Microspell's defaults.

The Package—In addition to dictionary files that add up to 178 K bytes, Microspell contains SPELL (14 K bytes), BUILD (14 K bytes), INVERT (8 K bytes), and EMPTY (2 K bytes), as well as help, demonstration, and documentation files. Only SPELL and the basic dictionary (128 K bytes) are needed for most Microspell operations. BUILD incorporates a list of words into the dictionary. EMPTY gives BUILD an empty dictionary to use as the basis for a new dictionary of the user's creation. INVERT lets you view the dictionary or remove words from it.

Dictionary—Microspell's distribution dictionary contains 20,000 words in four files totaling 128 K bytes. The basic vocabulary was taken from Thorndike's list of the 20,000 most frequently used words. Two additional vocabulary files are included in the package. Called ING.VOC and ED.VOC, these files are incorporated into the dictionary if your disk size permits. ING.VOC is 20 K bytes in size, and ED.VOC is 30 K bytes. I was able to squeeze in all of ED.VOC and three-fourths of ING.VOC. That gave the dictionary 26,000 words in 154 K bytes of disk space.

Microspell's dictionary handles about the same range of words as The Word's 45,000-word literal dictionary. That's primarily because Microspell can identify words in text by stripping a suffix and checking the spelling of a word root. Microspell also accepts many plurals on the same principle. Microspell's dictionary relies on the suffix-stripping routines, rather than on data compression, to extend the range of the words it covers.

The only trouble, as the Microspell manual points out, is that the suffix-stripping routines are sometimes wrong. As an experiment, I made up some nonwords out of roots and suffixes. Microspell accepted abstractment, abhorrities, boathood, boatize, hairful, footish, mountainette, and theaterhood; it rejected discontinerary, condications, abomination, abettulate, ligamentury, nuttuculate, vocabutation, writathlon, safetydom, and theatricate. In use, Microspell shows how it forms a word from root and suffix, so you can catch a mistake if you are observant and willing to check Microspell's work against a printed dictionary. But you can't correct such a mistake without exiting Microspell and running a text editor.

Performance—It took Microspell 1:06 to proofread the text in figure 1 and display a list of the misspelled words. That isn't the normal method of operation and doesn't mark or correct errors in the text file. Running Microspell in the normal way, reviewing one suspect word at a time, takes longer. The time required depends on the proficiency of the person running the program. My first few runs of Microspell were far slower than the ones reported here.

Microspell's ability to correct errors in the text file seems a big advantage over Spellguard and The Word. It took a total of 2:47 to run Microspell this way and correct all but one of the errors in the text in figure 1. (I'll say more about that one error later.) Spellguard took 1:46 to find and mark the errors, but then I had to change disks and run WordStar. Microspell proofed the text file and corrected all but one of the errors in about the same time Spellguard took to find and mark errors, plus the time needed to load WordStar and call up the marked text file. We would have to compare the 3:17 Microspell took with Spellguard's 1:46, plus the time necessary to use WordStar to make all the corrections in the original file and save the corrected file. Microspell's 2:47, then, has to be compared to Spellguard's 3:40. In general, Microspell has the edge on short files because the time needed to load a text editor after running the other spelling programs is a larger proportion of the total time required for the whole process of finding and correcting errors.

Except for that one special error, Microspell would have the clear advantage the correcting feature seems to offer. But that error, the nonword "inventory," was displayed as a correct word. Microspell doesn't let the user alter any word it considers correct. So I had to note the word, load WordStar, find the unmarked word, and correct the misspelling. Loading WordStar might also have been necessary if any correction changed the length of a word; such a change might destroy the text's alignment, especially if the text is justified. Microspell lost its edge

because of accepting the bad word. For a fair comparison with Spellguard and The Word, add about 1:20 to Microspell's timing of 2:47. That's a total of 4:07—27 seconds slower than Spellguard and 7 seconds slower than The Word.

Microspell proofread the 3000-word text file in 2:15 (the quick way). But it took 7:15 to proofread the file step by step and make corrections. That's about 30 seconds longer than it took me to proofread and mark the file with The Word and correct the file with WordStar, and about 1:32 longer than the whole process took with Spellguard. Microspell found fifty-five suspect words, including all but one of the misspellings in the file. This time Microspell was willing to accept the word "stewarades." So I had to run WordStar afterward to correct that, and that added about 1:20 to Microspell's timing. The time required to handle this file was about 8:35—almost three minutes slower than Spellguard and two slower than The Word. But don't forget that Microspell lets you look at the context of a suspect word and lets you probe the dictionary for a correct spelling. Those features may help you decide whether a suspect word is right or wrong, and may hand you the correct spelling on the spot, saving time-consuming trips to a printed dictionary.

The User's Guide—The Microspell user's manual contains twenty-nine pages of single-spaced, photo-offset material stapled between pasteboard covers. The print quality is good, the writing clear, and the organization sound. The manual includes a detailed table of contents, an overview of the program, summaries of the commands, switches, and error messages, and instructions for using each of Microspell's four utility programs. Two pages from a sample run of Microspell let the user know what to expect from the program. The manual's three-page explanation of the program's limitations would satisfy any consumer protection agency. A revised edition of the manual has just been released but did not reach me in time for inclusion in this review.

Microproof (CP/M Version)

If your disk space is extremely limited, Microproof may be the best proofreading program for you. On my system, I had room on a single disk for all the WordStar files, the Microproof dictionary, and Microproof's proofreading and correction programs. Furthermore, I was able to run both the Microproof proofreading program and the correcting program from *inside* WordStar. That's real convenience. And Microproof is very fast and reasonably accurate. By using root-suffix and root-prefix routines and data compression, author Phillip Manfield has made the 70 K-byte dictionary act like a literal dictionary of about 30,000 words. Manfield's inspiration? His thesis was riddled with misspellings, and someone told him it was impossible to write a good proofreading program to run on a system as small as a TRS-80 Model I. (Microproof *does* run on Model I, II, and III TRS-80s.)

The Package—The standard Microproof package includes the proofreading program MICPROOF (10 K

bytes), the dictionary-building program ADDTODIC (4 K bytes), and three dictionary files that total 72 K bytes. I strongly recommend the optional correction program CORRECT (4 K bytes) because Microproof can't mark errors in the text file. Without the correction program, you'll have to type in a long search string for every bad word, using your text editor's Find function. Counting CORRECT, MICPROOF, and the dictionaries, Microproof gives a complete proofreading system that performs well and occupies only 86 K bytes of disk space.

Dictionary—Microproof's data-compression technique includes replacing all roots with one-character tokens. The dictionary is based on *Webster's Pocket Dictionary* but is not nearly that large a literal dictionary. Much of the dictionary's vocabulary comes from prefix-root and suffix-root logic. Suffix routines accepted abstractment, hairful, and footish, but rejected abhorrities, boathood, boatize, mountainette, theaterhood, discontinerary, condications, abomination, abettulate, ligamentury, nuttulate, vocabutation, writathlon, safetydom, and theatricate. Prefix routines accepted inclosed because they treat a prefix and root as separate words: "in" and "closed."

Each word is identified to the dictionary as a verb, a noun, an adverb, or an adjective, or as more than one of those parts of speech. Knowing the part of speech helps the suffix and prefix routines avoid accepting some plausible but illegitimate words.

WICKED SWITCH

INTRODUCING
COMPLETE PROGRAMMABLE
CONTROL OF UP TO 8 DATA PORTS



MICRO MATRIX II Line Controlled Switching Matrix

A unique general-purpose switch for serial data units, MICRO MATRIX II can be operated by most computers using existing software. Z80 based, it will handle any combination of eight RS232 ports, for computers, video displays, printers, modems, you name it. Whatever the combination, you get fast, glitch-free switching, for under a thousand dollars. Which makes it even greater than the sum of its ports.

Digital Laboratories Inc.

600 Pleasant Street, Watertown, MA 02172. (617) 924-1680

DISCOUNT PRICES

MICROCOMPUTERS
 CRT TERMINALS
 PRINTERS
 DISKETTES
 SOFTWARE

WE'RE ON THE
EAST COAST

DUPRÉ ENTERPRISES, INC.

MICROCOMPUTER SALES DIVISION

SUITE 6 NELSON BLDG.
 271 FORT LEE ROAD
 LEONIA, NJ 07605

(201) 461-8086
 9 AM-3 PM
 MON.-FRI.



SB-80

Single Board Technology

- 4MHz Z80A CPU
- CP/M 2 operating system
- 64K 200ns main memory
- 8-inch dual floppy drives
- 50-pin expansion connector
- 2-serial ports
- 2-parallel ports
- 4-counter/timers
- Hard disk options available

Basic system with: 600K bytes

- 2.4 megabytes **\$3490**
- 1.2 megabytes **\$2990**

A Z80A CPU combined with the CP/M[®] operating system opens new vistas to software availability for eight-bit micros. FORTRAN, COBOL, BASIC, APL, PL I and Pascal are available now to accommodate today's scientific, educational, sophisticated small business and personal system users.

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

NORTHEAST COMPUTER SALES

563 South Main Street
 Bradford, Massachusetts 01830
 (617) 683-3024

The Price
 Is Nice.
\$2425

Performance—Microproof proofread the 400-word file in only 45 seconds. The program found thirty-two suspect words, six of which were in fact misspelled. Microproof missed one misspelled word. The program's prefix routine accepted interseeding, which Microspell rejected; on the other hand, Microproof's suffix routine rejected inventory, which Microspell accepted.

Microproof recognizes some hyphenated words as single compound words and treats others as two-word fragments. It ignores all single-character words, so if you mean "I" but type "J," Microproof won't let you know.

On the 3000-word file, Microproof took only 1:09 to find 109 suspect words, including all ten misspelled words. It rejected stewardess, which Microspell accepted. Microproof's prefix and suffix routines made no errors on this file.

The User's Manual—The Microproof manual is reasonably clear, but could use refinement. Its problems, all minor, stem from the manual's need to deal with both CP/M and TRSDOS, the TRS-80 operating system. Since I received Microproof, Cornucopia has developed the manual from an outline into an adequate user's guide. The manual includes facsimiles of screen displays and the print quality is good. More and bigger staples would help the manual withstand intensive use.

Wordsearch 1.03

Wordsearch is the only noncontender in the group of proofreading programs.

The Package—In addition to its dictionary (72 K bytes), Wordsearch includes the programs SEARCH (10 K bytes), WDS, WDL, WDA, WDT, WDM, and VIEW. All but SEARCH and VIEW are 4 K bytes in size, and VIEW is only 2 K bytes. SEARCH works by letting you access the smaller programs. It uses WDS to scan a text file for suspect words, WDL to list the suspect words, WDA to assign each suspect word to one of three groups, WDT to display the text file with suspect words highlighted, and WDM to merge good words with the dictionary. The reason for displaying the text with suspect words highlighted is mysterious, because all you can do is look; you can't reassign or mark the words.

Wordsearch provides no means of either marking suspect words in a text file or correcting misspellings. As

My Hardware

I ran the proofreading programs on my SuperBrain computer. My timings are slower than some of those advertised for the programs reviewed, but that doesn't mean the advertisements were false. On systems with larger disks or hard disks, all the programs should run faster. For SuperBrain users who have one of these programs but can't match my timings, the operating system I use (SB/E, from IE Systems of Newmarket, New Hampshire) performs disk operations about one-third faster than the standard SuperBrain operating system. Also, do not try putting the larger Spellguard dictionary or The Word's dictionary on a single disk. My operating system can handle 188 K bytes per drive, opposed to the standard 161 K bytes.

a result, the user has two choices. The first is to print on paper a copy of the entire text file with confirmed misspellings underscored (or in bold or surrounded by double parentheses, at your option). For a text file of any size, the time required for printing, unless you have an extremely expensive printer, is sufficient to prevent Wordsearch from being competitive with other proof-reading programs. Furthermore, after the file is printed, you have to work from the printed copy while using a text editor on the original unmarked file. Visual checking between paper and screen is time-consuming and far less accurate than using the search command of a text editor. Besides, if you'd been satisfied with the efficiency of working on paper, you wouldn't have bought a computer in the first place.

The second choice is to have Wordsearch print an alphabetical list of confirmed misspellings. This way, you need less time to print, but you have no idea where the errors are located. So you work with the text editor's search command. But that poses problems, too. Since Wordsearch doesn't use a mark character, you have to type the full misspelled word when you use a search command. That requires more checking between paper and screen and raises the possibility of making a typographical error when entering the string to be searched for. To make matters worse, since the list of misspelled words is alphabetical rather than in the order of occurrence in the text file, you often have to return to the beginning of the file to start the next search (or else use a global search, which is slower).

Wordsearch might deserve reevaluation if Keybits added a large dictionary and a means to mark errors in the original text. Unfortunately, Keybits plans no major changes in Wordsearch in the near future.

Dictionary—The dictionary I received with Wordsearch contains 7200 words in 72 K bytes. Rather than making the dictionary from a list of the most frequently used words, Keybits worked from a list of the 10,000 most frequently misspelled words. As a result of this approach and the dictionary's small size, Wordsearch considers the following words suspect: arm, baby, calm, catch, choices, assets, businessmen, chief, cover, dark, eyes, dinner, doubts, knew, land, life, thought.... You get the idea.

Why did Wordsearch take this approach? The user's guide says, "...ones [sic] written word vocabulary is a major subset of his total word vocabulary and varies from person to person. It is for this reason that we have provided a starter library of several thousand words, many of which are variations on the same word...Over time however, it will be necessary to add fewer words in order to stabilize your own tailored writing environment." If you can ignore the redundancies and mixed metaphors and somehow live with the knowledge that your environment has learned to write and tell the world what you're really like, you can get the message: Wordsearch assumes that everyone will write his or her own dictionary. Al Clark of Keybits says that after three months of adding words to the dictionary, the average

FREE your keyboard—interact directly with the screen. Why waste time typing? Use a 3-G Light Pen.

Mail Coupon of Call Today for Immediate Delivery

3-G Company, Inc. Dept. BT
Rt. 3, Box 28A, Gaston, OR 97119
(503) 682-4492

Remember, 3-G offers a 30-Day
Unconditional Money Back
GUARANTEE

TRS-80 Economy \$24.95 TRS-80 Professional \$39.95 PET Professional \$37.95 Apple Professional \$38.95

Model I or Model III

Yes, I want to make my computer more versatile. Rush me _____ 3-G Light Pens. (Add \$1.50 for mailing and handling—\$6.00 foreign.)

Enclosed is: check or money order MasterCard Visa

Card No. _____ Exp. Date _____

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

■ In his business, Al Zenker of Zenker Dental labs in Permiel, Pennsylvania uses our pens for data entry. Larry Goodman of Lowell, Massachusetts uses the pen to select telephone numbers to be dialed by his computer. Thorwald Ebsensen of Micro-Ed, Inc. in Minneapolis, Minnesota writes education software for the 3-G Light Pen. Dr. Richard Kerns of East Carolina University incorporates our pen in a demonstration with a voice synthesizer to teach his students how to use computers.

■ These people have discovered the benefits of using a 3-G Light Pen. Wouldn't a 3-G Light Pen make your system more versatile and more functional? Yes! Of course it would!

■ Don't Wait—order your pen today and receive:

- 1) 3-G Light Pen
- 2) Demonstration cassettes (with Professional TRS-80, PET and Apple)
- 3) Sample program listing
- 4) Complete documentation and instructions so you can write your own program in BASIC
- 5) Other Light Pen software and games available



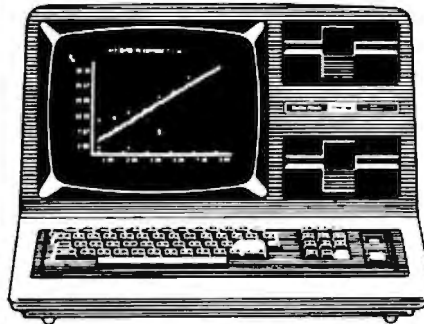
■ NO ASSEMBLY NECESSARY. READY TO PLUG IN AND USE

■ DEALER PACKAGE AVAILABLE

TRS-80®

DISCOUNT PRICING

Call Us
For Discount Prices on All Radio Shack Hardware and Software



MODEL II 26-4002 **\$3,439⁰⁰**

MODEL III 26-1066 **\$2,220⁰⁰**

PHONE (209) 526-1496

We Pay Freight

No Taxes on Out of State Shipments

Franchise Store 7079

Radio Shack

221 McHenry Ave.
Modesto, Calif. 95354

user can expect Wordsearch to report only one or two suspect words each time it's run. Keybits has a 50,000-word dictionary on disk, but Clark says there has been no demand for it from Wordsearch users.

If you consider yourself in the same league with Samuel Johnson, Noah Webster, and the *Oxford English Dictionary's* Dr J A H Murray, and if you have three months to devote to writing your own dictionary, Wordsearch is the proofreading program for you. But if you want to buy a program today and proofread a letter tomorrow, Wordsearch won't help you much.

Performance—In the 400-word text file, Wordsearch found 105 words suspect. It listed the suspect words on the screen after only 55 seconds. But the list was of little use until I'd used the assign option to confirm which words were misspelled and then used the text-display option (with the /OY switch) to print the file with the misspelled words underscored. Using the assign option took 2:55 to review the 105 suspect words. Printing the file brought the total elapsed time to 4:11. Making the corrections with WordStar and saving the corrected file took another 1:37, for a total of 6:13.

Things were worse when I used Wordsearch to proofread the 3000-word file. Wordsearch needed only 1:06 to proofread the file and list 517 suspect words on the screen, but it took me 8:15 to assign these words to one of three groups. Printing the whole file with misspellings underscored took more than 11 minutes. I abandoned that approach and started over. This time I just had the program print a list of confirmed misspellings. That took only 15 seconds, so I'd saved almost the full 11 minutes. But when I edited the file and used the search command to locate misspellings, I had to type in each string exactly. Since the list was alphabetical, I often had to return to the start of the file to initiate a new search. Alas, making the corrections and saving the file took another 3:28, so the total came to 13:49—roughly double the time required by any of the competing programs.

The User's Guide—The Wordsearch User Manual is incomplete, overwritten, and poorly organized. It stands as a Great Wall between the user and the program. The introduction says, "To take full advantage of this manual, begin by trying each function and feature at your terminal as you review it in the manual." A careful check revealed that my terminal was *not* in the manual. The system overview begins: "Wordsearch is a spelling word dictionary lookup system." That sounds like an attempt by a word, miraculously blessed with the ability to spell, to look up a dictionary. The Wordsearch User Manual sells for \$45. I'll bet the National Museum of Obfuscation, Redundancy, and Misplaced Modifiers would pay twice that amount for it!

Conclusions

Spellguard, The Word, Microspell, and Microproof should all win a place in the market for automatic proofreading software. Which program is best for you? That depends on which features you consider most important.

The Word and Spellguard are the most accurate pro-

grams because they use literal dictionaries. At this writing, The Word's dictionary is larger and occupies less disk space.

Spellguard, once its larger dictionary appears, will probably be best for the office because of its menu-driven operation. But The Word merits consideration there, too, because all its operations are so simple.

If you want your computer to look through the dictionary and propose alternatives to a misspelling, choose between Microspell and The Word.

If you prefer a single integrated program that does everything from proofreading to guessing the intended word and correcting the error in the original file, you'll go for Microspell. Because of its suffix-stripping routines, Microspell is slightly less accurate than the packages with literal dictionaries.

If you have limited disk space, Microproof offers big-dictionary performance through data compression and suffix-prefix routines, at some sacrifice of accuracy.

If you want a good proofreading program, but also want other features useful to writers and editors, you'll buy The Word.

My own preference? I like great accuracy, a large, literal dictionary, and a marking feature. I also like a program that can look up words in the dictionary on disk. Furthermore, I like to see a list of all suspect words at once. Since I'm a writer and editor, I find word-frequency software useful, and I'm usually short of cash. By far the least expensive of these programs, The Word has no shortcomings I've been able to find. I've already mailed my check for \$75 to Oasis Systems. ■

[While correcting the proof of this review, I received version 2.0 of The Word and I couldn't resist testing it. On the 400-word text file, it found the same number of suspect words as before, but the program works faster now. The Word took only 1:28 to proofread the file and list the suspects. The new REVIEW program eliminated the need to use WordStar to edit the list of suspects. With REVIEW, I needed only 26 seconds to review the suspects, and only 7 more seconds to mark the confirmed misspellings. I had loaded WordStar and was ready to correct after 2:46. I completed the corrections and saved the file in only 3:31.

On the 3000-word file, The Word 2.0 showed improved handling of WordStar's soft hyphens. As a result, it found only 38 words suspect, only 28 wrongly so. Moreover, The Word 2.0 proofread the file and listed the suspects in only 1:43. REVIEW enabled me to review the suspects in 31 seconds; MARK marked the confirmed misspellings in 28 seconds. (Reviewing and marking took 2:49 with Spellguard, but only 0:59 with The Word 2.0; the short list of suspects helps a lot.) I had loaded WordStar and was ready to correct after 3:27. It took another 1:50 to make the corrections and save the file, for a total of 5:17. For combined speed, convenience, and accuracy, I think The Word 2.0 has far surpassed its competitors. And it still costs only \$75.]

New Software, New Hardware Computer Languages, and Games

Jerry Pournelle
c/o BYTE Publications
70 Main St
Peterborough NH 03458

"Read any good books lately?" asked my mad friend Mac Lean.

Having just come back from an autograph party for *King David's Spaceship*, and the day before sent off the copyedited manuscript for the new Niven-Pournelle *Oath of Fealty*, I knew what to say. "Haven't had time. But I've written some good books lately...."

"Yeah, well, I wasn't talking about science fiction," said Mac Lean. "I meant good books on computers. I've got a dilly." He held up *PL/I: Structured Programming*, by Joan K Hughes.

"Hey, I know her," I said.

"Well, you tell her for me she's written a really top book. Good index. Clear English. Stand-alone chapters, so you don't have to thumb back and forth to find out what's going on."

"I'll do better than that," I said. "I'll tell my readers."

"Yeah. Sure. When?"

"Uh, real soon now...."

* * *

My apologies for taking so long in finishing this column, and my thanks to all of you who've written encouraging letters. Things do get hectic here at Chaos Manor, and the last few months have been something to see: books to get done, articles to write, and I built a new wing on the office, which meant moving everything around like Chinese Checkers, which meant that I lost the documentation to half the software sent me for review, which—

I am also, for my sins, Chairman of the Citizens Advisory Council on National Space Policy, which involves chairing meetings and editing papers and writing summaries and flying to Washington. The result was that for a good while I had no time to play with Ezekial, my Z80, but things are a bit caught up now, and maybe we can get onto a schedule. Just last week I had a surgeon remove the telephone from my ear.

One reason we got caught up was Spellguard.

Every now and then you find programs that do things right and have documentation that tells you what to do and how to do it—programs that are a joy to use. Spellguard is like that. (See the reviews of Spellguard, Microspell, the Word, Microproof, and Wordsearch on pages 434-448.) Spellguard finds spelling errors. That's all it does. It doesn't wash dishes, or set your clock, or do your taxes, but wow! can it find spelling errors in standard ASCII text files. And it doesn't care what editor you used to create the files.

Using Spellguard is simplicity itself. All you do is tell it what file to look at. It does the rest. It does *not* do it as fast as the ads say—at least it doesn't with Zeke, but then he's only running at 2 MHz, and my ancient iCom drives, while utterly reliable, are pretty slow. Help is on the way: I've got a pair of Lobo's 8-inch drives, and they've promised an S-100 double-density controller next month. If the controller is as fast and reliable as their drives, things are going to hum around here. We've been using Lobo drives (both 8-inch and 5¼-inch) on the boys' TRS-80 for months now, and we love them.

Meanwhile, Spellguard runs fine under Speed, a rather strange program available from the CP/M User's Group. Speed trades memory for rapid disk I/O, and if you have programs that don't use a lot of memory but have a lot of disk operations, Speed can cut running time dramatically. For Spellguard the saving is about 50%; the saving in posting my journals to ledgers is even more dramatic—70%.

Speed, with auxiliary programs to get it running properly, is available on Volume 38 of the CP/M User's group (CPMUG) disks. Those with access to a computer net may be able to find it in an on-line file. You need a bit of patching with DDT to install SPEED, but the documentation (also on CPMUG Disk 38) is clear enough.

One warning, though: Speed maintains the disk directories in RAM (random-access memory), and if you change disks without rebooting (in Speed that's control-B, rather than CP/M's control-C) the result is an unmitigated disaster!

But back to Spellguard. When you run Spellguard, it first gives you a table, telling you how many words it has read, the number and percentage of unique words, the number and percentage that it can't find in the dictionary, and finally a changing column that tells you the percentage of proofreading the program has done.

Many years ago, when I was young and impressionable, I fell under the spell of a science fiction writer named A E Van Vogt; later he became a friend, neighbor, and colleague. Van Vogt was (and still is) interested in a rather hard-to-define field of study called general semantics, and through him I was led to Alfred Count Korzybski and a strange book called *Science and Sanity*. That led me to Wendell Johnson at the University of Iowa. Professor Johnson's interests spanned everything from classical linguistics and speech therapy to general semantics.

One of Johnson's research interests was identifying text: how could you tell if an anonymous work had been written by a particular author? Dr Johnson used a number of quantitative measures, two of the most important being the type/token ratio and the verb/adjective ratio. Type/token means the ratio of unique words to total words; verb/adjective is self-explanatory. I remember going nearly blind counting total words and making tables of unique words in, for example, Marlowe's

Duchess of Malfi; the idea was to find out if Marlowe had written any of the Shakespearean plays. (As best we could calculate, he hadn't.)

Now Spellguard gives you automatic type/token ratios, and if you really want to, you can make up separate verb and adjective dictionaries, thus finding the ratio merely by typing in the text, which, believe me, is a great deal easier than doing it in teams of two with pencil and paper. Spellguard, with its efficient search algorithms, could be extremely useful in linguistic research projects.

Anyway, if you work with text at all, you'll love Innovative Software's Spellguard. It is an example of excellent software: a program that does one thing, does it very well, and has documentation to match.

Datebook and Milestone

Organic Software of Livermore, California, has also produced two excellent programs that I recommend, although I'll probably never use them.

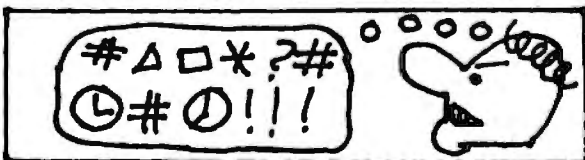
The first, Datebook, can keep track of about six months' worth of appointments for three people. We had no trouble getting it to run, and it seems to be easy to use. The main drawback is that you have to *want* to run it; Datebook requires both disk drives and all of your micro-computer's memory. What I want is Calendar, a program that I may have to write myself; it would come up when I turn on my system, insist that I give it the date (the way Lobo's LDOS operating system does), and then natter at me about what I have to get done. But it's fairly obvious that I can't write *that* program until I have hard disks with multimegabyte storage.

Calendar would solve my problem: I forget to look at my appointment book until it's too late. And that raises a question: is Datebook really better than an appointment book of the kind used by many physicians and lawyers? I can't answer that, but my guess is that I wouldn't buy a computer for that *alone*. Datebook has various search patterns, so you can look for appointment openings of stated lengths, and the program offers up to nine candidates—but you can do that by glancing at a book, too.

The value of Datebook is that it will keep three schedules simultaneously, so you can work appointments with your partners (it searches for times when you're all free). It will also search through and find all the appointments you've made with a particular person—a task that is more difficult and certainly more tedious if you must rely on visual inspection of a book (especially if there are a lot of entries). And of course Datebook can make hard copy, and update that often. All in all, if I worked in a business where I had lots of appointments and schedules, I'd probably use Datebook, but then I'm gadget-oriented—and I *have* a computer.

Organic's other interesting program is Milestone, and people who need it will like it a lot. Milestone is a PERT-chart generator. It performs critical-path analysis for jobs

BDOS ERROR ON B:BAD SECTOR



Before disk errors ruin your work again order BADLIM.

- BADLIM assures the reliability of your CP/M computer.
- You can use your disks 10 times longer without losing your data AND your time.
- BADLIM checks thoroughly your disk marking all the blocks which have defective sectors. The operating system will know that those sectors should be skipped.
- BADLIM is the only program that gives protection for soft and hard errors.
- The first time BADLIM will list which files in your disk are on bad sectors, so you can take action to correct it.
- But thereafter the bad areas in your disk will be automatically by-passed.
- For CP/M 1.4 single density and for CP/M 2.xx of any format and density. It is a must for Winchester as the media cannot be replaced.

BADLIM cost only \$73. Whatever the reason you have to use a computer you need BADLIM. Contact your dealer or call us today:

BLAT R&D Corp., 8016 188th. St SW, Edmonds
WA 98020. Phone: (206) 771-1408

DEALER INQUIRIES INVITED.

BADLIM

with up to 300 tasks; it computes milestones (critical events), monthly manpower levels, monthly costs—in short, it handles most of the details we used to include in the management-plan portion of a research proposal.

Milestone isn't easy to use. In fact, it's almost impossible to use on my system because I don't have a 24 by 80 terminal. I use a memory-mapped 16 by 64 video display, in part because I still use the old-fashioned Electric Pencil as a text editor, and Pencil requires it, in part because I like the smooth scrolling and fast response, and in part because I'm lazy and have never gotten around to buying a terminal. That's going to change one day.

Anyway, Milestone isn't easy to use, not because the directions for the *program* aren't clear (they're only fair), but because PERT charting and critical-path analysis are more arts than sciences, and not easy jobs. Milestone can make the jobs easier, and if I ever again have to generate research proposals, I'll certainly use Milestone.

One of my pet peeves is documentation without examples. I can't imagine why people write instructions on how to use a program but fail to include specific illustrations of what command to issue and the results.

Let me illustrate. Suppose I am opening Milestone after not looking at it for a couple of weeks (as indeed I am). I turn to page 36, and there I find:

"B(egin) and E(nd) work

These two values define when the normal working day begins and ends. They must be even hours as defined on a 24-hour clock. Follow the rules for entering integers rather than times."

Now I ask you, what does this mean? Presumably, I once knew, but I confess I've forgotten. Indeed, some of us go days on end without even thinking about computers!

I don't want to be too hard on Organic; Milestone, in fact, comes with a set of example cases. One is Dr Victor Frankenstein III's PERT for creating a monster. Event One, "Fanatic Desire to Create Life," is a milestone; it has no duration, but you don't start without it. We proceed to Task Two, "Move to ancestral castle," and continue searching for Grandfather's notes, hiring a linguist, etc. As it happens, Organic ran this example as part of a demonstration for me at the San Francisco Computer Faire, and I can testify that Milestone is both fast and accurate. I thought up the need for a linguist to translate the notes. That broke into subtasks: advertise, interview, hire. I watched Burns VanHorne of Organic enter the new tasks. Milestone thought for a moment, then rearranged itself, because this information became part of the critical path. (Not long ago they sent a revision of Milestone and I notice that the tasks I suggested are now in the case study.)

So they have examples, in the sense of worked-out problems for their program, but they should have in-

EPISODE™ THE VERSATILE COMPUTER



JUST ADD PERIPHERALS

EPISODE is a CP/M® computer with 1.6 M byte of disk storage on dual 5¼ floppies. Its compact design provides a wide range of standalone or network applications including data base sharing. EPISODE gives you total flexibility. You can add your own CRT and Printer, whatever brand and price range you choose. All the logic including the 64K RAM memory is contained on a single 6" x 8" circuit board ensuring maximum reliability.

EPISODE includes a unique software system called SUPERVYZ™ - a menu based software control system that allows the user to integrate application programs.

Dealer inquiries invited, foreign and domestic.



Epic Computer Corporation
7542 Trade Street
San Diego, CA 92121
Tel: 714-695-3560

*Supervyz is a trademark of Epic Computer Corporation. CP/M is a trademark of Digital Research.

See us at ComDEX Booth 1346

C Compiler only \$75

We have re-written Small-C as published by Ron Cain in the May, 1980 issue of Dr. Dobbs. The Code Works C compiler (CW/C) includes these additional features:

- Structures and unions
- For, switch/case, do-while
- Multidimensional arrays
- Conditional compilation (#ifdef, etc.)
- Assignment operators, e.g. x += 10;
- Can declare complex types, e.g. int (*(p)[5]);
- User supplied I/O buffers of any size
- Dynamic storage allocation (alloc and free)
- Command line arguments using argv and argc
- Improved error handling

CW/C is a proper subset of the full C language. We do not have: float, double, long, unsigned or short data types; static; initializers; sizeof; typedef; "?:"; casts; bit fields; goto; #undef, #if, #line.

CW/C generates assembly language source code that is then assembled using ASM or MAC. CW/C supports inline assembly language with the #asm ... #endasm preprocessor commands. Requires 56K 8080 or Z80 CP/M system. Distributed on single-density 8" disk or Northstar double density CP/M 5" disk. Includes an excellent User Manual, the executable CW/C compiler, runtime library, and several useful example programs written in C.

**THE
CODE
WORKS**

CW/C is \$75, including shipping in the US and Canada.
CA residents add 6% tax. Visa and MasterCard welcome.
CP/M is a registered trademark of Digital Research.

Box 550, Goleta, CA 93116 805-683-1585

cluded specific examples all over their manual—and so should every other publisher. Please?

Debate on Languages

My last column, on languages, generated a lot of correspondence. Some was predictable: I wasn't sufficiently respectful of LISP, the LISP Processing language written in 1956 by my friend John McCarthy, and since improved and expanded by McCarthy and my collaborator, Marvin Minsky, and used by my friends and associates who wrote ZORK, and—in other words, please, I don't dislike LISP users.

What I said was that LISP was fine for special purposes, but it wasn't among the candidates for replacing BASIC.

For those offended, my apologies, but I remain unrepentant. LISP may indeed be a great language for professional programmers, as it certainly is for those working in artificial intelligence. Furthermore, if you're someplace where you can learn LISP easily—say MIT or Stanford—then by all means grasp the opportunity.

Most of us, though, don't have that opportunity. Even if you have access to MIT's LISP-teaching programs, it's going to take time—lots of time—to learn. The ideal way to learn LISP is to use it; it does have the great feature of being an interactive language (which is BASIC's great ad-

vantage). But the LISP's available for microcomputers are very limited (Minsky himself wasn't able to do much with the one I have), and it isn't likely that they'll get better—not with our present hardware. Come the revolution, when 32-bit machines with 256 K bytes of active memory and 50 megabytes of disk storage can be bought for \$2000, LISP may then be the best thing available, but not now, unless you have very specialized needs.

In any case, this remains the *User's Column*, directed in large part toward nonprofessionals who are trying to make their small systems do useful things, and for those readers I don't recommend LISP. It can be fun to play with, and I'm glad Microsoft published it, but I doubt that microcomputer users will ever do more than play with LISP.

But the problem of languages has yet to be solved.

In theory, BASIC is an inadequate language. Listen to the hackers: they'll tell you that BASIC programs "are a maze of GOTOs" or that "you can't do structured programming in BASIC."

That isn't true. A good modern BASIC—say Microsoft's BASIC-80, or Software Systems' CBASIC—has *do while, if-then-else, case*, and nearly all the features Pascal has, plus string features that are a *lot* better than any Pascal I've seen, and decent I/O, which Pascal doesn't have at all. True, there are problems in BASIC that are easiest to solve with judicious use of GOTO statements, but it's certainly possible to write good BASIC programs without a single GOTO, and even easier to tame the GOTO so it never refers to anything outside a local modular block.

You *can* write top-down structured programs in BASIC. Best of all, you can write interactively, testing each step of the way, then test the program logic until it's working, after which you turn it over to Microsoft's BASCOM compiler, and wham. And for maybe 80% of the jobs you want a microcomputer to do, that's the best approach. It's almost certainly the fastest.

So what's wrong with it?

Plenty. First, BASIC still has a fatal flaw—no truly local variables. Passing parameters to a subroutine is hard, and controlling side effects (making sure you don't do something you didn't intend) isn't easy. You can reserve I,J,K,L as indices and set up "declarations" in remarks up at the top of the program, and with the new cross-reference programs you can *usually* find the side effects. Having done that, you still have trouble passing parameters, and if the program gets big, so that you'd like to compile it in chunks, you're out of luck. BASCOM doesn't permit decent chaining of programs, nor does it allow true compilation in parts.

In fact, the Microsoft BASCOM is not really the same language as its BASIC-80. In addition to the chaining problems, you can't use computed array sizes or common statements.

"But," protests the BASIC enthusiast, "that can be

Happy Hands

Offers Discounts on All

TRS-80TM

COMPUTERS

Call Collect For Prices
And Shipping Schedules
505-257-7865
HAPPY HANDS
P.O. DRAWER I
RUIDOSO, NEW MEXICO
88345

We Have What You Are Looking For

PROMPT SHIPPING

AVAILABLE SERVICE CONTRACTS

DISCOUNTED PRICES COMPARED TO ANY OTHERS

NO TAX ON OUT OF STATE SHIPMENTS

or write

fixed. In fact, I bet you somebody at Microsoft is working on it right now."

True. And maybe, one day, they'll really fix the BASIC/BASCOM system. I hope so, because I find BASIC programs fairly easy to read and write. I expect you'd be able to buy a lot of programs in compiled BASIC right now if it weren't for Microsoft's disastrous policy of demanding royalties for every program compiled with BASCOM. Competition will take care of that; meanwhile, I use BASIC-80 with BASCOM for routine jobs, and a lot of my most useful programs are written in CBASIC.

There's so much investment in BASIC software—take Joan Hughes, author of the PL/I book that so impressed Mac Lean. Joan runs Execudata, one of the first of the small-systems houses that have sprung up everywhere. She sells turnkey systems for small businesses. The hardware she favors is the Vector Graphic S-100 bus Z80 with its "mindless terminal," which is really memory-mapped video. The software comes from all over. The editor is Vector's, and I'm tempted to buy a Vector machine just to get it; it's a lot like Electric Pencil but with most of the bugs out. Execudata writes other software or buys it commercially. Like all first-rate systems houses, they support everything they sell, and their customers seem downright enthusiastic.

The interesting angle is that the author of the best book we've seen on PL/I sells software largely written in CBASIC.

Why? Execudata has been around several years. When Joan first started the company, there wasn't a PL/I for microcomputers and CBASIC was the only BASIC that allowed long variable names (remember the horrible days when variables were "A\$" and "B1" and you hadn't the foggiest what they referred to?) and structured concepts. She may change over, now that we have PL/I from Digital Research.

Digital's PL/I documentation is, if nothing to brag about, at least readable. PL/I-80 is a fairly healthy subset of the ANSI General Purpose (Subset G) PL/I, and it runs.

"Yeah, and so what," asked a friend. "Who'd use it?" "PL/I is unwieldy and inefficient," says a recent article in a magazine. On the other hand, Mac Lean has spent the last couple of weeks learning it and he loves it.

Meanwhile, I have—at last!—gotten not one but two Pascals that run, and I've been wading through Peter Grogono's *Programming in Pascal* (see references) and reading everything I can find on Pascal.

I recommend Grogono's book—for that matter, I recommend the Pascal/MT+ implementation of Pascal. It works, and unless Mike and Nancy Lehman have become liars, which I doubt, Pascal/MT+ is a full implementation of the Standard Pascal, along with a few much-needed extensions.

Their manual is improved, too. (They sent me an early

copy, and apparently my anguished screams were too much for them.) They've added a number of sections, and, according to Nancy, "That's all because of you...."

I also have the Sorcim Pascal/M up and running. Pascal/M compiles to an intermediate code. It's slower than Pascal/MT+, but it's also more compact and more portable. It, too, has extensions to standard Pascal, and I recommend it.

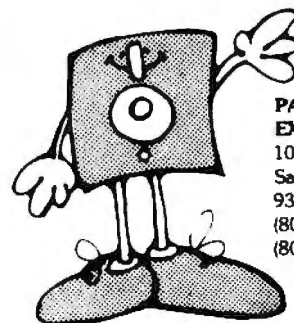
What I don't recommend is Pascal itself. Not yet, anyway. When I first looked at Pascal several years ago, I thought it was the nicest thing I'd ever seen. But the more I look at it, the more misgivings I have. I certainly could be wrong, and I'll know more by next column time. And by then, Mac Lean will have done things with PL/I so we can compare notes.

Meanwhile, don't throw away your CBASIC; they've made some improvements, also (Compiler Systems' President Gordon Eubanks says) as a result of my reviews. The needless limit on the line printer width has been fixed, and the COMMON and CHAIN features improved. I think the latest version has some other improvements, too, but I've mislaid the new manual. Although I've said it before, it's worth mentioning again: the CBASIC documentation is excellent.

Gordon also tells me that by the time this is printed there'll be a new version of CBASIC that allows nested IF

MEMOREX FLEXIBLE DISCS

BUY THE BEST FOR LESS.
Lowest prices. **WE WILL NOT
BE UNDERSOLD!!** Buy any
quantity. Call free (800) 235-
4137 for prices and information.
Dealer inquiries invited. C.O.D.'s
accepted.



**PACIFIC
EXCHANGES**
100 Foothill Blvd
San Luis Obispo, CA
93401 In Cal call
(800)592-5935 or
(805)543-1037

statements (fixing one of Joan Hughes's pet complaints), and before the end of the year they'll have parameter passing and local variables, and they're working on speeding it up.

The language situation isn't our only dilemma. Let's face it, our microcomputers are becoming obsolete. In one sense that's silly: we have more computing power than the government did ten years ago. The machines work reliably. And there's no point in replacing our machines just when we're finally getting good software.

But that's the problem: we're beginning to see hardware limitations on the new software.

Take Spellguard for instance. It's a good program. I use it often. But it can't touch *real* spelling programs like those that run on the big MIT computers. MIT's Spell (written, incidentally, in LISP) not only finds misspelled words—it shows you the word along with context, shows a menu of words it thinks might have been meant, offers you a chance to enter the new word in your permanent dictionary (if that's refused, offers the opportunity to put it in a dictionary kept just for this job), and, finally, lets you input the proper spelling, which it inserts into the text. It does all this at blinding speeds, searching dictionaries of 35,000 to 50,000 words. No 8-bit machine running floppy disks can touch that job. /Editor's note: *Don't be so sure, Jerry. See the review of spelling pro-*

grams in this issue. ...PL/

There are other limits. One controversy over text editors hinges on a simple forced choice: do you limit the amount of text you can work on to what can be held in memory (as Pencil does), or do you keep part of it on the disk (as WordMaster, WordStar, and Magic Wand do)? If you keep part on disk, you can't conveniently change disks: that can be a serious limitation if you want to bring in a chunk of an old file or make a quick copy of something you can't afford to lose. If you keep all the text in memory, not only are you confined to 10,000 words or less (with my system, anyway), but you encounter real problems if you want windows and multiple buffers or if you'd like the machine to do some computing on values in the text.

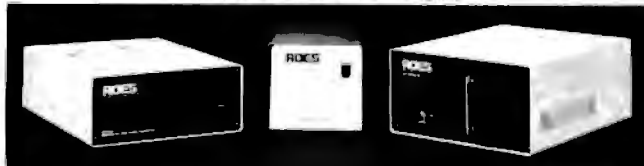
Obviously, I prefer Pencil's limits. I have Wand and WordStar, but I don't use them—Star because it natters at me (when was the last time you wanted to know line and column number every time you typed a letter?) and Wand because of the disk operations. (Word Master, on the other hand, is the best programming editor I know of.) None of the available editors, not one, can do what I'd really like them to—for instance, let me put equations in my text, solve them, and have the answers available as I write. (What I usually do is leave the text on the screen and turn to my programmable TI-59, and that's silly.)

MICRO MASSTOR™

COMPLETE WINCHESTER SUBSYSTEM FOR EVERY APPLICATION

- * 3.5 to 68 MBYTE/DRIVES
- * 5¼", 8" and 14" WINCHESTERS
- * HIGH PERFORMANCE DISK and DISK/TAPE CONTROLLERS

HARDEGE



AUTHORIZED DISTRIBUTOR

Micro-Tech Industries
P.O. Box 17383
Irvine, CA 92715



COMPLETE HARDWARE AND SOFTWARE SUPPORT

- | | |
|-------------|-------------|
| * S100 | * CP/M 2.2 |
| * TRS-80 II | * TRS-DOS |
| * APPLE II | * APPLE DOS |

(714) 559-0599

Yet what I want isn't impossible—for big machines. MIT's MACSYMA can solve intricate equations, and its EMACS editor is inherently more powerful than anything we can implement on a microcomputer. I haven't seen them combined, but it wouldn't be that different if the memory was available.

New Machines

For a few years we'll exploit what we have, but it isn't going to be long before Zeke becomes the world's smartest terminal (two memory-mapped screens, a 20 K-byte PROM monitor to control printing and I/O, etc), while a new machine does the work. Only—what will the new machine be?

Two years ago everyone would have said "the Z8000." Now we just don't know.

Next, when we get the new machine, what will we use for an operating system?

Again, two years ago everyone would have said "UNIX, of course." And if we had UNIX, which is a fairly complex tree-structured operating system developed by Bell Laboratories, we'd also have answered the language question, since UNIX contains a C programming-language compiler and is written in C.

Now, again, we just don't know.

What went wrong?

First, there weren't any reliable Z8000 chips. Now that problem's fixed—but there aren't many available Z8000 computers, are there?

There is one. Onyx has a working Z8000, with UNIX and C, hard disks, and 128 K bytes of memory. They're being shipped as fast as they're being made, and according to their customers they work and work well. There's a good chance I'll have an Onyx running here in a few weeks and I'll be able to tell you a lot more.

Meanwhile, there's a serious rival to the Z8000 and UNIX: the dual 8085/8088, working on an S-100 bus and running Digital Research's operating system that looks a lot like CP/M and allows you to bring over most of your CP/M files. The 8085/88 won't run Z80 code, but then neither will the Z8000. It does execute 8080 code.

Bill Godbout sells an 8085/88 system, and Tony Pietsch, the engineer who built my system, recommends it, along with hard disks and dual-sided double-density floppies to back up the hard-disk system. Tony is building a Godbout S-100 system and there's a chance I'll get one for review. The Lehmans use a Godbout S-100 8085/88 system for their Pascal/MT+ and they're very happy with it, while Sorcim's president Richard Frank says they've got half a dozen running constantly and that you can pitch the Godbout box out a second-story window without hurting it.

THE SYSTEM INTEGRATORS

Ithaca InterSystems™

THE MICRO FOR BIGGER IDEAS IS NOW MUCH BIGGER.

Multi-user Z80 Systems
*CP/M • *MP/M 1 to 4 User
(64K to 256K) Floppy and Hard Disk Systems



Terminals • Printers • Accessories • Service
Complete Business and Development Systems

Specialized Business Systems

5306 S. Bannock, Littleton, CO 80120
(303) 797-8709

™ Trademark of Ithaca Intersystems, Inc.

*CP/M and *MP/M are Registered Trademarks of Digital Research.

User's Column

In other words, Z8000 with UNIX has respectable supporters, and so does 8085/88. Prices aren't quite comparable: the Onyx system costs more, largely because of the UNIX software, which isn't cheap. Performance isn't comparable either: the Z8000 Onyx is much faster than the 8085/88 machines.

Fortunately, we don't have to make any decisions just yet. It may be that the best policy is to skip all the 16-bit machines entirely and wait for a new generation of 32-bit monsters. Certainly if you're contemplating buying your first system, go ahead and get one: I still recommend the S-100 bus and Z80. You can upgrade to dual-density floppies and hard disks without too much risk, but if you want a system to use rather than play with, be conservative and leave systems development to the Tony Pietsches of this world. (Notice that if I get new systems in here, they'll be in addition to Zeke; him I don't touch.)

And stand by. Exciting things are happening in microland.

* * *

I like computer games. I'm fond of ZORK and the various Automated Simulation games, and now they've got a new one called Star Warrior that's guaranteed to use up more time than you thought you'd give it, especially if you're a fan of Heinlein's *Starship Trooper*. The game has a lot of the same appeal as that book. It's

played in real time, and you jump about in space armor trying to wreak havoc on the dastardly enemy while avoiding death. And it's balanced; you usually get out alive, but just barely.

I'm a Star Warrior addict. The boys like ASI's Hellfire Warrior, which is an extension of their famous Temple of Apsai. They also like ASI's Rescue at Rigel, which is Dungeons and Dragons in spacesuits. I expect I'd like them too, if I had time to play them.

However, I'm not enough of a masochist to play Scott Adams's Adventure International games. There are those who like Scott's games a lot. Certainly, they aren't easy. Unfortunately, for me at least, they're just too tough. For example, he's got one called Balrog Sampler (it also has the title Maces and Magic #1 on it), a vastly complex game requiring two 5¼-inch disk drives. Like Automated Simulation's Temple of Apsai, when you enter the game it generates a random character for you, after which you buy weapons, armor, and the like, before setting out.

Unlike ASI's games, Adams's game gives you no choice. You *have* to accept the characters randomly generated for you and a scruffy lot they are. But don't worry—if you're lucky enough to get one who's strong as Superman and rich as Croesus, he's still going to get killed about the time you get interested in the game. *Everybody* gets killed in Adams's dungeon, and often unfairly. In Zork and Adventure there's some logic to the puzzles, but in Balrog various things pop up and kill you before you can run away. There's one room in his dungeon where you find an attendant and a wheel of fortune. If you don't play, the bouncer comes and kills you. If you do play, you lose.

There are other "puzzles" in Balrog, but all of them are inexplicable—at least to me—and I always get killed. So do the boys, and one of them is an experienced (and fanatical) Dungeons and Dragons player, so it isn't just my amateur status.

It wouldn't be so bad if you could just play, get killed, and start over, but since the game is in BASIC (with encrypted messages and all kinds of kludges to keep you from analyzing it) it takes forever to initialize, load, create a character, and go through the ritual of choosing weapons and armor, just so you can get killed two minutes later. The dungeon keeps score and the program alters itself after every expedition so that when next you play, the dungeon proudly displays the number of players who have entered and the number killed. Ours is up to about 25 for 25 now, and nobody in the neighborhood wants to see the game again.

Meanwhile, Workman & Associates continues to sell the original Crowther and Woods Adventure for CP/M systems (see my review, December 1980 BYTE, page 230), only now they've added a twist.

"Only with our Build-an-Adventure Kit can you truly build an Adventure," the Workman copy reads, and I guess that's nearly true. The "kit" consists of an Adven-

Ω STOCKING STUFFER!
Please see page 228 for further information

Turn to our
Double Page
Advertisement
for SUPER
CHRISTMAS
SAVINGS!

ATARI

WE CARRY THE COMPLETE LINE OF ATARI
SOFTWARE PERIPHERALS AND ACCESSORIES

| | |
|--|---|
| WEST COAST 1-800-235-3581 3833 Old Conejo Rd. #102 Newbury Park, CA 91320 1-805-499-3878 CA. TOLL FREE 1-800-322-1873 | EAST COAST 1-800-556-7586 12 Meeting Street Cumberland, RI 02864 1-401-722-1027 |
|--|---|

OMEGA SALES CO.

ture data base and instructions for altering it or, if you like, starting over with everything new.

The data base contains a travel table (description of each room, where you can go from there, and what commands get you where); the vocabulary (five-letter or shorter words that the program will recognize); initial conditions for various rooms (light, water, oil, etc); messages, objects, including their initial location and whether or not they can be moved; treasures, which are a kind of object; and various other stuff.

It's amazing what you can do with it. For example, you can specify that to get from a room, say BEDQUILT, to another, say SWISS CHEESE, you will be successful 25% of the time if you go East, but always if you go Up, or that the travel will fail if you are not carrying the skull, or that it will fail if you *are* carrying the skull. You can automatically transfer from one room to an identical room (identical to the player), except all commands work backward in the second room, or there are extra objects and doors.

In the actual Adventure game this is done a lot: for example, there's a room with a live dragon standing on a carpet and another with a dead dragon lying near a carpet. Most players think it's the same room, since it's the same location, but in fact it's not. In the first room the carpet isn't real: it's part of the room description. If you tried to take it, the program would say "I see no carpet here" if the program wasn't instructed to issue messages about the dragon only. In the second room, the carpet is real, and so is the dead dragon, except that you can't "take dragon" successfully because he's an immovable object. Once you've killed the dragon, however, you can't get back to the room in which he's still alive.

Workman's implementation of Adventure includes a "wizard" routine that lets you move freely through the dungeon. He doesn't tell you how to use the routine unless you buy the "Build-an-Adventure Kit."

To build an adventure, you use a standard editor, such as Wordmaster, to alter the game data base (or create a new one), after which you invoke a BUILDER program. The program takes your logically ordered data base and makes a work file out of it, while simultaneously patching other chunks into the ADVENT.COM file that controls the game.

You can construct very complex dungeons and when you're done you have a game that recognizes vocabulary. You don't have to specify the permissible moves the way you must in BASIC adventure games.

I asked Workman how many of the people who buy the game intend to market adventures and he chuckled. He isn't sure, but he suspects that most copies are sold to people who bought Adventure and then couldn't solve the puzzles and mazes. "We give them the original Adventure data base with the Adventure Kit," Workman said. "That contains the Adventure map. We also tell them how to move through the dungeon by magic. I

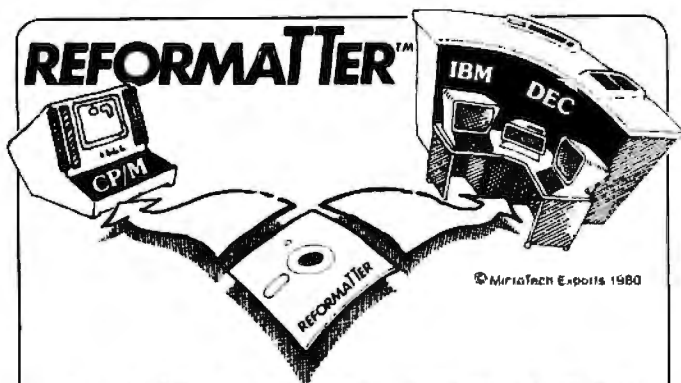
know that's why one guy bought the kit. He kept writing letters begging for the map. When we put out the kit, he bought the first copy."

Coming Up: In the next column I will continue to discuss languages, and I've also collected a raft of data bases I want to talk about. And I just finished letting Zeke do my taxes.... ■

References

- Grogono, Peter. *Programming in Pascal* (revised edition). Reading MA: Addison-Wesley, 1980. \$13.95.
 Hughes, Joan K. *PL/I—Structured Programming*, second edition. New York: John Wiley & Sons, 1979.

| Additional Information | | |
|---|--|-----------------|
| Innovative Software Applications POB 2797, Menlo Park CA 94025 | | |
| <i>Spellguard</i> | CP/M | \$295 |
| Organic Software, 1492 Windsor Way, Livermore CA 94550 | | |
| <i>Milestone</i> | CP/M, Apple Pascal, UCSD Pascal, CP/M-86 | \$295 |
| <i>Datebook</i> | CP/M, Apple Pascal, UCSD Pascal, CP/M-86 | \$295 |
| Workman & Assoc, 112 Marion Ave, Pasadena CA 91106 | | |
| <i>Adventure</i> | CP/M | \$29.95 |
| <i>Build-an-Adventure</i> | CP/M | \$97.50 |
| CP/M Users Group, 1651 Third Ave, New York NY 10028 | | |
| <i>Speed</i> | Volume 38 | |
| <i>Each volume</i> | CP/M 8-inch disk North Star 5¼-inch disk (depending on the number of disks needed) | \$8 \$12 |
| <i>Catalog</i> | | \$6 |
| Adventure International, POB 3435, Longwood FL 32750 | | |
| <i>Balrog Sampler</i> | CP/M | \$29.95 |
| Automated Simulations Inc, Dept SW7 Box 4247 1988 Leghorn St, Mountain View CA 94040 | | |
| <i>Star Warrior</i> | Apple II, TRS-80, Atari | \$ 39.95 |
| Digital Research, POB 579, Pacific Grove CA 93950 | | |
| <i>PL/I-80, MAC, RMAC, LINK-80</i> | CP/M | \$500 |
| MT Microsystems, 1562 Kings Cross Dr, Cardiff-by-the-Sea CA 92007 | | |
| <i>Pascal/MT+</i> | CP/M | \$475 |
| Sorcim, POB 32505, San Jose CA 95152 | | |
| <i>Pascal/M</i> | CP/M | \$225 |



GETS FILES ACROSS!

With **REFORMATTER** disk utilities you can read and write IBM 3740 and DEC RT-11 single density formatted diskettes on your CP/M[®] system.

REFORMATTER enables you to access large system databases, improve data exchange with other organizations, increase program development capabilities, and use your micro in distributed processing.

REFORMATTER programs feature bi-directional data transfer and full directory manipulation. ASCII/ERBCDIC conversion provided with CP/M ↔ IBM. *MP/M is now fully supported.*

Program Data Sheets, Application Guides, and Machine Compatibility Guides available.

Each program \$195.00 from stock. Specify CP/M ↔ IBM or CP/M ↔ DEC. Order from MicroTech Exports, Inc., 467 Hamilton Ave., Suite 2, Palo Alto, CA 94301 □ Tel: 415/324-9114 □ TWX: 910-370-7457 MUH-AIJOS □ Dealer and OEM discounts available.

CP/M[®] is a registered trademark of Digital Research

Book Reviews

Apple Pascal: A Hands-On Approach

Arthur Luehrmann and Herbert Peckham
McGraw-Hill Book Company, New York, 1981,
432 pages, softcover,
\$14.95

Reviewed by
Hartley G Lesser
3243 Oakes Dr
Hayward CA 94542

I knew very little about Pascal when I first sat down with this book. I had read a few magazine articles that described Pascal as a structured and understandable language, but my only programming experience was with BASIC and assembly language. I needed an introduction that assumed no prior knowledge, yet, at the same time, I wanted a book that didn't talk down to me. I'm happy to report that *Apple Pascal: A Hands-On Approach* is not only thorough and clear, but also treats the reader as the authors' equal. Although the authors begin at the most basic level, they seldom sound like lecturers. They teach as if they and the reader are working together on a series of intriguing experiments.

Written in a manner that will hold the interest of adults, this book also explains things clearly enough for children. My nine-year-old son worked through the first three chapters with apparent ease, although at a pace somewhat slower than my own. He learned to write simple Pascal programs and save them on disk, and moved on to the session on the graphics features of the Apple Pascal system. Judging from our experience, *Apple Pascal: A Hands-On Ap-*

proach will meet the needs of a wide variety of readers.

Although it focuses on Pascal, the book has more general applications. In addition to describing the mechanics of this one language, it explains sound programming techniques. If you have access to an Apple, then this book is an excellent way for you to learn the art of programming as well as the virtues of Pascal.

Hands On!

The title means what it says: this book's instructional method really requires you to get your hands on an Apple and work your way through. Mastering the material presented will require that you commit several hours each day to sessions with the Apple. The sessions present simple but interesting procedures that produce clear results—whether they be music, graphics, or text.

I resolved to spend two or three hours in front of my Apple each day for about six weeks. Sometimes events disrupted my schedule, but that only pointed out another of the book's strengths: the presentation of information in a natural sequence. With a minimum of rereading, I was usually able to pick up where I had left off. And at the end of six weeks of study, I had a firm grasp of the basics of Pascal.

The book is organized into work sessions rather than conventional chapters. The authors' method is to describe a project in general terms, and then try different approaches to see what works and what doesn't. The reader understands each point thoroughly as a result of running several slightly modified versions of the same program before achieving complete success.

68000

ERG68-696 68000 CPU in production. Meets or exceeds IEEE696 S-100 standard.

\$1995

Available software: Z80 emulator, 68K FORTH systems language, Whitesmiths' UNIX-like IDRIS—O/S with C or Pascal compilers.

Integrated 68000 systems also available.

Special offer: 68K Mini-System \$7395
CPU, 4 port I/O, 64K static RAM, 68K FORTH O/S and compiler, 10 slot mainframe, (2) 8" D/D, D/S floppy drives or a 5MB 5 1/4" hard disk drive.

Empirical Research Group, Inc.

PO Box 1176
Milton, WA 98354
206-631-4855

TERMINALS FROM TRANSNET

PURCHASE PLAN - 12-24 MONTH FULL OWNERSHIP PLAN - 36 MONTH LEASE PLAN

| | DESCRIPTION | PURCHASE PRICE | PER MONTH | | |
|--------------------------|-------------------------------|----------------|-----------|--------|--------|
| | | | 12 MOS | 24 MOS | 36 MOS |
| DEC | LA36 DECwriter II | \$1,095 | \$105 | \$ 58 | \$ 40 |
| | LA34 DECwriter IV | 995 | 95 | 53 | 36 |
| | LA34 DECwriter IV Forms Ctrl. | 1,095 | 105 | 58 | 40 |
| | LA120 DECwriter III KSR | 2,295 | 220 | 122 | 83 |
| | LA120 DECwriter III RO | 2,095 | 200 | 112 | 75 |
| | VT100 CRT DECscope | 1,695 | 162 | 90 | 61 |
| TEXAS INSTRUMENTS | TI132 CRT DECscope | 1,995 | 190 | 106 | 72 |
| | TI745 Portable Terminal | 1,595 | 153 | 85 | 58 |
| | TI765 Bubble Memory Terminal | 2,395 | 249 | 138 | 93 |
| | TI Insight 10 Terminal | 945 | 90 | 53 | 34 |
| | TI785 Portable KSR, 120 CPS | 2,395 | 230 | 128 | 86 |
| | TI787 Portable KSR, 120 CPS | 2,845 | 273 | 152 | 102 |
| DATAMEDIA | TI810 RO Printer | 1,695 | 162 | 90 | 61 |
| | TI820 KSR Printer | 2,195 | 211 | 117 | 80 |
| | DT80-1 CRT Terminal | 1,695 | 162 | 90 | 61 |
| LEAR SIEGLER | DT80-3 CRT Terminal | 1,295 | 125 | 70 | 48 |
| | DT80-5L APL 15' CRT | 2,295 | 220 | 122 | 83 |
| | ADM3A CRT Terminal | 650 | 62 | 36 | 25 |
| HAZELTINE | ADM31CRT Terminal | 1,095 | 105 | 58 | 40 |
| | ADM42 CRT Terminal | 2,195 | 211 | 117 | 80 |
| | 1420 CRT Terminal | 945 | 91 | 51 | 34 |
| TELEVIDEO | 1500 CRT Terminal | 1,095 | 105 | 58 | 40 |
| | 1552 CRT Terminal | 1,295 | 125 | 70 | 48 |
| NEC SPINWRITER | 920 CRT Terminal | 895 | 88 | 48 | 32 |
| | 950 CRT Terminal | 1,075 | 103 | 57 | 39 |
| GENERAL ELECTRIC | Letter Quality, 7715 RO | 2,895 | 278 | 154 | 104 |
| | Letter Quality, 7725 KSR | 3,295 | 316 | 175 | 119 |
| CENTRONICS | 2030 KSR Printer 30 CPS | 1,195 | 115 | 67 | 43 |
| | 2120 KSR Printer 120 CPS | 2,195 | 211 | 117 | 80 |
| | 730 Desk Top Printer | 715 | 69 | 39 | 26 |
| | 737 W/P Desk Top Printer | 895 | 86 | 48 | 32 |

FULL OWNERSHIP AFTER 12 OR 24 MONTHS • 10% PURCHASE OPTION AFTER 36 MONTHS

MICROCOMPUTERS

APPLE • COMMODORE • HP85 • DEC LSI 11

ACCESSORIES AND PERIPHERAL EQUIPMENT

ACOUSTIC COUPLERS • MODEMS • THERMAL PAPER • RIBBONS • INTERFACE MODULES • FLOPPY DISK UNITS

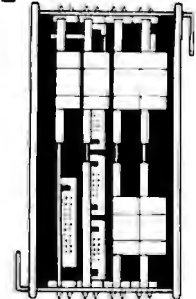


TRANSNET CORPORATION

1945 ROUTE 22 • UNION, N.J. 07083 • (201) 688-7800
TWX 710-985-5485

DEC LSI-11 Components

Dependable service at discount prices
Domestic and Export



Mini Computer Suppliers, Inc.

25 Chatham Rd., Summit, N.J. 07901
Since 1973

(201) 277-6150 Telex 13-6476

©Mini Computer Suppliers, Inc. 1979

6809 COLOR COMPUTER

EDITOR, ASSEMBLER AND MORE!

NEW!

SOFTWARE DEVELOPMENT SYSTEM

The Micro Works Software Development System (SDS80C) is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack! Vastly superior to RAM-based assemblers/editors, the SDS80C is non-volatile, meaning that if your application program bombs, it can't destroy your editor/assembler. Plus it leaves almost all of 16K or 32K RAM free for your program. Since all three programs, editor, assembler and monitor are co-resident, we eliminate tedious program loading when going back and forth from editing to assembly and debugging!

The powerful screen-oriented Editor features finds, changes, moves, copies and much more. All keys have convenient auto repeat (typamatic), and since no line numbers are required, the full width of the screen may be used to generate well commented code.

The Assembler features all of the following: complete 6809 instruction set; complete 6800 set supported for cross-assembly; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; and mnemonic error codes instead of numbers.

The versatile ABUG monitor is a compact version of CBUG, tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, breakpoints and more. **SDS80C Price: \$89.95**



CRACK THOSE ROMS!



SOURCE GENERATOR: This package is a disassembler which runs on the color computer and generates your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. **80C Disassembler Price: \$49.95**

CBUG IS HERE!

MONITOR TAPE: A cassette tape which allows you to directly access memory, I/O and registers with a formatted hex display. Great for machine language programming, debugging and learning. It can also send/receive RS232 at up to 9600 baud, including host system download/upload. 19 commands in all. Relocatable and reentrant. **CBUG Tape Price: \$29.95**

MONITOR ROM: The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The EPROM plugs into the Extended Basic ROM Socket or a modified ROMPACK. **CBUG ROM Price: \$39.95**

LEARN 6809!

6809 ASSEMBLY LANGUAGE PROGRAMMING, by Lance Leventhal, contains the most comprehensive reference material available for programming your Color Computer. **Price: \$16.95**

PARALLEL O!

USE A PARALLEL PRINTER with your Color Computer! Adaptor box plugs into the serial port and allows use of Centronics/Radio Shack compatible printers with parallel interface. Assembled and tested. **PI80C Price: \$69.95**

32K RAM!

MEMORY UPGRADE KITS: Consisting of 4116 200ns. integrated circuits, with instructions for installation. **4K-16K Kit Price: \$39.95. 16K-32K Kit (requires soldering experience) Price: \$39.95**

THE **MICRO WORKS**



GOOD STUFF!

WE SHIP FROM STOCK!

Master Charge/Visa and COD Accepted

P.O. BOX 1110 DEL MAR, CA 92014 714-942-2400

Book Reviews

The authors are careful to demonstrate the traps in the language system and how to cope with them. In fact, they instruct you to commit errors, then explain each error so that you really understand why some programs won't compile and run correctly. The explanations are all the more effective because they come after the demonstration.

Each new session begins with a brief summary of the previous session. After outlining the goals of the new session, the authors break it down into manageable sections. Each section treats a specific feature of Pascal—whether it be the command prompts, the use of variables, or the grammar rules that apply to the procedures under study. The authors end each session by presenting a brief summary and a series of thought-provoking questions and problems.

I strongly recommend that you answer the session-review questions and problems before you go on to the next session. The questions test your comprehension of the material presented, and although some questions are difficult, answering them lays a foundation for work to come. An appendix contains the answers, and the temptation to peek can be strong. Try to refrain from peeking until you've worked out your best answer to each question or problem. Then, of course, you can check your answers against those in the appendix.

Getting Started

Session 1, "Getting Started," tells the reader what he or she needs in order to work with the book: an Apple II or Apple II Plus computer with 48 K bytes of RAM (random-access read/write memory), a properly

installed language system, a TV monitor or a TV receiver with RF (radio frequency) modulator, and a pair of game paddles. Only one disk drive is required, but instructions are included for using more than one. The text calls for Apple Pascal version 1.1, contained on two disks marked Apple0: and Apple3:. Both disks come with the purchase of the language system. The authors provide an appendix, however, for users of Apple Pascal version 1.0 that states every change that must be made in the text to accommodate the earlier version of the language. They stress the importance of keeping back-up copies and explain all of the 26 steps necessary to copy the distribution disks using two drives (Appendix B) and the even more numerous steps necessary when using a single drive (Appendix A).

Session 1 proceeds with instructions for "booting" Pascal and then guides the reader on a tour of the Pascal system that includes the command-prompt line, the file-prompt line, the filer's date-set command, the filer's "volume" feature (which displays a list of input and output devices that are "on-line"), and the filer's L command (which lists the directory of a disk). The session ends with an explanation of how to toggle from one half of the Pascal "page" to the other. Considering how much material the first session covered, I was surprised at how smoothly everything had gone.

The Pascal editor, including how to obtain the workspace needed to create programs and how to move programs into and out of memory and onto a disk, is explained in Session 2. Session 3 teaches the writing, running, and changing of programs. It was during this session that I first began to feel

at ease with the Pascal language. In fact, the language seemed hospitable to my input.

Session 4 demonstrates the use of built-in procedures and taught me how to generate sound. I also learned how a function could provide input to a program, how a For loop works, and how to rename a disk or a file.

In Session 5, the importance of the distinction between local and global variables is emphasized, and the creation and calling of new procedures is explained.

Session 6 explains functions, comments brackets, and some new features of the editor. Session 7 presents more about graphics. I learned to use the "turtle," the creature that crawls across the screen drawing lines with pens of different colors—but I did encounter some difficulties in the process. I rushed through this session the first time. On the second time through, I was able to complete answers to all the questions and to write the programs requested by the authors. As a result of this experience, I recommend that you study at a moderate pace.

Session 8 covers branching statements, more graphics features, and the technique of obtaining user input for a running program. Session 9 tackles string variables and While loops, and Session 10 teaches number types and arithmetic. The authors deserve particular praise for this chapter; I loathe mathematics but found the material both interesting and effortless to learn.

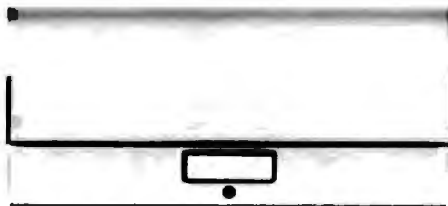
Discovering the Scalars

Session 11 introduces scalar data types and sets. This session is strikingly successful in leading the reader to discover, by directed experiments, what a scalar data

MITSUBISHI FLEXIBLE DISK DRIVE

SETTING NEW STANDARDS FOR RELIABILITY AND DURABILITY

- FULLY IBM AND SHUGART SA850R COMPATIBLE
- DOUBLE-SIDED, DOUBLE-DENSITY
- 1.6 MBYTE/DISK
- SOFTOUCH™ PROPRIETARY HEAD LOAD MECHANISM
- 3 MS TRACK-TO-TRACK ACCESS TIME
- HIGH QUALITY, ALL FERRITE MnZn HEADS
- PRECISION BUILT/MODULAR CONSTRUCTION
- 6 MONTH WARRANTY



***\$525.00** Available from stock. Terms: cash, check, money orders, VISA, MasterCard. Tax: 6% if California resident *Price subject to change without notice.

NCLDATA

1333 Lawrence Expressway, Suite 408
Santa Clara, California 95051
(408) 247-3450/TWX 910-338-7442
AUTHORIZED SALES AND SERVICE AGENT
FOR INFORMATION CONTACT HOLLY SAUER
OEM INQUIRIES INVITED

ADA **JANUS** 

the language that is based on the past but looks to the uses of the future.

JANUS is a true compiler for a subset of ADA. ADA is the much awaited U.S. Department of Defense language. With JANUS, it is available now on your CP/M system.

Now, JANUS includes Single & Double Precision Floating Point numbers, as well as Unlimited Precision Fixed Point numbers. The JANUS package is an integrated set of programs, supporting true Separate Compilation. The JANUS package produces ROMable, Re-entrant 8080 or optimized Z80 machine code. Code that is not only fast, but also is small because it includes a minimum of run-time support. But no other currently available compiler really compares with JANUS.

You too can take a step forward into the future. ORDER before December 31 and get in on the special introductory price of \$250.

The JANUS package consists of the JANUS compiler, linker, assembler, disassembler, and users manual.

JANUS requires an 8080/8085 or Z80 CPU, 56K of memory, and at least one 8" floppy disk. JANUS is supplied on a single density 8" floppy disk. Specify 8080 or Z80 optimized version.

CP/M is a trademark of Digital Research, Inc.
ADA is a trademark of the U.S. Department of Defense

RR SOFTWARE *specialists in state of the art programming*

P. O. BOX 1512, MADISON, WI 53701 (608) 244-6436

QUALITY parts at DISCOUNT PRICES

| | | |
|--|--|---|
| <p>RFI LINE FILTER for line to line & line to ground noise suppression CORCOM - 10K6 Rated: 10 amp 115/260 v 50-400 hz \$3.75 ea. 10 for \$35.00</p> | <p>MRF 901 MICROWAVE TRANSISTOR \$3.00 EACH</p> | <p>MINI SIZE BUZZERS 1 1/2 to 3 volts WITH WIRE LEADS 75¢ each 1 1/2 to 3 volts WITH PIN TERMINALS 75¢ each 3 to 7 volts WITH PIN TERMINALS 75¢ each</p> |
| <p>SUPER SMALL PHOTO-FLASH 170 MFD 330 VOLT 1 1/4" x 7/8" 2 for \$1.50 10 for \$7.00</p> | <p>TYPE N CONNECTOR KINGS UG 526 B-U F175 RG55, RG58, RG141 RG142, RG223 SOLDER TYPE \$1.75 each 10 for \$16.00</p> | <p>Free! SEND FOR OUR NEW 40 PAGE CATALOG Free!</p> |
| <p>HEADERS PRINTED CIRCUIT RIGHT ANGLE MOUNT 34 PIN HEADER 3M 3413-1003 \$1.25 EA 40 PIN HEADER ALPHA \$1.50 EA 50 PIN HEADER 3M 3433-1002 \$1.75 EA 40 PIN CONNECTOR 3M 3417 \$1.50 EACH</p> | <p>L.E.D.'s STANDARD JUMBO DIFFUSED RED 10 FOR \$1.50 GREEN 10 FOR \$2.00 YELLOW 10 FOR \$2.00 FLASHER LED 5 VOLT OPERATION JUMBO SIZE 2 FOR \$1.70 BI POLAR LED 2 FOR \$1.70 SUB MINI LED .079" x .098" 20 mA at 1.75v 10 FOR \$1.00 200 FOR \$18.00 QUANTITY PRICES AVAILABLE</p> | <p>14 CONDUCTOR RIBBON CABLE  SCOTCH-FLEX #3365 28 AWG STRANDED GRAY WITH RED MARKER 10 FEET FOR \$2.50 100 FOOT ROLL \$12.00</p> |
| <p>8 POLE DIP SWITCH \$1.50 each</p> | <p>ALL ELECTRONICS CORP. 905 S. Vermont Ave. P.O. BOX 20406 Los Angeles, Calif. 90006 (213) 380-8000 Mon. - Fri. 9 AM - 5 PM Saturday 10 AM - 3 PM</p> <p>TERMS • Quantities Limited • Min. Order \$10.00 • Add \$2.50 Shipping USA • Calif. Res. Add 6% • Prompt Shipping</p> <p>TRANSFORMERS 120 volt primaries 6 VOLTS at 150 mA \$1.25 12 V.C.T. at 500 mA \$2.50 18.5 V. at 3 AMPS \$6.50 18 VOLTS at 1 AMP \$4.50 25.2 VCT at 2.8 AMP \$6.50</p> <p>22/44 EDGE CONNECTOR TIN SOLDER TAIL 156 x 200  LARGE QUANTITIES AVAILABLE \$1.35 each 10 for \$12.50</p> | |

MODEL II



26-4002
64K 1 Drive
\$3297.00

DISCOUNT

TRS-80® **BUY DIRECT**

COMPUTER SPECIALISTS

MODEL III



CALL US... SAVE MONEY

26-1061 4K I, \$609.00
26-1062 16K III, 849.00
26-1066 48K III
W/2 Drives, RS232, 2077.00

1-800-841-0860 Toll Free Order Entry

MICRO MANAGEMENT SYSTEMS, INC.

No Taxes on Out Of State Shipments

Immediate Shipment From Stock on Most Items

DOWNTOWN PLAZA SHOPPING CENTER
DEPT. # 1
115 C. SECOND AVE. S.W.
CAIRO, GEORGIA 31728
(912) 377-7120 Ga. Phone No. & Export
TRS-80 is a registered trademark of the Tandy Corp.

A copy of the manufacturer's warranty can be obtained free upon specific written request to the Electronic's Department of our Cairo, Georgia Retail Store.

Kill Surges Like Lightning!



Permanent protection for small computers, communications, medical and other sensitive electronic equipment. Surge Sentry works in parallel with the power line to shunt destructive power surges in picoseconds! Triggers at 10% above the nominal peak voltage.

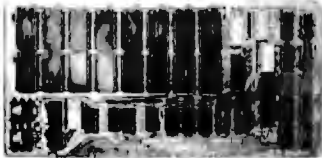
At \$89.50, it's less than the cost of a service call. Easy to install for immediate protection. Several models to choose from to fit your specific application.

For details and a free brochure, call or write



Telephone: (408) 438-5760

208 Mount Hermon Road, Suite 2, Scotts Valley, CA 95066
Dealer inquiries invited.



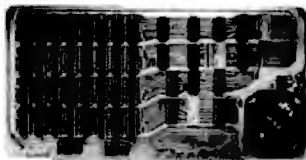
32K Static Ram Memory with Ultimate features

- Bank Select
- Extended Address
- 8/16 bit Data
- \$465 with 32KB
- \$295 with 16KB
- \$149 without memory chips
- All assembled and Tested

Features: Model-32KUS

Uniselect: 3

- 8/16 bit wide data
- Extended Addressing, 24 bit
- Bank Select by ports and bits - compatible with Cromemco, Alpha Micro, North Star and others
- Fully Static and low power - 600 mA typ.
- Two 16KB addressing, 32K bank select, with window capability in 2K increments
- EPROM (2718) can be mixed with RAM
- Provision for Battery back - up
- Fast Access Time - 250 nsec, will run with Z80/Z8000 to 4 Mhz, 8088/8088 or 68000 to 8 Mhz without wait states.



16K Static Ram Memory

- Bank Select
- \$195 Assembled and tested with lower power, 200 nsec chips

Features: Model-16KUS

'Uniselect'

- Fully Static - uses 2114L-2
- Bank Select by ports and bits - compatible with Cromemco, Alpha Micro

Other S-100 boards Available: Z80 CPU with 8 levels of Interrupts, I/O, ROM, RAM interface with built in Audio Cassette.

All boards conform to IEEE696/S100 specifications, fully socketed, screened legends, solder masks, Gold contacts, and Guaranteed for One Full Year. Deliver is from stock to 72 hours. Ordering: MC, Visa, C.O.D. accepted, Add \$5.00 for C.O.D. Personal check takes 7 to 15 days to clear before shipping. Undamaged boards can be returned within 10 days for full refund. Illinois residents add 5% sales tax

OEM & DEALER PRICING AVAILABLE

S.C. Digital P.O. Box 906 Phone:
Aurora, IL 60507 (312) 897-7749

Book Reviews

type is. A few quotes (page 238) will give you an idea of the writing style:

What is WHITE anyway? Well, what things could it be? First we note that WHITE appears in this program as a *parameter* that is being passed to the PENCOLOR procedure. That rules out the possibility of its being a reserved word, such as IF or FOR or WHILE or BEGIN, since reserved words never have *values*.

The things that have values in Pascal are *variables, constants, and functions*. Perhaps WHITE is one of these things. . . . if WHITE is an integer or a real number or a character or a string, then WRITELN (WHITE) will tell us what its value is.

Insert a semicolon after READLN and then the following new line:

WRITELN (WHITE)

Run the new version.

Well, whatever WHITE is, it does not belong to one of these standard data types. The error message makes that plain. WHITE seems to have a value, but it is not a number, a character, or a string. Very mysterious.

Here's another approach. . . .

And so on. The reader sees scalar data types and what they will and won't do. The authors let the reader infer much about scalars, and let the reader enjoy a real sense of discovery at every stage. The scalar data types are defined only after they have been revealed; by then, the reader feels like the Amerigo Vespucci of the scalars.

Session 12 uses the same experimental approach to introduce arrays and their uses. Session 13 provides a thorough introduction to rec-

ords and file systems. Session 14, the last in the book, discusses recursion and its uses. The session ends with a dazzling color-graphics program.

In addition to the appendices already mentioned, there are the following: "Names, Reserved Words, and Built-in Names," "The Command Structure of Apple Pascal," "Size and Quantity Limits in Apple Pascal," and "ORD and CHR Values of ASCII Character Set." A list of the 500 compiler error messages follows a comprehensive index.

Every book has its flaws, but those I will name are minor. There are some instructional paragraphs that are long and tedious—more, I think, as a result of the book's design than of the authors' prose. A more liberal use of graphics would have broken the paragraphs into digestible chunks. The book also neglected two important commands: the one that clears the screen of text and the one that inserts tabs in output to the screen. I found these commands elsewhere, but the book should have mentioned them.

In summary, *Apple Pascal: A Hands-On Approach* is a fine introduction to a powerful and increasingly popular programming language. I can unhesitatingly recommend this book to any Apple owner, and I would jump at the chance to buy a sequel. ■

Threaded Interpretive Languages

by R G Loeliger
BYTE Books,
Peterborough NH
1981, 251 pages,
hardcover, \$18.95

Reviewed by
A Richard Miller
61 Lake Shore Road
Natick MA 01760

Ron Loeliger's new book may well be the most important one in years for a growing number of FORTH programmers and enthusiasts. Although the book is called *Threaded Interpretive Languages*, the prospective reader should know that its subject is FORTH.

This book is well written and witty, but be warned that it is not trivial. It sets out to implement a Z80-based computer language, right before your eyes. The author calls his language ZIP: again, read FORTH.

For those who are able to discriminate among versions of this "newly arrived," high-level language (and/or assembler, and/or interpreter, and/or compiler, and/or operating system, and/or total computer environment, and/or seemingly whatever you wish), ZIP is a close approximation of microFORTH from FORTH, Inc. It is also generally similar to fig-FORTH, and to FORTH-79 systems including MMS-FORTH.

It has become traditional to introduce FORTH with a series of initially baffling keyboard entries. One might lead off with some arithmetic, using FORTH's Reverse Polish Notation (eg: the FORTH phrase { 5 5 * . }) instead of BASIC's more familiar ("PRINT 5*5. Next, one might demonstrate FORTH's ability to add new words to

its instruction set, adding a new word to do a given job (eg: the FORTH phrase { : SQUARE DUP * . ; } compiles a new instruction named SQUARE, which then might be executed as { 5 SQUARE } to do the same thing as the above examples). Soon, one is switching number bases with HEX, and DECIMAL, switching dictionary vocabularies with EDITOR, ASSEMBLER and FORTH, and eventually creating whole new types of defining words with <BUILDS (79-STANDARD now calls it CREATE) and DOES>.

This traditional approach presumes that one must have many hours of low-level experience with the language before considering why FORTH works the way it does. As with BASIC, most users never get around to learning how FORTH literally threads its way through the internals of the computer to gain its ends. But its unique internal design makes FORTH what it is and *Threaded Interpretive Languages* starts with internal design and stays there for most of its pages. It assumes no knowledge of FORTH but does demand more than a beginner's familiarity with computers. To practice routine FORTH operations, get another book, a lot of sample FORTH source code, an adequate FORTH system to run on your computer, and some learning projects of your own. To learn FORTH inside out, however, buy this book!

Any good FORTH system is very compact and very fast. For example, on the TRS-80 Model I or III, MMS-FORTH is about 20 times faster than Level II BASIC. Thus, many programmers do all FORTH programming in high-level FORTH. But FORTH includes a resident assembler and, where extra

speed helps, it is at your command. I like the author's unbiased way of balancing the trade-off between the ease and elegance of high-level FORTH and the "brute force" capabilities of assembly language.

The publisher deserves praise for treating this book as just that—a book. Up to now, most FORTH books have been indifferently printed and looseleaf bound. In contrast, *Threaded Interpretive Languages* is a solid little hardcover book, professionally produced and with a touch of class.

I do have some minor criticisms. The book uses black squares to represent the space characters within the code. Although it is useful to indicate the spaces (rather than to assume them), these large black squares overwhelm the eye and distract the mind. I recommend the use of unobtrusive open squares for the book's next edition. In a similar vein, the input lines are printed with proportional spacing between the characters, in contrast to the "typewriter-spaced" uniformity of a video terminal. Although this "typeset" style may appear more attractive, it is less faithful to the original material and is, I believe, misapplied here.

It is unfortunate that the author chose to call the language ZIP instead of FORTH, as that further complicates the issue. I imagine that, when he wrote this material, he wished to avoid any conflict with FORTH, Inc, which holds the rights to its name. However, in the last few years, FORTH, Inc has been gracious enough to encourage systems houses to produce versions with several variants on the name. His caution, therefore, appears unnecessary and—given the title of this important book—somewhat misleading.

It may also be misleading to say that the book implements a computer language. It does, but the author correctly warns that the implementation will require some work by the reader. It will also require some decisions that will affect certain trade-offs, lots of ability, time, patience, and a very good idea of what you intend to accomplish. A few expert programmers will follow his pattern to create elegant and streamlined FORTH. Others may concoct unfortunate approximations of good systems.

Most readers will do neither, but reading this development of a FORTH system will enable them to appreciate the several complete FORTH systems now available for microcomputers.

As a good book on music theory stimulates musicians, I believe this text will serve most effectively as a marvelous insight for those working with existing—and debugged—FORTH systems. In other words, do not study music theory without practicing on a musical instrument. And, if at all possible, do not design an instrument without first playing on another.

FORTH has existed only for a decade. It has thousands of users, but it was invisible to the general microcomputer community until the special FORTH issue of BYTE (August 1980). In this reviewer's opinion, *Threaded Interpretive Languages* is the first book of excellent quality among the few written about the language. ■

Software Received

This is a list of software packages that have been received by BYTE Publications during the past month. The list is correct to the best of our knowledge, but it is not meant to be a full description of the product or the forms in which the product is available. In particular, some packages may be sold for several machines or in both cassette and floppy-disk format; the product listed here is the version received by BYTE Publications.

This is an all-inclusive list that makes no comment on the quality or usefulness of the software listed. We regret that we cannot review every software package we receive. Instead, this list is meant to be a monthly acknowledgment of these packages and the companies that sent them. All software received is considered to be on loan to BYTE and is returned to the manufacturer after a set period of time. Companies sending software packages should be sure to include the list price of the packages and (where appropriate) the alternate forms in which they are available.

Apple

Auto-Modem, a telecommunication utility program for the Apple II. Floppy disk, \$39.95. Computer Station, 11610 Page Service Dr, St Louis MO 63141.

Castle Wolfenstein, a real-time graphics adventure program for the Apple II and Apple II Plus. Floppy disk, \$29.95. Muse Software, 330 N Charles St, Baltimore MD 21201.

Enhanced Centronics 739 Graphics Software, a utility program that prints high-resolution graphics for the Apple II. Floppy disk, \$44.95. Computer Station (see address above).

Enhanced Graphics Software, for the Epson MX-80. A utility program that prints high-resolution graphics for the Apple II. Floppy disk, \$44.95. Computer Station (see address above).

Enhanced Graphics Software, for the NEC Spinwriter (5510/5520). A utility program that prints high-resolution graphics for the Apple II. Floppy disk, \$44.95. Computer Station (see address above).

Falcons, a graphics arcade game for the Apple II and III. Floppy disk, \$29.95. Piccadilly Software Inc, 89 Summit Ave, Summit NJ 07901.

MACRO-SCED 2.1, a cursor-oriented screen editor for the Apple II. Floppy disk,

\$49.95. Computer Station (see address above).

Micro-DSS/Finance, a financial planning and analysis package for the Apple II Plus. Floppy disk, \$1500. Addison-Wesley Publishing, Jacob Way, Reading MA 01867.

NET-WORKS, a bulletin-board and information-service system for the Apple II. Floppy disk, \$124.95. Computer Station (see address above).

P-LISP 2.0, an implementation of the interpretive language LISP for the Apple II. Floppy disk, \$99.95. Pegasys Systems Inc, 4005 Chestnut St, Philadelphia PA 19104.

Powertext, a word-processing program for the Apple II. Floppy disk, \$199. Beaman Porter Inc, Pleasant Ridge Rd, Harrison NY 10528.

Professional Easywriter Version 4, a word-processing program for the Apple II. Floppy disk, \$250. Information Unlimited Software, 281 Arlington Ave, Berkeley CA 94707.

Ultra Hi-Res Graphics, a utility program that plots as much as a full page of output for the Paper Tiger 460G to 560G series printers and the Apple II. Floppy disk, \$49.95. Computer Station (see address above).

Word Handler, a word processor that does not re-

quire hardware modifications for the Apple II. Floppy disk, \$189. Silicon Valley Software, 652 Bair Island Rd, Redwood CA 94065.

Zork: The Great Underground Empire, Part I, Adventure-type game for the Apple II. Floppy disk, \$39.95. Personal Software, 1330 Bordeaux Dr, Sunnyvale CA 94086.

Commodore VIC

Biorhythm Compatibility, a program that compares biorhythm charts for the Commodore VIC-20. Cassette, \$14.95. Commodore, 950 Rittenhouse Rd, Norristown PA 19403.

Space Math, a utility program that solves basic mathematical problems for the Commodore VIC-20. Cassette, \$14.95. Commodore (see address above).

TI 99/4

Invoice Management, a utility program that maintains a customer-invoice file for the TI-99/4. Floppy disk, \$69.95. Texas Instruments Inc, Dallas TX 75265.

Saturday Night Bingo, a board game for the TI-99/4. Floppy disk, \$29.95. Texas Instruments Inc (see address above).

Speak & Spell Program, emulates a TI Speak & Spell for the TI-99/4. Floppy disk, \$29.95. Texas Instruments Inc (see address above).

Structural Engineering Library, five programs that solve engineering problems for the TI-99/4. Floppy disk, \$29.95. Texas Instruments Inc (see address above).

Teach Yourself Extended BASIC, a self-help guide to TI Extended BASIC for the TI-99/4. Floppy disk, \$24.95. Texas Instruments Inc (see address above).

TRS-80

B17 Disk/Bas, a utility program that saves and loads disk files to and from cassette tapes for the TRS-80 Model I. Cassette, \$14.95. ABS Suppliers, POB 8297, Ann Arbor MI 48107.

CC Writer, a word-processing program for the TRS-80 Color Computer. Cassette, \$30. Transformation Technologies, 194 Lockwood Ln, Bloomington IL 60108.

DC Circuit Analysis, a program that solves DC circuits for the TRS-80 Model I. Cassette, \$11.95. Computer Heroes, 1961 Dunn Rd, East Liverpool OH 43920.

KWIK Cassette Operating System, for the TRS-80 Model I. Cassette, \$24. KWIK Software, POB 328, Bolivar MO 65613.

Maxi Manager A.3, a database management system for the TRS-80 Model I. Floppy disk, \$99.95. Adventure International, POB 3435, Longwood FL 32750.

New DOS/80 Version 2.0, a disk operating system for the TRS-80 Model I. Floppy disk, \$149. Apparat Inc, 4401 S Tamarac Parkway, Denver CO 80237.

Stock Scoreboard, computes investment return and updates holdings for the TRS-80 Model I and III. Cassette, \$15. Gary L Gilbert, 975 D Elgin, San Lorenzo CA 94580.

Wordsmith, a word processor for disk systems, for the TRS-80 Model I. Cassette, \$14.95. ABS Suppliers (see address above). ■



TECHNOLOGY:

**12 ways American business
can increase productivity
and save energy
to improve its
competitive edge.**

ASK WESTINGHOUSE

Westinghouse technology improves productivity.



Precision Heating for Metal Processing increased productivity by 300 percent and cut energy costs by 50 percent for a forging facility.

The Westinghouse induction heating system is so much faster than any type of surface heating, it enables the forge to produce parts at three times the old rate. That's because the controlled electric current flow within the bar stock heats to the precise depth required.

Such controlled heating from within significantly reduces the energy waste that accompanies surface heating. It also means an improved environment for employees involved with forging, forming, rolling, heat treating or curing of coatings.

Office productivity increased 6 percent when a Westinghouse "Open Office" System was installed by a major Eastern bank.

"Open offices" improved communications, provided efficient work stations and lowered noise levels for the bank's programmers and analysts. Productivity increased almost overnight.

Today, white collar employees represent half of the American work force, but white collar productivity has increased only 0.4 percent per year in the last five years. Installing "open offices" by Westinghouse can improve those figures.



Microprocessor-based production control increased productivity 300 percent for an agri-business.

A Westinghouse Numa-Logic™ PC-700 programmable controller system replaced manual batching. Now a single 8-hour shift can mix 720 tons of 30 different types of feed requiring 41 separate ingredients. With only a 1 percent weight error in a given ingredient.

Before Numa-Logic, the same output required two 12-hour shifts, and there was a 20 percent weight error.

The Westinghouse Numa-Logic can increase productivity in a wide variety of process and manufacturing operations.

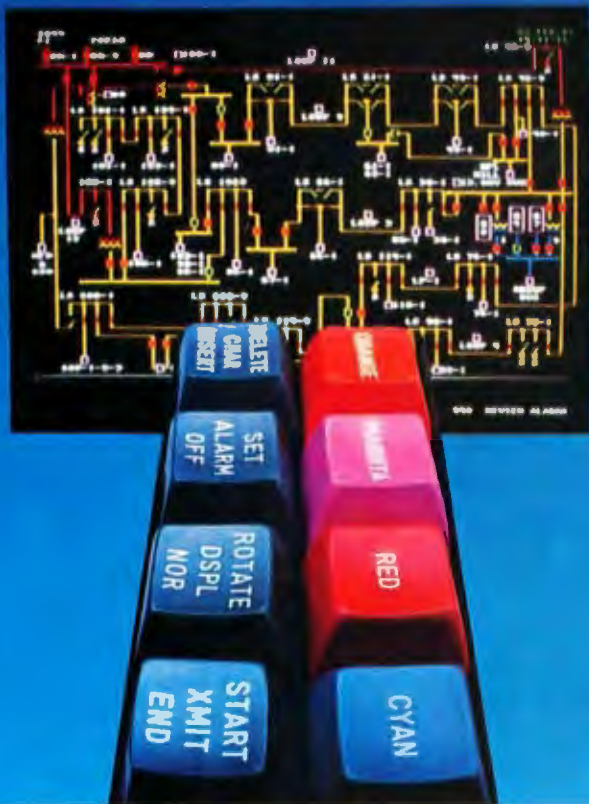
Ultrasonic Cleaning and Degreasing increased productivity by over 900 percent for a manufacturer of iron molds.

Instead of 1,300 man-hours and \$21,500 to clean 100,000 units, now it takes 133 man-hours and slightly over \$2,100.

Westinghouse Ultrasonic Cleaning does a faster, more thorough cleaning job than any other method. Using less harsh chemicals and no elbow grease, high intensity sound waves implode small vapor bubbles that blast off dirt and residue.

If cleaning has been your productivity bottleneck, ultrasonics could be the answer.

Westinghouse technology saves energy.



Energy Management will save over \$800,000 per year in fuel consumption and labor costs for a 600-acre, 150-building chemical plant.

A Westinghouse Industrial Energy Management System replaced the plant's slower, traditional ways of monitoring and adjusting energy generation and use.

Now, over 1,800 sensors provide the central computer with continuous data for real time analysis of the entire plant's energy generation, distribution and process systems.

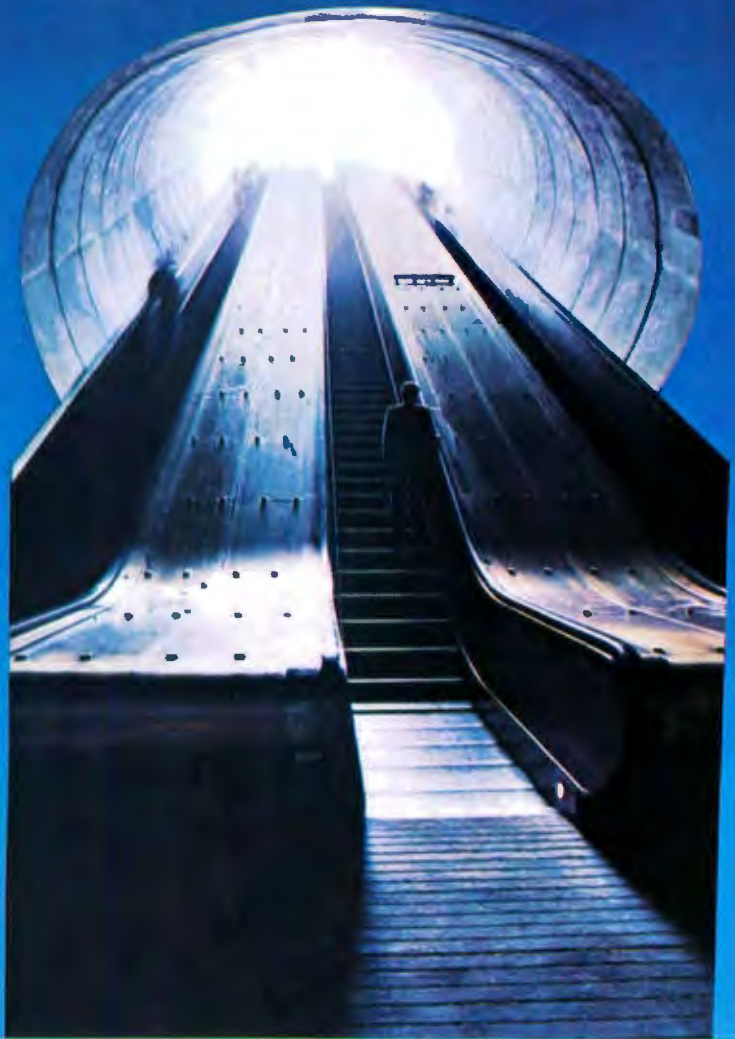
Result: Any deviation from optimum operational levels—anywhere—can be spotted and corrected in seconds. By one operator. At the press of a button.

Illumination costs were cut \$233,000 per year for a 22-story bank.

The reason? Westinghouse Ultralume[®] lamps. Westinghouse researchers discovered that combining three particular wavelengths of light produced a fluorescent that gives better lighting for less money.

Two Westinghouse Ultralume Fluorescents provide the bank with a lighting environment which the employees agree compares to four standard fluorescents while using only half the electricity.

The bank has since installed Ultralumes in two other facilities. And is saving an additional \$84,000 annually as a result.



Combustion Control has cut the fuel bill of an Eastern chemical company 15 percent, saving it \$75,000 per year.

The company installed a Westinghouse fully automatic boiler system on one of its four boilers.

Combining a probe-type oxygen analyzer with a microprocessor-based oxygen trim controller, the system optimized fuel consumption, increased safety, and decreased excess oxygen by 8 percent.

It has been so impressive that the company has ordered similar equipment for its three other boilers.

Modular escalators will save over \$150,000 per year in energy costs for the mass transit system of a major East Coast city.

The 354 Westinghouse Moduline 100[®] escalators used there save 30 percent of energy costs when going "up," 60 percent when going "down" compared to the conventional type.

These advanced Westinghouse escalators can be connected in modular sections, giving architects a design freedom they never had before. These escalators can skip a floor, span vertical rises of 100 feet or more, and provide a nonstop 10-story ride.

That's right, 10 stories.

Westinghouse technology for the future.



Electricity from sunlight is one step closer to economic reality.

The unique Westinghouse Dendritic Web process promises to significantly reduce the cost of manufacturing photovoltaic cells.

It produces long, thin, continuous strips of single crystal silicon, the main component of solar cells. The costly and wasteful slicing of silicon blocks has been eliminated.

Modules like the one pictured behind the dendritic strip above can produce up to 16 watts per square foot. Now, Westinghouse is working toward automated production facilities. And we've designed and installed systems for residential application.

Fuel Cells promise to be a highly efficient, compact, nonpolluting source of electric power.

Westinghouse is developing two types of fuel cells.

One is a phosphoric acid fuel cell targeted for the mid 80's. It converts any hydrogen-rich fuel such as synthetic gas from coal directly into electricity. It's environmentally benign, the only by-products are carbon dioxide, heat and pure water.

The other type is a solid oxide design. It's even more compact and more fuel efficient than the phosphoric acid fuel cell. With an 1800°F operating temperature, it's ideal for industrial cogeneration. It should be ready for use by the mid 90's.



High Power Battery technology may soon give commercial vehicles such as delivery vans a 100-mile cruising range, take only 4 to 6 hours to recharge, and last 100,000 miles.

Westinghouse is developing a high power nickel-iron battery that offers the best combination of high energy density, long life cycle, longer time between charges and competitive life cycle costs.

Smaller and lighter than older types of batteries, the new Westinghouse nickel-iron battery could also replace fossil fuels as the power source for industrial forklifts, mining machines, and airplane tow trucks.

It's already in limited production.

Super Small, Super Fast Processors will dramatically enhance America's military capabilities and ultimately revolutionize American industry.

Very High Speed Integrated Circuits (VHSIC) will increase processing capabilities by over 1,000 percent. It will be possible to put up to 500,000 transistors on a single chip.

The production and use of very pure silicon will enable such chips to process information at much higher rates of speed. And they'll require 1,000 times less power.

And advanced circuit pattern printing techniques will help deliver all of this capability in a package 400 times smaller than today's!

Through its technology, Westinghouse is ready to help American industry increase productivity

PRODUCTIVITY INCREASE IN MANUFACTURING, 1970-1980

| | |
|-----------------|--------|
| United States | 28.0% |
| Japan | 102.1% |
| the Netherlands | 74.8% |
| France | 60.6% |
| Germany | 59.9% |
| Italy | 59.0% |
| United Kingdom | 25.5% |

Source: Based on most recent data from the Bureau of Labor Statistics, United States Department of Labor, June, 1981

and...

**Reestablish our worldwide industrial leadership.
Improve our trade balance. Slow inflation, and
help preserve and improve our quality of life.**

For more information, call toll free

800-245-4474

In Pennsylvania, call 800-242-2550

*Or write: Six Gateway Center,
Dept. 10, Pittsburgh, PA 15222.*



ASK WESTINGHOUSE

Clubs and Newsletters

Computer Publicity News for Publishers

If you're in the computer or electronic publishing business, *Computer Publicity News* could be exactly what you've longed for. Send the newsletter your yearly editorial schedule and information on how you would like product releases and advertising sent to you, and *Computer Publicity News* will publish it free. The newsletter is sent to marketing professionals in the computer and electronic industries. The subscription rate is \$195 from Hi-Tech Publicity Consultants, 44 Monterey Blvd, Suite 170, San Francisco CA 94131, (415) 585-6102.

Computer Club Rides In Central Texas

The Computer Club of San Marcos has been formed to promote personal computing in central Texas. Correspondence from other clubs is invited, and all can attend meetings. For information, contact January Smith, POB 381, Martindale TX 78655, (512) 357-6762.

Packet-Switching Network

VADCG (Vancouver Amateur Digital Communications Group) is devoted to creating a packet-switching network via amateur radio. It is experimenting with high-speed protocol transmissions, and efforts are underway to connect a smart terminal node-controller board that interfaces any parallel or asynchronous serial device to the network. Other projects include an S-100 card to provide the centralized station node network control and a 1200-bit-per-second modem

for connection to VHF (very-high frequency) transceivers. Some public-domain software is available and more is being developed. Newsletter subscriptions are \$10 from VADCG, 818 Rondeau St, Coquitlam, British Columbia, V3J 5Z3, Canada.

Computer Graphics Software News

The Computer Graphics Software News reviews computer programs in the public and industrial domain that deal with computer-generated graphics. Areas of interest are computer-aided design and manufacturing, animation, business graphics, image processing, and petrophysical-related software. The subscription rate is \$50 a year (six issues). Contact *The Computer Graphics Software News*, 5857 S Gessner, Suite 401, Houston TX 77036, (713) 975-8509.

PET Users Meet In Golden State

The Southern California PET Users Group meets the first Tuesday of each month at 7 PM at the Data Equipment Supply Corporation, 8315 Firestone Blvd, Downey, California. For more details, call Lyle Phillips at (213) 693-3175.

CCAN

Construction Computer Applications Newsletter-CCAN is a monthly publication from the Construction Industry Press. It has information and reviews on computer products designed exclusively for the construction industry. A one-year subscription to the *Construction Computer Applications Newsletter-CCAN* costs \$48.

Contact the Construction Industry Press, 1105-F Spring St, Silver Spring MD 20910, (301) 589-4884.

Mail-Order Software Library

ESL (Educational Software Library) is a nonprofit, mail-order library of educational programs for the TRS-80 Models I and III. Members receive a bimonthly newsletter that describes current selections, which range from preschool to high school level.

A one-year membership costs \$20 and entitles you to the newsletter, two educational tapes, the opportunity to borrow programs for two-week periods at \$2 per tape, and the chance to purchase software at discount prices. Contact ESL Inc, 262 Park Ln, King of Prussia PA 19406.

Microsv Newsletter

The *Microsv* newsletter has short articles, technical tips, news, and programming help. It is primarily for Apple users, but much of the information can be applied to any system. For details on subscriptions or submitting editorial material, contact *Microsv*, 20th Century Business Systems, 324 W 145th Pl, Riverdale IL 60627, (312) 841-3400.

Librarians and Microcomputers

The University of Arizona Graduate Library School has announced the availability of the *Small Computers in Libraries Newsletter*. The newsletter acts as a clearinghouse

for the sharing of information on microcomputers in libraries. It offers glossaries, short tutorials, and reviews of programs and books pertinent to the subject. Subscriptions start at \$20 from the Graduate Library School, Attn: SCIL, University of Arizona, 1515 E First St, Tucson AZ 85719, (602) 626-3565.

New TRS-80 Group In North Carolina

The Greensboro TRS-80 Group is a recently formed club that wants to learn all it can about TRS-80 equipment. Contact David K Bodman, POB 7785, Greensboro NC 27407, (919) 855-9155.

Sun Shines On New CBBS

A new CBBS (computerized bulletin-board system) has gone on line in Orlando, Florida. The system is positioned to service central Florida, and licenses are available for other areas. No particular subject dominates the board. The 24-hour telephone number is (305) 830-8166.

National Apple Newsletter

Owners and users of Apple II and II Plus computers now have a club publication devoted to their needs. *The National Apple Newsletter* will print anything members demand: Pascal programs, home control, computerized alarm systems, and other practical applications. For more information, contact Scott Summer, 27 Leicester Way, Pawtucket RI 02860. ■

Event Queue

November 1981

November-December

Courses from Datapro, various sites throughout the US. Datapro Inc's educational program features seminars and one-day management briefings on a wide range of subjects. Among the topics to

be presented are "Structured Systems Analysis," "Introduction to Micro/Personal Computers," "Local Networks," "Evaluating and Selecting Computer Software Packages," and "BASIC: Introduction to Computer Programming."

Seminar enrollment fees are \$595 for Datapro sub-

scribers and \$645 for nonsubscribers. The management briefings cost \$360 and \$395, respectively. Contact Datapro Research Corporation, 1805 Underwood Blvd, Delran NJ 08075, (800) 257-9406; in New Jersey (609) 764-0100.

November-December

The Master Method of Selling

Small Business Systems, various sites throughout the US. MWL Inc is offering a series of one-day seminars for manufacturers of small-business systems and software vendors. The price for a seminar is \$135. Contact the Seminar Coordinator, MWL Inc, 32038 Watergate Ct, Westlake Village CA 91361, (213) 889-2607.

November-March 1982

Two-Day Seminars for Professional Development, Worcester Polytechnic Institute, Worcester MA. Courses on the fundamentals of data processing, data communications, and microprocessors are being offered by Worcester Polytechnic Institute at its campus and at selected locations in the Boston metropolitan area. The fee is \$445. Contact Ms Ginny Bazarian, c/o the Office of Continuing Education, Worcester Polytechnic Institute, Worcester MA 01609, (617) 793-5517.

November 12-14

Accounting and Information Systems Expo '81, MGM Grand Hotel, Reno NV. This exposition is geared toward accounting experts and information-systems analysts, designers, and managers. The emphasis will be on technological advances in the field and ways in which these advances can improve efficiency and effectiveness. For more information, contact Leanne Stone, c/o the University of Nevada-Reno, Division of Continuing Education, College Inn, Reno NV 89557, (702) 784-4046.

November 13

The Impact of New Technologies on Information Service Environments, Battelle Columbus Laboratories, Columbus OH. The Ohio chapters of ASIS (American Society

SAVE TIME and MONEY

Ask about our **LEASING** program

By letting us be your **PURCHASING AGENT**

We'll buy for you on the wholesale market using our expertise to get you the best available price. We have access to over 500 manufacturers. Our fee is one fourth of what we save you off the list price. Examples of total prices being paid by our clients (including our fee) are:

COMPUTERS

| | |
|---------------------|-------------|
| Alpha Micro 1030 | \$12,047.00 |
| Alpha Micro 1051 | 17,834.00 |
| Alpha Micro AM-1011 | 9,313.00 |

Altos 8000-10 \$6,397.00

| | |
|------------------------|----------|
| Altos 8000-15 | 4,450.00 |
| Altos 8000-2 | 2,629.00 |
| Apple 2 + 48K | 1,208.00 |
| Archives Model I | 4,794.00 |
| Archives Model II | 5,532.00 |
| Archives Model III | 6,289.00 |
| CCS Series 300-1A | 4,414.00 |
| CCS Series 400-1A | 6,374.00 |
| Cromemco System 3 | 5,850.00 |
| Cromemco Z-2H | 7,521.00 |
| Dynabyte 5200-A2 | 3,216.00 |
| Dynabyte 5200-B2 | 4,898.00 |
| Dynabyte 5615-A1 | 8,396.00 |
| Ithaca C.B. 128KSS/OD | 5,421.00 |
| Ithaca Sys. 2A W/Panel | 2,941.00 |
| NEC 8001A | 1,014.00 |
| NEC 8012A | 600.00 |
| NEC 8031A | 1,014.00 |
| North Star 64K DD | 3,073.00 |
| North Star 64K QD | 3,289.00 |

North Star Adv. \$2,995.00

| | |
|------------------------|------------|
| Televideo System I | \$2,380.00 |
| Televideo System II | 5,311.00 |
| Televideo TS-800 Term. | 1,324.00 |
| Vector 2600 | 4,221.00 |
| Vector 3005 | 6,458.00 |
| Vector 5005 | 7,308.00 |

SOFTWARE

| | |
|----------------|----------|
| Dbase II | \$500.00 |
| Spellguard | 200.00 |
| Dalastar | 230.00 |
| Spell Star | 180.00 |
| Wordstar | 305.00 |
| Basic Compiler | 277.00 |
| Fortran 80-CPM | 375.00 |



Mastercharge at 3% handling fee. Prices subject to change without notice. Minimum fee \$100. 15% cancellation fee.



PRINTERS

| | |
|--------------|----------|
| Anadex 9000 | 1,100.00 |
| Anadex 9501 | 1,278.00 |
| C. Itoh 25 P | 1,325.00 |
| C. Itoh 45 P | 1,700.00 |
| Diablo 630 | 1,975.00 |
| Diablo 1640 | 2,444.00 |
| Malibu 1650 | 1,798.00 |
| Malibu 200 | 2,320.00 |
| NEC 3510 | 1,980.00 |
| NEC 5510 | 2,345.00 |
| NEC 5520 KSR | 2,645.00 |
| NEC 5530 | 2,345.00 |
| NEC 7710 | 2,345.00 |

Epson MX80 \$468.00 IN STOCK!

| | |
|------------------|----------|
| Qume Sprint 9-35 | 1,738.00 |
| Qume Sprint 9-45 | 1,996.00 |
| Qume Sprint 9-55 | 2,085.00 |

CRT, DISK DRIVE, MODEMS

| | |
|------------------------|----------|
| Alpha Micro AM-600 | 8,075.00 |
| Anderson Jacobsen 1256 | 641.25 |

DEC VT 100 \$1,495.00

| | |
|--------------------------|----------|
| Hayes Micromodem Apple | 250.00 |
| Hayes Micromodem S-100 | 319.00 |
| Houston Instrument DMP-2 | 819.00 |
| Houston Instrument DMP-4 | 1,063.00 |
| Houston Instrument DMP-7 | 1,528.00 |
| Lobo Dual 8" DS/DD | 2,234.00 |
| Lobo Dual Mini Drives | 855.00 |
| Morrow 10 MEG | 2,750.00 |
| Morrow 20 MEG | 3,550.00 |
| Morrow 26 MEG | 3,375.00 |

Assembly, integration and testing available from our computer **REPAIR** division.

In Calif. call (415) 376-9020
International Telex 470851



THE PURCHASING AGENT

1635 School St., Ste. 101
Moraga, CA 94557

CALL TOLL FREE 800-227-2288
For latest wholesale prices and to order

for Information Science) are sponsoring this one-day seminar. Speakers and a panel will examine the impact of electronic publishing, video-discs, and personal computers on libraries and corporate information centers. Registration fees are \$40 for ASIS members, \$50 for nonmembers, and \$10 for students. For details, contact Katherine Frohberg, Oberlin College Library, Oberlin OH 44074, (216) 775-8285.

November 13-15

The Los Angeles Computer Showcase Expo, Convention Center, Los Angeles CA. The Computer Showcase is designed to place vendors and their intermediaries in touch with small-computer-system users. For details, contact the Interface Group, 160 Speen St, Framingham MA 01701, (800) 225-4620; in Massachusetts (617) 879-4502.

November 16-17

Computer-Aided Graphics Systems: Design and Drafting Tools, Marriott Pavilion Hotel, St Louis MO. This course has been designed for middle- and upper-level administrators who are responsible for planning, evaluating, selecting, acquiring, and implementing computer-graphics systems for industrial design and drafting purposes. The course fee is \$295.

For technical information, contact Ralph E Lee, Mathematics-Computer Science Building, University of Missouri-Rolla, Rolla MO 65401, (314) 341-4491. Course or registration information can be obtained from Martha K Fort, Arts & Sciences Continuing Education, 105A Humanities-Social Sciences Building, University of Missouri-Rolla, (314) 341-4943.

November 16-19

The 1981 Electronics and Aerospace Systems Confer-

ence (EASCON '81), Washington Hilton Hotel, Washington DC. The theme of this conference is "Government-Industry Interchange." The exhibition will include displays from many electronics and aerospace companies. For details, contact EASCON '81, 608 H St, SW, Washington DC 20024, (202) 347-7088.

November 19-21

Business and Personal Com-

puter Sales-Expo '81, Philadelphia Civic Center, Philadelphia PA. The Sales-Expo is aimed at a wide range of computer users. The show features exhibits of micro-computers, business supplies, peripherals, and software. For more information, contact Produx 2000 Inc, POB 2000, Bala Cynwyd PA 19004, (215) 457-2300.

November 20-22

Symposium on Small Com-

puters in the Arts, Philadelphia PA. The Symposium on Small Computers in the Arts (formerly the Personal Computer Arts Festival) is being held to bring together individuals interested in using small computers in the audio and visual arts. The Symposium will offer a range of presentations from introductory tutorials to sessions on advanced techniques. Workshops, exhibits, and demonstrations are also planned.

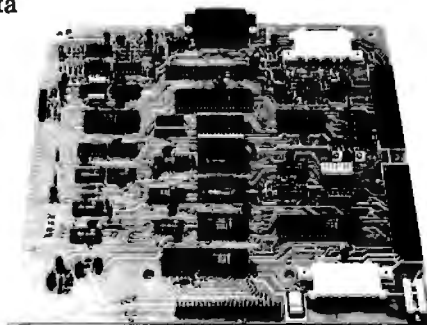


The DS120 Terminal Controller makes your LA36 perform like a DECwriter® III.

The Datasouth DS120 gives your DECwriter® II the high speed printing and versatile performance features of the DECwriter® III at only a fraction of the cost. The DS120 is a plug compatible replacement for your LA36 logic board which can be installed in minutes. Standard features include:

- 165 cps bidirectional printing
- Horizontal & Vertical Tabs
- Page Length Selection
- 110-4800 baud operation
- 1000 character print buffer
- X-on, X-off protocol
- Self Test
- RS232 interface
- 20 mA Current Loop interface
- Top of Form
- Adjustable Margins
- Double wide characters
- Parity selection
- Optional APL character set

Over 5,000 DS120 units are now being used by customers ranging from the Fortune 500 to personal computing enthusiasts. In numerous installations, entire networks of terminals have been upgraded to take advantage of today's higher speed data communications services. LSI microprocessor electronics and strict quality control ensure dependable performance for years to come. When service is required, we will respond promptly and effectively. Best of all, we can deliver immediately through our nationwide network of distributors. Just give us a call for all the details.



datasouth computer corporation

4740 Dwight Evans Road • Charlotte, North Carolina 28210 • 704/523-8500

See Us At **COMDEX '81**

November 19-22, 1981
Las Vegas Convention Center, Las Vegas, NV

Circle 130 on Inquiry card.

Event Queue

Complementing the Symposium will be the Fourth Annual Computer Music Concert. Contact the Symposium at POB 1954, Philadelphia PA 19105, (215) 243-8109.

November 22-24

Data-Telecommunications Expo, Rhein-Main-Halle, Wiesbaden, West Germany. Exhibits of equipment and systems for applications in commerce and industry plus a conference program com-

plementing these subjects will be presented. Details are available from Kiver Communications S.A., UK Branch Office, 171/185 Ewell Rd, Surbiton, Surrey, KT6 6AX, England.

December 1981

December 1-3

Legal Info, Shoreham Hotel, Washington DC. Automating legal-information systems is

the subject of this conference and exposition. Attorneys wishing to use computers in their work are invited to attend. Contact Legal Info, 1730 N Lynn St, Suite 400, Arlington VA 22209, (703) 521-6209.

December 1-4

Computer-Network Design and Protocols, Washington DC. Integrated Computer Systems (ICS) will be presenting a course on fundamentals

in computer communication-network concepts, technology, and implementation. Emphasis is on the practical aspects of network design, interfacing, protocols, and packet switching. For a schedule of times and locations, contact Ruth Dordick, c/o Integrated Computer Systems, 3304 Pico Blvd, POB 5339, Santa Monica CA 90405, (800) 421-8166; in California (800) 352-8251.

December 2-3

Introductory Seminar on UNIX, Key Bridge Marriott Hotel, Arlington VA. Human Computing Resources Corporation is offering this two-day seminar on the use of UNIX for programmers, analysts, and anyone needing to know about this operating system. For details, contact the Course Coordinator, c/o Human Computing Resources, 10 St Mary St, Toronto, Ontario, M4Y 1P9, Canada, (416) 922-1937.

December 3

California Computer Show, Hyatt Hotel, Palo Alto CA. For details and a schedule of upcoming events, contact the Show Administrator, c/o Norm De Nardi Enterprises, 95 Main St, Los Altos CA 94022, (415) 941-8440.

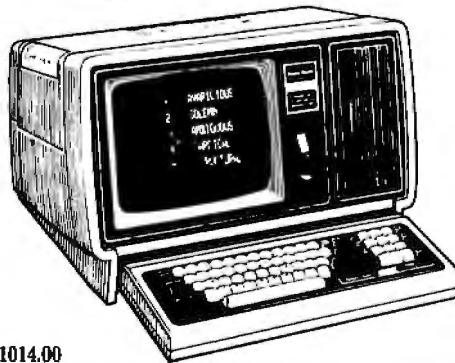
December 3-4

Computer Graphics: Micro-processor/Personal Computer Systems, Marriott Pavilion Hotel, St Louis MO. This course has been designed for managers, educators, and graphics users responsible for evaluating and acquiring microcomputers and graphics systems. The course fee is \$195.

For technical information, contact Ralph Lee, Mathematics-Computer Science Building, University of Missouri-Rolla, Rolla MO 65401, (314) 341-4491. Course or registration information can be obtained from Martha K Fort,

All Apple products in stock—Call for prices

SAVE BIG BUCKS



Model II 64K \$3395

| | |
|---------------------------|-----------|
| 28-4160 1 Drive Exp | \$1014.00 |
| 28-4161 2 Drive Exp | 1559.00 |
| 28-4162 3 Drive Exp | 2099.00 |
| 28-4530 Scripsit II | 259.00 |
| 28-4512 Profile II | 159.00 |
| 28-4511 Visicalc II | 259.00 |
| 28-4501 Gen Ledger | 179.00 |
| 28-4506 Mail List | 72.00 |

MODEL III

| | |
|--------------------------|-----------|
| 28-1061 4K I | \$ 599.00 |
| 28-1062 16K III | 859.00 |
| 28-1066 48K III | |
| W/2 Drives, RS 232 | 2225.00 |
| 28-1162 1st Drive | 765.00 |

IDS PAPER TIGERS

Dot Resolution Graphics quality print

| | | |
|--|---------------------|-----------|
| IDS 445G 7 wire printhead, graphics | (List \$ 985) | \$ 795.00 |
| IDS 460G 9 wire printhead, graphics | (List 1094) | 888.00 |
| IDS 560G 9 wire, wide carriage, graphics | (List 1394) | 1129.00 |

Model I

| | |
|-----------------------------------|----------|
| 28-1140 Expansion Interface | \$249.00 |
| 28-1141 16K Exp. Interface | 359.00 |
| 28-1142 32K Exp. Interface | 469.00 |
| 28-1145 RS 232C Board | 84.00 |
| 28-1160/1 Mini Disk Drive | 419.00 |
| 28-1563 Scripsit-Disk | 79.00 |
| 28-1566 Visicalc | 83.00 |

PRINTERS

| | |
|----------------------------------|-----------|
| 28-1167 9½ Line Printer VII | \$ 360.00 |
| 28-1166 Line Printer VI | 1080.00 |
| 28-1158 Daisy Wheel II | 1798.00 |
| 28-1165 Line Printer V | 1710.00 |
| 28-1401 Cable | 36.00 |

Color Computer 4K \$353

| | |
|------------------------------|----------|
| 28-3001 4K | \$353.00 |
| 28-3002 16K Ext. Basic | 533.00 |
| 28-3009 Joysticks | 22.50 |
| 28-3010 Color Video | 353.00 |
| 28-1206 Recorder | 54.00 |

All prices are subject to change without notice. Freight, handling, and insurance charges are extra. Most items are shipped United Parcel Service. Model II and other hardware weighing over 50 lbs. is shipped freight collect by truck. Certified Check for immediate shipment from stock. Master Charge, Visa or Bank Card add 3% surcharge.

Vern Street Products 114 West Taft Sapulpa, Ok 74066
 The Computer Store, Inc. 4949 South Peoria Tulsa, Ok 74105
 918-747-9333

Arts & Sciences Continuing Education, 105A Humanities-Social Science Building, University of Missouri-Rolla, (314) 341-4943.

December 8

Computer Networking Symposium/National Bureau of Standards, Gaithersburg MD. This conference is being sponsored by National Bureau of Standards and the Institute of Electrical and Electronics Engineers. Contact Robert Toense, B226 Technology Building, National Bureau of Standards, Washington DC 20234, (301) 921-3516.

December 9-11

The 1981 Winter Simulation Conference (WSC 81), Peachtree Plaza, Atlanta GA. WSC 81 will feature papers, panel discussions, and tutorials on discrete and combined simulation and modeling. The conference will be organized into tutorial, methodology, and application sessions. For information, contact John Carson, WSC 81 Registration Chairman, School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta GA 30332, (404) 894-2308.

December 15-19

Gulf Computer Exhibition, Dubai International Trade Centre, Dubai, United Arab Emirates. IBM, NCR, Apple, Honeywell, Philips, Wang, Hewlett-Packard, Data General, and other well-known manufacturers will be represented at this first exhibition of computer equipment in Dubai. The scope of the show takes in systems ranging from microcomputers to mainframes. Details are available from the Trade Centre Management Company, POB 9292, Dubai, United Arab Emirates, Telex 47474 DITC EM, and from Diana Clifton Sewell, International Office, Seymour House, 17 Waterloo

Pl, London, SE1Y 4AR, England.

December 16-18

The Twentieth IEEE Conference on Decision and Control (CDC), Vacation Village Hotel, San Diego CA. The CDC is the annual meeting of the IEEE (Institute of Electrical and Electronics Engineers) Control Systems Society. It is held in cooperation with the Society for Industrial and Applied Mathematics. The conference will include contributed and invited ses-

sions plus tutorials and presentations on all aspects of the theory and applications of systems involving decision, control, and adaptation. Other topics of interest include linear and nonlinear system theory, stability theory, large-scale system theory and decentralized control, estimation, identification, signal processing and stochastic control, and control systems. For more information, contact the Institute of Electrical and Electronics

Engineers Inc, 445 Hoes Ln, Piscataway NJ 08854.

December 28-30

Computer Modeling of Linguistic Theory, Grand Hyatt Hotel, New York NY. The ACL (Association for Computational Linguistics) is sponsoring three sessions on computer modeling of linguistic theory in conjunction with the annual meeting of the Linguistic Society of America. New models for grammars and new strategies

ATTENTION S-100 USERS, OEMs & ISOs!

MM-103 IS THE ONLY MODEM FOR YOUR NEEDS!

In previous issues, we listed more than 50 reasons why PMMI MM-103 modems are superior, along with a list of satisfied users that is now too long to print. Quality, integrity and low cost have made the MM-103 America's most popular modem. PMMI was the first to gain FCC approval and meet IEEE-696 S-100 standards. You won't find another modem for the S-100 bus with a wider range of Baud rates, more extensive and controllable software and such an unbeatable warranty. And since PMMI has eliminated the need for an acoustic coupler or an RS 232 adapter, your connection is more reliable and you buy no unnecessary hardware.

SO DON'T DELAY!
GO WITH THE MODEM WITH EXPERIENCE!



COMMUNICATIONS
[POTOMAC MICRO-MAGIC, INC.]

For further information, call or write:

Three Skyline Place
5201 Leesburg Pike, Suite 604
Falls Church, VA 22041
(703) 379-9660

Or dial into our 24 hour-a-day Modem Test Center:
(703) 379-0303 (300 Baud)

**AFTER ALL...
ALL MODEMS ARE NOT
CREATED EQUAL!**

THE WORD™ \$7500 COMPLETE

SPELLING PROOFREADER and COMPUTER DICTIONARY

The WORD is out!

Works with the editor of your choice to find those lurking spelling errors and sneaky typos.

SPELLING CHECKER

- 45,000 word dictionary
- Checks over 10 pages/minute
- Handles apostrophes, hyphens
- Marks mistakes in file
- CDOS™, CP/M® compatible
- Needs only 32K system

CP/M is a registered trademark of Digital Research

EXTRA FEATURES

- Automatic rhyme finder
- Crossword puzzle solver
- Correct spelling finder
- Word counter
- Word frequency analyzer
- Dictionary builder

AVAILABLE FOR:

- 8" Single Density CP/M
- also —
- 5¼" North Star™
- 5¼" Superbrain™
- Apple™ / Softcard™ CP/M

OASIS SYSTEMS (714) 291-9489
2765 Reynard Way, San Diego, CA 92103

for parsing will be the areas of most attention. Readings of contributed papers will also be featured. Contact Stan Petrick, IBM Research Center, POB 218, Yorktown Heights NY 10598.

January 1982

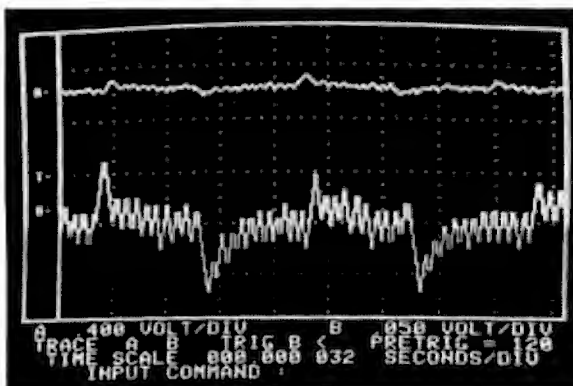
January-April

Fundamentals of Data Processing for Administrative Assistants and Office Support Staff, various sites throughout the US. The American Management Association (AMA) has designed this three-day course for secretaries, assistants, supervisors, and other personnel desiring to learn the fundamentals of data processing and its use in offices. Computer hardware and software, programming languages, and technology will be covered. The team fee for AMA members is \$470 per individual and \$550 for nonmembers. Individual fees are \$550 and \$630, respectively. For a schedule of dates and locations, contact the AMA, 135 W 50th St, New York NY 10020, (212) 586-8100.

January 6-8

The Fifteenth Annual Hawaii International Conference on Systems Sciences (HICSS-15), Honolulu HI. This conference is cosponsored by the University of Hawaii and the University of Southwestern Louisiana in cooperation with the Association for Computing Machinery (ACM). HICSS-15 is intended for medical information-processing researchers and practitioners. Among the topics to be covered are diagnosis by computer, computer-based medical instrumentation, computers and the handicapped, and the use of computers in individual and group practices, medical laboratories, and hospitals. Contact Dr Bruce D Shriver

DIGITAL STORAGE OSCILLOSCOPE INTERFACES



APPLESCOPE

Interface for the Apple II Computer

The APPLESCOPE system combines two high speed analog to digital converters and a digital control board with the high resolution graphics capabilities of the Apple II computer to create a digital storage oscilloscope. Signal trace parameters are entered through the keyboard to operational software provided in PROM on the DI control board.

- DC to 3.5 Mhz sample rate with 1024 byte buffer memory
- Pretrigger Viewing up to 1020 Samples
- Programmable Scale Select
- Continuous and Single Sweep Modes
- Single or Dual Channel Trace
- Greater than or less than trigger threshold detection

Price for the two board Applescope system \$595

*Dealer Inquiries Invited

Combine an Apple II or S100 based computer system with our interface circuit boards to create a digital storage oscilloscope at a fraction of the cost of other storage scopes.

The S100 interface provides an additional 1024 bytes of buffer memory in place of the PROM. The user must supply the graphics display and driving software. Price of the single board is \$495.

The SCOPEDRIVER is an advanced software package for the Applescope system. It provides expanded waveform manipulation and digital signal conditioning. The SCOPEDRIVER is available on 5¼" floppy disks for \$49.

For further information contact:

RC Electronics Inc.
7265 Tuolumne Street
Goleta, CA 93117
(805) 968-6614

and Dr Terry M Walker, c/o HICSS-15 Medical Information Processing, University of Southwestern Louisiana, POB 44330, Lafayette LA 70504.

January 7-10

The 1982 Winter Consumer Electronics Show (CES), Las Vegas Convention Center, Hilton Hotel, and the Jockey Club, Las Vegas NV. Conferences, workshops, seminars, sales meetings, press events, and exhibits of audio and video equipment, computers, telephones, and other consumer items highlight this show. For details, contact Consumer Electronic Shows, Two Illinois Center, Suite 1607, 233 N Michigan, Chicago IL 60601, (312) 861-1040.

January 12-15

Communication Networks Conference and Exposition, Georgia World Congress Center, Atlanta GA. The Communication Networks Conference is designed to bring users and the telecommunications industry together. The Conference features sessions, panel discussions, and tutorials on voice, data, and electronic-mail communications. For information, contact Communication Networks, 375 Cochituate Rd, POB 880, Framingham MA 01701, (617) 879-0700.

January 15-16

Microcomputers in Education, Uses for the 80s, Arizona State University, Tempe AZ. The Tenth Annual Math/Science Conference will emphasize the microcomputer as a medium for instruction, as a tool for research, and as an information manager. Workshops, demonstrations, panel discussions, and problem-solving groups will be featured. Contact Nancy Watson, 203 Payne Hall, Arizona State University, Tempe AZ 85287.

January 19-22

Peripheral Array Processors for Signal Processing and Simulation, Sheraton National Hotel, Washington DC. The fee for this course is \$795. For complete details, contact the Continuing Education Institute, 10889 Wilshire Blvd, Suite 1030, Los Angeles CA 90024, (213) 824-9545.

January 19-22

The Which Computer? Show, National Exhibition Centre, Birmingham, England. Information about this show can be obtained from Clapp & Poliak Inc, 245 Park Ave, New York NY 10167, (800) 223-1956; in New York (212) 661-8410.

January 20-22

Texas Computer Show, Dallas Convention Center, Dallas TX. Conferences, panel discussions, and seminars will be featured at this show. On display will be word- and data-processing equipment in addition to peripherals. For details, contact the Texas Computer Show, POB 214035, Dallas TX 75221, (214) 761-9108; in Georgia, (404) 452-0114; in Canada, (416) 252-7791.

January 28-30

Conference on Modeling and Simulation on Microcomputers, Bahia Hotel, San Diego CA. The Society for Computer Simulation (SCS) is presenting this conference. Papers, panel discussions, and tutorials on discrete and continuous simulation on microcomputers will be featured. Contact SCS, POB 2228, La Jolla CA 92038, (714) 459-3888. ■



The Price Is Nice.

SB-80

Single Board Technology

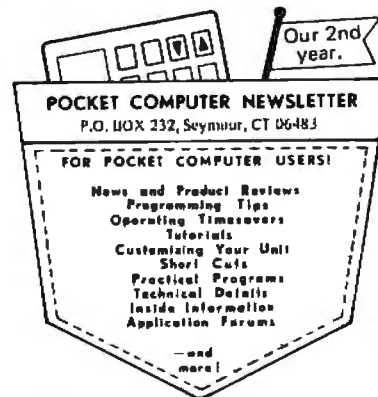
• CP/M is a registered trademark of Digital Research, Inc. A Z80A CPU combined with the CP/M operating system opens new vistas to software availability for eight-bit micros. FORTRAN, COBOL, BASIC, APL, PL 1 and Pascal are available now to accommodate today's scientific, educational, sophisticated small business and personal system users.

Basic system with: 600K bytes **\$2995**

- 1.2 megabytes \$3995
- 2.4 megabytes \$4995
- 4MHz Z80A CPU
- CP/M 2 operating system
- 64K 200ns main memory
- 8-inch dual floppy drives
- 50-pin expansion connector
- 2-serial ports
- 2-parallel ports
- 4-counter/timers
- Hard disk options available

S&M SYSTEMS, INC (617) 373-1599

P O Box 1225, 2 Washington Street, Haverhill, Ma 01830



FREE PREMIUM! 1982 subscribers will receive the special MATH1 package of PC programs. You qualify to receive this valuable free gift if you check either box 2 or 3 below! Don't delay! Get started learning how to enjoy your pocket computer today. Use this handy subscription card!

SUBSCRIPTION FORM

- 1981 Charter Subscriber (Issues 1 — 10). \$20.00 for U.S. delivery. (U.S. \$24.00 to Canada. U.S. \$30.00 elsewhere.)
- 1981/82 Charter Subscriber (Issues 1 — 20). \$40.00 in U.S. (U.S. \$48.00 to Canada. U.S. \$60.00 elsewhere.)
- 1982 Regular Subscriber (Issues 11 — 20). \$30.00 in U.S. (U.S. \$36.00 to Canada. U.S. \$45.00 elsewhere.)
- Sample issue. \$3.00 in U.S. (U.S. \$4.00 elsewhere.)

Orders must be accompanied by payment in full. We do not issue invoices for the POCKET COMPUTER NEWSLETTER.

Thank you for your remittance.

Name: _____

Addr: _____

City: _____ State: _____ Zip: _____

MC/VISA # _____ Expires: _____

Signature: _____

Linking a Pascal Microengine to a Cyber 170

Steven M Sedlet
931 Pebblebrook Dr
Lewisville TX 75067

Jonathan Dust
c/o BYTE Publications
POB 372
Hancock NH 03449

Microcomputers now on the market offer the speed, memory capacity, mass storage, and programming-language support facilities formerly available only on large mainframe computers. As a result, personal computers give users a convenient, inexpensive alternative to computing on larger machines. Personal computers, however, cannot offer the wide range of software utilities and applications packages or the variety of I/O (input/output) facilities available on large systems. The desire to incorporate the finer qualities of both modes of computing has motivated us to establish a mechanism for information and resource sharing between a personal computer, the Western Digital Pascal Microengine, and a large Control Data Corp Cyber 170 mainframe.

We have developed a file-transfer system to allow communication between the two machines. The Pascal Microengine, a hardware realization of UCSD's (University of California at San Diego) P-machine, is a desktop microcomputer for developing and executing Pascal programs. It is driven by a 16-bit processor that directly executes UCSD's p-code. The operating system consists of a Pascal compiler, a file manager, and a screen-oriented text editor. Mass storage for the Microengine system is provided by two Shugart single-den-

sity, single-sided 800R floppy-disk drives. Two RS-232 serial ports allow communication with the Microengine. One port is used for connection to the console (a serial video terminal). The second one, the remote port, is used to connect other RS-232 devices to the system. In our configuration, the remote port is connected to the Cyber by means of a modem.

The interface enables you to perform interactive processing on both the Microengine and the Cyber from the Microengine console. File transfers can be performed in both directions, allowing information and resource sharing between the two computers. The file-transfer system is written in UCSD Pascal and resides on the Pascal Microengine.

Why Have We Done This?

The value of interfacing two machines, such as the Pascal Microengine and the Cyber, extends beyond the ability to share data. You may take advantage of the finer points of each computer, consolidating their features to form an extended machine. For example, the interface between the Microengine and the Cyber allows you access to both the convenience of the screen-oriented editor on the Microengine and the power of the line-oriented editor, text formatter, and the fast central-processing unit

with extended word lengths on the Cyber.

The ability to share data also allows for storage flexibility. A Pascal program written for the Microengine might be too large to practically store on a Microengine disk, but it can be stored on the Cyber. On the other hand, if you have space available on Microengine disks, it will be cheaper to store programs there rather than pay for disk space on the Cyber. Using the interface, the Microengine can also use the I/O features of the Cyber, taking advantage of line printers, card readers, and plotters, for example.

File-Transfer System

The file-transfer-system program is stored as object code and executed on the Microengine. When run, the program establishes communication with the IAF (Interactive Facility) on the Cyber. You may log onto IAF and perform interactive processing on the Cyber under NOS (Network Operating System). The file-transfer program is initially in Emulator Mode. In this mode, you may perform interactive processing under IAF or return to the Microengine interactive system by entering a Control-E at the console keyboard. Processing under IAF can be resumed, without logging in again, by reexecuting the file-transfer-system object code. All file trans-

**DISK DRIVE WOES?
PRINTER INTERACTION?
MEMORY LOSS?
ERRATIC OPERATION?**

Don't Blame The Software!



Power Line Spikes, Surges & Hash could be the culprit!
Floppies, printers, memory & processor often interact! Our patented ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash.

- ISOLATOR (ISO-1) 3 filter isolated 3-prong sockets; Integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket \$62.95
- ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (8 sockets total); Integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank \$62.95
- SUPER ISOLATOR (ISO-3), similar to ISO-1 except double filtering & Suppression \$94.95
- ISOLATOR (ISO-4), similar to ISO-1 except unit has 8 individually filtered sockets \$106.95
- SUPER ISOLATOR (ISO-11) similar to ISO-2 except double filtering & Suppression \$94.95
- CIRCUIT BREAKER, any model (add-CB) Add \$ 8.00
- CKT BRKR/SWITCH/PILOT (CBS) Add \$16.00

AT YOUR DEALERS
Master-Card, Visa, American Express
Order Toll Free 1-800-225-4876
(except AK, HI, PR & Canada)

Electronic Specialists, Inc.
171 South Main Street, Natick, Mass. 01760
Technical & Non-800: 1-617-655-1532

Important Titles . . .

BASIC COMPUTER LOGIC

John Scott, Cossor Electronics Limited
This book examines digital integrated circuits from the most basic gates to the most complex. Sections on number systems, memories, and the design of logic circuits using Boolean algebra and Karnaugh mapping are also included.
256pp. ISBN 0-669-03706-0 \$21.95

MICROCOMPUTER INTERFACING

Principles and Practices
G. Jack Lipovski, University of Texas
"This book treats the details of using specific integrated circuit devices (including many popular peripherals) to achieve real results. A wide range of interfacing and use topics are treated in depth, and the book acquaints the reader with relevant technical terminology." — Terry Ritter, Motorola Semiconductor Products, Inc.
448pp. ISBN 0-669-03619-6 \$24.95

from Lexington Books

LexingtonBooks, D. C. Heath and Company
125 Spring Street, Lexington, MA 02173
(617) 862-6650 (212) 924-6460
HEATH Call our toll-free number, 800 428-8071

Olympic Sales Company

SERVING YOU SINCE 1947

Main Showroom & Offices:
216 South Oxford Avenue
Los Angeles, CA 90004

WE HONOR VISA and MASTERCHARGE

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

Write & request our FAMOUS Catalog!
Hundreds & hundreds of products from many manufacturers such as SONY, CASIO, VICTOR, CODE-A-PHONE, MATTEL, SHARP, CANON, and on and on... too many to list here!

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.

hp HEWLETT PACKARD

| | Retail Your Cost | | |
|--------------------------------|------------------|---------|--|
| HP-85 Microcomputer | 3250.00 | 2595.00 | |
| HP-83 Microcomputer | 7250.00 | 1795.00 | |
| 16K Exp-Memory Module | 295.00 | 259.95 | |
| Graphics Plotter 7225 | 2450.00 | 2089.95 | |
| Personality Mod. for 7225 | 750.00 | 679.95 | |
| 2631B Impact printer/hvy dty | 3950.00 | 3295.00 | |
| Option 020 for 2631B | 150.00 | 129.95 | |
| 8 Disk Drives to choose from | | | |
| 829025 | 1300.00 | 1149.95 | |
| 9895A 8" Dual Drive | 6850.00 | 5595.00 | |
| Graphics Tablet 9111A | 2050.00 | 1699.95 | |
| HP-41CV New 2.2K bytes mem | 325.00 | 259.95 | |
| HP-41C Calculator | 250.00 | 188.95 | |
| Card Reader for 41CV/C | 215.00 | 188.95 | |
| Printer for 41CV/C | 385.00 | 284.95 | |
| Optical Wand for 41CV/C | 125.00 | 97.95 | |
| Dual Ram equals 4 Mem. Mod's | 95.00 | 84.95 | |
| Memory Modules for 41C | | 26.95 | |
| HP-97 Programmable Printer | 750.00 | 579.95 | |
| HP-67 Programmable Calculator | 375.00 | 297.95 | |
| HP-34C Programmable Scientific | 150.00 | 117.95 | |
| HP-38C Programmable Bus. R/E | 150.00 | 119.95 | |
| HP-32E Adv. Scientific | 65.00 | 48.95 | |
| HP-37E Business Mgmt. | 75.00 | 58.95 | |

We carry a large inventory of Libraries, accessories and supplies.

apple computer

We are an AUTHORIZED SERVICING APPLE DEALER

The best price in America!

- 16K-32K-48K-96K-128K
- Drive with controller DOS 3.3 and others .. 8B column cards
- Dot Jones & Quote Reporter
- DC Hayes Microsystem II and others...
- Graphics Tablet
- Pascal and Fortran
- Languages
- VisiCalc and more and more
- APPLE III 96K and 128K "CALL US" Ask for Package One to Three Special Prices!



Texas Instruments

| | | |
|-------------------------------------|--------|----------|
| T1-99/4 Home Computer | 850.00 | \$379.95 |
| 10" Color Monitor for 99/4 | 650.00 | 319.95 |
| 32K Exp. Mem. Module | 399.95 | 314.95 |
| Extendible Basic, a MUST for 100.00 | 75.00 | |
| J2K Module | | |
| Speech Synthesizer | 150.00 | 129.95 |
| Disk Memory Drive | 500.00 | 397.95 |
| RF Modulator | 69.50 | 49.50 |
| Telephone Coupler (Modem) | 225.00 | 189.95 |
| Printer (solid state) | 400.00 | 319.95 |
| T1-59 Programmable Calculator | 295.00 | 199.95 |
| T1-58C Programmable Calculator | 130.00 | 93.95 |
| PC-100C Prnter/Plotr for 59/58 | 225.00 | 149.95 |
| T1-57 Scientific Calculator | 99.95 | 39.95 |
| MBA Finance & Business | 70.00 | 51.95 |
| T1 Investment Analyst | 65.00 | 46.95 |
| T1-55 Slide Rule | 40.00 | 32.95 |
| T1-Programr Hexidcenti/Octal | 65.00 | 48.50 |

We carry a large inventory of software, accessories and supplies.

OHIO SCIENTIFIC

Professional Computers Retail Your Cost
CBPDF-48K 3495.00 3195.00

- Dual 8" Drives • 64 col x 32 line/color
- 7 MIPS FAST! • Many more standard features

Fortran & Pascal available
Many other OSI products available at discounted prices, of course!

ATARI PERSONAL COMPUTER

*****SPECIAL ATARI 400 (16K)*****
Retail: \$595.00 Your Cost: \$339.95
Language cartridge not included. Optional basic language cartridge: \$64.95

| | | |
|------------------------------------|---------|--------|
| 800 16K bytes of RAM | 1090.00 | 759.95 |
| 410 Program Recorder | 90.00 | 79.95 |
| 810 Disk Drive | 600.00 | 469.95 |
| 825 Printer (80 col Centronic 737) | 999.95 | 779.95 |
| 820 Printer (40 col impact) | 450.00 | 359.95 |
| 830 Acoustic Modem | 200.00 | 159.95 |
| 850 Interface Module | 220.00 | 179.95 |
| Atari VisiCalc | 200.00 | 169.95 |

Large inventory of software and accessories.

PRINTERS

| | Retail Your Cost | | |
|----------------------------------|------------------|---------|--|
| • DIABLO (Letter Quality) | | | |
| 630 R102 bi-directional/tractors | 2965.00 | 2699.00 | |
| 1640K109 keyboard, tractors | 3072.00 | 2899.95 | |
| 630 RD Receiver 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 | | | |
| 445C with graphics | 795.00 | 695.00 | |
| 480C with graphics | 1394.00 | 1195.00 | |
| 500G New full size | 1635.00 | 1309.00 | |
| • EPSON | | | |
| MX 80 impact printer | 645.00 | 499.95 | |
| MX 70 impact printer | 500.00 | 399.95 | |
| MX 80 FT cut-sheet/tractor | 745.00 | 639.95 | |
| MX 100 FT 15" paper | 945.00 | 799.00 | |

WE ALSO HAVE . . .

| | Retail Your Cost | | |
|---|------------------|--------|--|
| • NOVATION Modems | | | |
| CAT | 199.95 | 159.95 | |
| D-CAT | 199.95 | 159.95 | |
| APPLE-CAT Duoc connect | 349.95 | 314.95 | |
| • SANYO Monitors | | | |
| High Resolution, Number 1 seller! | | | |
| 13" Color (new) high quality | 550.00 | 399.95 | |
| 12" Green Phosphor | 360.00 | 239.95 | |
| 12" Black and White | 340.00 | 219.95 | |
| 15" Black and White | 370.00 | 239.95 | |
| 9" B/W the best seller! | 235.00 | 149.95 | |
| • AMDEK (Leelex) High Quality Monitors | | | |
| 100 12" B/W, 12 MHz | 179.00 | 129.95 | |
| 100-80 12" B/W, metal cab., space for floppy | 199.00 | 159.95 | |
| 100-G 12" Green, 12 MHz | 199.00 | 159.95 | |
| 300-G 12" Green, 18 MHz | 249.00 | 189.95 | |
| Color I 13" Color, NTSC comp, 4480 input, audio amp & speaker | 448.00 | 329.95 | |
| Color II 13" Color, RGB input, hi res graphics, speaker | 999.00 | 899.95 | |
| • HAZELTINE Video Display Terminals | | | |
| • SHUGART Disk Drives | | | |
| • DEC VT100 & VT103 | | | |

Call us for your DISCOUNTED price TODAY!

NEW! From T1-Series 10 Personal Information Terminal Retail 995.00 Your Cost 795.00

fers must be performed in the IAF NULL subsystem.

While in Emulator Mode, you may continue interactive processing on the Cyber, or may enter one of the Control-key commands. These include Control-E (exit), Control-R (receive), Control-T (transmit), Control-S (switch character-set modes), and Control-A (assistance). Receive Mode allows for the transfer of files from the Cyber to the Microengine. Transmit Mode enables the transfer of files from the Microengine to the Cyber. (The names of the two modes of transfer reflect the concept that file transfers are initiated from the Microengine, that is, files are either received at or transmitted from the Microengine.)

Control-S enables switching of character-set modes. There are two character sets recognized by the Cyber, Normal and ASCII (American Standard Code for Information Interchange). You must transfer a file in the proper mode to insure conversion between Cyber and Microengine

character representations. In ASCII mode, the Cyber recognizes uppercase and lowercase ASCII characters. This mode of transfer is used only for text (nonexecutable) files. Normal mode must be used for transferring program files to the Cyber. In this mode, all alphabetic characters are interpreted as uppercase. Control-A may be entered to receive a menu of the above control key commands. Listing 1a demonstrates the use of the S and A control key commands.

Listing 1b demonstrates the interaction between the user and the file-transfer system when transferring files from the Cyber to the Microengine in Receive Mode. The file-transfer system performs the transfer by fetching the file to be transferred from your Cyber disk space, performing the transfer, and then cataloging it on Microengine disk using the UCSD Pascal filer system.

To access Receive Mode, you must enter a Control-R from the console, while in Emulator Mode. You will then receive confirmation at the con-

sole screen and be prompted for the name under which the file is to be cataloged on Microengine disk and the name of the Cyber file to be transferred. The file must reside on your permanent file space on the Cyber. Files that are strictly local will not be transferred. In response to either prompt, you may enter STOP, in which case control will return to Emulator Mode without performing the transfer. If legal file names are entered, you will be asked if the file is to be echoed at the console screen while the transfer is being made. Once you have responded to this prompt, the transfer is initiated. You may abort the transfer while in progress by entering an S (stop) at the console keyboard. If the transfer is aborted, you will receive the message:

TRANSFER TERMINATED BEFORE
COMPLETION
—FILE NOT CATALOGED

and Emulator Mode will be resumed. Upon completion of a transfer, a message is written at the console and Emulator Mode is resumed.

Listing 1c demonstrates the command sequence during a transfer from the Microengine to the Cyber in Transmit Mode. To effect the transfer, the file is fetched from Microengine disk, transferred across the link to the Cyber, and cataloged in your Cyber disk space. The file will exist as the primary local file on the Cyber upon completion of the transfer.

Once Transmit Mode is entered, you will be prompted for the name of both the file to be transmitted and the name under which the file is to be cataloged on the Cyber. As in Receive Mode, you may enter STOP in response to either prompt in order to resume Emulator Mode without initiating the file transfer.

Once the file transfer has been initiated, it may be aborted by entering S at the console keyboard, in which case the message:

NO FILE TRANSFERRED

Text continued on page 476

ATTENTION GOVERNMENT D P USERS AND PURCHASERS

We represent many fine micro products and manufacturers on the U.S. Government's GSA Schedule, including

**Apple, Cromemco, Micropolis, NorthStar,
Osborne and Seequa Computers**

Purchasing from the Schedule will save you the time consumed by the bid process. Products shipped throughout the United States and world-wide. Visit or write any of our stores for more information or to receive our catalogue of products represented.

**Computers,
Etc.....
the dependable store**

257 West Street, Annapolis, MD 21401 — (301) 268-6505

13A Allegheny Avenue, Towson, MD 21204 — (301) 296-0520

9330 Georgia Avenue, Silver Spring, MD 20910 — (301) 588-3748

6671 Backlick Road, Springfield, VA 22150 — (703) 644-5500

Plaza 38, 2442 Route 38, Cherry Hill, NJ 08002 — (609) 779-0023

Callers outside metropolitan areas served by our stores

Please call (301) 268-5801

*Career Opportunities Available * An Equal Opportunity Employer*

Listing 1: Sample runs of the various file-transfer-system commands. In listing 1a, the Control-A (assistance) and Control-S (switch character sets) commands are displayed. In listing 1b, the Control-R (receive file from Cyber) command is shown. Listing 1c gives an example of the Control-T (transmit file to Cyber) command.

(1a) (control-A) (* user wishes to see menu of control key commands *)

CONTROL-E--->EXIT TO UCSD SYSTEM.
CONTROL-S--->SHIFT TRANSFER MODES (NORMAL<--->ASCII).
CONTROL-R--->RECEIVE FILES.
CONTROL-T--->TRANSMIT FILES
CONTROL-A--->ASSISTANCE : DISPLAY MENU.

THIS INTERFACE OPERATES ONLY IN CDC NULL SUBSYSTEM.

(control-S) (* user wishes to switch character set modes *)

PROGRAM FILES MUST BE TRANSFERRED IN CDC NORMAL MODE.
TEXT FILES (U/L CASE) MUST BE TRANSFERRED IN CDC ASCII MODE.
PLEASE ENTER TRANSFER MODE N=NORMAL OR A=ASCII---> A
ASCII MODE

(1b) (control-R) (* user wishes to transfer file, CYBER-Microengine *)

FILE TRANSFER - CYBER TO MICROENGINE
NOTE : CDC FILE TO BE TRANSFERRED MUST BE PERMANENT

ENTER MICROENGINE FILENAME , E.G. FILENAME.TEXT
OR ENTER "STOP" TO TERMINATE

prime.text

ENTER NAME UNDER WHICH THE FILE IS CATALOGED ON THE CYBER

primnum

DO YOU WISH THE FILE TO BE ECHOED AS IT IS TRANSFERRED? (Y/N) Y

:
:

[listing of file]

:
:

EOT ENCOUNTERED
PRIMUM CLOSED AND CATALOGED

(1c) (control-T) (* user wishes to transfer file, Microengine-CYBER *)

FILE TRANSFER - MICROENGINE TO CYBER

ENTER NAME OF FILE TO BE TRANSMITTED FROM THE MICROENGINE
OR ENTER "STOP" TO TERMINATE
E.G. FILENAME.TEXT

prime.text

ENTER CDC FILENAME, OR ENTER "STOP" TO TERMINATE

NOTE : FILE WILL BECOME A CDC PERMANENT FILE,
OLD PRIMARY FILE WILL BE LOST

primenum

DO YOU WISH THE FILE TO BE ECHOED AS IT IS TRANSFERRED ? (Y/N) N

TRANSFER COMPLETE
PRIMUM IS A CDC PERMANENT FILE

MICROMAIL HAS THE RIGHT TERMINAL AT THE RIGHT PRICE.



Model 912 C shown

TELEVIDEO

| | |
|---------------------------|-----------------|
| 910 ^{NEW!} | \$569.00 |
| 912 | \$699.00 |
| 920 | \$749.00 |
| 950 | \$939.00 |

QUME Letter Quality

NEW!
SPRINT 9/45/1
\$1824.00
 9/35 **CALL**

DIABLO Letter Quality

| | |
|----------------|------------------|
| 630..... | \$1950.00 |
| 1640 RO | CALL |
| 1640 KSR | CALL |
| 1650 RO | CALL |
| 1650 KSR | CALL |

ANADEX

8000
\$799.00

DEC

LA 34 DA
\$899.00

TELETYPE

43 PF (TTL)
\$975.00

ANADEX

| | |
|---------------|------------------|
| DP 9500 | \$1279.00 |
| DP 9501 | \$1279.00 |
| DP 9000 | \$1179.00 |
| DP 9001 | \$1179.00 |

TEXAS INSTRUMENTS

| | |
|--|------------------|
| 810/2 | \$1399.00 |
| <small>(includes upper/lower case option)</small> | |
| 810/2 VFC/CP | \$1549.00 |
| <small>(includes u/l case, forms control & compressed print)</small> | |

SOROC

| | |
|--------------|------------------|
| IQ 120 | \$689.00 |
| IQ 135 | \$849.00 |
| IQ 140 | \$1099.00 |

DEC

| | |
|-------------------|------------------|
| VT 100..... | \$1399.00 |
| DEC LA 34AA | \$999.00 |

C. ITOH

CIT 101..... ^{Special!} **\$1399.00**

NEC

| | |
|-------------------|-----------------------|
| 3500 SERIES | Call For Price |
| 5500 SERIES | Call For Price |
| 7700 SERIES | Call For Price |

CALL TOLL FREE
(800) 854-6028

To Order: Send check to MICROMAIL, P.O. Box 3297, Santa Ana, CA 92703. Personal or company checks require two weeks to clear. Visa/MasterCard accepted. C.O.D. requires a 15% deposit. **Handling:** Add 3% to orders less than \$750, 2% to orders \$751 - \$2000, 1% to orders over \$2000. **NOTE:** Handling charges are waived on orders pre-paid in advance by check. **Shipping:** We ship FREIGHT COLLECT via UPS or Motor Freight. Air and Express delivery is available. Prices subject to change without notice.

MICROMAIL

P.O. Box 3297
 Santa Ana, CA 92703
 Phone: 714/731-4338
 TWX: 910 595 1146

Text continued from page 474:

will appear at the console. If the transfer is allowed to run to completion, a message will be printed at the console. In either case, Transmit Mode will be terminated and Emulator Mode resumed.

File-Transfer Program

The file-transfer program that interfaces the Microengine to the Cyber (listing 2) is written in UCSD Pascal on the Microengine. It consists of three basic modules:

- the emulator
- the file transmit procedures (Microengine to Cyber)
- the file receive procedures (Cyber to Microengine)

The main program, which is the emulator, performs the communication between the Microengine console and the Cyber IAF system. It does this, alternately testing for input to the Microengine from the Cyber (remote port) and from the Microengine console (console port), by testing the status bits associated with each port. The status register for the console port is at address -1007 (two's complement) and the status register for the remote port is at address -991 (two's complement). Access to the status bit (bit 1 of the status registers) is achieved through a variant record:

```
type STATRG = record
  STATREG : packed array [0..7] of
    boolean
end;
STATREC = record
  case BVAR : boolean of
    TRUE : (STATREGADDR :
      integer );
    FALSE : (STATPTR : STATRG)
end;
```

The Boolean variable, BVAR, is originally set to true, and the variant field, STATREGADDR, is set to the address of the status register. This is done at the beginning of the file-transfer program. BVAR is then set false, making the variant field a

Text continued on page 486

Listing 2: The emulator program, as written for the Pascal Microengine.

PROGRAM EMULATOR ;

```
(*
(*          JONATHAN DUST
(*          STEVEN SEDLET
(*          DEPARTMENT OF COMPUTER SCIENCE
(*          COLORADO STATE UNIVERSITY
(*          JUNE, 1980
(* THIS PROGRAM PERFORMS THE FOLLOWING TASKS :
(* 1. IT SERVES AS AN EMULATOR BETWEEN THE WESTERN DIGITAL
(*    PASCAL MICROENGINE AND THE CDC CYBER 171/172. THE MAIN
(*    PROGRAM ALLOWS A USER AT THE MICROENGINE CONSOLE TO LOG
(*    INTO THE CYBER.
(* 2. IT PROVIDES FOR THE TRANSFER OF FILES FROM THE CYBER TO
(*    THE MICROENGINE, AND FROM THE MICROENGINE TO THE CYBER.
(*
(* IT IS INTENDED THAT THE PROGRAM WILL ULTIMATELY BE USED TO
(* EFFECT THE TRANSFER OF FILES BETWEEN COMPUTERS CONNECTED TO
(* RIAS RING NETWORK. MODIFICATION WILL BE REQUIRED FOR THIS
(* PURPOSE.
(*
(* THE PROGRAM MODULES CONSIST OF :
(* MAIN PGM - THE EMULATOR, ALLOWS USER TO LOG INTO CYBER.
(* RECEIVEFILE - ALLOWS THE TRANSFER OF A FILE FROM THE CYBER
(*              TO THE MICROENGINE.
(* TRANSMITFILE - ALLOWS THE TRANSFER OF A FILE FROM THE
(*              MICROENGINE TO THE CYBER.
(*
(* PROGRAM EXECUTION :
(* THE PROGRAM IS WRITTEN IN UCSD PASCAL AND RESIDES ON MICRO-
(* ENGINE DISK. TO INITIALLY EXECUTE THE PROGRAM, THE FILE,
(* "EMULATOR.CODE" MUST BE FETCHED AND EXECUTED. THE FILE
(* "EMULATOR.TEXT" CONTAINS THE SOURCE CODE. ONCE THE PRO-
(* GRAM IS RUNNING, A CR WILL SOLICIT THE LOGIN MESSAGE FROM
(* THE CYBER.
(*
(* ONCE LOGGED IN, THE USER MAY ISSUE ANY LEGAL TELEX COMMAND,
(* AS WELL AS
(* CNTRL-E - EXITS EMULATOR AND RETURNS TO THE MICROENGINE
(*           INTERACTIVE SYSTEM. RE-EXECUTION OF THE PRO-
(*           GRAM WILL RESUME TELEX, UNLESS THE USER HAS
(*           BEEN TIMED-OUT IN THE MEANTIME. WHEN
(*           LOGGING OUT USING "BYE", HIT CNTRL-E AFTER
(*           RECEIVING LOGOUT MESSAGE, THEN TURN OFF MODEM.
(* CNTRL-R - PASSES CONTROL TO THE PROCEDURE "RECEIVEFILE",
(*           ALLOWING THE TRANSFER OF A FILE FROM THE CYBER
(*           TO THE MICROENGINE.
(* CNTRL-T - PASSES CONTROL TO PROCEDURE "TRANSMITFILE",
(*           ALLOWING THE TRANSFER OF A FILE FROM THE
(*           MICROENGINE TO THE CYBER.
(* IN THE LATTER 2 CASES THE PROGRAM WILL PROMPT THE USER FOR
(* NECESSARY INFORMATION. IN BOTH CASES THE FILE TRANSFER
(* CAN BE TERMINATED WITH A CNTRL-S.
(*
(* MAJOR DATA STRUCTURES :
(* STATREC - RECORD USED TO ACCESS INDIVIDUAL BITS OF AN
(*           ADDRESS LOCATION, NECESSARY TO ALLOW EXAMINATION
```

Listing 2 continued on page 478

Listing 2 continued:

```
(* OF THE SERIAL PORT STATUS REGISTERS FOR DETECTION*)
(* OF INPUT FROM THE CYBER OR FROM THE CONSOLE. THE *)
(* STRUCTURE IS ALSO USED TO CHANGE CERTAIN BITS OF *)
(* THE SERIAL STATUS REGISTERS (PP. 34-42, PASCAL *)
(* MICROENGINE REFERENCE MANUAL). INDIVIDUAL BIT *)
(* ACCESS IS IMPLEMENTED BY USING A RECORD CONSIST- *)
(* OF A BOOLEAN FIELD AND A VARIANT FIELD. WHEN THE *)
(* BOOLEAN IS TRUE, THE VARIANT PART IS AN INTEGER *)
(* & IS SET EQUAL TO THE ADDR OF A STATUS REGISTER. *)
(* WHEN THE BOOLEAN IS SET FALSE, THE VARIANT PART *)
(* IS A POINTER INTO A PACKED ARRAY[0..7] OF *)
(* BOOLEAN, ALLOWING ACCESS INTO THE 8 INDIVIDUAL *)
(* BITS OF THE WORD. *)
(* THE RECORDS OF THIS TYPE ARE : *)
(* STATREG1 - USED TO DETECT IF A CHARACTER HAS *)
(* BEEN ENTERED FROM THE CONSOLE. *)
(* STATREG8 - USED TO DETECT IF A CHARACTER HAS *)
(* BEEN SENT BY THE CYBER. *)
(* PARITYON, PARITYODD - SEE PP. 37-42 *)
(* T - A ONE ELEMENT ARRAY USED TO HOLD THE CHARACTER WRITTEN/ *)
(* READ TO/FROM THE SERIAL PORTS. AN ARRAY IS USED, *)
(* RATHER THEN A CHAR VARIABLE, BECAUSE THE UCSD PASCAL *)
(* COMMANDS, UNITREAD AND UNITWRITE, REQUIRE AN ARRAY. *)
```

```
TYPE STATRG = RECORD
    STATREG : PACKED ARRAY [0..7] OF BOOLEAN
END ;
STATREC = RECORD
    CASE BVAR : BOOLEAN OF
        TRUE : (STATREGADDR : INTEGER) ;
        FALSE : (STATPTR : sTATRG)
    END ;
VAR T : PACKED ARRAY [0..2] OF CHAR ;
FOREVER : BOOLEAN ;
STATREG1, STATREG8 : STATREC ;
SKIP : BOOLEAN ;
ASCII : BOOLEAN ;
```

```
PROCEDURE ASCII MODE ;
(* THIS PROCEDURE SETS THE CYBER CHARACTER MODE TO ASCII *)
VAR M : PACKED ARRAY [1..12] OF CHAR ;
BEGIN (* PROC ASCII MODE *)
    M := 'CSET, ASCII ' ;
    M[11] := CHR(13);
    UNITWRITE(8, M, 11, 0, 1);
    UNITWAIT(8);
    UNITREAD(8, M, 11, 0, 1);
    UNITWAIT(8);
    WRITELN('ASCII MODE') ;
    WRITELN
END ; (* PROC ASCII MODE *)
```

```
PROCEDURE CHARMODE ;
(* THIS PROCEDURE ALLOWS THE USER TO SWITCH CYBER CHARACTER *)
(* MODES (NORMAL <--> ASCII) *)
VAR M : PACKED ARRAY [1..12] OF CHAR ;
BEGIN (* PROC CHARMODE *)
```


Listing 2 continued:

```
WRITELN ;
WRITELN('PROGRAM FILES MUST BE TRANSFERRED IN A CDC NORMAL MODE. ');
WRITELN('TEXT FILES (U/L CASE) MUST BE TRANSFERRED IN A CDC ASCII MODE. ');
WRITE('PLEASE ENTER TRANSFER MODE N=NORMAL OR A=ASCII---> ');
UNITREAD(1,M,1,0,1) ;
UNITWAIT(1) ;
WRITELN ;
IF (M[1]='A') OR (M[1]='a')
  THEN BEGIN
    ASCII := TRUE ;
    ASCII MODE
  END
ELSE BEGIN
  ASCII := FALSE ;
  M := 'CSET,NORMAL ' ;
  M[12] := CHR(13) ;
  UNITWRITE(8,M,12,0,1) ;
  UNITWAIT(8) ;
  UNITREAD(8,M,11,0,1) ;
  UNITWAIT(8) ;
  WRITELN('NORMAL MODE') ;
  WRITELN
  END ;
WRITELN
END ; (* PROC CHARMODE *)

PROCEDURE RECEIVEFILE ;
(* TRANSFER A FILE FROM THE CYBER TO THE MICROENGINE. *)
(* THE TRANSFER IS PERFORMED BY GENERATING A TELEX "TAPE" *)
(* COMMAND FOLLOWED BY A "LIST" COMMAND. TAPE *)
(* MODE IS ENTERED TO ENABLE DETECTION OF AN EOT (END OF *)
(* TEXT) CHARACTER. THE CYBER FILE TRANSFERRED MUST BE THE *)
(* PRIMARY FILE. THE FILE IS TRANSFERRED TO A BUFFER, THEN *)
(* ONTO THE MICROENGINE DISK. A "NORMAL" COMMAND IS THEN *)
(* GENERATED TO EXIT TAPE MODE. *WARNING : THE NORMAL COM- *)
(* MAND WILL CAUSE CANCELLATION OF ASCII MODE. *)

VAR DONE : BOOLEAN ;
O : STRING ;
N : PACKED ARRAY [1..13] OF CHAR ;
P : PACKED ARRAY [1..13] OF CHAR ;
FILENAME : STRING ;
RCVEFILE : TEXT ;
USERTERM : BOOLEAN ;
VERIFY : BOOLEAN ;
BUFF1 : PACKED ARRAY [1..32766] OF CHAR ;
BUFFINDEX : INTEGER ;
I : INTEGER ;
M : PACKED ARRAY [0..20] OF CHAR ;
BYE : BOOLEAN ;

PROCEDURE RCVEREADY ;
BEGIN (* PROC RCVEREADY *)
  P[1] := CHR(10) ;
  P[2] := CHR(13) ;
  P[3] := CHR(10) ;
  P[4] := 'R' ;
```

Listing 2 continued on page 480

Listing 2 continued:

```
P[5] := 'E' ;
P[6] := 'A' ;
P[7] := 'D' ;
P[8] := 'Y' ;
P[9] := ' ' ;
P[10] := ' ' ;
P[11] := ' ' ;
P[12] := CHR(13) ;
P[13] := CHR(10) ;
IF P = N
  THEN BYE := FALSE
  ELSE BEGIN
    BYE := TRUE ;

    WRITELN('ERROR-CDC FILENAME NOT FOUND-CHK DIRECTORY')
  END
END ; (* PROC RCVEREADY *)

PROCEDURE LISTFILE ;
BEGIN (* PROC LISTFILE *)
  M[0] := 'T' ;
  M[1] := 'A' ;
  M[2] := 'P' ;
  M[3] := 'E' ;
  M[4] := CHR(13) ;
  UNITWRITE(8,M,5,0,1) ;
  UNITWAIT(8) ;
  UNITREAD(8,M,6,0,1) ;
  UNITWAIT(8) ;
  M[0] := 'L' ;
  M[1] := 'I' ;
  M[2] := 'S' ;
  M[3] := 'T' ;
  M[4] := CHR(13) ;
  UNITWRITE(8,M,5,0,1) ;
  UNITWAIT(8)
END ; (* PROC LISTFILE *)

BEGIN (* PROC RECEIVEFILE *)
  CHARMODE;
  WRITELN('FILE TRANSFER - CYBER TO MICROENGINE') ;
  WRITELN('NOTE : CDC FILE TO BE TRANSFERRED MUST BE PERMANENT') ;
  WRITELN ;
  WRITELN('ENTER MICROENGINE FILENAME, E.G. FILENAME.TEXT') ;
  WRITELN(' OR ENTER "STOP" TO TERMINATE') ;
  READLN(FILENAME) ;
  IF FILENAME<>'STOP'
  THEN BEGIN
    WRITELN('ENTER NAME UNDER WHICH THE FILE IS', .
      'CATALOGED ON THE CYBER') ;
    READLN(0) ;
    WRITE('DO YOU WISH THE FILE TO BE ECHOED AS IT IS',
      ' TRANSFERRED ? (Y/N) ') ;
    UNITREAD(1,T,1,0,1) ;
    UNITWAIT(1);
    WRITELN ;
    IF T[0] = 'Y'
```

Listing 2 continued:

```
        THEN VERIFY := TRUE
        ELSE VERIFY := FALSE ;
        M[0] := 'O' ;
        M[1] := 'L' ;
        M[2] := 'D' ;
        M[3] := ',' ;
        FOR I := 1 TO LENGTH(O) DO
        M[I+3] := O[I] ;
        M[LENGTH(O)+4] := CHR(13) ;

I := (LENGTH(O)+5) ;
UNITWRITE(1,M,I,0,1) ;
UNITWRITE(8,M,I,0,1) ;
UNITREAD(8,M,13,0,1) ;
UNITWAIT(8) ;
FOR I := 0 TO 12 DO N[I+1] := M[I]
RCVEREADY ;
IF BYE=TRUE
    THEN EXIT(RECEIVEFILE)
    ELSE LISTFILE ;
USERTERM := FALSE ;
DONE := FALSE ;
BUFFINDEX := 0 ;
WHILE (NOT DONE) AND (NOT USERTERM) DO
    BEGIN
        BUFFINDEX := BUFFINDEX + 1 ;
        UNITREAD(8,T,1,0,1) ;
        UNITWAIT(8);
        IF ORD(T[0]) = 17 THEN DONE := TRUE ;
        IF ORD(T[0]) = 13
            THEN BEGIN
                IF VERIFY THEN WRITELN
                END
                ELSE IF ORD(T[0]) <> 10 THEN IF VERIFY THEN WRITE(T[0]) ;
                BUFF1[BUFFINDEX] := T[0] ;
                IF STATREG1.STATPTRSTATREG[1] = TRUE
                    THEN BEGIN
                        UNITREAD(1,T,1,0,1) ;
                        UNITWAIT(1) ;
                        IF ORD(T[0]) = 19 THEN USERTERM := TRUE
                    END
                END ;
            END ;
        IF NOT USERTERM
            THEN BEGIN
                M := 'NORMAL' ;
                M[6] := CHR(13) ;
                UNITWRITE(8,M,7,0,1) ;
                UNITWAIT(8) ;
                UNITREAD(8,M,9,0,1) ;
                UNITWAIT(8) ;
                IF ASCII=TRUE THEN ASCII MODE ;
                WRITELN('EOT ENCOUNTERED') ;
                REWRITE(RCVEFILE,FILENAME) ;
                FOR I := 1 TO BUFFINDEX DO
                    IF ORD(BUFF1[I])=13
                        THEN WRITELN(RCVEFILE)
```

Listing 2 continued on page 482

```

        ELSE IF 'ORD(BUFF1[I]) <> 10
            THEN WRITE(RCVEFILE,BUFF1[I]) ;
CLOSE(RCVEFILE,LOCK) ;
WRITELN ;
WRITELN(FILENAME, ' CLOSED AND CATALOGED')
END
ELSE BEGIN
    T[0] := 'S' ;
    UNITWRITE(8,T,1,0,1) ;
    UNITWAIT(8) ;
    UNITREAD(8,T,15,0,1) ;
    UNITWAIT(8) ;
    WRITELN ;
    WRITELN ;
    WRITELN('TRANSFER TERMINATED BEFORE COMPLETION',
        ' - FILE NOT CATALOGED')
    END ;
END
ELSE WRITELN('NO FILE TRANSFERRED')
END ; (* PROC RECEIVEFILE *)

PROCEDURE TRANSMITFILE ;
(* TRANSFER A FILE FROM THE MICROENGINE TO THE CYBER. *)
(* TRANSFER IS PERFORMED BY CREATING A PRIMARY CYBER FILE, *)
(* ENTERING TEXT MODE, AND TRANSMITTING THE MICROENGINE FILE *)
(* TO THE CYBER. AFTER THE FILE IS TRANSFERRED, A "BREAK" *)
(* (CNTRL-C) IS GENERATED, FOLLOWED BY A "PACK" COMMAND. *)
(* THE TRANSFERRED M.E. FILE IS THEN THE CDC PRIMARY FILE, *)
(* AND MUST BE SAVED IF THE USER WISHES TO RETAIN IT. *)
(* IF THE TRANSFER IS TERMINATED BY A CNTRL-S, THE REST OF *)
(* THE FILE IS READ AND BLANK LINES TRANSMITTED TO THE *)
(* CYBER. THIS IS NECESSARY DUE TO THE TIMING CONSTRAINTS *)
(* BETWEEN THE TWO COMPUTERS. *)

VAR DONE : BOOLEAN ;
Z : INTEGER ;
X : STRING ;
FILENAME : STRING ;
TRANSFILE : TEXT ;
CDCFILENAME : STRING ;
USERTERM : BOOLEAN ;
VERIFY : BOOLEAN ;
CH : CHAR ;
I : INTEGER ;
M : PACKED ARRAY [0..20] OF CHAR ;

PROCEDURE XMITRDFILE ;
(* THIS PROCEDURE TRANSMITS A CHARACTER FROM THE MICROENGINE *)
(* TO THE CYBER. *)

BEGIN (* PROC XMITRDFILE *)
    READ(TRANSFILE,CH) ;
    T[0] := CH ;
    IF NOT USERTERM
        THEN BEGIN

```

Listing 2 continued:

```
        UNITWRITE(8,T,1,0,1) ;
        UNITWAIT(8) ;

        IF VERIFY THEN WRITE(T[0])
        END ;
    IF EOLN(TRANSFILE)
    THEN BEGIN
        IF (NOT USERTERM) AND (VERIFY)
        THEN WRITELN ;
        T[0] := CHR(13) ;
        T[1] := CHR(10) ;
        UNITWRITE (8,T,2,0,1) ;
        UNITWAIT(8) ;
        READLN(TRANSFILE)
        END ;
    IF STATREG1.STATPTRSTATREG[1] = TRUE
    THEN BEGIN
        UNITREAD(1,T,1,0,1) ;
        UNITWAIT(1) ;
        IF ORD(T[0]) = 19 THEN USERTERM := TRUE
        END
    END ; (* PROC XMITRDFILE *)

PROCEDURE REPLACEFILE ;
BEGIN (* PROC REPLACEFILE *)
    X:='REP';
    FOR I := 0 TO (LENGTH(X)-1) DO
        M[I] := X[I+1] ;
        M[3] := CHR(13) ;
        UNITWRITE(8,M,4,0,1) ;
        UNITWAIT(8) ;
        UNITREAD(8,M,13,0,1) ;
        UNITWAIT(8)
    END ; (* PROC REPLACEFILE *)

BEGIN (* PROC TRANSMITFILE *)
    CHARMODE ;
    WRITELN('                FILE TRANSFER - MICROENGINE TO CYBER') ;
    WRITELN('ENTER NAME OF FILE TO BE TRANSMITTED FROM MICROENGINE') ;
    WRITELN('OR ENTER "STOP" TO TERMINATE') ;
    WRITELN('E.G. FILENAME.TEXT') ;
    READLN(FILENAME) ;
    IF FILENAME <> 'STOP'
    THEN BEGIN
        RESET(TRANSFILE,FILENAME) ;
        WRITELN(FILENAME, ' OPENED') ;
        WRITELN ;
        WRITELN('ENTER CDC FILENAME, OR ENTER "STOP" TO TERMINATE') ;
        WRITELN('NOTE : FILE WILL BECOME A CDC PERMANENT FILE, ',
            'OLD PRIMARY FILE WILL BE LOST') ;
        READLN(CDCFILENAME) ;
        IF CDCFILENAME <> 'STOP'
        THEN BEGIN
            WRITELN ;
```

Listing 2 continued on page 484

DIGITAL DATA RECORDER MODELS DC-1, DC-3

For five years now, the CC series recorders have been the industry NRZ Asynchronous recorder standard. Now the D series sets a new standard in stability and reliability with its tachometer feedback LC stabilized motor circuit.



DC1 Model
Price \$275.00
DC3 Model
Price \$295.00

- 4800 or 9600 Baud
(3" or 6" per second)
- 10⁻⁸ Error Rate
RS232 or TTL
In and Out
- RTS motor start
- CTS Data start
- DB 25 or special connector optional
- 110/220 - 50/60 Hz
- Wow & Flutter ±.3%
- Speed Stability (long term) ±.1%

NATIONAL MULTIPLEX CORPORATION

260 Lackland Drive East
Middlesex, New Jersey 08846
Tel. (201) 356-9200 TWX 710-997-9530

Listing 2 continued:

```

WRITE('DO YOU WISH THE FILE TO BE ECHOED ',
      AS 'IT IS TRANSFERRED ? (Y/N) ');
UNITREAD(1,T,1,0,1);
WRITELN;
IF T[0] = 'Y'
  THEN VERIFY := TRUE
  ELSE VERIFY := FALSE;
M[0] := 'N';
M[1] := 'E';
M[2] := 'W';
M[3] := ',';
FOR I := 1 TO LENGTH(CDCFILENAME) DO
  M[I+3] := CDCFILENAME[I];
M[LENGTH(CDCFILENAME) + 4] := CHR(13);
Z := (LENGTH(CDCFILENAME))+5;
UNITWRITE(8,M,Z,0,1);
UNITWAIT(8);
UNITREAD(8,M,13,0,1);
UNITWAIT(8);
M[0] := 'T';
M[1] := 'E';
M[2] := 'R';
M[3] := ',';
M[4] := 'B';
M[5] := 'L';
M[6] := 'K';
M[7] := 'E';
M[8] := 'D';
M[9] := 'T';
M[10] := CHR(13);
UNITWRITE(8,M,11,0,1);
UNITWAIT(8);
UNITREAD(8,M,11,0,1);
UNITWAIT(8);
M[0] := 'T';
M[1] := 'E';
M[2] := 'X';
M[3] := CHR(13);
M[4] := CHR(10);
UNITWRITE(8,M,5,0,1);
UNITWAIT(8);
UNITREAD(8,M,18,0,1);
UNITWAIT(8);
DONE := FALSE;
USERTERM := FALSE;
WRITELN;
WHILE NOT EOF(TRANSFILE) DO XMITRDFILE;
M[0] := CHR(13);
M[1] := CHR(10);
M[2] := CHR(3);
UNITWRITE(8,M,3,0,1);
UNITWAIT(8);
UNITREAD(8,M,18,0,1);
UNITWAIT(8);
M[0] := 'T';
M[1] := 'E';

```

NorthStar™

HORIZON II COMPUTERS

Shop around find your best price then call us **COLLECT*** we'll match the price plus ship it direct to you by **AIR**

ABSOLUTELY FREE!*

WORRY FREE WARRANTY - This is our third year with North Star with a reputation of only the finest service (call North Star for a reference) all repairs are handled through our store service center.

*CONTINENTAL U.S. ONLY

**LONG ISLAND
COMPUTER GENERAL STORE**

103 ATLANTIC AVE. LYNBROOK NEW YORK 11563
(516) 887-1500

```

M[2] := 'R' ;
M[3] := ',' ;
M[4] := 'T' ;
M[5] := 'T' ;
M[6] := 'Y' ;
M[7] := CHR(13) ;
M[8] := CHR(10) ;
UNITWRITE(8,M,9,0,1) ;
UNITWAIT(8) ;
UNITREAD(8,M,10,0,1) ;
UNITWAIT(8) ;
M[0] := 'P' ;
M[1] := 'A' ;
M[2] := 'C' ;
M[3] := CHR(13) ;
UNITWRITE(8,M,4,0,1) ;
UNITWAIT(8) ;
UNITREAD(8,M,13,0,1) ;
UNITWAIT(8) ;
REPLACEFILE ;
IF NOT USERTERM
    THEN WRITELN('TRANSFER COMPLETE')
    ELSE WRITELN('TRANSFER TERMINATED BEFORE COMPLETION') ;
WRITELN(CDCFILENAME, ' IS A CDC PERMANENT FILE')
END
ELSE WRITELN('NO FILE TRANSFERRED')
END
ELSE WRITELN('NO FILE TRANSFERRED')
END ; (* PROC TRANSMITFILE *)

```

PROCEDURE PRNTHelp ;

(* THIS PROCEDURE PRINTS OUT THE MENU OF CONTROL KEY COMMANDS. *)

```

BEGIN (* PROC PRNTHelp *)
    WRITELN ;
    WRITELN ;
    WRITELN(' CONTROL-E--->EXIT TO UCSD SYSTEM.' ) ;
    WRITELN(' CONTROL-S--->SHIFT TRANSFER MODES (NORMAL<-->ASCII).' ) ;
    WRITELN(' CONTROL-R--->RECEIVE FILES.' ) ;
    WRITELN(' CONTROL-T--->TRANSMIT FILES.' ) ;
    WRITELN(' CONTROL-H--->DISPLAY ABOVE CONTROL COMMANDS.' ) ;
    WRITELN
END ; (* PROC PRNTHelp *)

```

BEGIN (* MAIN PROGRAM - TERMINAL EMULATOR *)

```

PRNTHelp ;
WRITELN(' PLEASE TYPE RETURN FOR LOGIN MESSAGE IF NOT LOGGED IN.' ) ;
STATREG1.BVAR := TRUE ;
STATREG8.BVAR := TRUE ;
STATREG1.STATREGADDR := -1007 ;
STATREG8.STATREGADDR := -991 ;
STATREG1.BVAR := FALSE ;
STATREG8.BVAR := FALSE ;
UNITCLEAR(8) ;
UNITCLEAR(1) ;
FOREVER := TRUE ;
WHILE FOREVER DO

```

pointer into a Boolean packed array. Since the memory address associated with this field has been previously set to the address of the status register, and because a pointer type is merely an address of a memory location, we now have a pointer into the individual bits of the status register.

In Emulator Mode, the status bits associated with the two ports are alternately tested. If input is detected at the remote port, a *unitread* instruction is executed to fetch the character, followed by a *unitwrite* command to the console. These instructions are UCSD Pascal low-level intrinsics for accessing a peripheral device. Linefeeds (ASCII character 10) are not echoed. At the end of a line, the Cyber transmits a carriage return followed by a linefeed. On the Microengine a carriage return implies a linefeed, so the linefeed from the Cyber is redundant. If input is detected at the console port, a "unitread" is initiated to fetch the character. The character is first checked to determine if it is one of the previously discussed control-key commands, in which case the appropriate action is taken. If the character is not a control character, the emulator assumes it is meant for the Cyber, and it is transferred to the remote port by execution of a "unitwrite" command.

Input to the remote port is given priority over input to the console port so that the stream from the Cyber is not interrupted. This is implemented by placing the code for testing the remote-port status bit in a "while" loop and the code for testing the console-port status bit in an "if" statement in the main program. As long as characters are being received at the remote port, the emulator will continue to read them and echo them to the console. Only when there are no more characters detected at the remote port is the console-port status bit checked. Even then, only one character is accepted before the remote-port status bit is again tested. Consequently, characters entered at the console while information is being sent by the Cyber are displayed, but ignored.

```

BEGIN
  WHILE STATREGS.STATPTRSTATREG[1]=TRUE DO
    BEGIN
      UNITREAD(8,T,1,0,1) ;
      UNITWAIT(8) ;
      IF ORD(T[0]) <> 10
        THEN BEGIN
          UNITWRITE(1,T,1,0,1) ;
          UNITWAIT(1)
        END
      END ;
    IF STATREG1.STATPTRSTATREG[1]=TRUE
      THEN BEGIN
        UNITREAD(1,T,1,0,1) ;
        UNITWAIT(1) ;
        SKIP := FALSE ;
        IF ORD(T[0])=05
          THEN BEGIN
            FOREVER := FALSE ;
            SKIP := TRUE
          END ;
        IF ORD(T[0])=18
          THEN BEGIN
            RECEIVEFILE ;
            SKIP := TRUE
          END ;
        IF ORD(T[0])=20
          THEN BEGIN
            TRANSMITFILE ;
            SKIP := TRUE
          END ;
        IF ORD(T[0])=19
          THEN BEGIN
            CHARMODE ;
            SKIP := TRUE
          END ;
        IF ORD(T[0])=08 THEN PRNTHelp ;
        IF SKIP=FALSE
          THEN BEGIN
            UNITWRITE(8,T,1,0,1) ;
            UNITWAIT(8)
          END
        END
      END
    END
  END

```

END
END.

File transfer from the Cyber to the Microengine is performed by the procedure RECEIVEFILE. The transfer is implemented by generating an

OLD, filename

IAF command to fetch the file from your Cyber file space. The procedure

then waits for a READY response from the Cyber. If it does not receive the response, the routine assumes that the file was not found, that is, the Cyber actually generated a

filename NOT FOUND

response.

In the latter case, an error message is printed at the console and Emulator Mode is resumed. You must then re-enter Receive Mode to reattempt the file transfer. It is because of this type of response by the Cyber that file transfers must be performed in the IAF NULL subsystem. The response made by IAF to commands differs between IAF subsystems, and the file-transfer program was designed to accommodate the responses made in the NULL subsystem.

If the file is successfully fetched, the routine generates a TAPE command, causing the Cyber to enter the TAPE subsystem under IAF. Performing the transfer in this subsystem is necessary since it is only in this mode that the Cyber generates an EOT (end-of-text) character to allow detection of transfer completion. The actual transfer is initiated by generating an IAF LIST command.

The transfer is performed by reading the listed output from the Cyber, at the remote port, into a buffer in Microengine memory, BUFF1, consisting of an array of characters. Upon completion of the transfer, BUFF1 is written to Microengine disk. It is necessary to use this intermediate storage because of the activity of the Microengine disk-drive head as a file is written. At certain intervals as it is writing, the head must position itself to available partitions. In doing so, it misses a few characters, since the Cyber will not withhold its transmission to allow positioning of the disk head. This, of course, is allowed for when writing from Microengine memory to disk, and so the writing of the file to Microengine disk is postponed until the file transfer is completed. (Because of this use of intermediate storage, the size of Microengine memory places a limit of 32,767 characters on the size of files received from the Cyber.)

During the transfer, certain characters must be noted. If you have requested echoing of the file to the console as it is transferred, a "writeln" command must be generated if a carriage return (ASCII character 13) is detected from the Cyber. As in Emulator Mode, a linefeed is redun-

dant and must not be echoed to the screen.

The detection of an EOT (ASCII character 17) indicates the completion of the transfer. If the transfer is terminated by detection of an EOT character, a suitable message is written to the console, BUFF1 is written to Microengine disk, the file is cataloged and closed, and Emulator Mode is resumed.

If, during file transfer, an S is entered at the console keyboard, it is transmitted to the Cyber, causing the listing of the file to be terminated. A termination message is written to the console screen and Emulation Mode is resumed without writing BUFF1 to Microengine disk.

Since IAF was placed in the TAPE subsystem in order to enable the detection of an EOT mark, it must now be returned to the NULL subsystem. This is done, before returning to Emulator Mode, by generating a Normal command to IAF. If, however, you have been operating in ASCII Mode, you will want to remain in

that mode. To this purpose, a Boolean variable, ASCII, is maintained to keep track of the character mode. If ASCII is true, the character-set mode is switched to ASCII before returning to Emulator Mode.

Transmission of a file from the Microengine to the Cyber is performed by the procedure TRANSMITFILE. After you are prompted for the name of the Microengine file to be transferred, the file is opened and you will be prompted for the name under which the file is to be cataloged on the Cyber. Keying in STOP in place of either file name will terminate Transmit Mode and resume Emulator Mode without initiating the transfer. The transfer is performed by generating a

NEW, Cyber filename

IAF command, thus creating a new primary local file on the Cyber and listing the Microengine file to the Cyber. Since a new primary file is created, the user must take care to

SciTronics introduces . . .

REAL TIME CLOCKS

with full Clock/Calendar Functions

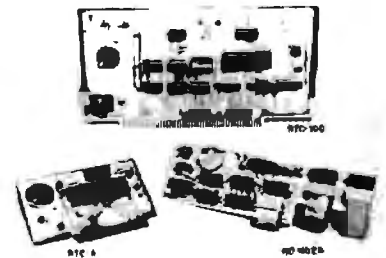
The Worry-free Clocks for People Who Don't Have Time to Worry!!

What makes them worry-free?

- Crystal controlled for high (.002%) accuracy
- Lithium battery backup for continuous clock operation (6000 hrs!!!)
- Complete software in BASIC-including programs to Set and Read clock
- Clock generates interrupts (seconds, minutes, hour) for foreground/background operation

Applications:

- Logging Computer on time
- Timing of events
- Use it with the SciTronics Remote Controller for Real Time control of A.C. operated lights and appliances



Versions available for:

- S-100 bus computers **RTC-100 \$159**
- Apple II computer **RTC-A \$129**
- SciTronics RC-80 owners **RC-80CK \$109**

Send Check or money order to: **SciTronics Inc.**
523 S. Clewell St., P.O. Box 5344
Bethlehem, PA 18015
(215) 868-7220

Please list system with which you plan to use controller • Master Charge and Visa accepted. COD's accepted. PA residence add sales tax.

save the old primary file before entering Transmit Mode.

Before the transfer is initiated, BLKEDIT mode is entered in IAF by generating a

TERM, BLKEDIT

command. BLKEDIT mode is designed to allow multiple-line input from a terminal to the Cyber, rather than line-by-line transmission. In this mode, the file transmission can be viewed as a stream of characters instead of a series of lines. Thus, the Microengine does not have to wait for the Cyber to accept each line before transmitting the next.

Following the command, a

TEXT

IAF command is generated to allow the file transmitted from the Microengine to be read into the newly defined CYBER file. Then, the nested procedure XMITRDFILE performs the transfer. When the transfer is completed, BLKEDIT mode is terminated and Cyber filename is cata-

logged on the Cyber by generation of TERM, TTY, and REPLACE IAF commands.

In addition to the two transfer routines (with nested procedures) and the emulator (main) routine, there are two other procedures:

1. CHARMODE allows the user to choose the character-set mode (Normal or ASCII) for file transfer. It is accessed by entering a Control-S while in Emulator Mode.

2. PRNTHelp lists the menu of control commands available to the user in Emulator Mode. PRNTHelp is accessed by entering Control-A while in Emulator Mode.

Limitations, Tradeoffs, Extensions

Our file-transfer system has been used extensively at data rates up to 1200 bps (bits per second) and has proven successful in its intended purpose. The system does contain some limitations, however, either due to tradeoffs between versatility and simplicity or as a result of the inherent qualities of the machines. One such

limitation is the constraint that all file transfers must be performed under the Cyber NULL subsystem. As described earlier, this is necessary since the program must test for certain responses from the Cyber. Originally, a "busy wait," in the form of an empty Pascal "for" loop, was used to halt program execution until the Cyber had generated its response. In this way, the Microengine did not have to wait for a specific response, but only had to make sure that it gave the Cyber sufficient time to generate it. Because of the variation in response time by the Cyber, coupled with the rapid processing of the Microengine, the range of the loop bounds had to be made very large to insure that the Cyber had completed its response before the Microengine resumed execution of the file-transfer program. So instead of employing the "busy wait," the program was tailored to the responses made by the Cyber in the NULL subsystem. This approach was cleaner and more efficient but was chosen at the cost of

WE DISCOUNT PRICES — NOT SERVICE



APPLE II PLUS 48K
\$1,075

APPLE II PLUS 16K \$1,025

HARDWARE

| | |
|---|------|
| DISK II DRIVE & INTERFACE | 499 |
| DISK II SECOND DRIVE | 439 |
| BASF 5 1/4" DISKETTES (10) | 25 |
| LANGUAGE SYSTEM W/PASCAL | 379 |
| INTEGER BASIC FIRMWARE CARD | 149 |
| APPLESOFT II FIRMWARE CARD | 149 |
| CENTRONICS PRINTER INTERFACE CARD | 179 |
| HIGH-SPEED SERIAL INTERFACE CARD | 145 |
| GRAPHICS TABLET | 649 |
| APPLE IEEE-488 INTERFACE CARD | 339 |
| M&R SUP-R-MOD RF MODULATOR | 25 |
| MICROSOFT Z-80 SOFTCARD SYSTEM | 299 |
| MICROSOFT 16K RAM CARD | 169 |
| VIDEX 80 COLUMN BOARD | 295 |
| HAYES MICROMODEM II | 299 |
| AMDEX 13" COLOR MONITOR | 429 |
| NEC 12" GREEN MONITOR | 255 |
| SILENTYPE PRINTER W/INTERFACE | 350 |
| EPSON MX-100 | 829 |
| QUME SPRINT 5/45 PRINTER | 2499 |



SOFTWARE

| | |
|--|-----|
| APPLE DOS TOOLKIT | 65 |
| APPLE PLOT | 60 |
| TAX PLANNER | 99 |
| APPLE FORTRAN | 159 |
| APPLE PILOT | 119 |
| APPLEWRITER | 85 |
| DOW JONES PORTFOLIO EVALUATOR | 45 |
| DOW JONES NEWS & QUOTES REPORTER | 85 |
| THE CONTROLLER | 495 |
| VISICALC (16 SECTOR) | 159 |
| VISIPILOT | 149 |
| VISITREND/VISIPILOT | 215 |
| DESKTOP PLAN II | 159 |
| BPI BUSINESS SOFTWARE (EACH) | 335 |
| SUPER TEXT II | 125 |
| PROGRAMMA APPLE PIE | 110 |
| EASYWRITER (80 COLUMNS) | 219 |
| D.B. MASTER | 180 |
| WORD STAR | 299 |
| MICROSOFT FORTRAN | 149 |



APPLE III 128K
\$3,295

| | |
|---------------------------|-----|
| DISK III | 479 |
| MONITOR III | 280 |
| INFORMATION ANALYST | 399 |
| PASCAL III | 215 |
| SILENTYPE III | 329 |

ATARI 800 16K
ATARI \$739

| | |
|-----------------------------------|------|
| ATARI 400 (16K) | 339 |
| 410 PROGRAM RECORDER | 69 |
| 810 DISK DRIVE | 439 |
| 815 DUAL DISK DRIVE | 1199 |
| 16K RAM MEMORY MODULE | 89 |
| 850 INTERFACE MODULE | 159 |
| 830 ACOUSTIC MODEM | 159 |
| 825 PRINTER (CENTRONIC 737) | 650 |
| ATARI VISICALC | 149 |
| BASIC LANGUAGE | 45 |
| ASSEMBLER EDITOR | 45 |
| MUSIC COMPOSER | 45 |
| STAR RAIDER | 39 |

computer age, inc.

Authorized Apple Dealer & Service Center
4688 CONVOY STREET, SAN DIEGO, CA 92111
(714) 565-4062 Technical & California
(800) 854-1941 Outside California Order Desk

TO ORDER: Please send cashier's check, money order or personal check (allow 10 business days to clear). VISA and Master Card credit card service add 3%. American Express credit card service add 5%. Shipping, handling and insurance in U.S. add 3% (minimum \$4). California residents add 6% sales tax. Foreign orders add 10% for shipping. Equipment is subject to price change and availability. All equipment carries factory warranty. Store prices differ from mail order prices. TELEX: 697120 DATAMAX-SDG

CALL OR WRITE FOR A COMPLETE PRICE LIST

versatility. The program can be extended to accept responses made under other subsystems as well, but this would lengthen the program size considerably.

Another such limitation is the restriction on the size of files transferred from the Cyber to Microengine disk, due to the use of a memory buffer. A large file can be transferred by dividing it into smaller files on the Cyber, transmitting the files separately and merging them at the Microengine. If more memory is available, the buffer size can be increased to allow the transfer of large files.

The file-transfer system might also be extended to allow the transfer of object-code files. Due to the incompatibility of binary codes on the two machines, a remapping of the codes would be required for file transfers in both directions. Again, this enhancement would considerably increase the size of the transfer program.

When we designed the file-transfer system, we intended it to be adapted, with minimal modification, to other microcomputers and minicomputers. The program was also designed for eventual use as a skeleton of a file-transfer system for a network of computers in the Department of Computer Science at Colorado State University.

At present, the system has been adapted to an Altair 8800 and an Intertec SuperBrain. The primary modification made to the program, in order to adapt it to the Altair, was in the emulator section. In the Microengine, the serial-port status registers are memory-mapped and can be tested using the Pascal record construct presented earlier. The ports on the Altair cannot be tested in this manner. The UCSD Pascal system allows assembly-language linking to Pascal programs, however, and so the adaptation to the Altair was made possible by the addition of two assembly-language functions, one to test the port to the Cyber and one to test the port connected to the system console. (The listing of modifications to the file-transfer-system program can be obtained from the authors.) ■

The cure for pollution is people. Working together.



Our streets and countryside have become dumping grounds for trash. But all across America, people are now recycling 8 million tons of it a year.

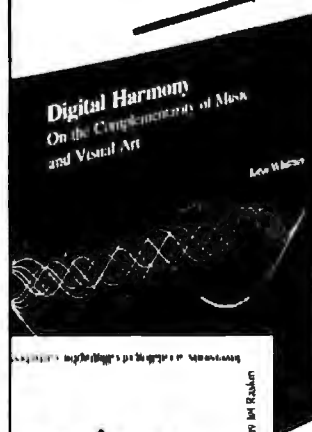


We create staggering amounts of garbage. But in Virginia Beach, they turned a mountain of garbage into a recreational hillside.

For a brochure showing how you can participate in dozens of projects like these, write **Keep America Beautiful, Inc.** 99 Park Avenue, New York, N.Y. 10016.



A Public Service of This Magazine & The Advertising Council



versions
by
Scott Kim

UNLIMITED.

Exploration of the arts through computer technology.

DIGITAL HARMONY by John Whitney

Lays the foundation for the whole new field of audio-visual art made possible by microcomputers. Whitney, a pioneer of the special effects technology used in STAR WARS and 2001: A SPACE ODYSSEY, explains the special union of computer graphics and music. Illustrations and descriptions of Whitney's computer, peripherals, and film techniques.

ISBN 07-070015-X, 240 pp., hardcover \$21.95

INVERSIONS: A Catalogue of Calligraphic Cartwheels by Scott Kim

Filled with intriguing designs, words that read the same right-side up and upside down, words within words, and unexpected symmetries, these compositions create a fresh way to look at the alphabet. Invertible writing appeals to everyone who loves beauty in mathematics and design.

ISBN 0-07-034546-5, 128 pp., softcover \$8.95



Order by mail or phone. Call toll free 800-258-5420.

Please send: DIGITAL HARMONY \$21.95
 INVERSIONS \$8.95

Add 75c per book to cover postage and handling.
Check enclosed in the amount of \$ _____
VISA MasterCard

Card # _____ Expires _____

Name _____

Street _____

City _____ State _____ Zip _____

**BYTE
BOOKS**

70 Main St.
Peterborough, NH
03458

FREE
with software purchase —
One CPM Handbook

DISCOUNT SOFTWARE

Ad #19

ULTIMATE SOFTWARE PLAN

We'll match any advertised price on any item that we carry. And if you find a lower price on what you bought within 30 days of buying it, just show us the ad and we'll refund the difference. It's that simple.

Combine our price protection with the availability of full professional support and our automatic update service and you have the Ultimate Software Plan.

It's a convenient, uncomplicated, logical way to get your software.

CP/M / DISK WITH MANUAL / MANUAL ONLY

ARTIFICIAL INTELLIGENCE
Medical (PAS-3) \$849/\$40
Dental (PAS-3) \$849/\$40

ASYST DESIGN
Prof Time Accounting \$549/\$40
General Subroutine \$269/\$40
Application Utilities \$439/\$40

COMPLETE BUS. SYSTEMS
Creator \$269/\$25
Reporter \$169/\$20
Both \$399/\$45

COMPUTER CONTROL
Fabs (B-free) \$159/\$20
UltraSort II \$159/\$25

COMPUTER PATHWAYS
Pearl (level 1) \$ 99/\$25
Pearl (level 2) \$299/\$40
Pearl (level 3) \$549/\$50

DIGITAL RESEARCH
CP/M 2.2
NorthStar \$149/\$25
TRS-80 Model II (P+T) \$159/\$35
MicroPolis \$169/\$25
Gromemco \$189/\$25
PL/I-80 \$459/\$35
BT-80 \$179/\$30
Mac \$ 85/\$15
Sid \$ 65/\$15
Z-Sid \$ 90/\$15
Tex \$ 90/\$15
DeSpool \$ 50/\$10

D.M.A.
Ascrom \$149/\$15
DMA-DOS \$179/\$35
CBS \$369/\$45
Formula \$539/\$45

GRAHAM-DORIAN
General Ledger \$729/\$40
Acct Receivable \$729/\$40
Acct Payable \$729/\$40
Job Costing \$729/\$40
Payroll II \$729/\$40
Inventory II \$729/\$40
Payroll \$493/\$40
Inventory \$493/\$40
Cash Register \$493/\$40
Apartment Mgt \$493/\$40
Surveying \$729/\$40
Medical \$729/\$40
Dental \$729/\$40

MICRO-AP
S-Basic \$269/\$25
Selector IV \$469/\$35

MICRO DATA BASE SYSTEMS
HDBS \$269/\$35
MDBS \$795/\$40
DRS or QRS or RTL \$269/\$10
MDBS PKG \$1295/\$60

MICROPRO
WordStar \$319/\$60
Customization Notes \$ 89/\$na
Mail-Merge \$109/\$25
WordStar/Mail-Merge \$419/\$85
DataStar \$249/\$60
WordMaster \$119/\$40
SuperSort I \$199/\$40
Spell Star \$175/\$40

MICROSOFT
Basic-80 \$289/\$na
Basic Compiler \$329/\$na
Fortran-80 \$349/\$na
Cobol-80 \$574/\$na
M-Sort \$124/\$na
Macro-80 \$144/\$na
Edit-80 \$ 84/\$na
MuSimp/MuMath \$224/\$na
MuLisp-80 \$174/\$na

✓ (New items or new prices)

CP/M users: specify disk systems and formats. Most formats available

ORGANIC SOFTWARE
TextWriter III \$111/\$25
DateBook II \$269/\$26
Milestone \$269/\$30

OSBORNE
General Ledger \$ 59/\$20
Acct Rec/Acct Pay \$ 59/\$20
Payroll w/Cost \$ 59/\$20
All 3 \$129/\$60
All 3 + CBASIC-2 \$199/\$75
✓ Enhanced Osborne. \$269/\$60
✓ With 'C' Basic \$349/\$75

PEACHTREE*
General Ledger \$399/\$40
Acct Receivable \$399/\$40
Acct Payable \$399/\$40
Payroll \$399/\$40
Inventory \$399/\$40
Surveyor \$399/\$40
Property Mgt \$799/\$40
CPA Client Write-up \$799/\$40
P5 Version Add \$129

SOFTWARE WORKS
Adapt (CDOS to CP/M) \$ 69/\$na
Ratfor \$ 86/\$na

SOHO GROUP
MatchMaker \$ 97/\$20
WorkSheet \$177/\$20

STRUCTURED SYSTEMS
GL or AR or AP or Pay \$599/\$40
Inventory Control \$599/\$40
Analyst \$199/\$25
Letterright \$179/\$25
QSort \$ 89/\$20
✓ NAD \$ 87/\$20

SUPERSOFT
Diagnostic I \$ 49/\$20
Diagnostic II \$ 84/\$20
Disk Doctor \$ 84/\$20
Forth (8080 or Z80) \$149/\$30
Fortran \$219/\$30
Fortran w/Ratfor \$269/\$35
Other less 10%

TCS
GL or AR or AP or Pay \$ 79/\$25
All 4 \$269/\$99
✓ Compiled each \$ 99/\$25

UNICORN
Mince \$149/\$25
Scribble \$149/\$25
Both \$249/\$50

WHITESMITHS
'C' Compiler \$600/\$30
Pascal (incl 'C') \$850/\$45

"DATA BASE"
FMS-80 \$649/\$45
✓ dBASE II \$595/\$50
Condor II \$899/\$50
✓ Access/80 \$699/\$50
✓ Optimum \$749/\$50

"PASCAL"
Pascal/MT+ \$429/\$30
Pascal/Z \$349/\$30
Pascal/UCSD 4.0 \$429/\$50
Pascal/M \$189/\$20

"WORD PROCESSING"
WordSearch \$179/\$50
SpellGuard \$229/\$25
VTS/80 \$259/\$65
Magic Wand \$289/\$45
Spell Binder \$349/\$45

"OTHER GOODIES"

✓ Select \$269/\$na
✓ Forecaster \$199/\$na
✓ Micro Plan \$419/\$na
✓ The Last One \$549/\$na
SuperCalc \$269/\$50
Target \$189/\$30
BSTAM \$149/\$15
BSTMS \$149/\$15
Tiny 'C' \$ 89/\$50
Tiny 'C' Compiler \$229/\$50
Nevada Cobol \$ 98/\$20
MicroStal \$129/\$25
Vedit \$224/\$25
MiniModel \$105/\$15
StatPak \$449/\$50
Micro B + \$449/\$40
Raid \$229/\$20
String/80 \$224/\$35
String/80 (source) \$ 84/\$20
ISIS II \$279/\$na
Plan 80 \$199/\$50
\$269/\$30

APPLE II*

INFO UNLIMITED
EasyWriter \$224
Daladex \$349
Other less 15%

MICROSOFT
Softcard (Z-80 CP/M) \$250
Fortran \$179
Cobol \$499

MICROPRO
WordsStar \$269
MailMerge \$ 99
WordStar/MailMerge \$349
SuperSort I \$159
✓ SpellStar \$129

PERSONAL SOFTWARE
Visicalc 3.3 \$159
CCA Data Mgr \$ 84
Desktop/Plan II \$159
Visitem \$129
Visidex \$159
Visiplot \$149
Visitrend/Visiplot \$229
Zurk \$ 34

PEACHTREE*
General Ledger \$224/\$40
Acct Receivable \$224/\$40
Acct Payable \$224/\$40
Payroll \$224/\$40
Inventory \$224/\$40

"OTHER GOODIES"
dBASE II \$329/\$50
VU #3R
(use w/Visicalc) \$ 79
✓ Context Connector (use w/Visicalc) \$129
✓ Micro Courier \$219
✓ TCS Apple (complete business) \$269/\$99

Super-Text II \$127
Data Factory \$134
DB Master \$184
Charles Mann less 15%
STC less 15%

Books Received

Ada, An Introduction, Ada Reference Manual, Henry Ledgard. New York: Springer-Verlag, 1981; 26.5 by 18.75 cm, 373 pages, softcover, ISBN 0387-90568-5, \$12.95.

Apple BASIC for Business, For the Apple II, Alan J Parker and John F Stewart. Reston VA: Reston Publishing, 1981; 17.5 by 23.5 cm, 301 pages, softcover, ISBN 0-8359-0226-1, \$14.95; hardcover, ISBN 0-8359-0228-5, \$17.95.

Beyond COBOL, Gary D Brown. New York: John Wiley & Sons, 1981; 15.5 by 23.5 cm, 200 pages, hardcover, ISBN 0-471-09030-1, \$17.50.

Computer Peripherals, Barry Wilkinson and David Horrocks. New York: Crane Russak & Company, 1981; 15.5 by 23.5 cm, 310 pages, softcover, ISBN 0-340-32652-3, \$19.75.

Data Processing with Applications, 2nd ed, Robert J Condon. Reston VA: Reston Publishing Company, 1981; 15.5 by 23.5 cm, 477 pages, hardcover, ISBN 0-8359-1254-X, \$16.95.

Digital Circuits and Systems, Richard L Castellucci. Reston VA: Reston Publishing Company, 1981; 16 by 23.5 cm, 332 pages, hardcover, ISBN 0-8359-1297-3, \$18.95.

Executive Computing, How to Get It Done on Your Own, John M Nevison. Reading MA: Addison-Wesley, 1981; 16 by 23.5 cm, 319 pages, softcover, ISBN 0-201-05248-2, \$8.95.

50 Programs in Basic for the Home, School & Office, Jim Cole. Woodboro MD: ARCsoft Publishers, 1981; 14 by 21.5 cm, 80 pages, softcover, ISBN 0-86668-002-0, \$9.95.

Finite Elements, An Introduction, Volume I, Eric

ORDERS ONLY—CALL TOLL FREE VISA • MASTERCHARGE

1-800-854-2003 ext. 823 • Call. 1-800-522-1500 ext. 823

Overseas—add \$10 plus additional postage - Add \$2.50 postage and handling per each item • California residents add 6% sales tax • Allow 2 weeks on checks, C.O.D ok • Prices subject to change without notice All items subject to availability • ®—Migs Trademark.

THE DISCOUNT SOFTWARE GROUP

6520 Selma Ave. Suite 309 • Los Angeles, Ca. 90028 • (213) 666-7677
Int'l TELEX 499-0032 BVHL Attn: DiscSoft • USA TELEX 194-634 BVHL Attn: DiscSoft •
TWX 910-321-3597 BVHL Attn: DiscSoft

Becker, Graham F Carey, and J Tinsley Oden. Englewood Cliffs NJ: Prentice-Hall, 1981; 15.5 by 23.5 cm, 258 pages, hardcover, ISBN 0-13-317057-8, \$24.95.

Flight Deck Uses for the HP-41C, Volume I, Melvin N Peterson. San Francisco CA: MNP Star Enterprises, 1981; 13.5 by 21.5 cm, 59 pages, softcover, ISBN 0-938880-01-2, \$12.

The Hexadecimal Chronicles, Don Lancaster. Indianapolis IN: Howard W Sams & Company, 1981; 21.5 by 28 cm, 377 pages, softcover, ISBN 0-672-21802-X, \$17.95.

How to Get Started with CP/M, Carl Townsend. Beaverton OR: dilithium Press, 1981; 14 by 22 cm, 127 pages, softcover, ISBN 0-918398-32-0, \$9.95.

Introduction to Computers and Information Processing. Language Edition, Don Cassel and Martin Jackson. Reston VA: Reston Publishing Company, 1981; 18 by 24 cm, 472 pages, hardcover, ISBN 0-8359-3150-1, \$19.95.

An Introduction to Computer Programming and Data Structures Using MACRO-11, Harry R Lewis. Reston VA: Reston Publishing Company, 1981; 18.5 by 24 cm, 241 pages, hardcover, ISBN 0-8359-3143-9, \$18.95.

Jewels of Formal Language Theory, Arto Salomaa. Rockville MD: Computer Science Press, 1981; 16 by 23.5 cm, 144 pages, hardcover, ISBN 0-914894-69-2, \$24.95.

Knowledge and the Flow of Information, Fred I Dretske. Cambridge MA: The MIT Press, 1981; 16 by 24 cm, 273 pages, hardcover, ISBN 0-262-04063-8, \$18.50.

Microcomputer Power Series, Data Management Techniques, John P Grillo and J D Robertson. Dubuque IA: Wm C Brown Company Publishers, 1981; 21.5 by 28 cm, 208 pages, softcover,

**NEVER
UNDERSOLD!**

**We Meet or Beat
Any Advertised Price!**
NORTHSTAR



HORIZON II
64k Quad Density
•Two 5 1/4" Dbl. Side
Dbl. Density Drives
•Full Factory Warranty
•List \$4495

PCB PRICE
ONLY

\$3275

HORIZON II
32k Double Density
Reg. \$3695 **\$2695**

HORIZON II
64k Double Density
Reg. \$4195 **\$3050**

HORIZON II
32k Quad Density
Reg. \$3995 **\$2895**



SUPERBRAIN™
64k Double Density **64k QD**
\$2650 **\$2950**

HARD DISCS

5mbyte for
S-100, TRS-80, SUPERBRAIN,
HEATH H 89, ZENITH

List \$3495 **\$2795**

CORVUS

FOR TRS-80, Apple, Superbrain,
Alpha-Micro, S-100 Bus, Altos

10mbyte **\$4295**
20mbyte **\$5300**
Mirror backup **\$650**
Host Multiplexer **\$760**
Master Multiplexer **\$760**
Interface Card, 5' cable **\$195**

5 1/4" DISK DRIVES

Tandon CDC Single Side Double Density .. **\$225**
Tandon CDC Double Side Double Density .. **\$350**
Tandon 100-4 80 track ... **\$600**
5mb Hard Disk
Seagate ST-506 ... **\$1350**

DISKETTES

Verbatim 525-01... Box of 10 **\$29**
Dysan 5 1/4, SS, DD Soft... Box of 10 **\$34⁷⁵**

PRINTERS

COMET C.Hoh **\$450**
COMET II C.Hoh parallel **\$825**
EPSON MX80 parallel **\$479**
EPSON MX80 RS232 **\$549**
EPSON GRAFTRAX **\$90**
STARWRITER 25cps parallel **\$1495**
STARWRITER 25cps RS232 **\$1650**
STARWRITER II 45cps parallel **\$1795**
STARWRITER III 40cps RS232 **\$1750**
NEC 7710 RS232 **\$2395**
MPI88G with graphics. Reg. \$749 **\$650**

TELEVIDEO

910C **\$595**
912C **\$665**
920C **\$720**
950 **\$950**

LANGUAGES

C Basic II **\$98**
M Basic 80 **\$275**
MT Pascal **\$430**
Fortran 80 **\$450**
Cobol 80 **\$650**
M Basic Compiler. **\$329**

SUPERBRAIN

S-100 Bus Adapter
LIST \$595 **\$475**

SUPERBRAIN
Parallel Port **\$75**

LIST \$205
SBE Prom **\$155**

GRAPHICS

Graphics board **\$896**
Symbol Generator **\$200**
Graphics Plotter **\$200**
3-D Graphics **\$400**
Surface Plotter **\$450**
Graphics Terminal
Emulator **\$450**

To Order Call (206) 453-8159

Mail and telephone orders only. Mastercharge, VISA add 3%. No COD. All prices FOB origin.
Send for catalog.

PACIFIC COMPUTER BROKERS

11056 Palatine North, Seattle, WA 98133

BYTE

TOLL-FREE SUBSCRIPTION LINE

1-800-258-5485

New Hampshire Residents Dial 924-9281

The Quickest Way To

- Order a Subscription
- Renew a Subscription
- Change or Correct an Address
- Give a Friend a Gift Subscription
- Inquire about a Subscription

We are waiting to help you. Call us between:

8:30-4:00 Mon.-Thurs.

8:30-12:30 Fridays

(Eastern Time)

BYTE the small systems journal

Books Received

ISBN 0-697-09954-7, \$16.95.

Microcomputer Power Series, Guide to System Applications. Same as above; 288 pages, softcover, ISBN 0-697-09952-0, \$17.95.

Microcomputer Power Series, Introduction to Graphics. Same as above; 144 pages, softcover, ISBN 0-697-09953-9, \$15.95.

Microcomputer Power Series, Techniques of BASIC. Same as above; 272 pages, softcover, ISBN 0-697-09951-2, \$18.95.

Microsystems '81, Proceedings of the 4th Annual Conference (London, March 11-13, 1981). Westbury House, division of IPC Science and Technology Press (POB 63, Bury Street, Guilford, Surrey, England, GU2 5BH), 1981; 16.5 by 23.5 cm, 124 pages, softcover, ISBN 0-86103-046-X, £12.50.

Osborne 16-Bit Microprocessor Handbook, Adam Osborne, Gerry Kane. Berkeley CA: Osborne/McGraw-Hill, 1981; 18 by 23 cm, 771 pages, softcover, ISBN 0-931988-42-X, \$19.95.

Pascal Programs for Scientists and Engineers, Alan R Miller. Berkeley CA: Sybex, 1981; 18 by 23 cm, 374 pages, softcover, ISBN 0-89588-058-X, \$16.95.

Representations, Philosophical Essays on the Foundations of Cognitive Science, Jerry A Foder. Cambridge MA: The MIT Press, 1981; 16 by 24 cm, 343 pages, hardcover, ISBN 0-262-06079-5, \$20.

67 Ready-To-Run Programs in BASIC: Graphics, Home & Business, Education,

Games, William Scott Watson. Blue Ridge Summit PA: Tab Books, 1981; 13.5 by 21 cm, 182 pages, softcover, ISBN 0-8306-1195-9, \$6.95; hardcover, ISBN 0-8306-9660-1, \$12.95.

Sociological Methods & Research, Volume 9, Number 4, edited by David R Heise. Beverly Hills CA: Sage Publications, 1981; 13.5 by 21.5 cm, 141 pages, softcover, ISSN 0049-1241, \$5.50.

Structured Requirements Definition, Ken Orr. Topeka KS: Ken Orr and Associates, 1981; 15 by 23 cm, 235 pages, softcover, ISBN 0-9605884-0-X, \$25.

Taming Your Computer, A Guide for Business and Professional People, Jerome Kanter. Englewood Cliffs NJ: Prentice-Hall, 1981; 18.5 by 24 cm, 246 pages, hardcover, ISBN 0-13-884403-8, \$17.95; softcover, ISBN 0-13-884395-3, \$8.95.

Telecommunications Management for Business and Government, 2nd ed. Larry A Arredondo, edited by Harry Newton. New York: Telecom Library, 1981; 21.5 by 28 cm, 270 pages, softcover, ISBN 0-936648-07-4, \$30.

32 BASIC Programs for the Apple Computer, Tom Rugg and Phil Feldman. Beaverton OR: dilithium Press, 1981; 13.5 by 21 cm, 284 pages, softcover, ISBN 0-918398-34-7, \$17.95.

The Year of the Robot, Wayne Chen. Beaverton OR: dilithium Press, 1981; 13.5 by 21 cm, 182 pages, softcover, ISBN 0-918398-50-9, \$7.95. ■



ATARI 800 16K \$749



OMEGA
SALES CO.

ATARI SPECIALS

ATARI 400 16K Personal Computer \$349

ATARI PERIPHERALS

410 Program Recorder \$ 60

810 Disk Drive \$449

820 40 Column Printer \$299

822 40 Column Thermal Printer \$349

EAST COAST

1-800-556-7586

12 Meeting Street
Cumberland, RI 02864
1-401-722-1027

WEST COAST

1-800-235-3581

3533 Old Conejo Rd. #102
Newbury Park, CA 91320
1-805-499-3678

OMEGA SALES CO.

This is a list of books received at BYTE Publications during this past month. Although the list is not meant to be exhaustive, its purpose is to acquaint BYTE readers with recently published titles in computer science and related fields. We regret that we cannot review or comment on all the books we receive; instead, this list is meant to be a monthly acknowledgment of these books and the publishers who sent them.

Information Hiding in Pascal

Packages and Pointers

Michael B Feldman
Department of Electrical Engineering and Computer Science
The George Washington University
Washington DC 20052

Information hiding is the principle that allows programs written at a *high level* to be insulated from messy *low-level* details. This principle fosters program reliability for two related reasons:

- Since low-level details are relegated to lower-level programs (procedures, functions, macroinstructions, etc), they can, in principle, be coded *once*, instead of once per program. Thus, the detailed code need be debugged only once. Moreover, the calling programs cannot disturb them because they cannot gain access to these details.
- High-level programs, being insulated from low-level details, can be written more cleanly, making them easier to maintain. Since higher-level programmers know that lower-level details have already been debugged, they can concentrate on their assigned task—writing the higher-level material.

Information hiding is equally valid for single- and multi-programmer tasks. It is clear that even a single programmer can benefit from writing low-level code only once.

What Is a Package?

One important application of the information-hiding principle is in the definition, in some programming language, of new data types not already supported. Pascal, for example, does not support complex numbers—at least in the standard language. A *package*, also called a *class* or *data abstraction*, is an encapsulation of a new data type, together with a set of primitive functions or procedures that handles the details of creating instances of the new type and performing operations on it.

To continue with our example of complex numbers, a complex-number package generally contains the following parts:

- a definition of complex data as consisting of a real part and an imaginary part

- a method to be used by higher-level programs in creating new complex data, given two integers or real numbers to serve as the real and imaginary components
- a set of operations on complex numbers so higher-level programs can do arithmetic on complex numbers without needing access to the details of what complex numbers look like internally

Such a set of operations should ordinarily be *minimal* (without redundant operations) and *complete* (ie: calling routines don't need any additional operations to do everything required). For complex numbers, we would need sum, difference, product, quotient, and absolute value or magnitude operations, plus some comparison operations, such as equals, less than, greater than, etc. The general idea is that this extended data type "comes with" the same general level of support offered by the base language for integers and real numbers.

Ideally, a package should be defined by two pieces: a *functional specification* of the type and its operations, which gives a list of the legal operations and a description of *what* each operation does (not *how*), and a *group of programs* implementing the operations and responsible for handling the messy lower-level details.

Jean Ichbiah, developer of the new Ada language, explains the package idea by referring to a wrist-watch—say, one of the new digital ones with many features. The owner's guide describes the watch's features, explaining what each button does (time, date, light, set alarm, and so on). The user receives a warranty from the manufacturer that the watch will perform as advertised. It is not necessary to know anything about how the watch works to use it effectively. Furthermore, the manufacturer would probably refuse to honor the warranty on a watch whose internal circuits have been tampered with. So, the internal parts of a watch are—we hope—packaged to discourage tampering. Indeed, more complex equipment is often packaged with a lock or seal. This way, only an authorized technician can get inside,

or an attempt by a user to get in will be obvious and void the warranty.

Ichbiah asserts that software producers are going to be called upon more and more to guarantee their products. However, it will be difficult to give an effective warranty on products whose reliability has not been proven (at least to our own satisfaction; recalls occur in many industries). More important, it is difficult to guarantee a product whose internal parts can be tampered with by a user. Packages, then, are a way to foster warrant-ability.

There are several programming languages that support variations on the package theme. The language SIMULA67, used more in Europe than in the United States, provides a similar concept called *class*; experimental languages such as Concurrent Pascal, CLU, and Alphard support the idea in one form or another, and Ada emphasizes packages by that name as an important principle of modular design. Standard Pascal does not support packages as such; let us examine how we can implement their principle in Pascal.

Packages in Standard Pascal

A package should consist of a functional specification—ideally recognized by the compiler—and an implementation module. Pascal has no facility for separating the specification part from the implementation part. Therefore, we write the specification part, in an ap-

propriate style, as a block comment.

Also implicit in the notion of a package is the fact that we can physically isolate the package from other packages and calling programs. Unfortunately, Pascal is not much help here, since neither a compile-time facility for copying separate pieces of source text into a source file nor a facility for separate compilation of packages is supported. Many implementations of Pascal provide one or both of these, but this discussion is limited to the possibilities of the standard language.

Another limitation of Pascal is that all type definitions must appear in one group following a "type" keyword, and these must appear before all code for functions and procedures. This hinders the ability to group a type definition with all its operations, another type to be grouped with its operations, and so on. Once again, there are some implementation-dependent relaxations of this rule.

A Pascal Complex-Number Package

To summarize the previous sections, Pascal does not permit the *direct* production of packages because of its lack of separate compilation facilities and its rigid syntax for defining new types. With some good programming-style conventions, however, and perhaps a bit of manual preprocessing of the source code, a fairly good approximation can be achieved.

How shall we implement a complex-number package? Let us define a Pascal type called COMPLEX as a record with real and imaginary components:

```
type COMPLEX =  
    record REALPART: real;  
           IMAGPART: real  
    end;
```

We could then declare variables of type COMPLEX:

```
var A, B, C, D, E, F: COMPLEX;
```

and set A, B, and C as follows:

```
A.REALPART := 1.5; A.IMAGPART := -3.7;  
B.REALPART := 2.0; B.IMAGPART := -5.1;  
C.REALPART := 0.0; C.IMAGPART := 4.1
```

How shall we do arithmetic on complex numbers? Suppose we defined a procedure:

```
procedure CADD(C1, C2: COMPLEX; var  
RESULT: COMPLEX)
```

The complex sum RESULT is a complex number that gives:

```
RESULT.REALPART := C1.REALPART +  
C2.REALPART;  
RESULT.IMAGPART := C1.IMAGPART +  
C2.IMAGPART
```



Writing this procedure would be quite straightforward, and we could do the equivalent of saying $D = A + B$ by writing:

CADD(A,B,D)

Things start looking messier when we try to emulate a more complicated expression like $D = A + B + C$. We would then have to write something like:

CADD(A,B,E); CADD(C,E,D)

As the expression gets longer, we need more separate calls to the CADD procedure, each doing only a single operation. It would be better if we could write an *expression*, as we would if we were dealing with integers or real numbers. In other words, can we turn CADD into a *function*, then write:

D := CADD(A, CADD(B,C))

which is much cleaner (especially in longer expressions)?

Writing functions to do this operation, and others like difference, product, quotient, etc, would be easy if our Pascal functions looked like:

function CADD (C1, C2 : COMPLEX) : COMPLEX

that is, if functions could return complex numbers as value. Pascal sets up an obstacle here: functions can return only *scalar* types, and COMPLEX is a *structured* type, a record. What can we do?

Enter the Pointer

What is a pointer? It is an abstraction of the idea "the data at the address: ..." Pointers exist in many programming languages, notably PL/I. A pointer in Pascal is written in publication language as \uparrow . Since many implementations use the symbol @ instead, we shall use it as well.

In Pascal, you can declare a variable to be a pointer:

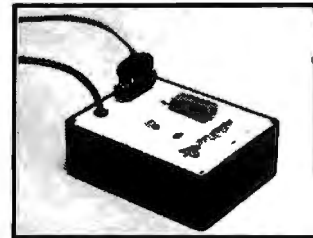
var P: @INTEGER

which is read "P is a pointer to an integer." Pascal, differing from PL/I, for example, requires not only a declaration of all pointers, but also a declaration of the type of thing pointed to. This is a protection against using pointers indiscriminately to point to different things at different times and is a reflection of the Pascal "strong-typing" philosophy. P@ is read "the thing pointed to by P."

Pointers must be used with care. In fact, it is often said that "pointers are to data what GOTOs are to program code." But in appropriate situations, pointers in Pascal are extremely useful.

Pascal textbooks illustrate pointers as a way to link nodes in a list or tree structure, and many of you are familiar with this application. What is not usually

Model 953A EPROM PROGRAMMER



- Programs 2508, 2768, 2516, 2716, 2532 and 2732 five volt EPROMS.
- Complete - no personality modules to buy.
- Intelligent - microprocessor based, programs and verifies any or all bytes.
- RS-232 serial interface - use with computer or terminal.
- Verify erasure command - verifies that EPROM is erased.
- Extended diagnostics - error output distinguishes between a bad EPROM and one which needs erasing.
- May be used for extremely reliable data or program storage.
- All power on programming socket under processor control. LED warning light indicates when power is applied.
- Complete with Textool zero insertion force socket.
- High performance/cost ratio.
- Standard DB-25 I/O connector.

PRICE \$289



BAY TECHNICAL ASSOCIATES, inc.

HWY. 603, P.O. BOX 387
BAY ST. LOUIS, MISSISSIPPI 39520
(601) 467-8231



A Message to our Subscribers

From time to time we make the BYTE subscriber list available to other companies who wish to send our subscribers promotional material about their products. We take great care to screen these companies, choosing only those who are reputable, and whose products, services, or information we feel would be of interest to you. Direct mail is an efficient medium for presenting the latest personal computer goods and services to our subscribers.

Many BYTE subscribers appreciate this controlled use of our mailing list, and look forward to finding

information of interest to them in the mail. Used are our subscribers' names and addresses only (no other information we may have is ever given).

While we believe the distribution of this information is of benefit to our subscribers, we firmly respect the wishes of any subscriber who does not want to receive such promotional literature. Should you wish to restrict the use of your name, simply send your request to BYTE Publications Inc, Attn: Circulation Department, 70 Main St, Peterborough NH 03458. Thank you.

discussed in the texts is, first, that pointers don't have to be used as that kind of link, and second, that pointers are scalar types, and thus may be returned as function values.

Listing 1: Pascal programming examples (see the text for details).

(1a)

```
type COMPNUM =
  record
    REALPART, IMAGPART: real
  end;
  COMPLEX = @COMPNUM
```

(1b)

```
function MAKECOMP (R,I: real): COMPLEX;
var P: COMPLEX;
begin NEW (P);
      P@.REALPART := R; P@.IMAGPART := I;
      MAKECOMP := P
end;
```

(1c)

```
function RE( C: COMPLEX): real;
begin RE := C@.REALPART end;
function IM( C: COMPLEX): real;
begin IM := C@.IMAGPART end;
```

(1d)

```
function CSUM ( X,Y : COMPLEX): COMPLEX;
begin
  CSUM := MAKECOMP (RE(X) + RE(Y), IM(X) + IM(Y))
end;
```

(1e)

```
function CEQUALS ( X,Y: COMPLEX ): Boolean;
begin
  CEQUALS := RE(X) = RE(Y) & IM(X) = IM(Y)
end;
```

(1f)

```
type COMPNUM =
  record
    REALPART, IMAGPART: real;
    TEMPORARY: Boolean
  end;
```

(1g)

```
function MAKECOMP (R, I: real): COMPLEX;
var P: COMPLEX;
begin NEW(P);
      P@.REALPART := R;
      P@.IMAGPART := I;
      P@.TEMPORARY := TRUE;
      MAKECOMP := P
end;
```

We can use pointers advantageously in creating our package for complex numbers. Instead of using the type COMPLEX to name our complex-number record, let us rename that record COMPNUM and use COMPLEX to refer to a pointer to a COMPNUM, as shown in listing 1a. Declaring variables as in:

```
var A, B, C, D, E, F : COMPLEX
```

does not create six records—only six pointers. The records come into being later.

We can give a calling program an easy way to create a complex number by noticing that the Pascal predeclared function NEW can be used to create instances of a type at execution time. A call such as NEW(P), where P is a pointer to some type, creates space for an instance of that type, returning the location of the new instance in P. We can now write a Pascal function MAKECOMP, as in listing 1b.

MAKECOMP creates a new complex number with real and imaginary parts and returns a pointer to that new number as its value. A user can then write:

```
A := MAKECOMP(2.0, -5.5)
```

and, assuming that A is of type COMPLEX, never realize what is going on at the lower level.

We can further insulate the user from the "dot" notation of Pascal records and any concern with pointers by writing two functions that access the real and imaginary components (see listing 1c). Given that Y is of type real, Y := RE(A) looks much like the corresponding notation from mathematics.

At this point, we can start writing other functions to do complex arithmetic. All such functions can now be written with arguments and return values of type COMPLEX, and no further reference must ever be made to lower-level implementation details. For example, see the code for CSUM in listing 1d. A function to determine if two complex numbers are equal might be written as in listing 1e.

Giving Back the Memory

This would all work very well, except for one problem. If we were to write the complex-expression equivalent of:

$$E = (A \times B) + (C \times D)$$

$$[E := CSUM(CPROD(A,B), CPROD(C,D))]$$

our scheme would call NEW to get space for the temporary results CPROD(A,B) and CPROD(C,D), as well as for the final sum of the two. What happens to the two temporary records we created?

They remain allocated and will not be reused. Continual use of expressions like this will allocate temporary space that will not be recovered. Eventually, our program will run out of dynamic-memory space (usually called *heap* space) and "bomb," even though we're not actually using all that space.

good implementation strategy (pointers and records) and the right low-level primitive functions (MAKECOMP, RE, IM) has given us a healthy level of insulation for higher-level programs from messy details. Even fundamental operations like sum and equals can be written using the notations of the application area, rather than the esoterica of the programming language.

An objection could be made that we are paying a price in run-time efficiency by insisting on all these levels of insulation, each imposing either a subprogram call (and its overhead) or an indirect (pointer) reference (also with an associated overhead). There is no doubt that a price measured in machine performance is exacted here. We counter by pointing out that almost any device used in programming to increase *people* efficiency (and this includes high-level languages) takes its toll in reduced machine performance. In today's world of fast and inexpensive hardware, it's a price worth paying.

The Specification Part

The routines shown previously constitute part of what is usually called the *package body*, namely, the implementing code for all the routines. Ideally, we should be able to write a section giving only functional specifications, and this would be the only part visible to a user or calling program.

Listing 2: *The specification part of a package that states the complex-number data type. It is included in the Pascal program as a comment and explains what the attributes of the package are, but not necessarily how they work.*

```
(* package ComplexNumbers
type COMPLEX                               details private
function MAKECOMP ( R,I : real )           : COMPLEX;
function RE ( C : COMPLEX )                : real;
function IM ( C : COMPLEX )                : real;
function CSUM ( X,Y : COMPLEX )            : COMPLEX;
function CDIFF ( X,Y : COMPLEX )           : COMPLEX;
function CPROD ( X,Y : COMPLEX )           : COMPLEX;
function CQUOT ( X,Y : COMPLEX )           : COMPLEX;
function CEQUALS ( X,Y : COMPLEX )         : Boolean;
function CLESSEQ ( X,Y : COMPLEX )         : Boolean;
function CGTREQ ( X,Y : COMPLEX )         : Boolean;
...and possibly some complex I/O routines. *)
```

Listing 3: *A complex-number package written for the Pascal-like language Ada.*

```
function "" (x,y: complex) return complex is
  R,I: float;
begin
  R := RE(x)*RE(y) - IM(x)*IM(y);
  I := RE(x)*IM(y) + IM(x)*RE(y);
  return (R,I);
end;
function "" (x: float; y: complex) return complex is
  TEMP : complex;
begin
  TEMP := (x * RE(y), x * IM(y));
  return TEMP;
end;
```

Since Pascal has no facility for separating these two important sections, we shall write the specification part as a block comment. A specification part for complex numbers is shown in listing 2.

Operator Overloading

In writing our complex-number package in Pascal, we were forced to use prefix-function notation (ie: CSUM(X,Y), and so on). Ideally, a higher-level program should be able to write $X + Y$ when $X + Y$ is meant, and the compiler should be able to invoke the addition routine appropriate to the declared types of X and Y . Suppose, for example, that X and Y were vectors of integers. If we had written a routine to add two vectors, there ought to be some way to inform the compiler that vector addition is what is meant by $X + Y$ if X and Y are declared as vectors. In other words, instead of calling our complex-addition routine CSUM, we should be able to call it $+$, and let the compiler determine when its use is appropriate.

To give an example of how this *can* be done in Ada, here are two functions, both called $*$, to do complex multiplication and multiplication of a complex by a real scalar (see listing 3).

The two most important parts of this example are the two additional operators named $*$ —the compiler can tell which one is meant, in an expression, by the types of the operands—and the fact that in Ada, unlike Pascal, structures can be returned as function values. The pointer scheme used in this article is thus unnecessary in Ada.

This technique of adding power to an arithmetic operation, extending its range to cover new data types, is known as *operator overloading*. Several experimental languages have supported overloading; SNOBOL4 is a major language in the "real world" that has supported it for more than ten years. But no widely used procedural language permits operator overloading. As the Ada language comes into wide use, many people will discover and appreciate its overloading facility, as well as other niceties that make packages easy to do. ■

References

1. Brinch Hansen, P. "The Programming Language Concurrent Pascal." *IEEE Transactions on Software Engineering*, volume SE-2, number 2, June 1975, pages 199 through 207.
2. Dahl, O J, B Myhrhand, and K Nygaard. *The SIMULA67 Common Base Language*. Oslo: Norwegian Computing Centre, Publication S-22, 1970.
3. Griswold, R E, J F Poage, and I P Polonsky. *The SNOBOL4 Programming Language, 2nd ed.* Englewood Cliffs NJ: Prentice-Hall, 1971.
4. Liskov, B H and S N Zilles. "Abstraction Mechanisms in CLU." *Communications of the ACM*, volume 20, number 8, August 1977, pages 564 through 576.
5. Wegner, P. *Programming with Ada*. Englewood Cliffs NJ: Prentice-Hall, 1980.
6. Wolf, W A, R L London, and M Shaw. "An Introduction to the Construction and Verification of Alphard Programs." *IEEE Transactions on Software Engineering*, volume SE-2, number 4, December 1976, pages 253 through 265.

A Voice for the Apple II Without Extra Hardware

Robert A Payne
7437 Arizona Ave
Los Angeles CA 90045

With an Apple II computer and a standard cassette-tape player, I have been able to store human voices in digital form and recall them later with relatively good fidelity. In fact, my 48 K-byte Apple computer can store up to three minutes of digital voice data without additional hardware or disk storage.

My experiments in this area began after reading other articles concerning the application of home computers to voice recording (see reference). These prompted me to try simple hardware additions to a standard Apple computer and to experiment with various low-priced A/D (analog-to-digital) converters that were readily available from local electronics supply houses.

The problems I encountered fell into three general categories: first, most inexpensive A/D converters will not operate in the range of 10,000 to 12,000 samples per second. This is the minimum rate acceptable for reasonable word reproduction. Second, at higher sample rates the computer memory required to store the digital data exceeds the memory of the Apple computer after only a few seconds of actual operation. And finally, the hardware I was adding to the computer tended to be cumbersome and of relatively low quality. I would have to overcome each of these problems before I could store voices in my computer.

Recording the Voice

The idea for recording voice without additional hardware came from looking at commercially available software that digitizes voice

input to the Apple computer from a standard cassette-tape recorder through the cassette-input port. It is possible to monitor zero crossings of any analog signal, including voice, simply by making a recording of the signal on a cassette tape, then plugging the recorder into the Apple cassette-input port and playing the tape back while monitoring memory location C060 (hexadecimal), bit 7 (cassette input). Above a certain level of input signal, the cassette input will read high; below this level it will read low. The level of this transition is called the *threshold*.

If voice is thought of as being a simple sinusoidal function, it is readily apparent that each time the signal crosses the threshold, the state of the cassette-input bit changes. A history of these changes contains all of the frequency characteristics of the original analog input, assuming two threshold crossings per cycle. Since this method of data gathering really amounts to a 1-bit A/D conversion, amplitude information is not present and the stored voice will be reproduced at a constant volume depending on the hardware used for the actual playback.

It should also be noted at this time that the sampling rate must meet the Nyquist criteria. That is, the rate at which the cassette-input port is read must be equal to at least twice the frequency of the highest voice harmonic that we wish to store.

The ideal cassette recorder should have a volume and a tone control so that the user can input the correct amplitude and control the frequency

range to reproduce a given voice with minimal noise and to cause the midpoint of the input signal's peak-to-peak amplitude to be set at the point where the Apple threshold ("0" to "1" transition) occurs. The quality of speech recorded will vary dramatically with changes in these parameters, and each individual will have to find the correct settings by experimentation. For my own voice and cassette recorder, I use relatively low volume settings with the tone control adjusted to its highest frequency.

Data Compression

At this point, by using the cassette input for data, I had solved the problems of not being able to find inexpensive A/D converters that could sample at a fast enough rate to record voice and of having to add wires and power supplies to my Apple computer. However, once I learned how to record voice and store it in memory, I found that about twenty seconds of data were all I could handle. This was the result of packing 8 bits of A/D data into each memory location.

On close inspection I found that the data that had been stored did not always change from sample to sample. This was true when low-frequency signals were being input and also during the times when no input was being sensed at the cassette-input port (eg: when the speaker stops to breathe, or at the beginning of a recording before the speaker has started talking). Since the data fluctuations had this characteristic, I decided to store data such that the first bit of each memory location represented

the status of the A/D input and the next 7 bits represented a counter indicating the number of samples collected while that input remained unchanged. If the counter overflowed the allotted 7 bits, the same A/D bit would be stored in the next memory location with a new counter value.

Listing 1 is written in 6502 machine language and should load voice data into any Apple computer with 48 K bytes of memory. For machines with less memory, the operands in statements 849 and 810 (hexadecimal) can be changed to a smaller hexadecimal number representing the most-significant byte of the upper limit of memory.

At this point I had a computer memory full of A/D data that contained enough samples to reproduce between one and three minutes of reasonably understandable human voice. The exact time of playback is a

function of voice pitch and the setting of the inputs on the tape recorder. Also, certain sounds such as "sssss" tend to cause a great deal of change in the A/D data relative to the sampling rate and will therefore give less voice recording time for a given amount of memory.

Although it is difficult to analyze the efficiency of this new A/D packing technique by data inspection, I assume that it is five to six times more efficient than the method of packing 8 bits per word. I base this conclusion on the improvement in time for a given memory size. Reproducing the voice data for playback was the next logical experimental step.

Reproducing the Voice

The Apple computer has an on-board speaker that can be toggled by a read or a write to memory location

C030 (hexadecimal). The software shown in listing 2 will unpack the stored A/D data and toggle the speaker each time that the data counter reaches zero and the A/D bit changes state. This amounts to producing a "click" on the output speaker each time the original input voice signal had a zero crossing.

It may be hard to imagine how these clicks can reconstruct the human voice since they have no tones or amplitudes related to the original voice input. Try not to think about the individual clicks; instead, think of a series of clicks being output at a varying frequency which is a function of the original voice input. This varying frequency is an FM (frequency modulated) reproduction of that original input signal.

Although the reproduced signal is understandable if output in the above manner, there are several significant sources of noise that degrade the voice, one being the Apple's on-board speaker itself. The others relate to the method of sampling and reproducing the data. To reproduce any analog signal stored in digital format, it is very important to sample the A/D converter at a constant rate and to make the corresponding D/A (digital-to-analog) conversion at that same uniform rate. Any variance of these rates will cause high noise levels that will have to be filtered.

Unfortunately, the software that I had written to sample the input data had several different logical paths to follow depending on whether the counter was being incremented or whether it plus the data bit were being stored, and whether the least- or most-significant bit of the storage location had to be incremented. Each case took a different number of machine cycles to complete and therefore affected the time required to return and read the cassette-input port. When I modified the software to make each logical path use the same number of machine cycles, what I was really doing was slowing down each logical loop until they all ran at the rate of the slowest loop. This had the undesired effect of lowering the sample rate and reducing the bandwidth of the input signal, which at-

Listing 1: *A/D input routine. Record your voice input on the cassette tape, then run the tape while executing this program starting at location 800 (800G). Voice data will be stored from location 1000 through BFFF in the form of data plus counter. Adjust the number at location 81F to change the sample rate of the A/D converter. The lower the number, the better the quality, but less time will be available for a given amount of memory.*

| | | | |
|-----|----------|------------|------------------------------------|
| 800 | A9 00 | LDA # \$00 | |
| 802 | 8D 00 10 | STA \$1000 | Store zero |
| 805 | EE 03 08 | INC \$0803 | Increment storage LSB |
| 808 | D0 F8 | BNE \$0802 | |
| 80A | EE 04 08 | INC \$0804 | Increment storage MSB |
| 80D | AD 04 08 | LDA \$0804 | |
| 810 | C9 C0 | CMP # \$C0 | Check for end of memory |
| 812 | D0 EC | BNE \$0800 | |
| 814 | A9 00 | LDA # \$00 | Restore storage LSBs and MSBs |
| 816 | 8D 03 08 | STA \$0803 | |
| 819 | A9 10 | LDA # \$10 | |
| 81B | 8D 04 08 | STA \$0804 | |
| 81E | A0 0A | LDY # \$0A | Load sample rate delay counter |
| 820 | 88 | DEY | |
| 821 | D0 FD | BNE \$0820 | |
| 823 | AD 60 C0 | LDA \$C060 | Get data from cassette input port |
| 826 | 29 80 | AND # \$80 | Use only the first bit |
| 828 | CD A0 09 | CMP \$09A0 | Compare to previous A/D sample |
| 82B | 8D A0 09 | STA \$09A0 | Replace old A/D value with new one |
| 82E | D0 05 | BNE \$0835 | Branch if bit changed state |
| 830 | E8 | INX | Increment counter |
| 831 | E0 7F | CPX # \$7F | Compare counter to overflow value |
| 833 | D0 E9 | BNE \$081E | Branch if counter < 127 |
| 835 | 8A | TXA | Move counter to accumulator |
| 836 | A2 00 | LDX # \$00 | Zero counter |
| 838 | 4D A0 09 | EOR \$09A0 | OR bit with counter value |
| 83B | 8D 00 10 | STA \$1000 | Store data plus counter |
| 83E | EE 3C 08 | INC \$083C | Increment storage location |
| 841 | D0 DB | BNE \$081E | |
| 843 | EE 3D 08 | INC \$083D | |
| 846 | AD 3D 08 | LDA \$083D | |
| 849 | C9 C0 | CMP # \$C0 | Check for end of memory |
| 84B | D0 D1 | BNE \$081E | |
| 84D | A9 00 | LDA # \$00 | Restore program locations |
| 84F | 8D 3C 08 | STA \$083C | |
| 852 | A9 10 | LDA # \$10 | |
| 854 | 8D 3D 08 | STA \$083D | |
| 857 | 00 | BRK | End of storage routine |

tenuated the higher harmonics to the point where word recognition became extremely difficult.

Two solutions to the above problem were possible: the first was to use digital-filtering techniques on the stored data to remove unwanted noise. I rejected this due to the complexity of designing a bandpass filter which is not symmetrical with respect to a frequency equal to one half of the A/D sampling rate. The design of this type of filter requires the use of complex multiplying coefficients and is not practical for real-time microcomputer operations on large amounts of data.

Instead, I used the hardware filters controlled by the cassette-tape-recorder tone control and sent the data back to the cassette to be either recorded on tape or output in the PA (public address) mode. To do this I changed the output software to toggle memory location C020 (cassette output) instead of the Apple speaker. The results were quite good when using this method to reproduce the stored voice. I used the cassette tone control to filter out unwanted noise.

Just to prove that anyone can understand a voice that had been recorded and then reproduced with the methods I have discussed in this article, I tried recording random passages from several different textbooks and playing them back to different listeners. Most had no trouble understanding the output once I had optimized the sampling rates and tone controls for my own voice.

Future Plans

The next step in my experiments will be to store digitized voice on the computer disk, which should allow approximately ten minutes of playback. I am also trying to find methods of packing voice data into more efficient patterns to minimize memory-size requirements. I hope this article helps others find inexpensive methods of bringing speech to their computers. ■

Reference

Anderson, James C. "An Extremely Low-Cost Computer Voice Response System," February 1981 BYTE, pages 36-43.

Listing 2: A/D output routine. First store data using listing 1 and a cassette recorder. After the data is stored in the Apple memory, it can be output to the on-board speaker by running this program from location 860 (860G). To send the data back to the cassette-output port, change location 874 to 20 and run the program from location 860 with the tape recorder in either the record or PA mode. The counter in location 877 should be adjusted until the optimal output is found. The number at location 892 is the most-significant byte of the upper limit of memory.

| | | | | | | |
|-----|----|----|----|-----|--------|-------------------------------------|
| 860 | AD | 01 | 10 | LDA | \$1001 | Get A/D data |
| 863 | 29 | 7F | | AND | #\$7F | Mask for counter only |
| 865 | AA | | | TAX | | Move counter to X register |
| 866 | AD | 01 | 10 | LDA | \$1001 | Get A/D data |
| 869 | 29 | 80 | | AND | #\$80 | Mask for data only |
| 86B | CD | A0 | 09 | CMP | \$09A0 | Compare to previous data |
| 86E | 8D | A0 | 09 | STA | \$09A0 | Store current data |
| 871 | F0 | 03 | | BEQ | \$0876 | Branch if current data = last data |
| 873 | 8D | 30 | C0 | STA | \$C030 | Toggle output |
| 876 | A0 | 0D | | LDY | #\$0D | Programable delay loop |
| 878 | 88 | | | DEY | | |
| 879 | D0 | FD | | BNE | \$0878 | |
| 87B | CA | | | DEX | | Decrement A/D counter |
| 87C | 30 | 02 | | BMI | \$0880 | Used only for initial value of zero |
| 87E | D0 | F6 | | BNE | \$0876 | Branch if A/D counter <> 0 |
| 880 | EE | 61 | 08 | INC | \$0861 | Increment data pointer's LSBs |
| 883 | EE | 67 | 08 | INC | \$0867 | |
| 886 | D0 | D8 | | BNE | \$0860 | Test for MSB increment |
| 888 | EE | 62 | 08 | INC | \$0862 | Increment data pointer's MSBs |
| 88B | EE | 68 | 08 | INC | \$0868 | |
| 88E | AD | 68 | 08 | LDA | \$0868 | |
| 891 | C9 | C0 | | CMP | #\$C0 | Test for the end of memory |
| 893 | D0 | CB | | BNE | \$0860 | Branch to next sample |
| 895 | A9 | 01 | | LDA | #\$01 | Restore pointers |
| 897 | 8D | 61 | 08 | STA | \$0861 | |
| 89A | 8D | 67 | 08 | STA | \$0867 | |
| 89D | A9 | 10 | | LDA | #\$10 | |
| 89F | 8D | 62 | 08 | STA | \$0862 | |
| 8A2 | 8D | 68 | 08 | STA | \$0868 | |
| 8A5 | 00 | | | BRK | | |

Need a Real-Time Multi-Tasking Executive for 8080 and Z80?

AMIX

CP/M®
Interface
Also Available

- Faultless operation proven in world wide use
- Truly hardware independent
- Optimized for fast interrupt response
- Minimal memory requirements
- ROMable for control applications
- Terminal Handler is CP/M BDOS compatible
- Console Driver supports Intel iSBC boards
- SYSGEN speeds user system configuring
- Program in PL/M, Fortran, Pascal or Assembler
- Source code included (Intel or Zilog mnemonics)
- Unlimited use licence agreement
- Complete documentation (available separately)
- Low cost



KADAK Products Ltd.

206-1847 West Broadway Avenue
Vancouver, B.C., Canada V6J 1Y5
Telephone (604) 734-2796

Dealer enquiries invited

CP/M is a trademark of Digital Research Corp.; RMX/80, iSBC are trademarks of Intel Corp.

enter project DBMS



CONDOR SERIES 20/DBMS is the answer to your data processing needs whether you're an experienced or first time computer user.

- ▶ Create data base files in minutes using screen formatting techniques.
- ▶ Access vital information using powerful English-like instructions
- ▶ Non-computer professionals can develop applications for accounting, personnel, inventory, work in progress, and more.

The Answer To:

- A General Ledger System
- An Inventory Control System
- A Purchase Order System
- A Data Tracking System
- A Personal Record Keeping System
- And many more applications.

in simple English instructions.

| | | |
|---------|---------|---------|
| APPEND | DIR | RENAME |
| CHANGE | DISPLAY | REORG |
| COMBINE | EMPTY | RESTART |
| COMPARE | ENTER | SAVE |
| COMPUTE | FORMAT | SELECT |
| COPY | HELP | SET |
| DATE | JOIN | SORT |
| DBMS | LIST | STAX |
| DEFINE | LOGDISK | SYS |
| DEGROUP | POST | TERM |
| DELETE | PRINT | TITLE |
| DESTROY | PROJECT | UPDATE |
| DIC | READ | WRITE |

AVAILABLE AT:

| | | |
|---------------------|-------------------|------------------|
| U.S. DEALERS | Niagara Falls, NY | Huntsville, AL |
| Ann Arbor, MI | Wilmington, DE | San Antonio, TX |
| Toledo, OH | Philadelphia, PA | Denver, CO |
| Detroit, MI | Bloomington, IN | Fort Collins, CO |
| Chicago, IL | Minneapolis, MN | Provo, UT |
| Milwaukee, WI | Iowa City, IA | Seattle, WA |
| Birmingham, MI | Quad Cities, IA | California |
| New York, NY | Birmingham, AL | |

DISTRIBUTOR OUTLETS
Microsource
Lifeboat Associates

FOREIGN DEALERS
Canada
Australia
England

CONDOR SERIES 20/DBMS is compatible with many Z-80 microcomputers with at least 48K RAM running under CP/M® operating systems.

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

CONDOR COMPUTER CORPORATION

P.O. Box 8318
Ann Arbor, Michigan 48107
(313) 769-3988

Dealer Inquiries welcome. M-481

CONDOR SERIES 20/DBMS

User's Manual (\$35, plus tax) Additional information.

Please Send To:

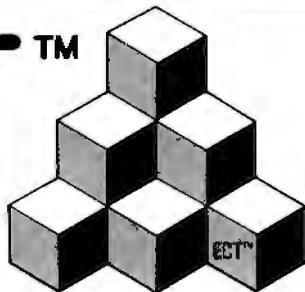
Name _____ Position _____

Company _____ Address _____

City _____ State _____ Zip _____

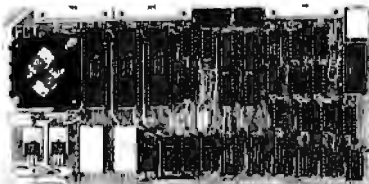
Phone () _____ Computer _____ CRT _____

ECT™



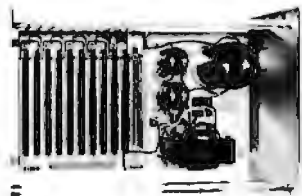
Building Blocks for Microcomputer Systems, Dedicated Controllers and Test Equipment.

**R²/I/O
S-100 ROM,
RAM & I/O
BOARD**



ECT's R²/I/O is an S-100 Bus I/O Board with 3 Serial I/O Ports (UART's), 1 Parallel I/O Port, 4 Status Ports, 2K of ROM with the 8080 Apple Monitor Program and 2K of Static RAM.

\$295.00



**RM-10
S-100
RACK MOUNT
CARD CAGE**

ECT's RM-10 is a rack mount 10 slot Card Cage with Power Supply, consisting of an ECT-100 rack mount Card Cage (19"W x 12.25"H x 8"D), the MB-10 Mother Board (with ground plane and termination) all 10 connectors and guides and the PS-15A Power Supply (15A @ 8V, 1.5A @ ± 16V).

\$295.00

Specializing in Quality Microcomputer Hardware

Industrial • Educational • Small Business • Personal

Card Cages, Power Supplies, Mainframes, CPU's, Memory, I/O, OEM Variations

ECT™ ELECTRONIC CONTROL TECHNOLOGY (201) 686-8080

763 Ramsey Ave., Hillside, NJ 07205

NEC™

does it again!



The NEC™ 8023 matrix printer outperforms every printer in its price range! Unbelievable? Do a comparison and see for yourself...

FEATURES:

- High Resolution Graphics: 144 x 160 dots/inch
- Proportional Spacing
- Lower Case Descenders
- 9 x N Dot Matrix
- 8 Character Sizes
- 5 Unique Alphabets
- Greek Character Set
- Graphic Symbols
- 100 CPS Print Speed
- Bidirectional, Logic Seeking Printing
- Adjustable Tractors
- Single Sheet Friction Feed
- Paper Empty Sensor
- Vertical & Horizontal Tabbing
- Bidirectional Paper Feed
- Bold & Underlined Print

Yes, once again NEC has engineered a superior printer as it did with the NEC Spinwriter.™ The 8023 MatrixPrinter is backed by the NEC warranty and complete support organization. To place an order, call Orange Micro or visit one of the Orange Micro Printer Stores.



Orange Micro
Inc.

SHERMAN OAKS STORE
13604 Ventura Blvd.
Sherman Oaks, CA 91423
(213) 501-3486

3150 E. La Palma
Suite G
Anaheim, CA 92806
(714) 630-3322
(800) 854-8275
TOLL FREE

ANAHEIM STORE
3150 E. La Palma, Suite I
Anaheim, CA 92806
(714) 630-3622



META TECHNOLOGIES



26111 Brush Avenue, Euclid Ohio 44132
CALL TOLL FREE 1-800-321-3552 TO ORDER
IN OHIO, call (216) 289-7500 (COLLECT)

1001 THINGS TO DO WITH YOUR PERSONAL COMPUTER

BY MARK SAWUSCH

333 pages \$7.95

333 pages, written in simple terms, of "what-to-do" and "how-to-do-it". Suitable not only for microcomputers, but for programmable calculators as well. Includes program listings, formulas, a glossary of computer terms and more! Definitely a MUST BUY!

A PARTIAL LIST OF APPLICATIONS

| | |
|---------------------------------|-------------------------|
| Real Estate Evaluation | Test Your Typing Speed |
| Astrology | Finances & Investments |
| Income Tax | Biorythm |
| Speed Reading | Energy Efficiency |
| Personality Test | Antenna Design |
| Statistical Analysis | Letter Writing |
| Logic Circuit Analysis | Recipe Index/Calculator |
| Carpenter and Mechanic's Helper | |
| General Purpose Clock Timer | |

"OTHER MYSTERIES" VOLUME III

by Dennis Kitsz

Call now and place your order for this new book, "THE CUSTOM TRS-80™ & OTHER MYSTERIES", from IJG, Inc. More than 300 pages, with over 60 photographs, of projects for the hardware hobbyist. Includes schematics, PC layouts, software driver code, etc. for such do-it-yourself undertakings as high resolution graphics, reverse video, real-time clock/calender, music synthesis, ROM/RAM additions and more!

THE CUSTOM TRS-80™ \$29.00
CALL FOR AVAILABILITY

MICROPARAPHERNALIA

NEWDOS by APPARAT

NEWDOS/80 by Apparat \$139.95
 NEWDOS UPGRADE CALL
 NEWDOS + with ALL UTILITIES

| | |
|----------------|---------|
| 35-track | \$69.95 |
| 40-track | \$79.95 |

BOOKS

TRS-80™ DISK
 AND OTHER MYSTERIES .. \$19.95
 MICROSOFT™ BASIC DECODED \$29.95

META NOTATIONS. . .

MTC introduces its FREE computer "bulletin board" service. Set up your terminal or terminal software for 300 baud, parity disabled, 8-bit word length, and 1 stop bit. Dial (216) 289-8689. After the connection is established, type LOGIN META. When asked for a validation code, type META. Have fun!

In a couple of months MTC will introduce the successor to AIDS-III/CALCS. It is called AIDS/P™ and is based on MTC's PRIMAL™ (Practical Relational Information Management Applications Library), a powerful system for PRIME minicomputers. AIDS/P features the best of the critically acclaimed AIDS-III/CALCS but is probably an order of magnitude beyond it in power. It will be first made available to AIDS-III/CALCS owners (for an upgrade charge), then to the general public. Price will be in the \$200-\$300 range.

Effective September 1, 1981, Metatronics Corporation became a subsidiary of MTC. Metatronics will carry the complete MTC product line in addition to its own. Order processing and fulfillment departments have been combined to improve service response levels. MTC's superior software and supplies marketing, and Metatronics exceptional peripheral offerings should prove to be a formidable combination. (Sorry guys, if you can't beat us, join us. . .)

MTC now offers a more complete selection of diskette products (ad deadlines prevented inclusion in anything but this column). New manufacturers are MAXELL and 3M. Definitely call for specific information. For example, MAXELL Brand 5 1/4" diskettes in a PLASTIC LIBRARY CASE are only \$34.95 for a box of 10! SCOTCH Brand diskettes are comparably value-priced. MTC is also introducing its own PARAGON™ Brand media products. The intent is to offer a super-high quality product at a very competitive price. For example, a box of 10 single-sided, soft-sector, double-density, 100% certified diskettes with HUB RINGS is only \$24.95! A full line of products (including HEAD CLEANING KITS, etc.) will be offered. The PLAIN JANE™ (almost 200,000 units sold) diskette line will become part of the PARAGON™ MAGNETICS operation (but don't quote us verbatim).

Let your TRS-80™ Test Itself With THE FLOPPY DOCTOR & MEMORY DIAGNOSTIC

by David Stambaugh

A complete checkup for your MODEL I or MODEL III. THE FLOPPY DOCTOR-Version 3 completely checks every sector of single or double density 35-, 40-, 77-, or 80-track disk drives. Tests motor speed, head positioning, controller functions, status bits and provides complete error logging. THE MEMORY DIAGNOSTIC checks for proper write/read, refresh, executability and exclusivity of all address locations. Includes both diagnostics and complete instruction manual.

SYSTEM DIAGNOSTICS . \$24.95
For MODEL III \$29.95

Single Sided, Soft-Sector 5 1/4-inch,
(for TRS-80™) Mini-floppy

DISKETTES

\$19.95
box of 10

PLAIN JANE™

These are factory fresh, absolutely first quality (no seconds!) mini-floppies. They are complete with envelopes, labels and write-protect tabs in a shrink-wrapped box.

PLAIN JANE™ Diskettes \$19.95

PLAIN JANE™ Gold

Introducing MTC's premium generic diskette. Single-Sided, Soft-Sector, DOUBLE-DENSITY, 5 1/4-inch diskettes with reinforcing HUB-RINGS. Individually 100% ERROR-FREE certified. Invest in GOLD!

PLAIN JANET™ Gold \$24.95

VERBATIM'S PREMIUM DISKETTES

DATALIFE™

Seven data-shielding improvements mean greater durability and longer data life. These individually, 100% error-free certified diskettes feature thicker oxide coating, longer-lasting lubricant, improved finer, superior polishing and more! Meets or exceeds IBM, Shugart, ANSI, ECMA and ISO standards.

VERBATIM DATALIFE™ DISKETTES

5 1/4-inch (box of 10)
 MD525-01 \$26.95
 10 boxes of 10 (each box) \$25.95

8-inch FLOPPIES

Double-Density, FD34-8000 . \$43.95

'RINGS' & THINGS

HUB RING KIT for 5 1/4" disks. \$10.95
 HUB RING KIT for 8" disks. \$12.95
 REFILLS (50 Hub Rings) \$ 5.95
 CLEANING KIT for 5 1/4" drives . \$24.95
 5 1/4-inch diskette case \$3.50
 8-inch diskette case \$3.95

5 1/4-inch File Box for
50 diskettes \$24.95

8-inch File Box for
50 diskettes \$29.95

TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation. DATALIFE is a trademark of VERBATIM. PLAIN JANE, AIDS-I, AIDS-III, CALCS-III, CALCS-IV, MERGE-III are trademarks of MTC.
© 1981 by Metatechnologies Corporation, Inc.

MOST ORDERS SHIPPED WITHIN ONE BUSINESS DAY

Products damaged in transit will be exchanged.

PRICES IN EFFECT Nov. 1, 1981 THRU November 30, 1981,
Prices, Specifications, and Offerings subject to change without notice.

8111

WE ACCEPT

- VISA
- MASTER CHARGE
- CHECKS
- MONEY ORDERS
- C.O.D.

- Add \$3.00 for shipping & handling
- \$3.00 EXTRA for C.O.D.
- Ohio residents add 5 1/2% sales tax.

What's New?

PERIPHERALS



Computer-Driven Typewriter

The Bytewriter operates as a letter-quality printer and as an office typewriter without any attachments. The self-contained mechanism uses electromagnetic actuators to interrupt the motion of a set of levers driven by a Smith-Corona 8000 office typewriter's motor. A microprocessor controls the operation of the Bytewriter and provides an automatic self-test.

The Bytewriter costs \$795. For more information, contact Bytewriter, 125 Northview Rd, Ithaca NY 14850, (607) 272-1132.

Circle 501 on inquiry card.

Silentype Thermal Printer

The Silentype thermal printer offers 80-column, draft-quality copy and the ability to print high-resolution graphics. The Silentype can be used with Apple II, II Plus, and III microcomputers. It prints upper- and lowercase text at up to 40 cps (characters per second). Graphics characters are printed at 60 dots per inch. Standard heat-sensitive paper is used instead of aluminized rolls. With the Apple III, type styles can be specified.

The Silentype printer costs \$395. For more information, contact Apple Computer Inc, 10260 Bandley Dr, Cupertino CA 95014, (408) 996-1010.

Circle 502 on inquiry card.

IBM or Apple?

The Apple II will soon have available for it an 8088 microprocessor card that will enable it to run software for the 8088/86 family. The 8088 is the same microprocessor used in the new IBM Personal Computer. The MetaCard is a secondary processor card featuring a 5 MHz 8088; 64 K bytes of programmable memory with parity checking, expandable to 128 K; 2 K bytes of ROM (read-only memory), expandable to 8 K; an external bus connector for expansion to 384 K bytes of memory; a real-time clock interrupt for multitasking; provisions for 8087 floating-point support; full-speed concurrent processing by both the 8088 and the Apple's 6502; interrupts in both directions be-

tween processors; and access to the Apple's memory by both processors. In most applications when the MetaCard is active, the 6502 will be used as an I/O (input/output) processor.

For software, CP/M-86 will be included. MP/M-86 and UCSD Pascal 4.0 will also be offered for multitasking purposes. The MetaCard can directly address up to one half megabyte of memory. Software that will run under CP/M-86 will run on the MetaCard including software for the IBM Personal Computer. The price for the MetaCard, which will occupy one of the Apple slots, is \$980. Contact Metamorphic Microsystems, POB 1541, Boulder CO 80306, (303) 499-6502. Circle 503 on Inquiry card.

TRS-80 Model III Light Pen

The 3G Light Pen lets you bypass the TRS-80 Model III's keyboard and act directly on the information on the video display. It is fully assembled and comes with a demonstration game cassette, sample program, and manual. The pen sells for \$39.95 and is available from 3G Company Inc, Rt 3, Box 28A, Gaston OR 97119, (503) 662-4492.

Circle 577 on Inquiry card.

Inexpensive Modem

The Model 1080 VersaModem offers the ability to converse with information utilities such as The Source, CompuServe, Dow Jones, computerized bulletin boards, and university computers. The direct-connect VersaModem operates at 300 bps (bits per second) using Bell standard 103 protocol and connects to your terminal or computer through an RS-232C serial port. The VersaModem costs \$119. For details, contact Bizcomp Corporation, POB 7498, Menlo Park CA 94025, (415) 966-1545.

Circle 504 on Inquiry card.

Where Do New Products Items Come From?

The information printed in the new products pages of BYTE is obtained from "new product" or "press release" copy sent by the promoters of new products. If in our judgment the information might be of interest to the personal computing experimenters and homebrewers who read BYTE, we print it in some form. We openly solicit releases and photos from manufacturers and suppliers to this marketplace. The information is printed more or less as a first-in first-out queue, subject to occasional priority modifications. While we would not knowingly print untrue or inaccurate data, or data from unreliable companies, our capacity to evaluate the products and companies appearing in the "What's New?" feature is necessarily limited. We therefore cannot be responsible for product quality or company performance.

What's New?

PERIPHERALS

Tractor-Feed Conversion

The Model 16 Fanfold Feeder allows continuous-form paper to be used with IBM Selectrics and other typewriters or printers. It maintains continuous-form alignment, installs easily, and requires no electrical or mechanical connections. The adjustable-width tractors accept form widths of up to 16½ inches and can be used with single- or multiple-part forms. The price for the Model 16 Fanfold Feeder is \$149.95. Contact McAnn Company, POB 3173, San Mateo CA 94403, (415) 349-1229.

Circle 505 on Inquiry card.

12-Inch Green-Phosphor Monitor

The Video-300 monitor features a 12-inch screen, 18 MHz bandwidth, and a resolution of 1000 scan lines at the center and 800 at the corner. Its green-phosphor display cuts down annoying reflection and glare. The monitor weighs 17 pounds and measures 29 by 37 by 34 cm (11¾ by 14½ by 13¾ inches). The suggested retail price for the Video-300 monitor is \$249 from Amdek Corporation, 2420 E Oakton St, Suite E, Arlington Heights IL 60005, (312) 364-1180. Amdek was formerly known as Leedex Corporation.

Circle 507 on Inquiry card.

Expand the TRS-80

The MDX-1 and -2 expansion interface boards are hardware- and software-compatible with the TRS-80 Model I computer. They feature 32 K bytes of memory expansion, provisions for a 2 K- or 4 K-byte EPROM (erasable programmable read-only memory), a direct-connect, 300-bit-per-second modem, a serial port, a parallel port, a dual-cassette option, and hardware for a real-time clock. The MDX-2 also has a floppy-disk controller. The MDX-2 bare board costs \$74.95, and the MDX-1 costs \$64.95. Manuals are \$5.95. Parts kits and cabinets are available. Contact Micro-Design, POB 748, Manchaca TX 78652, (512) 282-0225.

Circle 509 on Inquiry card.

TRS-80 Telecommunications

The Connection offers telecommunications capabilities on Model I TRS-80s with or without an expansion interface. This direct-connect modem eliminates noise and data loss or distortion. The unit features an RS-232C I/O (input/output) port and runs at 300 bps (bits per second) in duplex or simplex modes. It can be connected to two-way radios and can provide computer-to-computer communications over the air. Software, documentation, a list of on-line bulletin boards, and operating procedures are included with the Connection. It is available for \$249 from the Microperipheral Corporation, 2643 151st PI NE, Redmond WA 98052, (206) 881-7544.

Circle 508 on inquiry card.

1200 BPS Direct-Connect Modem

The CM2020 is a 1200-bit-per-second single-card modem that saves valuable workspace because it measures only 30 square inches. Using a microprocessor-based design, auto-dialing, self-testing, and auto-answering are made available on the modem. Other features include self-testing or testing via the terminal, frequency-sensitive carrier-detect circuitry that will not trigger data-carrier detect unless there is true in-band carrier energy present, Bell 202S-compatibility, and selectable call origination that supports auto-dialing, dial-through, and conventional dialing. The CM2020 modem costs \$200, in 50-unit lots. For details, contact InterTel, 6 Shattuck Rd, Andover MA 01810, (617) 681-0600.

Circle 508 on inquiry card.

Epson MX-100

The 136-column MX-100 dot-matrix printer uses matrices that range from 9 by 9 to 18 by 18 dots. It can print 12 different character weights and sizes. The printer also features Epson's disposable print head and GRAF-TRAX, a high-resolution bit-image graphics capability. Using paper 15½ inches wide, the MX-100 can print up to 233 columns in the condensed-print mode. Bidirectional printing at 80 cps (characters per second) can be accomplished by using its logic-seeking function.

The printer comes with a friction paper feed and adjustable tractors on a removable tractor mechanism. The suggested retail price for the MX-100 is \$995. For details, contact Epson America Inc, 23844 Hawthorne Blvd, Torrance CA 90505, (213) 378-2220.

Circle 510 on inquiry card.

What's New?

PERIPHERALS

High-Resolution Light Pen for the Apple

The LPS II light pen makes use of the Apple II's 280- by 192-pixel resolution. Applications such as computer-aided design, menu selection, graphics, circuit analysis, word processing, and game playing can benefit from the LPS II. It is compatible with all available languages. It works at a 60 Hz rate, which allows true animation and drawing. When the video beam passes on the screen, the LPS II uses video-synchronization information to determine the pen's location. The LPS II is available for \$285 from Gibson Laboratories, Bldg 10, 406 Orange Blossom, Irvine CA 92714, (714) 559-8727.

Circle 511 on inquiry card.

Housing for Disk Drives and Video Display

The Super Card Cage V1 includes a four-slot Multibus motherboard and space for mounting two 8-inch floppy-disk drives, a video monitor, a switching power supply, and a separate keyboard enclosure. The unit is predrilled for a fan, connectors, fuse, power cord, and power switch. Optional configurations accommodate up to six Multibus cards or a six-slot S-100 bus, an eight-slot Q-BUS, or twelve-slot STD-BUS motherboards. The Super Card Cage V1 costs \$495. Contact Psytek Inc, 1900 Pickwick Ave, Glenview IL 60025, (312) 729-3200.

Circle 513 on inquiry card.

Tractor-to-Friction-Feed Conversion

The Paper Tractor enables a tractor-feed printer to print with single-sheet paper. The device is made of sheet plastic into which standard or letterhead paper is inserted. The Paper Tractor is then fed into the tractor-feed printer, where it carries the paper into the print area. It can be used on front-, back-, and dual-tractor-feed printers and with Epson, Paper Tiger, GP-80M, and other popular printers. The device sells for \$19.50 and is available from Paper Tractor, POB 4218, Santa Barbara CA 93103, (800) 235-6967; in California (805) 966-5448.

Circle 515 on inquiry card.

2-Megabyte 5-Inch Floppy-Disk Drives

The Megafloppy 1117 family of floppy-disk drives offers up to 2 megabytes of storage in a single 5-inch drive. There are two single- and two double-sided drives using 96- or 100-track-per-inch double-track technologies in this family of floppy-disk drives. Data-recording density is 12,000 bits per inch. The 1117 provides 6 ms track-to-track positioning speed with transfer rates of 600,000 bps (bits per second). The drives are compatible with industry-standard interfaces, mounting dimensions, and bezels. Double-sided models provide 2.175 and 2.025 megabytes of formatted storage, and single-sided versions offer 1.2 and 1.125 megabytes. For pricing and availability, contact Micropolis Corporation, 21329 Nordhoff St, Chatsworth CA 91311, (213) 709-3300.

Circle 512 on inquiry card.

Plug-A-Bubble

The Plug-A-Bubble system features removable bubble-memory cassettes designed for harsh environments or critical data-storage applications. The system consists of a 128 K-byte bubble-memory cassette and holder. A chassis, containing two holders and an interface card, fits in the same space as a 5-inch floppy-disk drive. The cassette and holder can be designed to interface with any system.

Each Plug-A-Bubble cassette has a 48 ms average access time and requires +5 and +12 V at 8 W for operation. Also available is a development kit that includes the bubble circuits, a prototyping board, and instructions for designing bubble systems. For information about memory-system products, contact Intel Corporation, 1302 N Mathilda Ave, Sunnyvale CA 94086, (800) 538-1876; in California (408) 734-8102.

Circle 514 on inquiry card.

Graphics and Photography System

The Professional Graphics System can generate graphics on large-screen televisions. Also, it can perform video titling and graphics on tape or simulate a General Electric Genegraphics system for the production of 4- by 5-inch transparencies, 35 mm slides, or Polaroid prints using the screen printer from Image Resource Corporation of Palo Alto, California. Professional Graphics can transfer any display from an Apple II's high-resolution screen and output it as full NTSC (National Television Standard Code) video with interlace and meet SMPTE (a time code broadcasting standard) criteria.

The Professional Graphics System runs on a 48 K-byte Apple II or Apple II Plus, with a disk drive. It costs \$2950. Contact Symtec, 15933 W Eight Mile Rd, Detroit MI 48235, (313) 272-2950.

Circle 516 on inquiry card.

What's New?

SOFTWARE

More FORTH

Nautilus Systems is marketing a cross-compiler program for FORTH. It automatically forward references any word or label. It can produce headerless code and ROMable (read-only memory) code with initialized variables. This cross-compiler has a load map as well as a full list of undefined symbols.

Machine-readable versions of the cross-compiler program are available for CP/M, TRS-80 Model I, Heath H-89, and North Star computers. Each includes an executable version of fig-FORTH 1.0, the cross-compiler source code, and documentation. The price for the program is \$200 from Nautilus Systems, POB 1098, Santa Cruz CA 95061, (408) 475-7461.

Circle 517 on inquiry card.

VT-100 Terminal Emulator Program

ABT VT-100 is a Pascal program that uses the Videx 80-column card and the Apple communications card to emulate a Digital Equipment Corporation VT-100 terminal. It recognizes all the ANSI (American National Standards Institute) and VT-52 escape sequences. When used with Apple Pascal, this program can transmit Pascal text files from the Apple to another computer. Not all of the VT-100 features are offered.

The ABT VT-100 program costs \$495. For more information, contact Advanced Business Technology Inc, 12333 Saratoga-Sunnyvale Rd, Saratoga CA 95070, (408) 446-2013.

Circle 519 on inquiry card.

Custom-Design Your Own Character Sets

The Code Works has two programs to help Atari users design their own character sets. With the Fontedit program, users can create the Russian alphabet, APL characters, or special-purpose graphics symbols. Together with Fontedit, the Knotwork program assists users in designing patterns of Celtic Interlace, a technique used by seventh-century Irish monks to illustrate manuscripts. Both programs run on Atari microcomputers. They are available together for \$15.95 on cassette or \$18.95 on disk. Contact the Code Works, POB 550, Goleta CA 93116, (805) 683-1585.

Circle 521 on inquiry card.

Software for the TRS-80 Voice Synthesizer

SAYIT is a program for TRS-80 Model I Level II computers with or without disk drives. SAYIT allows the Radio Shack Voice Synthesizer to add voice output to BASIC programs. SAYIT adds a SAY command to BASIC that makes the synthesizer speak string or numeric expressions or a combination of the two. Arithmetic expressions are also correctly verbalized. Phonetic spelling can be used to make difficult words intelligible. A talking keyboard feature echoes each key struck and can be switched on or off from BASIC. The program can also be used in experiments using the International Phonetic Alphabet and phonetic strings. SAYIT costs \$125, including a manual. Contact Baysik Speech, Suite 289, 1259 El Camino Real, Menlo Park CA 94025.

Circle 518 on inquiry card.

WordStar for Z-89

The WordStar word-processing program is now available for the Zenith Model Z-89 microcomputers. WordStar allows users to print and edit simultaneously and has a tab feature that automatically lines up decimal points in columns. A hyphen-help feature asks users whether to insert a hyphen at the end of certain lines. Boldface, double strike, strikeout, subscript, superscript, overprint, and accent entry commands are also included. WordStar can interrupt itself, execute another program, and return. It will run on CP/M-based Z-89 or Heath H-89 computers with 48 K bytes of memory, but the simultaneous printing and editing feature requires 64 K bytes. The price for WordStar is \$395. Contact your Heath/Zenith dealer or write Zenith Data Systems, 1000 Milwaukee Ave, Glenview IL 60025, (312) 391-8181.

Circle 520 on inquiry card.

Electronic Mail for Apple Users

Micro-Courier allows Apple II owners to transmit data to other computers over telephone lines. Transmissions can be sent automatically at a cost of less than \$0.25 for 1000 words of text. The system also maintains telephone lists and sorts messages by individual users. Micro-Courier costs \$250.

Micro-Telegram allows Apple users to access Western Union services and to send and receive teletypewriter exchange, Telex, and international cables. Apple users can access stock, foreign exchange, gold, and futures information, as well as sports reports and ski conditions from the Western Union data base. Micro-Telegram costs \$250. For more details, contact Microcom, 89 State St, Boston MA 02109, (617) 367-6362.

Circle 522 on inquiry card.

What's New?

SOFTWARE

The Micro Link

The Micro Link program lets computer users communicate with each other over telephone lines. Files can be prepared in advance and transmitted automatically. The program features a word-wrapped display fitted to any screen width. The Micro Link can scan The Source, data bases, and computerized bulletin-board systems and record segments of the displays. The Micro Link can serve as a host for another computer or a terminal, so it only needs to be present at one end. The program supports originate and answer modes, full- and half-duplex, and operates at standard data rates. Files can be transmitted in character-, line-, or memory-block protocol. To run, Micro Link needs a Z80- or 8080-based computer with a serial port and modem, 16 K bytes of programmable memory, and the Micropolis disk operating system or CP/M 1.4. The program comes on 16-sector, 5- or 8-inch disks. The price is \$89 from Wordcraft, c/o Microcomputer Software Associates, 1122 B St, Hayward CA 94541, (415) 534-2212.

Circle 523 on Inquiry card.

FORTH for OSI

S-FORTH is a full implementation of fig-FORTH that runs on all Ohio Scientific (OSI) disk-based computers, from the C1P to the C3. It includes an editor, a virtual-memory disk subsystem, and compatibility with OS65D commands.

S-FORTH is available on either 5- or 8-inch floppy disks for \$34.95 or for \$49.95 including the source listing. Contact Aurora Software Associates, POB 99553, Cleveland OH 44199, (216) 221-6981.

Circle 524 on Inquiry card.

Program for Property Brokers

The Income Property Analysis System (IPAS) is a system of programs for investors, syndicators, and brokers of income properties. With IPAS, the before- and after-tax cash flows of income properties can be analyzed. Provisions are made for handling multiple notes with straight or negative amortization, interest-only notes, or wraparound notes. The program can also be used to analyze rates of return for income property that is already owned. A separate program allows the investor to project after-tax rates of return for up to 10 years, using individual inflation rates for income, expenses, and appreciation of the property value.

The IPAS runs on a TRS-80 Model I or Model III with at least one disk drive and 32 K bytes of memory. The price is \$225. A manual can be purchased separately for \$5. For details, contact Advanced Business Microsystems, 5801 Marvin D Love Fwy, Suite 103, Dallas TX 75237, (214) 339-2109.

Circle 525 on Inquiry card.

Automatic Graphing of Functions

Automatic Graphing of Functions lets users graph equations in the form $y = mx + b$ and $y = f(x)$. It can graph formulas, multiple equations, summation, sine, cosine, and more. The axis is automatically scaled for the size of the screen display. The program has manual or automatic range selection. It is available for the TRS-80 Model I Level II and the Model III. The cassette and manual cost \$19.95 from David L Modney, 4144 N Via Villas, Tucson AZ 85719.

Circle 526 on Inquiry card.

Telecommunications for the AIM-65

The MDA 2.2 program allows the AIM-65 to function as a full-duplex terminal for communication with a timesharing system or host computer. Utilities are provided for saving and loading BASIC programs or object files through the terminal simulator at speeds up to 2400 bps (bits per second). MDA 2.2 is available in EPROM (erasable programmable read-only memory) along with a source-code listing and manual for \$50. Contact Thorson Engineering Company, 6225 76th St S E, Snohomish WA 98290, (206) 334-4214.

Circle 527 on Inquiry card.

Dial-Up Software for Your Apple

Online will allow you to call your computer while you're away from home or let your computer take messages in the form of a private message system. It requires a 48 K-byte Apple II Plus with the Hayes Micromodem and at least one disk drive. Up to 50 user accounts, which require an account number and a password for log-in, can be set up. A guest account can also be arranged. Each account can be assigned different priority levels that determine which features or areas of the system may be accessed by that account. This makes Online useful for clubs or businesses that pass many messages and need privacy and security. The program handles mail between accounts and supports auto reply, read again, and delete modes. Online costs \$89.95 from Southwestern Data Systems, POB 582, Santee CA 92071, (714) 562-3670.

Circle 528 on Inquiry card.

What's New?

SYSTEMS

Hewlett-Packard's New Business Computer

Hewlett-Packard's new desktop business computer, the HP 125, is designed for business managers and professionals. It is especially useful for financial decision making, planning, and analysis. The HP 125 provides word-processing and management communications capabilities. It can be used as a remote terminal to an HP 3000 network, or it can be connected to a mainframe computer through dual RS-232C ports, at speeds up to 9600 bps (bits per second).

The HP 125 has twin Z80A microprocessors, 64 K bytes of memory, and a separate terminal processor. Most functions are performed by the use of eight "soft keys," whose functions are labeled on the screen. Editing keys are standard on the HP 125, as is the ability to store five pages of displayed information.

The CP/M operating system is employed, and Hewlett-Packard has already created five packages for the system: VisiCalc/125, Graphics/125, Word/125, BASIC/125, and LINK/125. The programs range in price from \$125 to \$500 and are designed exclusively for businesses and programmers using the HP 125 and CP/M.



There are two HP 125 modules from which to choose: the Model 10 and the Model 20. The Model 10 uses dual 5-inch floppy-disk drives with 500 K bytes of storage. The Model 20 offers 2.4 megabytes of memory on 8-inch disks. Both models can be expanded with additional drives.

The HP 125 systems start at \$7460 for the dual 5-inch drives, two RS-232C ports, and an 80-character-per-second thermal printer. Contact the Inquires Manager, Hewlett-Packard, 1507 Page Mill Rd, Palo Alto CA 94304, (415) 857-1501.

Circle 529 on Inquiry card.

8086 Boards for the S-100

The Tec-86 is a 16-bit, 8086, S-100 microcomputer system. It includes vectored interrupts, 64 K bytes of dynamic memory (or 32 K bytes of static memory) that are expandable to 1 megabyte, two RS-232C ports, three 8-bit parallel ports, an EPROM (erasable programmable read-only memory) boot for CP/M-86, a double-

density floppy-disk controller; dual 8-inch Shugart floppy-disk drives, a metal enclosure, a power supply, and cabling. Software for the Tec-86 includes CP/M-86, Pascal/86, and Microsoft BASIC-86.

The Tec-86 costs \$3990. For details, contact Tecmar Inc, 23600 Mercantile Rd, Cleveland OH 44122, (216) 464-7410.

Circle 530 on inquiry card.



What's New?

MISCELLANEOUS

64 K-Byte Memory Card for Apple II

Legend Industries Ltd's 64 K-byte programmable-memory board for the Apple II switches 16 K-byte banks of memory over the Apple's ROM (read-only memory) address space. The board is fully compatible with the Apple Language Card. Refresh signals are taken from the Apple motherboard by removing a 4116 memory circuit and inserting a jumper into the socket. The 4116 is then reinserted onto the 64 K-byte board. The board is priced at \$300. For details, contact Legend Industries Ltd, POB 112, Pontiac MI 48056.

Circle 531 on Inquiry card.

Dynamic-Memory Evaluation Kit

A 64 K-byte Dynamic RAM Evaluation Kit to aid designers in evaluating the MCM6665 HMOS (high-speed metal-oxide semiconductor) programmable memory is available from Motorola's IC Division. The kit is comprised of ten 200 ns MCM6665L20 integrated circuits, a manual request coupon, two data sheets, a Motorola memory selector guide, and a notebook for the designer, and costs only \$150. Contact Motorola IC Division, 3501 Ed Bluestein Blvd, Austin TX 78721, (512) 928-6660.

Circle 533 on Inquiry card.

CBASIC/86 for CP/M-86 Systems

CBASIC/86 supports the complete CBASIC language for systems running under CP/M-86. It allows programs written in CBASIC for 8080- and Z80-based systems to be transferred to 8086-based systems without modification. Configured as a CP/M-86 compact-memory model, the system supports a full 64 K bytes of memory for both data and code segments. The suggested retail price is \$325 from Compiler Systems Inc, 37 N Auburn Ave, POB 145, Sierra Madre CA 91024, (213) 355-1063.

Circle 535 on Inquiry card.

COMMLOG

COMMLOG is designed to work with the Apple II and the Hayes Micromodem II. It transforms the combination into a "smart telephone" that displays approximate long-distance time and charges while you talk. It has a built-in calendar routine for logging the day and date. After a call, the person called, duration, date, time, and charges are logged to the disk. Cumulative charges for the month are displayed. COMMLOG has charge codes for attributing calls to different persons or office divisions. It allows standard or military time, and handles holiday rates. COMMLOG has file-maintenance functions for editing, printing, and initializing an auto-dial directory. The program works on an Apple II with 48 K bytes of memory plus Applesoft in ROM (read-only memory). The cost is \$39.95 from Harvey's Space Ship Repair, POB 3478, Las Cruces NM 88003, (505) 522-1482.

Circle 532 on Inquiry card.

In-Circuit Emulator for S-100 Bus

The MICE-48 emulator for the 8048 family of single-circuit microcomputers is S-100-bus-compatible. It can emulate Intel, or equivalent 8035, 8039, 8048, 8049, and 8748 parts; National 8040 and 8050 parts; plus CMOS (complementary metal-oxide semiconductor) versions. MICE-48 runs under CP/M and features trace, unlimited number of breakpoints, display/modify of program memory, external programmable memory, registers, input/output ports, and flags. A mapping command allows the user to map program memory to PROM/EPROM (programmable read-only memory/erasable PROM) or to the emulator's memory.

The MICE-80 emulator, supporting software, and an 8048 macroassembler cost \$950. Contact Signum Systems, 726 Santa Monica Blvd, 217, Santa Monica CA 90401, (213) 451-5382.

Circle 534 on Inquiry card.

Unlimited Storage for Local Networks

Your local Cluster/One Model A microcomputer network for the Apple II can now have virtually unlimited file storage with the addition of the Version 1.1 File Server from Nestar Systems Inc. Version 1.1 includes a real-time clock/calendar, turnkey applications support, new file-access synchronization modes, and support of DOS 3.3 and Apple Pascal 1.1. It offers a 30% increase in disk speed, and allows 80 concurrently open files.

The Network File Server, Version 1.1 is being shipped with all new Cluster/One Model A orders. Current installations can be upgraded in the field for a one-time fee. Software and hardware supplements to the Server permit a network of up to 65 Apple II computers to access disk memory in 16.5-, 33-, or 66-megabyte increments. For complete details, contact Nestar Systems Inc, 2585 E Bayshore Rd, Palo Alto CA 94303, (415) 493-2223.

Circle 536 on Inquiry card.

What's New?

MISCELLANEOUS

Simple Video-Display Timer and Controller

The CRT 5047 preprogrammed video-timer and controller integrated circuit is designed for the video-control function in display terminals. It is especially effective for terminals that use 80 by 24 display formats with a 5 by 7 dot-character matrix, although it can be preprogrammed for other display formats.

The CRT 5047 uses a fixed ROM (read-only memory) program that eliminates the software required to specify the display parameters. A two-integrated-circuit combination of the CRT 5047 and the CRT 8002B-003, a video-display-attributes controller, provides all of the electronics for a video terminal. In 100-unit lots, the CRT 5047 costs \$18. For more information, contact Standard Microsystems, 35 Marcus Blvd, Hauppauge NY 11787, (516) 273-3100.

Circle 537 on Inquiry card.

FIFO from Programmable Memory

The 8X60 FIFO RAM Controller is an integrated circuit that converts programmable-memory circuits into FIFO (first-in, first-out) buffer memories. With it, two asynchronous systems can be interconnected for buffered-data transfer rates exceeding 8 MHz.

The 8X60 provides up to a 12-bit address to a user-selected programmable memory of the desired data width. FIFO depth is selectable to one of four values: 64, 256, 1024, and 4096. Logic is contained within the 8X60 to eliminate contention between read and write operations. Inputs and outputs are standard TTL (transistor-transistor logic), and all address outputs are tri-state. Specifications and pricing are available from Signetics, 811 E Arques Ave, POB 409, Sunnyvale CA 94086, (408) 739-7700.

Circle 539 on Inquiry card.

IEEE-488 Interface for the Apple

The IEEE-488 interface card enables Apple II and Apple II Plus computers to monitor production lines, record and evaluate data, run test equipment, and interface with any apparatus compatible with the IEEE-488 bus. Voltmeters, spectral analyzers, disk drives, and speech synthesizers can be controlled by this card. Also, it can be used to attach non-IEEE-488-compatible peripherals to the bus. The card can be driven by Applesoft or Integer BASIC or any Apple II-supported language. Up to three cards can be installed in the Apple, allowing control of as many as 42 instruments.

The IEEE-488 card costs less than \$500. It is available from Apple Computer Inc, 10260 Bandley Dr, Cupertino CA 95014, (408) 996-1010.

Circle 541 on Inquiry card.

Single-Circuit CMOS Microcomputers

The Series 80 family of CMOS (complementary metal-oxide semiconductor) single-circuit microcomputers is composed of four microcomputer circuits, peripheral circuits, and a development-support system. The series operates on ISIS- or CP/M-based systems. Series 80 corresponds to the 8048/8049-type NMOS (n-type MOS) devices. In addition to the 8048/8049 instructions, 13 other instructions are offered, including two types of HALT and three types of FLOAT instructions. Eight instructions implement port moves and indirect-decrement functions.

Among the Series 80 family is a development tool, the MPB800,

which is an evaluation board that provides real-time emulation and debugging features. Also, there is the MSM80C48 microprocessor, which offers 1 K bytes of ROM (read-only memory) and 64 bytes of programmable memory, and the MSM80C49, which offers twice the memory contents of the C48. Both units feature a timer/event counter, single-level interrupts, 110 instructions, and operate from 5 V \pm 10% supply voltage with full TTL (transistor-transistor logic) compatibility. For more information on these products, contact OKI Semiconductor, 1333 Lawrence Expy, Suite 401, Santa Clara CA 95051, (408) 984-4842.

Circle 540 on Inquiry card.

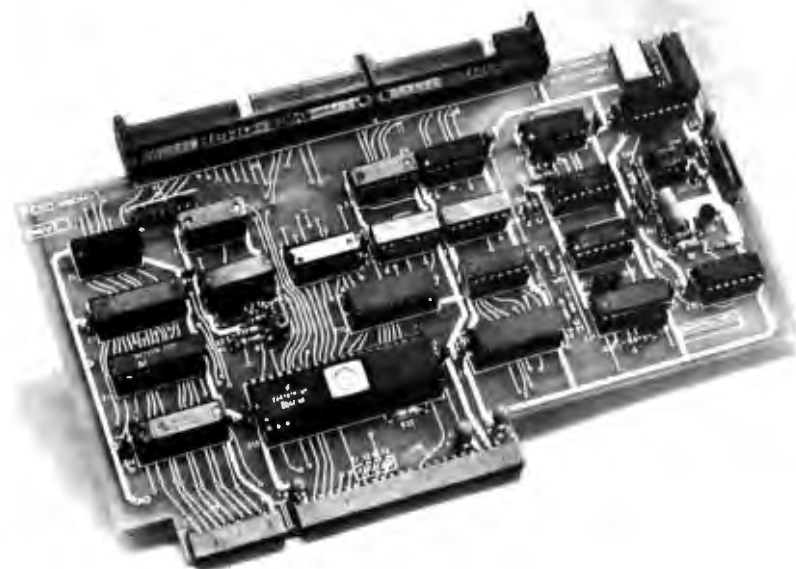
ZX80 Enhancements

Sinclair Research Ltd has an 8 K-byte extended BASIC ROM (read-only memory) and a 16 K-byte programmable memory-expansion module for its ZX80 microcomputer. The extended BASIC features 37 new functions that can be programmed by single key strokes, extended and improved graphics, floating-point arithmetic to 9-digit accuracy, and log and trig functions with their inverses. The BASIC ROM costs \$39.95, which includes a new keyboard and a manual. The 16 K-byte expansion plugs onto the back of the ZX80. It costs \$99.95. For more information, contact Sinclair Research Ltd, One Sinclair Pl, Nashua NH 03061, or call operator 508 at (800) 543-3000.

Circle 542 on Inquiry card.

What's New?

MISCELLANEOUS



Controller Board for Heath Systems

Users can double the 5-inch floppy-disk storage capacity of Heath 88/89 microcomputers with the FDC-880H floppy-disk-controller board from CDR Systems Inc. The board runs under CP/M 2.2 and is capable of handling as many as four Shugart-compatible 5- or 8-inch drives simultaneously. In addition, the FDC-880H handles single- and double-sided operation and single- and double-density data.

The board converts 5-inch hard-sectored disks to soft-sectored double-density.

The FDC-880H unit is supplied with a cable, zero-origin conversion PROM (programmable read-only memory), boot PROM with disk diagnostics, and hardware and software manuals. It costs \$695 and is available from CDR Systems Inc, 7667 Vickers St, Suite C, San Diego CA 92111, (714) 275-1272.

Circle 543 on inquiry card.

New AMD PROMs

Advanced Micro Devices' (AMD) new family of PROMs (programmable read-only memories) uses a platinum-silicide fuse, which offers a 97% programming yield. Among the family members are the Am27S40 and the Am27S41. Both are 4 K-byte by 4-bit bipolar PROMs. The Am27S40 has open-collector outputs while the Am27S41 has three-state outputs. The devices offer 50 ns or 35 ns maximum access times, respectively. The Am27PS41 is a three-state,

power-switched PROM that relieves power problems by reducing consumption from 875 mW to 425 mW when deselected.

The platinum-silicide fuse is normally programmed with a single pulse. There have been no fuse failures reported in more than 13 billion hours of tests.

In 100-unit lots, prices for this family of PROMs begin at \$44.90. For more information, contact Advanced Micro Devices Inc, 901 Thompson Pl, Sunnyvale CA 94086, (408) 732-2400.

Circle 544 on Inquiry card.

Upgrade Your Casiotone

Robin Whittle, 42 Yeneda St, North Balwyn, Australia, has a technical bulletin that contains extensive yet simple modifications for the Casiotone M-10 keyboard instrument. The M-10 is a handheld, four-voice synthesizer. With Robin's modifications, the M-10 can have 25 voices, two-octave drop switches, hold, sustain, a milder vibrato than normal, and adjustable tuning. The parts required cost approximately \$20. Robin's bulletin, which includes the theory and construction notes, costs \$3.

Circle 545 on inquiry card.

North-Holland Catalog

Books and journals covering computer communications, simulation, artificial intelligence, programming languages and techniques, computing in medicine and biology, and other related subjects are described in the North-Holland Computer Publications Survey 1980. Many of the publications are papers from conferences and seminars. For the brochure and price list, contact Elsevier/North-Holland-Journals Information Center, 52 Vanderbilt Ave, New York NY 10017, (212) 867-9040.

Circle 546 on inquiry card.

Handbook Explains EEPROM

The E²PROM Family Applications Handbook describes the operation and application possibilities of Intel's 16 k-bit EEPROM (electrically erasable programmable read-only memory). The handbook shows ways to interface the device to a microprocessor and program it. The handbook is available free from Intel Corporation, Literature Department SV3-3, 3065 Bowers Ave, Santa Clara CA 95051, (408) 734-8102.

Circle 547 on inquiry card.

Printers Plus

...computers, peripherals, accessories and supplies!



APPLE ACCESSORIES

| | |
|------------------------------|------|
| Apple II & 48K | CALL |
| Disk II w/controller DOS 3.3 | CALL |
| Disk II Add-On | CALL |
| Microsoft Z80 Softcard | 319. |
| 16K Ram Card | 159. |
| CCS Parallel Card | 109. |
| Async Serial Card | 139. |
| Clock/Calendar Card | 109. |
| IEEE Card | 239. |
| A-D Card | 99. |
| Mountain Comp. Romplus | 139. |
| KB Filter ROM | 49. |
| CPS Multifunction Card | 199. |
| Supertalker | 259. |
| Paymar L/C Adapter - New | 49. |
| - Old | 39. |
| M&R Super Mod | 25. |
| Superterm | 319. |
| Videx Video Term | 309. |

APPLE SOFTWARE

| | |
|------------------------------|---------|
| Personal S/W Desktop Plan II | \$ 169. |
| CCA Data Mgmt | 85. |
| Visicalc | 169. |
| Visiplot | 159. |
| Visitrend/Visiplot | 219. |
| Visidex | 169. |
| Visitem | 129. |
| Micropro Wordstar | 299. |
| Super-Sort | 159. |
| Mail-Merge | 99. |
| Data Star | 239. |
| Spell Star | 199. |
| Muse Super Text II | 129. |
| Address Book | 44. |
| Form Letter Module | 79. |
| Stoneware-DB Master II | 199. |
| Microcom-MicroCourier | 239. |
| Infotory | 199. |

RIBBONS

| | |
|------------------|--------------|
| NEC | \$77.00/Doz. |
| Qume | 45.00/Doz. |
| Diablo | 66.00/Doz. |
| Anadex | 135.00/6 ea. |
| Tritel | 95.00/Doz. |
| TI/DEC/TTY | 45.00/Doz. |
| Epson | 13.95/ea. |
| MPI/Axiom/Base 2 | 10.00 ea. |

MAGNETIC MEDIA

Premium Quality At Bargain Prices
5 1/4" Diskettes, all Formats

100% Certified with hub rings, box of 10

| | |
|---|-------|
| Single sided, single density | 26.95 |
| Single sided, double density | 29.95 |
| Double side, double density | 38.95 |
| 8" Diskettes, All Formats, 100% Certified | |
| Single sided, single density | 29.95 |
| SSSD Error Free | 32.95 |
| Single sided, double density | 39.95 |
| Double sided, double density | 49.95 |

EPSON'S

Complete Stock of MX-80, MX-80 F/T
MX-100 Printers, Graphics Chip Sets
Cards and Cables



NEC-8023 A, 100 cps Matrix Printer

Hi-Res dot graphics, proportional spacing, correspondent quality printing, bi-directional tractor and friction feed, 80, 132 col. Greek & Math symbols. Everything you need in a small printer.

List \$840 \$699.



MODEMS

| | |
|------------------------|---------|
| UDS 103 LP, direct | \$ 169. |
| 103 JLP Auto Answer | 219. |
| 202 LP 1200 BAUD | 259. |
| NOVATION CAT, acoustic | 159. |
| D-CAT, direct | 169. |
| Auto Cat | 219. |
| Apple Cat | 339. |
| HAYES S100 Micromodem | \$349. |
| Apple Micromodem | 329. |
| Smart Modem | 249. |

VIDEO MONITORS

| | |
|------------------------|---------|
| Zenith 12" Green | \$ 139. |
| NEC 12" Green | \$239. |
| Amdex 12" B/W (Leedex) | \$ 139. |
| Amdex 13" Color Lo-Res | \$439. |

VIDEO TERMINALS

| | |
|-----------------|--------|
| Ampex Dialog 80 | \$995. |
| Ampex Dialog 30 | 795. |
| Televideo 920C | 845. |
| Televideo 950 | 995. |



NEC

PC-8000 Series
Microcomputer System.

INTRO
PRICING
\$ 1099.00

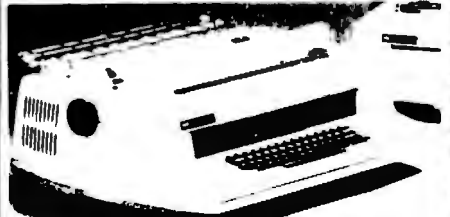
| | |
|--|-------|
| • Z-80A CPU 4 MHz | |
| • 5 user programmable function keys • 82 Keys with numeric keypad • 160 x 100 resolution • 80 character screen | |
| PC-8001A Microcomputer w/32K RAM | 1099. |
| PC-8012A I/O Unit w/32K RAM | |
| Expansion slots | 699. |
| PC-8031A Dual Mini-Disk Drive Unit | 1099. |
| PC-8032A Add-On Dual Mini Disk Drive Unit | 949. |



MPI 88G / 99G MATRIX

High resolution dot-addressable graphics for Apple. Enhanced "correspondence quality" printing. Tractor and friction feed. Serial and Parallel Input. 100 cps Bidirectional printing. 80, 96 and 132 column widths!

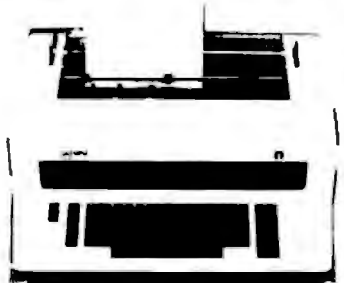
| | | |
|------------------------------------|-------|--------|
| 88 G List | \$749 | \$589. |
| 99 G List | \$849 | \$660. |
| Apple Parallel I/O Card/Cable/Disk | | \$110. |
| with Graphics Prom (Ap-Pak) | | \$145. |
| IEEE I/O Card | | \$55. |
| Single Sheet Feeder | | \$25. |
| QT Cover | | \$25. |



NEC SPINWRITERS

| | |
|------------------------|----------|
| 5510/5530 RO w/tractor | \$2,550. |
| 7710/7730 RO w/tractor | \$2,595. |
| 5520 KSR w/tractor | \$2,850. |
| 7720 KSR w/tractor | \$2,895. |
| 3510/3530 RO | \$1,895. |
| Bi-directional tractor | \$225. |
| Pusher tractor | \$350. |

NEW!



OLYMPIA

Letter quality. Daisy wheel printer typewriter interfaces to Apple, Atari, NEC, TRS80 and RS232 Serial ports. A truly cost effective letter quality printer that functions as a typewriter.

| | |
|--|------|
| ES100 RO Computer printer | |
| List \$1690 | CALL |
| ES100 Typewriter only | " |
| Interface Card Only | " |
| (specify serial or parallel) | " |
| I/O Cable (specify serial or parallel) | " |
| Apple Serial Card | " |
| Print Wheels & Ribbons | " |

TO PLACE YOUR ORDER CALL:

TELEPHONE (714) 744-7314 TELEX 697120

or write to:

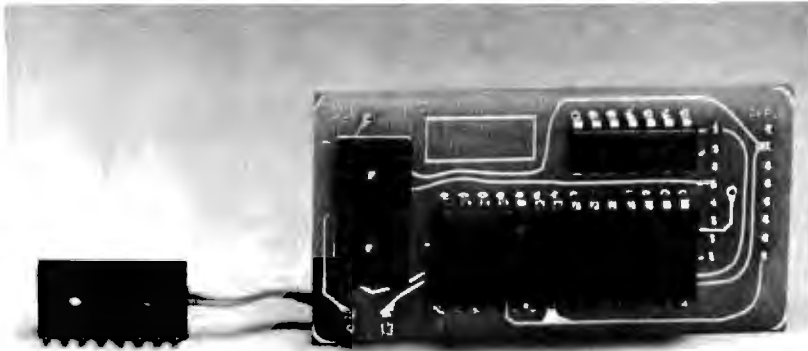
PALOMAR
Computer Products

910-105 W. San Marcos Blvd., San Marcos, CA 92069

TERMS OF SALE: Cash check money order bank wire transfer credit card or purchase orders from qualified firms only. All shipments. Please include telephone number with order and expiration date on credit card orders. Call area residents add 6% sales tax. Advertised prices are for prepaid orders. 13% shipping point. Add \$4 for shipping in CA. Pricing and availability subject to change without notice.

What's New?

MISCELLANEOUS



Type-Ahead Buffer

The Model 150 Type-Ahead Buffer for the Apple II features a 40-character type-ahead capability. It eliminates the need to wait for computer prompts before entering the next command or data. No software patches, circuit board cuts, or jumpers are required. The Model 150 costs \$49.95 and is available from Vista Computer Company, 1317 E Edinger, Santa Ana CA 92705, (714) 953-0523.

Circle 550 on Inquiry card.

FORTH for the Apple

TransFORTH II is a fully compiled, floating-point implementation of fig-FORTH for Apple II, II Plus, or III microcomputers. It has transcendental functions, strings and arrays, high- and low-resolution graphics, Turtlegraphics, and music.

TransFORTH II has a suggested price of \$125. For details, contact Insoft, 259 Barnett Rd, Unit #3, Medford OR 97501, (503) 779-2465.

Circle 551 on Inquiry card.

Articles and Papers Compilation

The Battelle Memorial Institute has a booklet listing the titles of papers and articles from its staff. The booklet contains the names and dates of the publications in which an article or paper appeared and the author(s).

Copies of the booklet, entitled *Published Papers and Articles: 1980*, are free from the Reprint/Brochure Center, Battelle Memorial Institute, 505 King Ave, Columbus OH 43201, Attn: Jane Carr, (614) 424-7727. Battelle is an independent research and development institute.

Circle 552 on Inquiry card.

A Modem for the Atari

The Microconnection is an answer/originate, direct-connect modem for Atari 400 and 800 computers. The Microconnection features autodial/autoanswer operation (optional), which allows an unattended Atari to send messages, text, or other data to a host computer, and automatically answer the telephone and receive data, too.

The Microconnection is Bell 103 compatible and operates at 300 bps (bits per second). Models are available for use without the Atari 850 interface and provide a socket for connection to any serial printer capable of 300 bps operation. A cassette recorder can be plugged into the unit for storage and playback of received data.

With autodialing terminal software, power supply, and a cable, the Microconnection costs \$199.50. The autodial/autoanswer option is \$79 extra. For complete details, contact the MicroPeripheral Corporation, 2643 151st Pl, NE, Redmond WA 98052, (206) 881-7544.

Circle 549 on Inquiry card.



64 K-Bit ROM

GTE's 2364 is a 64 K-bit ROM (read-only memory) with an automatic power-down feature that reduces power requirements. The device operates with a 40 mA current in the active mode and an 8 mA current in the standby mode. It uses a single +5 V supply.

The 2364 is organized as an 8 K-byte by 8-bit unit. The device has access times of 250 and 300 ns. All inputs and outputs are TTL- (transistor-transistor logic) compatible.

In lots of 250, the 300 ns 2364 ROM costs \$21.20. Contact GTE Microcircuits Division, 2000 W 14th St, Tempe AZ 85281, (602) 968-4431.

Circle 548 on Inquiry card.

consumer computers

Mail Order DISCOUNTS

FREE SHIPPING*
on all pre-paid cash orders

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.....279
 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.
 Please call for prices

Apple Computer
Authorized Dealer



APPLE II PLUS

16K NOW \$1025
 48K NOW \$1089
 64K* NOW \$1199

*Includes 16K Ramboard

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

ORDER TOLL FREE
800-854-6654
 In California and
 outside continental U.S.
(714) 698-8088
 Telex 695-000 Beta CCMO

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 Ramcrum 32K Module.....189

Available Now!!
 Asteroids, Missile Command and Star Raiders...\$5 ea.
 WE STOCK ALL ATARI COMPUTER SOFTWARE AND
 HARDWARE.
 PLEASE CALL OR WRITE FOR COMPLETE PRICE LIST.

APPLE DISK DRIVES ONLY \$439



w/controller and DOS 3.3 \$499

SEE OUR ADSON PAGES 146 & 147 FOR MORE DISCOUNTS

Printers

Epson MX-80 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

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). Cashier no residents add 6% sales tax. We accept C.O.D.'s. OFM'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 manuals, user's warranty manuals (40 days). Showroom prices may differ from mail order prices.

Video Monitors

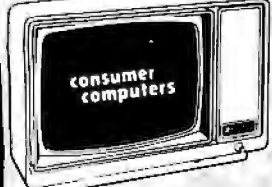
Amdex/Laedex Video 100 12" B&W.....155
 Amdex/Laedex Video 100G 12" Green Phosphor.....179
 Amdex (Hitachi) 13" Color w/audio output.....389
 NEC 12" Green Phosphor Display JB-1201M.....CALL
 NEC 12" Lo-Res Color Display.....CALL
 NEC 12" Hi-Res RGB Color Display.....CALL
 Sanyo 9" B&W Display.....185
 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 2VM-121.....149

16K RAMBOARD by ConComp for Apple II Computers AVAILABLE NOW FOR ONLY \$130

VIC20™ \$259



ZENITH 12" GREEN \$149



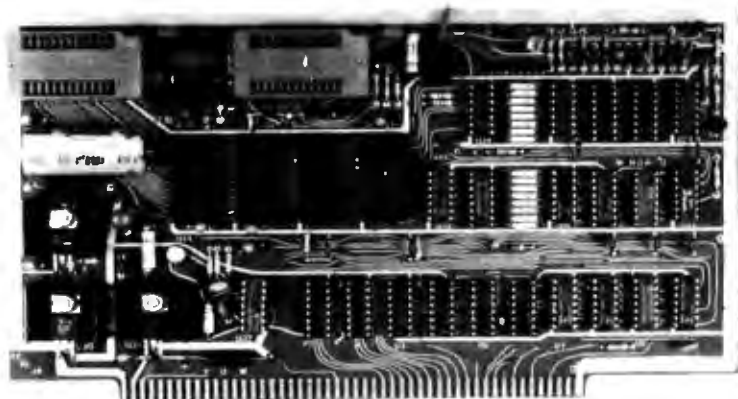
consumer computers

Personal Computer
 Color * Sound * Graphics
 Call or write for more info.
 Disk drives available soon!

Send Orders to:
consumer computers Mail Order
 8314 Parkway Drive
 La Mesa, California 92041

What's New?

MISCELLANEOUS



Programming and EPROM Memory on One Board

SSM Microcomputer Products' PBI S-100 board combines programming and memory capabilities. Four on-card sockets provide a total of 4 K or 8 K bytes of memory, depending upon whether 2708 or 2716 EPROMs (erasable programmable read-only memories) are used. Two programming sockets are provided for a 2708 and a 2716. Separate on-

card circuits allow programming of 5 V 2708 and 2716 EPROMs without board modifications. The programming voltage is generated on-board.

The PBI board with software for programming and verifying EPROMs costs \$265. A kit version is available for \$179. Contact SSM Microcomputer Products Inc, 2190 Paragon Dr, San Jose CA 95131, (408) 946-7400.

Circle 553 on Inquiry card.

MicroCOMPOSER-II

MicroCOMPOSER-II is a typesetting system that is added to a Compuwriter II typesetting machine made by CompuGraphic. MicroCOMPOSER-II consists of software and a hardware interface. The hardware interface is placed inside the Compuwriter and connected to a TRS-80 Model I or III microcomputer. MicroCOMPOSER-II reads files created using the TRS-80's word-processing programs and feeds them to the Compuwriter II for a hard-copy printout.

Cove View Press, the marketing agent for this microApplications Associates' system, recommends using the Scripsit or Electric Pencil word-processing programs. The word-processing programs allow text to be formatted to fit MicroCOMPOSER-II standards. The TRS-80 must have at least 32 K bytes of memory and one or more disk drives. MicroCOMPOSER-II costs \$1500. For details, contact Cove View Press, POB 637, Garberville CA 95440, (707) 923-3476.

Circle 555 on Inquiry card.



Reversible Floppy Disks

Omni Resources has developed a reversible 5-inch floppy disk. Each Omni Flip/Floppy has two recording surfaces, two sets of write-enable notches, two index holes, and reinforcing hub rings. Each disk is rated for over 12 million passes without disk-related errors or significant wear. Omni's 5-pack sells for \$21, and a 10-pack costs \$40. For more information, contact Omni Resources, 4 Oak Pond Ave, Millbury MA 01527, (800) 343-7620; in Massachusetts (800) 252-8770.

Circle 554 on Inquiry card.

Double-Density Digital Cassette

Magnetic Information Systems has introduced a line of digital cassettes that have been selected and certified for storing twice the normal bit density. Each cassette is certified for 0 errors at 1600 bpi (bits per inch) and is guaranteed for a year. To complement this line, MIS will also supply alignment tapes to help users calibrate their machines to this higher storage capacity. For additional information, contact Magnetic Information Systems, POB 806, 415 Howe Ave, Shelton CT 06484, (203) 735-6477.

Circle 556 on Inquiry card.

COMPUTER STOP

ORDER BY PHONE
MON.—SAT.
10-6

2545 W. 237 St. Torrance, CA. 90505

(213) 539-7670 PST
TELEX: 678401 TAB IRIN

LOWEST PRICES IN THE WEST, NORTH, SOUTH & EAST



apple computer 1-800-421-1947
Sales and Service

| | |
|--|--------|
| NEC 8001A | \$1100 |
| NEC 8012A | \$ 750 |
| NEC 8031A | \$1100 |
| NEC RGB Monitor | \$ 999 |
| NEC General Accounting System | \$ 350 |

APPLE HARDWARE

| | |
|---------------------------------------|-----|
| Parallel Printer Interface Card | 160 |
| Communications Card | 195 |
| High Speed Serial Interface | 160 |
| Pascal Language System | 425 |
| Centronics Printer Interface | 185 |
| Applesoft Firmware Card | 160 |
| Integer Firmware Card | 160 |
| Disk][with Controller DOS 3.3 | 529 |
| Disk][only | 475 |
| Graphics Tablet | 625 |

OTHER HARDWARE

| | |
|--|------|
| Alf Music Synthesizer (3 Voice) | 245 |
| 9 voice | 175 |
| ABT Numeric Keypad | 119 |
| Micromodem][..... | 295 |
| Apple Clock | 245 |
| Rom Plus with Keyboard Filter | 175 |
| Introl/X-10 System | 250 |
| Romwriter | 150 |
| DoubleVision 80 x 24 Video Interface | 245 |
| CCS Arithmetic Processor | 399 |
| CCS Parallel Interface | 119 |
| 16K Ram Card | 145 |
| Microworks DS-65 Digisector | 339 |
| SVA 8 inch Disk Controller | 350 |
| Sup-R-Mod | 30 |
| CCS Synchronous Serial Interface | 159 |
| CCS Asynchronous Serial Interface | 159 |
| Corvus 10 Meg. Hard Disk | 4395 |
| Corvus Constellation | 595 |

MISCELLANEOUS/SUPPLIES

| | |
|--|----|
| 16K RAM (200-250 NS) | 29 |
| Verbatim Datalife Diskette (Box of 10) | 30 |
| Dysan Diskettes (Box of 5) | 22 |
| Apple Diskettes (Box of 10) | 45 |
| Verbatim Diskette Boxes (Holds 50 Disks) | 18 |
| Silentye Paper (Box of 10 rolls) | 40 |



MONITORS/DISPLAYS

| | |
|---|-----|
| Leedex Video 100 12" | 140 |
| Sanyo 9" Monitor | 195 |
| KG-12C Green Phos. Monitor | 275 |
| Sanyo 12" Green Phosphor. Monitor | 275 |
| NEC 12" Green Phosphor. Monitor | 275 |
| Sanyo 12" B/W Monitor | 250 |

PRINTERS

| | |
|---|------|
| Apple Silentye with Interface | 525 |
| IDS 445 (Paper Tiger) with Graphics | 650 |
| IDS 460 with Graphics | 1049 |
| IDS 560 with Graphics 10) | 1199 |
| Centronics 737 | 795 |
| NEC Spinwriter (RO, Serial) | 2650 |

SOFTWARE

| | |
|---|-----|
| The Controller | 525 |
| Apple Post (Mailing List Program) | 45 |
| Easywriter Professional System | 195 |
| Apple Pie 2.0 | 110 |
| DB Master Data Management | 175 |
| The Cashier | 210 |
| Apple Writer | 65 |
| Visicalc | 175 |
| CCA Data Management System | 90 |
| Full Screen Mapping for CCA DMS | 59 |
| Pascal Interactive Terminal Software (PITS) | 29 |
| Basic Interactive Terminal Software (BITS) | 29 |
| Data Capture | 45 |
| Data Factory DMS | 110 |
| Apple Plot | 55 |
| Apple Pilot | 120 |
| Magic Wand Word Processor (Needs Z-80 Softcard) | 345 |
| Dow Jones Portfolio Evaluator | 45 |
| Fortran | 140 |

ORDERING INFORMATION: Phone orders invited using VISA, MASTERCARD or bank wire transfers. VISA & MC credit card service charge of 2%.

Mail order may send charge card number (include expiration date), cashier's check, money order or personal check (allow 10 business days to clear.) Please include a telephone number with all orders. Foreign orders (excluding Military PO's) add 10% for shipping. All funds must be in U.S. dollars (letters of credit permitted). Shipping, Handling and Insurance in U.S. add 3% (minimum \$4.00). California residents add 6% sales tax. Our low margins prohibit us to send COD or on purchase orders or open account (please send for written quotation). All equipment is subject to price change and availability. Equipment is new and complete with the manufacturer warranty. We do not guarantee merchantability of products sold. All returned equipment is subject to a 15% restocking fee. We ship most orders within 2 days.

WE ARE A MEMBER OF THE CHAMBER OF COMMERCE.

RETAIL STORE PRICES MAY DIFFER FROM MAIL ORDER PRICES.

PLEASE SEND ORDERS TO:
COMPUTER STOP, 2545 W. 237 St., TORRANCE, CA 90505

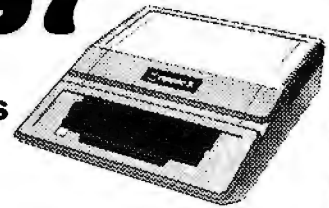
ELECTRONICS CENTER

CALL TOLL FREE

1-800-228-4097



Call For "Unbelievable" Low Low Prices
On These Lines:



AMDEK
APPLE
ATARI
BASE 2
CENTRONICS
COMMODORE
DC HAYES
HAZELTINE
LEEDEX

MACROTRONICS
MAXELL
MICROSOFT
MOUNTAIN HARDWARE
N.E.C.
NORTHSTAR
PANASONIC
SANYO
SYNCOM



YOUR ELECTRONICS PLAYGROUND

1840 "O" Street Lincoln, Nebraska 68508
In Nebraska Call (402) 476-7331



STOP

DON'T TURN THIS PAGE. . .

. . . if you are tired of dealing with mail order houses that never have in stock what you need, when you need it. We are not a mail order house. Micro Source of Texas is a stocking wholesale distributor of microcomputer printers, video display terminals, and supplies. What makes us different? We don't just take orders!

Whether you're a dealer, systems integrator or first-time micro user, you expect help from your supplier in determining the best product to fit a particular application. We give that help, and more. Since complete documentation is essential, we provide it with every order we ship. And if you're located in Texas, stop by and we'll demonstrate our products without obligation. Try to do that mail order!

Don't waste valuable time. Talk to Micro Source. We can help.

MICRO SOURCE

LOOK

AT THESE POPULAR. . .

. . . low cost, high quality products:

- EPSON MX-80 & MX-100 printers
- C.ITOH "Starwriter" WP printer
- TELEVIDEO Model 910 CRT terminal
- TI SILENT 700 & OMNI 800 printers

Need supplies? We stock ribbons and accessories for EPSON, C.ITOH, DIABLO, QUME, NEC, AND DEC. printers. All products and supplies are in stock, available for immediate delivery.

Micro Source of Texas is a specialty distributor handling only peripheral hardware. We don't sell microcomputers or software. So if you're a systems dealer, consider us a dependable supplier, not a competitor.

Micro Source of Texas, Inc.
834 N. Glenville Drive
Richardson, Texas 75081

214-690-5111

LISTEN

TO WHAT WE OFFER. . .

LOW PRICES

The best in the industry! Because of our volume purchases, we offer attractive discounts to independent dealers and micro systems builders. Call or circle our reader inquiry number and receive a current dealer price list and catalog.

IMMEDIATE DELIVERY

We stock a variety of popular micro printers and display terminals including EPSON, C.ITOH, and TELEVIDEO. If your needs are immediate, we'll ship within 24 hours of receiving your order. And if you're nearby, just drop in and pick up your order the same day.

TECHNICAL ASSISTANCE

Micro Source offers in-depth application assistance to Apple, Commodore, and TRS-80 dealers, among others. We want you to buy the right product with the right interface at the right price. Product support and courteous service are "standard features" with Micro Source. Call today and make us prove it!

WE'RE IN TEXAS

Ask about our **NO FREIGHT CHARGE** special offer to Texas customers

You'll like our service. You'll love our price!

Ohio Scientific Superboard II \$329.



- 4K static RAM on board, expandable to 8K
- Full 53-key keyboard, with upper and lower case. Plus user expandability.
- Video interface and audio cassette interface.

The Ohio Scientific Superboard II at \$329 — in today's economy — has got to be the best buy by far. It will entertain you with spectacular graphics made possible by its ultra high resolution graphics and super fast BASIC. It will help you in school or industry, as an ultra powerful scientific calculator. Advanced scientific functions and a built-in "immediate" mode allow you to solve complex problems without programming.

The Superboard II can be expanded economically, for business uses, or to remotely control your home appliances and security. Even communicate with other computers.

Read what's been written about Superboard II:

"We heartily recommend Superboard II for the beginner who wants to get into microcomputers with a minimum cost. A real computer with full expandability."

—POPULAR ELECTRONICS, MARCH 1979

"The Superboard II is an excellent choice for the personal computer enthusiast on a budget."

—BYTE, MAY 1979

- It's the first complete computer system on a board.
- Superboard II uses the ultra powerful 6502 Microprocessor
- 8K Microsoft BASIC-in-ROM

Buy Now. Quantities Limited!

610 Board For use with Superboard II and Challenger 1P. 8K static RAM. Expandable to 24K or 32K system total. Accepts up to two mini-floppy disk drives. Requires +5V @ 4.5 amps.

Mini-Floppy Disk Drive Includes Ohio Scientific's PICO DOS software and connector cable. Compatible with 610 expander board. Requires +12V @ 1.5 amps and +5V @ 0.7 amps. [Power supply & cabinet not included.]

4KP 4K RAM chip set.

PS-005 5V 4.5 amp power supply for Superboard II.

PS-003 12V power supply for mini-floppies.

RF Modulator Battery powered UHF Unit.

C1P Sams C1P Service manual

C4P Sams C4P Service manual

Ohio Scientific and independent suppliers offer hundreds of programs for the Superboard II, in cassette and mini-floppy form.

\$298

311

79

45

45

35

8

16

OS-65D V3.3 Operating System

Supports a command "KERNEL", Microsoft 9-digit BASIC, a 6502 Assembler Editor and debugger utility. Available for C1P, C4P and C8P floppy disk computers.

- Expanded to a self-teaching operating system. V3.3 comes in a 6 disk set with an easy-to-follow manual which leads the first time user from the operation of simple menuized programs through programming in BASIC and storing data on disk to a complete program development system with advanced capabilities.

- BASIC feature expansions including a full feature screen editor, full upper/lower case compatibility with "Normal" typewriter operation, PRINT USING, and screen formatting capability.

- Improved graphics support including direct X, Y plotting and the ability to dump medium resolution (64 x 128) graphics directly to the AC-19A low cost printer.

- Enhanced utilities including greatly simplified Create, Initialize and Delete functions, new Single Disk Copier, a communications support utility for the optional modem and Resequencer.

- Compatible with OS-65D V3.2 files and programs but has greatly improved disk I/O throughput.

24K Ram Required **Only \$79**

Freight Policies All orders of \$100 or more are shipped freight prepaid. Orders of less than \$100 please add \$4.00 to cover shipping costs. Ohio residents add Ohio Sales Tax.



Hours: Call Monday thru Friday.
8:00 AM to 5:00 PM Eastern Time
TOLL FREE: 1-800-321-5805

Guaranteed Shipment

Cleveland Consumer Computers & Components guarantees shipment of computer systems within 48 hours upon receipt of your order. Our failure to ship within 48 hours entitles you to \$35 of software, FREE.

To Order: Or to get our free catalog **CALL 1-800-321-5805 TOLL FREE.** Charge your order to your **VISA** or **MASTER CHARGE** account. Ohio residents call: (216) 464-8047. Or write, including your check or money order, to the address listed below.



CLEVELAND CONSUMER COMPUTERS & COMPONENTS

P.O. Box 46627

Cleveland, Ohio 44146

Order Form:

CLEVELAND CONSUMER COMPUTERS & COMPONENTS
P.O. Box 48827 Cleveland, Ohio 44146

- Superboard II \$329.
- 610 Board \$298.
- Mini-Floppy Disk Drive \$311.
- RF Modulator \$35.
- OS-65D V3.3 [Specify System] \$79.
- C1P Sams Service Manual \$8.

[Attach separate sheet for other items.]

NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

PHONE: _____

Payment by: VISA _____ MASTER CHARGE _____ MONEY ORDER _____

Credit Card Account # _____

Expires _____ Interbank # [Master Charge] _____

TOTAL CHARGED OR ENCLOSED \$ _____ [Ohio Residents add Ohio Sales Tax]

Orders of less than \$100, please add \$4.00 to cover shipping costs. Orders will be accepted from U.S. and Canada only. All prices quoted are U.S., date of publication, standard UPS shipping FOB the factory.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

CS CALIFORNIA COMPUTER SYSTEMS

\$100

| | |
|--|------------------------------|
| 2032 32K STATIC RAM A & T. | |
| 450 NSEC. \$579.00, 300 NSEC. \$585.00, 200 NSEC. \$629.00 | |
| 2116 16K STATIC RAM A & T. | |
| 450 NSEC. \$285.00, 300 NSEC. \$289.00, 200 NSEC. \$329.00 | |
| 2065 64K DYNAMIC RAM A & T. | \$548.95 |
| 2200 5-100 MAIN FRAM A & T | \$379.95 |
| 2422 FLOPPY DISC WITH CPM 2.2" | \$329.95 |
| 2802 6502 PROCESSOR A & T. | \$282.95 |
| 2810A Z80 CPU A & T | \$249.95 |
| 2710A 4 SERIAL 1/0 A & T. | \$291.95 |
| 2710A 2 SERIAL, 2 PARALLEL A & T. | \$305.95 |
| 2720A 4 PARALLEL A & T. | \$214.95 |
| PROTO BOARDS WW | \$39.95, SOLDER TAIL \$29.95 |

APPLE PRODUCTS

| | |
|------------------------------------|----------|
| 7114A 12K ROM/PROM. | \$68.50 |
| 7424A CALENDAR/CLOCK. | \$106.95 |
| 7440A PROGRAMMABLE TIMER | \$98.50 |
| 7470A A TO D CONVERTER | \$105.95 |
| 7490A GPIB (IE 488) INTERFACE | \$265.95 |
| 7710A ASYNC SERIAL | \$125.95 |
| 7712A SYNC SERIAL | \$153.95 |
| 7720A PARALLEL STANDARD. | \$98.95 |
| 7720B PARALLEL CENTRONICS. | \$98.95 |
| 7811B ARITHMETIC PROCESSOR W/DISC. | \$342.95 |
| 7811C ARITHMETIC PROCESSOR W/ROM | \$342.95 |
| 7500A WW BOARD | \$22.95 |
| 7510A SOLDER TAIL BOARD | \$23.95 |

SOFTWARE

| | |
|--|---------|
| 2610 CPM/M MACRO ASSEMBLER ON DISK | \$76.95 |
| 2620 CPM/M SYMBOLIC INSTRUCTION DEBUGGER | \$64.25 |
| 2630 CPM/M TEXT FORMATER | \$64.25 |
| 2640 CPM/M BACKGROUND PRINT UTILITY | \$42.95 |

OTHER CCS PRODUCTS ARE AVAILABLE. CALL FOR PRICE.

SSM MICROCOMPUTER PRODUCTS

\$100 PRODUCTS

| | |
|-----------------------------------|--------------------------|
| CB1A 8080 PROCESSOR PCBD | \$32.95 |
| KIT | \$155.95, A & T \$215.95 |
| CB-2 280 PROCESSOR BOARD. | |
| KIT | \$198.95, A & T \$269.95 |
| VB1C 64 x 16 VIDEO, PCBD. | \$32.95 |
| KIT | \$153.95, A & T \$199.95 |
| VB2 64 x 16 VIDEO, PCBD | \$32.95 |
| KIT | \$175.95, A & T \$234.95 |
| VB3 80 CHARACTER VIDEO 4MHZ | |
| KIT | \$345.95, A & T \$425.95 |
| UPGRADE RAMS FOR VB-3 | \$42.00 |
| 104 2 PARALLEL 2 SERIAL, PCBD | \$32.95 |
| KIT | \$155.95, A & T \$194.95 |
| PB-1 2708, 2716 PROGRAMMER BOARD. | |
| KIT | \$135.95, A & T \$185.95 |
| MB-10 16K STATIC RAM. | |
| KIT | \$299.95, A & T \$339.95 |

APPLE PRODUCTS

| | |
|-------------------------------|-------------------------------------|
| A408 IEEE 488 INTERFACE | \$399.95 |
| A10 SERIAL/PARALLEL INTERFACE | |
| KIT | \$125.95, A & T \$155.95 |
| AS10 SERIAL I/O | |
| KIT | \$87.95, A & T \$97.95 |
| AP10 PARALLEL 10 | |
| KIT (W/O CABLES) | \$67.95, A & T (W/O CABLES) \$87.95 |

OTHER SSM PRODUCTS ARE AVAILABLE. CALL FOR PRICES.

MIKOS

MONDAY-FRIDAY, 8:00 TO 12:00, 1:00 TO 5:30
THURSDAYS, 8:00 TO 9:00 P.M.

(415) 728-9121

P.O. BOX 955 • EL GRANADA, CA 94018

PLEASE SEND FOR IC, XISTOR AND COMPUTER PARTS LIST

NOV. SPECIAL SALE ON PREPAID ORDERS

(CHARGE CARDS AND C.O.D. OR P.O. NOT AVAILABLE ON THESE OFFERS)

10% OFF ON WAMECO PCBD'S WITH MIKOS PARTS

WMC inc. WAMECO INC. BOARDS WITH MIKOS PARTS

| | |
|-----------------------------------|--------------------------|
| MEM-3 32K STATIC RAM, PCBD. | \$36.95 |
| KIT LESS RAM | \$95.95, A & T \$135.95 |
| CPU-2 Z80 PROCESSOR, PCBD. | \$32.95 |
| KIT LESS ROM. | \$109.95, A & T \$149.95 |
| EPM-2 16K/32K EPROM, PCBD. | \$32.95 |
| KIT LESS ROM. | \$65.95, A & T \$99.95 |
| FPB-1 FRONT PANEL, PCBD | \$48.50 |
| KIT | \$144.95, A & T \$184.95 |
| CPU-1 8080 PROCESSOR, PCBD. | \$29.95 |
| KIT | \$89.95, A & T \$129.95 |
| QMB-12 13 SLOT MOTHER BOARD, PCBD | \$39.95 |
| KIT | \$95.95, A & T \$135.95 |

OTHER WAMECO PRODUCTS ARE AVAILABLE. CALL FOR PRICES.

MIKOS PARTS ASSORTMENTS ARE ALL FACTORY MARKED PARTS. KITS INCLUDE ALL PARTS LISTED AS REQUIRED FOR THE COMPLETE KIT LESS PARTS LISTED ALL SOCKETS INCLUDED

LARGE SELECTION OF LS TTL AVAILABLE. PURCHASE \$50.00 WORTH OF LS TTL AND GET 10% CREDIT TOWARD ADDITIONAL PURCHASES. PREPAID ORDERS ONLY.

VISA or MASTERCARD: Send account number, interbank number, expiration date and sign your order. Approx. postage will be added. Check or money order will be sent post paid in U.S. If you are not a regular customer, please use charge, cashier's check or postal money order. Otherwise there will be a two-week delay for checks to clear. Calif. residents add 6% tax. Money back 30-day guarantee. We cannot accept returned IC's that have been soldered to. Prices subject to change without notice. \$10 minimum order. \$1.50 service charge on orders less than \$10.00.



FLOPPY DISK DRIVES

| | |
|---|-------|
| Qume Datatrak-8 | \$540 |
| Virtually the industry standard. High quality/reliability. Full featured, double-sided, double density. | |
| SA851R | \$540 |
| Full featured drive, double sided, double density | |
| SA801R | \$430 |
| Single sided, double density, very consistent | |

| | |
|-----------------------------|-------|
| FDD100-8 | \$430 |
| Qume Datatrak 5 5 1/4" | \$345 |
| SA-400 5 1/4" | \$299 |
| Tandon TM-100 48 TPI 5 1/4" | \$350 |
| 96 TPI | \$425 |

NEW! Tandon 8" thinline drives. Call for details.

CONTROLLERS

| | |
|------------------------------|--------|
| Tarbell single density kit | \$195 |
| Tarbell single density A & T | \$310 |
| Tarbell double density A & T | \$425 |
| CCS 2422 w/CPM 2.2 | \$350 |
| Godbout Disk 1 | \$450 |
| MDA MXV-21 LSI-11 controller | \$1050 |
| (RX-01, RX-02 compatible) | |



MISCELLANEOUS

| | |
|-------------------------------|----------------------|
| CCS Mainframe | \$395 |
| 2 Disk drive enclosure | \$ 95 |
| (fits Siemens, Shugart, Qume) | |
| CP-206 power supply | \$110 |
| (powers two floppies) | |
| Cable Kits 2 drives | \$ 35 |
| 3 drives | \$ 40 |
| 4 drives | \$ 45 |
| Diskettes ss | \$39/10 - ds \$59/10 |

CPU

| | |
|---------------|--------|
| CCS 2810 | \$ 275 |
| Godbout Z-80A | \$ 275 |
| Godbout 8085A | \$ 295 |

MEMORY

| | |
|----------------------|--------|
| CCS 2065 64K dynamic | \$ 625 |
| CCS 2116 32K static | \$ 675 |
| Godbout RAM 17 64K | \$ 995 |

I/O

| | |
|----------------------|--------|
| CCS 2710 4 SIO | \$ 325 |
| Godbout Interfacer 1 | \$ 225 |
| Godbout Interfacer 2 | \$ 225 |

Qume S/5 - Daisy Wheel Printer

| | |
|---|--------|
| Sprint 5/45 RO | \$2699 |
| Sprint 5/55 RO | 2829 |
| Sprint 5/45 KSR | 3029 |
| Sprint 5/55 KSR | 3159 |
| Forms Tractor | 210 |
| Pinfeed platen | 155 |
| Paper Guide | 30 |
| Paper Basket | 50 |
| many print wheels, ribbons, & more available. | |

Terms of sale: cash or checks, purchase orders from qualified firms and institutions. Minimum order \$25. CA residents add 6% tax. Prices subject to change without notice. All goods subject to prior sale. Minimum shipping/handling charge \$4.00.

Electrolabs

POB 1608, Palo Alto, CA 94302 (415) 321-5601

WE WILL NOT BE UNDERSOLD

DISK DRIVES



| | | |
|--------------------------------------|-------------------------|-------|
| FOR TRS-80* Model I | | |
| CCI-100 | 5 1/4", 40 Track (102K) | \$299 |
| ADD-ON DRIVES FOR ZENITH Z-89 | | |
| CCI-189 | 5 1/4", 40 Track (102K) | \$389 |
| Z-87 | Dual 5 1/4" system | \$995 |

External card edge and power supply included. 90 day warranty/one year on power supply.

| | | | | | | |
|-------------------|---------|----------------|-----------------|---------|--------|-------|
| CORVUS | 5 mg | \$3089 | 10 mg | \$4489 | Mirror | \$699 |
| RAW DRIVES | | | 8" SHUGART 801R | \$399 | | |
| 5 1/4" TANDON | \$ CALL | POWER SUPPLIES | | \$ CALL | | |

DISKETTES

| | | | |
|--|--------|---------------|-----------------------|
| — Box of 10 | | | |
| 5 1/4" | Maxell | \$40 | BASF/Verbatim \$26.95 |
| 8" | Maxell | \$45 | BASF/Verbatim \$36.00 |
| PLASTIC FILE BOX—Holds 50 5 1/4" diskettes \$19.00 | | | |
| PLASTIC LIBRARY CASE | | 5 1/4" \$3.00 | 8" \$ 4.00 |
| HEAD CLEANING DISKETTE | | \$25.00 | |
| FLOPPY SAVER | | \$10.95 | RINGS \$ 6.95 |

16K RAM KITS

200ns for TRS-80,* Apple II, (specify): 2 for \$37 **\$19**
Jumpers \$2.50

COMPUTERS/SYSTEMS

| | | |
|---|--------------------------|------------|
| ARCHIVES | 64K, 2-Drives, 77 Track | \$CALL |
| ALTOS | ACS8000 Series | \$CALL |
| ZENITH | 48K, all-in-one computer | \$2200 |
| ATARI | 400 \$ 359 | 800 \$ 789 |
| MATTEL | INTELLIVISION | \$ 259 |
| APPLE PERIPHERALS | \$CALL | |
| SYSTEM SPECIAL | | |
| Apple II Plus 48K w/drive and controller. Epson MX-80 printer and interface. SUP-R Mod RF Modulator: List \$2965 You Pay \$2295 | | |

TERMINALS

| | | |
|-----------|------------|------------|
| ADDS | Viewpoint | \$CALL |
| ZENITH | Z-19 | \$ 725 |
| TELEVIDEO | 910 \$ 559 | 920C \$729 |
| IBM | 3101-10 | \$1189 |

S-100 CALIFORNIA COMPUTER SYSTEMS

| | | | |
|--|--------|-------------------|--------|
| MAINFRAME | \$359 | Z80 CPU | \$ 269 |
| 64K RAM | \$599 | FLOPPY DISC CNTRL | \$ 359 |
| INTEGRATED SYSTEM W/INTERNAL CABLES, TESTED \$1975 | | | |
| 2P + 2S I/O | \$ 269 | | |
| 4 PORT SERIAL I/O | \$ 249 | | |
| 4 PORT PARALLEL I/O | \$ 179 | | |
| CABLES | \$CALL | | |

CASIO CALCULATORS

| | | |
|-------------------------|----------------|----------|
| POCKET COMPUTER | FX702 | \$199.00 |
| DESK PRINTER/CALCULATOR | FR100 | \$ 79.95 |
| SCIENTIFIC CALCULATOR | FX8100 | \$ 49.95 |
| GAME WATCH | CA90 Plastic | \$ 49.95 |
| GAME WATCH | CA901 Steel | \$ 69.95 |
| SPORT WATCH | AX210 Calendar | \$ 59.95 |

BUSINESS SOFTWARE

| | |
|-------------------------|--------|
| WORDSTAR for Apple II | \$ 329 |
| WORDSTAR for Zenith Z89 | \$ 329 |

For fast delivery, send certified checks, money orders or call to arrange direct bank wire transfers. Personal or company checks require two to three weeks to clear. All prices are mail order only and are subject to change without notice. Call for shipping charges.

PRINTERS



| | | |
|-------------------------|-------|--------|
| NEC SPINWRITER | | |
| 7710 R.O. Par | | \$2395 |
| 7710 R.O. Par w/tractor | | \$2585 |
| 7720 KSR w/tractor | | \$2795 |
| 7730 R.O. Ser | | \$2395 |
| 7730 R.O. Ser w/tractor | | \$2595 |
| NEW 3500 Series | | \$CALL |
| EPSON | MX-70 | MX-80 |
| MX-80FT | MX100 | \$CALL |

| | | |
|--------------------|----------------------|--------|
| PAPER TIGER | | |
| IDS 445 | Graphics & 2K buffer | \$ 639 |
| IDS 460 | Graphics & 2K buffer | \$ 799 |
| IDS 560 | Graphics | \$1049 |

| | | |
|--------------------|---------------|-------------------|
| ACCESSORIES | | |
| ANADIX | DP-8000 \$849 | DP-9500/01 \$1295 |

| | | |
|--------------------------------|-------------------------------|--------|
| OKIDATA | | |
| Microline 80 | Friction & pin feed | \$CALL |
| Microline 82 | Friction & pin feed | \$CALL |
| Microline 83 | 120 cps, uses up to 15" paper | \$CALL |
| Call for new Microline series! | | |

| | | |
|-------------------|------------------------------|--------|
| CENTRONICS | 739, new model with graphics | \$ 739 |
|-------------------|------------------------------|--------|

| | | |
|----------------|----------------------------|--------|
| C. ITOH | | |
| Starwriter I | 25 cps, parallel interface | \$1439 |
| Starwriter I | 25 cps, serial interface | \$1495 |
| Starwriter II | 45 cps, parallel interface | \$1770 |
| Starwriter II | 45 cps, serial interface | \$1870 |

| | | |
|-------------------|---------|--------|
| AXIOM | GP-80M | \$ 319 |
| DATA SOUTH | 180 cps | \$CALL |

MONITORS

| | | |
|--------------------------|-----------------|------------------------|
| BELL & HOWELL | 9" B & W BHD911 | \$155 |
| LEEDEX | 12" B & W \$129 | 12" Green Screen \$159 |
| | 13" Color \$329 | |
| SANYO | 9" B & W \$149 | 12" Green Screen \$238 |
| | 12" B & W \$219 | 13" Color \$399 |
| ZENITH | 13" Color \$349 | 12" Green Screen \$129 |

TELECOMMUNICATIONS

| | | |
|-----------------------------------|-------------------|--------------------|
| LIVERMORE STAR MODEM | 2-year guarantee | \$125 |
| UNIVERSAL DATA SYSTEMS | UDS103LP \$149 | UDS103JP \$215 |
| NOVATION | CAT \$139 | D-CAT \$149 |
| | AUTO-CAT \$199 | APPLE CAT II \$339 |
| D.C. HAYES | SMART/STACK MODEM | \$235 |
| | MICRO-MODEM II | \$295 |
| CCI Telnet Communications Package | | \$135 |

APPLE ACCESSORIES AND SOFTWARE

| | | | |
|---|----------|------------------|----------|
| Mfr. by: Microsoft - Mountain Computers - Videx - CCS - Personal Software | | | |
| VISICALC | \$185.00 | VISIDEX | \$159.00 |
| VISITERM | \$119.00 | VISILOT | \$139.00 |
| Z-80 SOFTCARD | \$259.00 | VIDEX BOARD | \$249.00 |
| KEYBOARD ENHANCER | \$110.00 | 16K CARD | \$159.00 |
| APPLE JOYSTICK | \$ 49.00 | SUP-R FAN | \$ 39.00 |
| SUP-R MOD | \$ 25.00 | CCS CARDS | \$ CALL |
| APPLE CARDS | \$ CALL | ASCII EXPRESS | \$ 59.00 |
| SUPERCALC | \$199.00 | ALF9 VOICE BOARD | \$149.00 |
| CPS MULTIFUNCTION CARD | | | \$199.00 |

ENTERTAINMENT

| | | | |
|---|---------|--------------|---------|
| Mfr. by: On Line - Broderbund - Sirius - California Pacific | | | |
| FLIGHT SIMULATOR | \$29.00 | SARGON II | \$29.00 |
| WIZARD & PRINCESS | \$28.00 | ABM | \$21.95 |
| MYSTERY HOUSE | \$24.00 | GORGON | \$34.95 |
| HI-RES FOOTBALL | \$35.00 | MICROPAINTER | \$29.00 |
| RASTER PLASTER | \$25.95 | APPLE PANIC | \$27.95 |
| SPACE EGGS | \$17.95 | MATTEL GAMES | \$27.00 |

DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED

Send for FREE Catalogue

The CPU SHOP

TO ORDER CALL TOLL FREE 1-800-343-6522

TWX: 710-348-1796 Massachusetts Residents call 617/242-3361

5 Dexter Row, Dept. B11M
Charlestown, Massachusetts 02129
Hours 10AM-6PM (EST) Mon.-Fri. (Sat. till 5)

Technical Information call 617/242-3361
Massachusetts Residents add 5% Sales Tax
Tandy Corporation Trademark® Digital Research



A PROFESSIONAL MICROCOMPUTER



\$2995

THE BEST VALUE ON THE MARKET

- Z80 4MHZ
- 64K RAM
- DUAL 8" DRIVES
- 1.2 MB STORAGE
- 2 SERIAL I/O
- 2 PARALLEL I/O
- OPERATING SYSTEM AND UTILITIES

MICRO BUSINESS ASSOCIATES, INC.
500 SECOND STREET
SAN FRANCISCO, CA 94107
415-957-1343

9 TRACK TAPE DRIVES

800 BPI
45 IPS
FULL MANUAL
\$4850 VALUE



\$2400
NEW IN
ORIGINAL
BOXES

PERTEC Model 8840A-9-45
INDUSTRY STANDARD INTERFACE
CAPABLE OF IND. STD. ANSI-IBM DATA FORMAT

- READ/WRITE DATA IN STANDARD ANSI-IBM COMPATIBLE FORMAT
- DUMP WINCHESTERS AND HARD DISKS; 10 inch reels hold up to 3850 of tape. 34.55 Megabytes unlocked.
- EXCHANGE DATA & PROGRAMS WITH LARGE MAIN FRAMES AT SCHOOL, WORK, SERVICE BUREAUS ETC.
- BARGAIN PRICED MINI-COMPUTER UPGRADE GEM L341 \$4850

A large OEM inventory makes these industry standard drives available at a fraction of their current list price. Full size drives handle up to 10 8 inch reels of standard nonreversible 1/2 inch mag tape. 18 inch rack mount or use right out of the box or steel shipping frame.

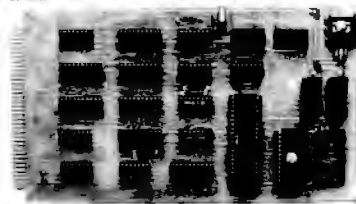
SPECIFICATION SUMMARY: 9-track, 800 BPI, dual head (read after write) 45 IPS read/write, 200 IPS ream, 80T/80T serpentine, 110 VAC 60-Hz solid state recent manufacture, all I/O signals TTL/DTL compatible, lesson arm tape built-in full control panel Call or write for full set of technical specifications.

INTERFACES: Electrovalue encourages the development of interfaces to popular systems. Interfaces best for popular minis and are being developed for several hobby computers. If you'd like to develop and document an interface to a popular small system call to discuss discounts.

ELECTROVALUE INDUSTRIAL, INC.
P.O. BOX 157-B
MORRIS PLAINS, NJ 07050
Phone reservations and questions are welcome.
201/267-1117

CONTROL-Z

SINGLE BOARD Z-80K* COMPUTER FOR CONTROL USES



USES: Industrial Test Equipment, Intelligent Programmable Controller, Automatic Drilling Equipment, Splice Heating & Power Systems, Machine Control, Security Systems, Traffic Signal Control, Apparatus Control, Robotics, OEM Products, Etc.

FEATURES: 4 Meg Z-80K* on board crystals, 14 7448, sockets for 2 2716s (4K PROMs), 3-8 bit parallel TTL output ports, 2-8 bit parallel TTL input ports, 8 timing output ports (800 nsec. coherence level), 6 high current output lines (Power Controller), 4 output enabled output lines, extra single bit TTL output for serial I/O, Z-80 control lines brought to edge connector, extra port connectors brought to edge connector, 4 reset port disable bits for port expansion, on board 16Kbit, 4Kx8 (PC) memory, 4.5M standard 72 pin edge connector, fully socketed, requires -5 to 10 volts, 500 mA.

PRICE: \$295. Model 9100Z \$45 Full function monitor program with download capacity, software's timer driver & full test hardware.

TERMS: CHECK, MC, VISA, & C.O.D. Call for add'l 6% tax. *Standard Minimum 90 Day, for Full Case Shipping Included.

COMPUTER-AID

1192 DE LA VINA SANTA BARBARA, CA 93101 (805) 966-3077

Circle 255 on Inquiry card.

Circle 82 on Inquiry card

LOWEST POSSIBLE PRICES BEST POSSIBLE WARRANTY



model III 16K

\$839

color
computer 4K
\$310



call TOLL FREE 1-800-343-8124

computer plus 245A Great Road
Littleton, MA 01460
617-486-3193
Write for your free catalog.
195-30 is a registered trademark of Tandy Corp.

Circle 91 on Inquiry card.



NEW! for
the '89 from

MAGNOLIA
MICROSYSTEMS

DOUBLE DENSITY DISK CONTROLLER

for both 5 1/4" & 8" drives
only \$595 complete
including CP/M™ 2.2

MAGNOLIA MICROSYSTEMS, INC.
2812 Thornhyke W., Seattle 98199
(206) 285-7266 (800) 426-2841

CP/M is a trademark of Digital Research.

Circle 237 on Inquiry card.



FREE!

1981
DISCOUNT
ELECTRONICS
CATALOG

JOIN THE PAK!

Send for our Free catalog and become a member of our exclusive Pak. Our members receive Poly Paks*

exciting catalog several times a year. We offer: Penny Sales, Free Premiums and Low.

Low Prices on a wide variety of

Electronic Products such as Computer Peripherals, Integrated Circuits, Speakers, Audio Equipment, Rechargeable Batteries, Solar Products, Semiconductors, and much, much more! Take advantage of our 25 years as America's foremost Supplier of discount electronics.

POLY PAKS, INC.
P.O. BOX 942, B711
S. LYNNFIELD, MA. 01940

Over
4.5 Million
Satisfied
Customers

(617) 245-3828

Circle 348 on Inquiry card.

WANTED: APPLE, PET, TRS-80, CP/M SOFTWARE

Westico is a publisher and distributor of professional software for microcomputers. If you have a new program ready for distribution or want your existing programs to reach a larger market, contact: Phillip Woellhof, V.P. Mktg. Westico, Inc. 25 Van Zant Street Norwalk, CT 06855 (203) 853-6880

To increase your profits, take advantage of Westico's worldwide promotion and distribution

WESTICO
The Software Express Service

SPECIALS of the MONTH

ATARI 800 Computers \$ 750.00
ATARI 810 Disc Drives \$ 450.00
ATARI Software 25% off
APPLE II & 48 K Computers \$1,150.00
LOBO Disc Drive for APPLE II \$ 395.00
8" Dual Drive Subsystems 2.4Mb
DS-DD complete \$1,795.00
CDC LARK Subsystems 16Mb with 1
cartridge-power supply-cables. \$5,200.00
Complete Word Processing System
with DIABLO Printer. \$4,200.00
CALIFORNIA Computer Systems 300 Dual
8" Drive Computer, 64K RAM, OASIS-2.4
Mb Disc memory, 25 serial ports, 1
Centronics compatible parallel port, a
teletype 910 CRT-COMLETEL. \$5,800.00
EPSON MX-7D Printers \$ 385.00
EPSON MX-80-F/T Printers \$ 685.00
IDS 460G Printers \$ 800.00
IDS 560G Printers \$1,150.00
CITOH STARWRITER 25 Printers \$1,380.00
DIABLO 630 RD Printers \$2,240.00
NEC SPINWRITERS Call for price
APPLE Peripherals Call for price
MOUNTAIN HARDWARE CPS
Multifunction Cards \$ 180.00

Meade's
DATA SYSTEMS
"THE COMPLETE SYSTEMS AND SUPPORT TEAM"

MARKET SQUARE SHOPPING CENTER, RIDGE RD & ALBEMARLE AVE. WINSTON IN 28621

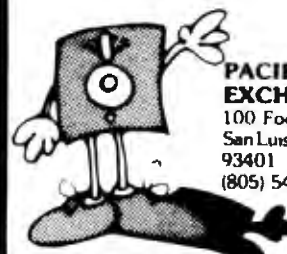
219/838-5350

Circle 246 on Inquiry card.

wabash®

When it comes to
Flexible Disks, nobody
does it better than
Wabash.

MasterCard, Visa Accepted.
Call Free: (800) 235-4137



PACIFIC
EXCHANGES
100 Foothill Blvd
San Luis Obispo, CA
93401 (In Cal call
(805) 543-1037)

Circle 332 on Inquiry card.

California Computer Systems



- 2810 CPU Only — \$250.00
- 2422 Dsk Cont Only — \$300.00
- 2065C 64K Only — \$425.00
- 2032C 32K Only — \$620.00
- 2718 2x2 Only — \$305.00
- 2200A Mainframe Only — \$349.00
- 2501 Mother Board Only — \$106.00
- 2116C 16K Static Ram 200ns Only — \$309.00
- 2520K Extender Board Only — \$52.00

TERMINALS

- Televideo 910 — \$575.00
- Televideo 912C — \$665.00
- Televideo 920C — \$740.00
- Televideo 950 — \$950.00
- Ampex Dialog 80 — \$950.00
- Zenith Z19 — \$745.00

PRINTERS

- C-ITOH Comet I
9 x 7 Dot Matrix . . . \$450.00
- C-ITOH Comet II . . \$810.00
132 Column Printer
9 x 7 Dot Matrix
- C-ITOH Star Writer •
Call for best price
- EPSON MX 80 . . . \$470.00
- Anadex 9501 . . . \$1,275.00
Graphic Printer

LEXICON LX-11, *acoustic* . . \$145.00

S-100 - CONNECTOR

TI or Better



SOLDER TAIL

\$2.50



MICRO SALES

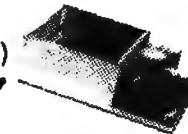
11 EDISON DRIVE ★ NEW LENOX ★ ILLINOIS 60451
CALL TOLL FREE: 1-800-435-9357 ★ MONDAY thru SATURDAY
(ILLINOIS RESIDENTS CALL: 815-485-4002) ★ 8:00 a.m. to 6:30 p.m.

TERMS: Prepayment — C.O.D. up to \$100.00 — M/C Visa
\$5.00 Processing and Handling added to each order PLUS
Shipping Charges.

Please allow personal check to clear before shipment.

S1 — MOD (KIT)

\$199.00



Complete S-100 12 Slot Main Frame. Ample system power with regulated power for drives. Excellent for Subsystem or Hobby use. Four hours to build. (6 conn., incl., less fans)

S-100 BOARDS

EXPANDABLE RAM

This is the best all around 64K board you can buy. If after you see it, you don't agree return for full refund. Bank Select by extended address lines or I.O 40H.



★ **\$400.00 A&T** ★

FLOPPY DISK DRIVES

DUAL DRIVE SUBSYSTEM

\$1,045.00

\$245.00 w/no Drives
2 SHUGART 801R
POWER SUPPLY



- Shugart 801's — \$395.00
- Shugart 851's — \$585.00
- Qume DT-8's — \$540.00
- Shugart 400's — \$255.00
- Tandom 5¼ — \$255.00
- MPI B-51 — \$255.00



Z — 80 CPU

The first time this world popular CPU offered in Kit. Two serial, 3 parallel, CTC, EProm Z-80 at 4 mhz. Software buad rate, etc. (Less Prom. & Cable)



\$250.00

U\$ — D\$K \$275.00

Double Density 8" and 5" Disk Controller designed for S-100 IEEE standards. Uses Western Digital 1795, 1691, 2143 Chip Set



32K (Kit)

- 300NS Lo-Lo Power 4K by 1 Chips
- Extended Address Lines
- Phantom Line
- 9 Regulators



\$250.00

TWIN VERTICAL DRIVES

5" \$550.00 — 8" \$980.00



- CHIPS -

Z-80A — \$6.95

Z-80A SUPPORT

CTC — \$6.55

SIO — \$25.50

PIO — \$6.50

DMA — \$18.75

2718-\$6.75

2708-\$3.95

4116-\$2.50

2114-\$2.75

INTEL

2141-\$4.00

S-100 CARD EXTENDER \$12.50

- Z89 FA \$2,150.00
- Z89 GA \$1,970.00
- Z87 Dual 5¼ Disk Unit \$960.00
- Z47 BA Dual 8 Disk Unit . . . \$2,750.00
- Expansion Interface \$128.00
- CP/M® V.2.2 for 289 \$140.00



data systems

Quality Affordable Microcomputers



- Microsoft BASIC V5.1 for CP/M \$150.00
- Microsoft FORTRAN \$180.00
- Microsoft COBOL \$365.00

Circle 418 on inquiry card.

HOBBY ROBOTICS' Shoppers Mart

— For the SERIOUS Hobbyist —



Hobby Robotics Directory



Amateur Robotics Designer Newsletter

ARO Newsletter: Quarterly. Keeps you abreast of 181841 news, parts up interest! \$6.00

Complete RU-2 Manual! Everything you need to build your own robot shown, detailed! Build from base up with Hobby Robotics' highly maneuverable 2H car etc. Super traction base, extendable arms etc. rated at 15 lbs. grip-like hands! Manual only \$25.00 (includes shipping with first purchase)

Hobby Robotics' Parts Supplier Directory. Check-out of names, addresses, phone numbers you want for hard-to-find parts, systems, build-your-own-robot info! Only \$3.50. Get yours now!

HOBBY ROBOTICS
5070 E Buford Highway
Norcross, GA 30071 404/448-0190

Please send items checked below:

Di Newsletter: RU-2 Manual
Parts Directory: Robot Base

FREE ▶ Hobby Robotics' Catalog of FREE (includes shipping)

Total Enclosed \$ _____ Cashiers Check/MD
Personal Check _____ Bank American

FREE ▶ Mastercharge _____ Bank Americard

Acct. # _____
Signature _____ Exp _____
Name _____
Address _____
City _____
State _____ Zip _____

HOBBY ROBOTICS' ROBOT BASE
Ready to roll!
ONLY \$495 (includes shipping)

HOBBY ROBOTICS
5070 E Buford Highway • Norcross, Ga. 30071 • 404/448-0190

8035/9 BOARDS



CPU 1K RAM, 40 I/O lines
Parallel I/O 2 8255s, 70 mil line drivers
Serial I/O 3 8251s, RS 232C interface
A/D-D/A 8/1 channel
All boards 4x7, 86 pin edge connector
Assembled - \$125 Bare - \$20
Hardware & Software Tools available

**Make check payable to:
SKP ELECTRONICS**
2211 Caper Tree Dr.
Tustin, CA 92680
(714) 832-1732

California residents add 6% sales tax
Please add \$3.00 for shipping and handling
COD charges extra

INSTANT PLATEN FOR THE EPSON MX80

PROFESSIONAL LOOK FOR YOUR CHECKS INVOICES LETTERHEAD AND ENVELOPES WITH TRACTOR ADJUSTMENTS ONLY

INSTANT PLATEN \$9.00
PLUS HANDLING AND SHIPPING 1.00

COMPUTEROOM DEPT SFC
PO BOX 895, MONTEREY CA 93940
DISTRIBUTORS/DEALERS WELCOMED

Circle 445 on Inquiry card.

Circle 380 on Inquiry card.

Circle 482 on Inquiry card.

RAM

For ATARI

Get the most from your ATARI 400. Memory expansion to a full 48K is now possible with our 48K Board. Expand your ATARI 800 with our 32K Board.

48K Board \$299
32K Board \$199

INTEC

Suite # 111
3387 Del Rosa Ave. North
San Bernardino, CA 92404
(714) 864-5269

CA residents add 6 percent tax
ATARI is trademark of ATARI, Inc.

Circle 199 on inquiry card.

UV EPROM ERASER



\$49.95

- ERASES ALL UV ERASABLE EPROMS (2716, 2716, 2732, 2564, etc.)
- CHECK FIFTEEN MINUTE ERASE TIME
- ERASES OVER FIFTEEN EPROMS AT A TIME
- LAMP LIFE 7200 HOURS
- TIMER AND SAFETY INTERLOCK SWITCH OPTION ADD \$20.00

THE BEST 6809 SINGLE BOARD COMPUTER AVAILABLE

- Floppy Controller
- Printer Port
- RS-232 Port
- SMT/PC Compatible
- Bus I/O Chip
- Full Documentation

PRICE: \$389.00

FOR THE SS-50 AND S-100 BUS
ASSEMBLED, TESTED, 48 HOUR BURN IN, 90 DAY WARRANTY

| | | |
|-------------------|--------|---|
| 2114 RAM 300 ms | \$2.95 | STRAIGHT FROM THE FACTORY 8 GUARANTEED: |
| 2716 EPROM 550 ms | \$4.50 | |

EPROM PROGRAMMER for 2716, 2732 \$39.50
In Circuit Emulator for 68xx, 8085, 2801 \$39.95

WE ACCEPT VISA, MASTERCARD, C.O.D. CHECKS

PHONE ORDERS (305) 974-0967

LOGICAL DEVICES INC.
161 W. GARDLAND PARK BLVD. • FT. LAUDERDALE, FLORIDA 33311
400 5110 SHIPPING \$30.00 C.D. CHARGES

Circle 230 on Inquiry card.

ANALOG ↔ DIGITAL DIGITAL ↔ ANALOG

**CONVERSION MODULES
SOFTWARE
GAIN CONTROL**

high accuracy — programmable gain instrumentation amplifier — custom board test — \$100 — 2 to 15 kHz conversion time — mixable high and low inputs — gain from 1 to 1024 — 12 bit simple and hold amplifier 8-channel differential — 16-channel — analog to digital high accuracy — programmable gain instrumentation amplifier — custom board test — \$100 — 2 to 15 kHz conversion time — mixable high and low inputs — gain from 1 to 1024 — 12 bit simple and hold amplifier 8-channel differential — 16-channel — analog to digital high accuracy — programmable gain instrumentation amplifier — custom board test — \$100 — 2 to 15 kHz

For additional details about the AD-100-4 and other fine California Data Corporation 100% individually tested, high reliability products, circle the reader service card number below or for faster response write or call us.

CALIFORNIA DATA CORPORATION
3475 Old Conejo Road, Suite C-10
Newbury Park, CA 91320
(805) 498-3651

Circle 59 on Inquiry card.



FULL PERFORMANCE CPM* computer
\$1995 list

dealer-distributor discounts

Alspa Computer, Inc.
5215 Scotts Valley Drive
Scotts Valley, CA 95066
(408) 438-3326

*trademarks of Digital Research, Inc.

Circle 17 on Inquiry card.

QUARTZ CRYSTALS

| | | | | | | |
|----------|-----------|-----------|-----------|-----------|-----------|------------|
| 3214-S | 5.2426-S | 9.8336-S | 20.000-S | 36.2896-S | 42.851-S | 48.8128-S |
| 3300-S | 5.610-S | 9.8648-S | 20.4988-S | 36.3636-S | 42.8768-S | 47.2768-S |
| 1.025-S | 5.7145-S | 9.9050-S | 22.1184-S | 37.9878-S | 42.9256-S | 47.3688-S |
| 1.8432-S | 5.955-S | 18.000-S | 27.6258-S | 33.3788-S | 42.9256-S | 48.000-S |
| 1.8437-S | 5.987-S | 18.2458-S | 25.7655-S | 35.4448-S | 43.000-S | 48.2008-S |
| 2.000-S | 5.000-S | 18.4068-S | 26.5005-S | 38.6758-S | 43.0278-S | 48.8658-S |
| 2.0871-S | 5.144-S | 18.7755-S | 26.6706-S | 38.8756-S | 43.0748-S | 48.7038-S |
| 2.4678-S | 6.1658-S | 18.8255-S | 27.980-S | 39.2128-S | 43.1858-S | 48.7768-S |
| 2.500-S | 6.2018-S | 18.8538-S | 27.8006-S | 39.6656-S | 43.2256-S | 48.7008-S |
| 2.9557-S | 6.400-S | 11.1380-S | 27.8506-S | 39.6658-S | 43.3338-S | 48.7338-S |
| 2.9558-S | 6.5638-S | 11.150-S | 28.4006-S | 39.7538-S | 43.3708-S | 48.8128-S |
| 3.000-S | 6.77638-S | 11.2188-S | 28.6276-S | 39.8786-S | 43.4078-S | 48.2508-S |
| 3.007-S | 6.75848-S | 11.2880-S | 28.7538-S | 39.9878-S | 43.4378-S | 48.1258-S |
| 3.300-S | 6.9003-S | 11.4178-S | 29.8758-S | 40.4448-S | 43.4448-S | 51.3128-S |
| 3.2768-S | 7.0003-S | 11.6556-S | 29.9376-S | 40.5928-S | 43.5568-S | 51.7778-S |
| 3.500-S | 7.0338-S | 11.6818-S | 30.2648-S | 40.8128-S | 43.6788-S | 51.8508-S |
| 3.576-S | 7.0816-S | 12.440-S | 30.3006-S | 40.8538-S | 43.6968-S | 52.8128-S |
| 4.000-S | 7.1188-S | 14.2132-S | 30.2856-S | 40.8758-S | 43.7278-S | 56.7508-S |
| 4.1643-S | 7.2588-S | 14.4308-S | 30.3738-S | 41.0888-S | 43.8128-S | 59.6008-S |
| 4.3476-S | 8.000-S | 15.000-S | 31.4378-S | 40.9258-S | 43.8148-S | 60.7508-S |
| 4.8003-S | 8.0506-S | 16.4008-S | 31.7538-S | 41.0006-S | 43.8518-S | 66.7508-S |
| 4.8103-S | 8.1416-S | 16.5068-S | 31.9008-S | 41.1988-S | 43.8888-S | 70.4008-S |
| 4.8503-S | 8.1818-S | 16.600-S | 32.200-S | 41.150-S | 43.9256-S | 75.000-S |
| 4.9343-S | 8.5303-S | 16.3488-S | 33.2006-S | 41.0578-S | 44.0008-S | 80.3338-S |
| 4.9152-S | 8.4998-S | 17.2248-S | 33.8256-S | 41.0006-S | 44.0278-S | 89.9888-S |
| 5.000-S | 8.6798-S | 17.2424-S | 34.6556-S | 41.9858-S | 44.1758-S | 100.8658-S |
| 5.0888-S | 8.8056-S | 18.000-S | 34.7638-S | 42.8258-S | 44.1778-S | 101.4658-S |
| 5.1263-S | 8.9008-S | 18.4328-S | 34.8718-S | 42.1006-S | 44.2568-S | 103.0658-S |
| 5.1853-S | 8.9006-S | 19.4888-S | 35.9356-S | 42.7158-S | 44.2826-S | 103.4658-S |
| 5.1858-S | 8.47708-S | 19.7508-S | 36.000-S | 42.8148-S | 44.3006-S | 104.9118-S |

ALL L — \$2.00 ALL H — \$1.00 10% MORE DEDUCT 1%

ADD \$1.00 SHIPPING
CAL. RES. ADD 6% SALES TAX
FREE OSCILLATOR SCHEMATICS
WITH ANY ORDER

QUALITY COMPUTER PARTS
P.O. BOX 743 / CHATSWORTH, CA 91311

Circle 353 on Inquiry card.

MEMOREX FLEXIBLE DISCS

WE WILL NOT BE UNDER-SOLD! Call Free (800)235-4137 for prices and information. Dealer inquiries invited and C.O.D.'s accepted.



PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo,
CA 93401 In Cal.
call (800) 592-5935
or (805) 543-1037



Circle 333 on Inquiry card.

Best prices anywhere! Now a Toll-Free "800"

COMPUTERS

NORTHSTAR HORIZON II

HRZ-2-32DD, List \$3695..... CALL
 HRZ-2-64DD, List \$4195.....
 HRZ-2-Q32, List \$3995.....
 HRZ-2Q64, List \$4495.....
 NEW...NORTH STAR ADVANTAGE. CALL

DYNABYTE

List..... Less 30%

ALTOS

PLEASE CALL FOR PRICES

SUPERBRAIN By INTERTEC



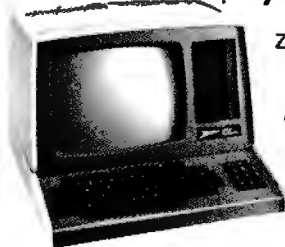
64K DD.....\$2695
 64K QD.....\$2995
 DSS-10MEG.....\$3195
 INTERTUBE.....\$725
 Emulator.....\$725

CROMEMCO

CS2, List \$4695..... **OUR PRICE \$3549**
 CS3, List \$7995..... **OUR PRICE \$6349**

ZENITH

**data
systems**



Z-89.... List
\$2895

**OUR PRICE
\$2139**

Intersystems..... CALL FOR PRICES

TERMINALS

TeleVideo



Televideo 910.....\$579
 912C.....\$659
 920C.....\$729
 950.....\$945

SOROC



Soroc IQ120.....\$689
 IQ130.....\$579
 IQ135.....\$719
 IQ135 w/g.....\$789
 IQ140.....\$1049

HAZELTINE

1420..... CALL
 1500.....\$789
 1510..... CALL

HAZELTINE *ESPIRIT*

ZENITH Z19 ...\$719

Most items in stock for immediate delivery. Factory sealed cartons w/full factory warranty. NYS residents add appropriate sales tax. Prices do not include shipping. VISA and Master Charge add 3%. C.O.D. orders require 25% deposit. Prices subject to change without notice.

PRINTERS

CENTRONICS

739-1.....\$749
 739-3.....\$799
 704-11 parallel.....\$1569
 709-9.....\$1519

TI 810



810 Basic.....\$1289
 810 Full Option.....\$1599
 820 RO Basic.....\$1545
 820 KSR Basic.....\$1739

NEC 7510.....\$2395
 7530.....\$2395

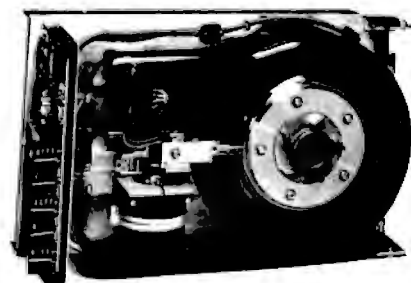
Diablo 630.....\$2049

PaperTiger 445G.....\$739
 460.....\$799
 460G.....\$839
 560G.....\$1099

Epson..... CALL FOR PRICES

DISK SYSTEMS

MORROW



Discus 2D.....\$849
 Dual Discus 2D.....\$1389
 2+2.....\$1199
 M-26.....\$3599
 M-10.....\$2999

COMPUTERS WHOLESAL

P.O. Box 144 Camillus, N.Y. 13031

800-448-5715

In N.Y. call 315-472-2582



Z-80 and 8086 FORTH

Z-80 FORTH—a complete program development system. Uses standard CP/M compatible random access disk files for screen storage. Package includes: Interpreter/compiler with virtual memory management, line editor, screen editor, Z-80 Assembler, de-compiler, utilities, demonstration programs, and 80 page user manual. System requirements: Z-80 microcomputer, 48 kbytes RAM, CP/M 2.2 or MP/M 1.1.

Z-80 FORTH WITH NAUTILUS SYSTEMS CROSS-COMPILER. Extend/modify the FORTH runtime system, recompile on a host computer for a different target computer, generate headerless code, generate ROMable code with initialized variables. Supports forward referencing to any word or label. Produces load map and list of unresolved symbols. 107 page manual. System requirements as for Z-80 FORTH above. \$200.00

8086 FORTH with line editor, screen editor, assembler, and utilities. Uses standard CP/M compatible random access files for screen storage. Requires 8086 or 8088 microcomputer, 64 kbytes RAM, and CP/M-86 operating system. \$100.00

MACHINE TEST PROGRAM PACKAGE for Z-80 systems. Includes memory, floppy disk, printer, and terminal tests with all source code. Requires CP/M 2.2. \$50.00

All software distributed on eight-inch soft sector single density diskettes. Prices include shipping by first class or UPS within USA or Canada. COD charges extra. Purchase orders accepted at our discretion. CP/M and MP/M are registered trademarks of Digital Research, Inc. Z-80 is a registered trademark of Zilog, Inc.

Laboratory Microsystems
4147 Beethoven Street
Los Angeles, CA 90066
(213) 390-8292

Circle 220 on inquiry card.

Convert your TRS-80 into a DEVELOPMENT SYSTEM

Z-80 In-Circuit
emulation and
EPROM/EEPROM
programming in
a single compact
unit.



Debug stand-alone
systems with
program in
TRS-80 RAM,
then copy working program into PROM.

Only \$329 including personality module
for 2716, 2516, 2758, 2508, 2532, 2816,
2808, 48016.

ORION INSTRUMENTS

172 Otis Ave, Woodside, CA 94062
(415) 851-1172

Circle 326 on inquiry card.

SCR SUPER-BUYS

UPS ANYWHERE IN CONTINENTAL U.S.

① FREE DECODER PLANS plus a brochure describing our new UHF-VHF Conversion Kit are yours just by sending us your name. address and an 18c stamp **FREE**

② VHF VARACTOR-TUNER. 300 ohms input. Tunable for Channels 2-to-13. All solid-state. Made by leading name manufacturer New-surplus. **\$495 ea.**

③ BRAND NAME POWER SUPPLIES. ±5V/6A. Voltage adjustable and IC regulated ideal for CMOS, computer-based instruments, etc. New-surplus. **\$2395 ea.**

④ 6-FOOT TELEPHONE CORD with AMP brand, modular phone-jack at one end, and 4-spade-lug leads at the other. Normally priced at \$2.49 each **99c ea.**

*Call us for special large quantity pricing quotations.

SCR ELECTRONICS INC.

9533 Valley View Street, Cypress, CA 90630

\$10.00 MIN. ORDER HANDLING/SHIPPING \$5.00

Pay by CHECK, M.O., VISA, M/C, C.O.D.

For Free Buyers Guide Circle No. 375

Circle 375 on inquiry card.

PRIAM

Disk Subsystems
and
Accessories,
(SMD interface available)

lowest cost and greatest established reliability for H.P., DEC, Apple, Z-80, 8085... and so on.

We can show you how to overcome "foreign disk" warranty worries.

Special Opportunity:

14A. S-100 Power Supply Kit

Input: 95-220VAC, 50/60 Hz
Outputs: 14A @ ±8VDC **\$29.95**
2A @ ±18VDC

Includes: UL Spec. Transformer, Rectifiers, Computer Grade Capacitors. RFI line filter, and Schematics.

ADVANCED TECHNOLOGY

735 Loma Verde, Palo Alto, CA 94303
415-493-5930

Send 36 ct SASE for our 16 page flyer.

Circle 10 on inquiry card.

CP/M® Compatible \$GOLD DISK\$ Z-80 Software

Z-80 Disassembler **\$175.**
ppd
creates assembly language source files

E-Z Text **\$75.**
ppd

unique text file word processor

Bower-Stewart & Associates

POST OFFICE BOX 1389

HAWTHORNE, CALIFORNIA 90250

213 / 676-5055



Trademark
Digital Research



Circle 51 on inquiry card.

SOFTWARE AUTHORS

micro's-mini's-main frames

Take advantage of our exciting development program for new software in all fields!

20% Royalty!

For that professional push contact: Michael L. Dean, V.P. Research & Development.

InfoSoft Computer Systems
P.O. Box 562, Concord, CA 94522
(415) 680-0202

Innovative  Solutions™

Circle 195 on inquiry card.

CP/M COMMUNICATIONS

LYNC™

THE BEST AVAILABLE PROGRAM
FOR CP/M COMMUNICATIONS

LYNC is extremely powerful and easy to use and a must for every computer user that wants to communicate with time-sharing systems or other CP/M computers.

TERMINAL MODE

In this mode your system acts as a terminal. Can send to or receive from a time-sharing system. When receiving data from a remote system, received data is buffered to your maximum memory. Then can be saved as a disk file.

LYNC MODE

Communicate on-line with another computer similarly equipped. Both ends can type messages that appear simultaneously on both screens.

SEND: AUTOMATIC ERROR DETECTION & RETRY

LYNC sends block of information with 16 bit checksums. In case of error it will keep retransmitting until successful.

FETCH

Once both systems are in LYNC mode, either operator can FETCH files from other systems.

REMOTE AND LOCAL DIRECTORY

Can display both local and remote directories.

BAUD RATES: UP TO 9600 BAUD

SELF GENERATING I/O ROUTINES REQUIRE NO PATCHING

PRICE \$95 TERMS MONEY ORDER, CHECK, C.O.D. M.C OR VISA
PLEASE SPECIFY DESIRED FORMAT: S: Single Density, 5" Microfloppy;
TR: 5.25 Mod II with CP/M, Kern Star single or double density; Supertrun
3.0 DOS or later. Commence 5" single density.

COMPUTER-AID

1192 DE LA VINA • SANTA BARBARA, CA 93101

(805) 966-3077

Circle 83 on inquiry card.

3M scotch®

Buy the finest in data recording
products from your DISCONNECTION.

5 1/4" (soft, 10 or 16 hard) **Price / 10 \$27.00**

8" (single side / density) **27.00**

8" (reversible, sgl. density) **40.00**

8" (sgl. side, dbl. density) **35.00**

8" (dual side, dbl. density) **40.00**

MC or VISA, add **1.00**

• Postage and handling included

• Send check, M.O. MC or VISA to.

DISCONNECTION

POB. 538

Mpls. Minnesota 55440

/612/871-1677 before noon CST

Circle 144 on inquiry card.

FORTH FOR/MAT™

SCREEN EDITOR

A MUST FOR THE SERIOUS FORTH PROGRAMMER

• All code is Forth-79 standard. Each line of code is fully explained and flow-charted (Forth style) for easy modification.

• This editor works just like the popular word processors on the market except it is written in high level forth and is confined to the 1024 byte boundary of a forth screen.

• There are over 20 different commands for cursor positioning, text modification, tabs, relocating lines, spreading lines, and moving lines to other screens.

• Insert mode is toggled on and off for midstream insertions and deletions. Text ahead of CP is moved right during insertion and left during deletion if insert mode is on.

• Column position is displayed at all times.

• Bomb proof — all unused control codes are trapped.

• Must be used with a CRT that has cursor addressing or with a memory mapped video.

• Send check or money order in the amount of \$50.00 and receive complete source code, flowcharts, documentation, and instructions for bringing up on your system.

KV33 CORPORATION
P.O. BOX 27246
TUCSON, AZ 85726
(602) 889-5722

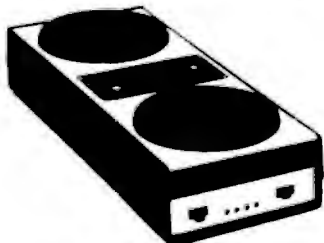


Circle 219 on inquiry card.

SPECIALS on INTEGRATED CIRCUITS

| | | | | |
|------------------------------------|------|---------|---------|----------|
| 6502 | 7.45 | 10/6.95 | 50/6.55 | 100/6.15 |
| 6502A/6512A | 8.40 | 10/7.95 | 50/7.35 | 100/6.90 |
| 6520 PIA | 5.15 | 10/4.90 | 50/4.45 | 100/4.15 |
| 6522 VIA | 6.45 | 10/6.10 | 50/5.75 | 100/5.45 |
| 6532 | 7.90 | 10/7.40 | 50/7.00 | 100/6.60 |
| 2114-L200 | | 3.75 | 25/3.50 | 100/3.25 |
| 2114-L300 | | 3.15 | 25/2.90 | 100/2.65 |
| 2716 EPROM | | 7.00 | 5/6.45 | 10/5.90 |
| 2532 EPROM | | | | 14.50 |
| 8116 Hitachi 2K x 8 CMOS RAM | | | | 14.50 |
| 4116-200 8K RAM (NEC) | | | | 8 for 19 |
| Zero Insertion Force 24 pin Socket | | | | 2.00 |
| 6550 RAM (PET 8K) | | | | 12.70 |
| S-100 Wire Wrap Socket | | | | 2.40 |

A P Products 15% OFF
A P Hobby-Blox 15% OFF

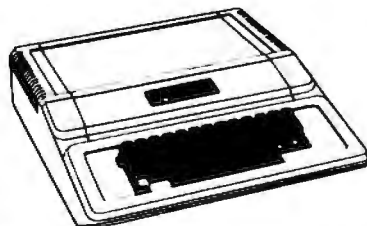


THE STAR MODEM

From Protica/Liversmore Data Systems

| | |
|----------------|------------|
| RS232 MODEM | SALE \$128 |
| IEEE 488 MODEM | SALE \$199 |
| RS232 CCITT | \$170 |
| IEEE 488 CCITT | \$270 |

We carry Apple II+ from Bell & Howell



fullFORTH+ for Apple II \$75
 A full-featured FORTH with enhancements. Conforms to FORTH Interest Group standards.

FORTH for PET by Cargile/Riley \$50
 Full FIG model with all 79 Standard extensions.
Metacompiler for FORTH for independent object code 30

KMMM PASCAL for PET/CBM \$85
 Includes translator for true machine language object code.

EARL for PET/CBM 65
 Editor, Assembler, Relocator, Linkeditor.

SuperGraphics - BASIC Language Extensions 30
 Fast Machine Language Graphics routines for PET/CBM

SM-KIT - Super PET/CBM ROM based Utilities 40

SubSDRT for PET/CBM by James Strasna 35
 Flexible general purpose machine language sort routine.

PaperMate 60 Command Word Processor (Riley) 40
 Full-featured CBM/PET version with tape or disk text files.

FLEX-FILE Data Base/Report Writer/Mail List 60
 Versatile PET/CBM data handling system by Michael Riley.

4 Part Music System for PET/CBM \$60
 Includes Visible Music Monitor and D/A Converter.

Commodore



CBM-PET SPECIALS

| | Net | SALE |
|--|--------|------|
| 8032 80 x 25 CRT, business keyboard | (1495) | 1100 |
| Micro Mainframe | (1995) | 1600 |
| 8096 Board (extra 64K RAM for 8032) | (500) | 400 |
| 8050 Dual Disk Drive - 1 megabyte | (1795) | 1375 |
| 8250 Dual Disk Drive - 2 megabyte | (2195) | 1760 |
| CBM IEEE Modem | (395) | 199 |
| 4016 full size graphics keyboard | (995) | 795 |
| 4032 full size graphics keyboard | (1295) | 999 |
| 4040 Dual Disk Drive - 330,000 bytes | (1295) | 999 |
| 2031 Single Disk Drive - 165,000 bytes | (695) | 560 |
| 4022 Tractor Feed Printer | (795) | 630 |
| C2N External Cassette Deck | (75) | 65 |
| VIC 20 Color Computer | (299) | 269 |
| VIC 1515 Graphic Printer | (395) | 315 |
| Used CBM/PET Computers | | CALL |
| 8024-7 High Speed Printer | (1995) | 1345 |

WE WILL MATCH ANY ADVERTISED PRICE

***** EDUCATIONAL DISCOUNTS *****

Buy 2 PET/CBM Computers, receive 1 FREE

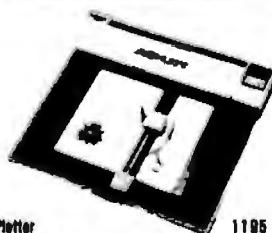
| | |
|---|-----|
| WordPro 3 Plus - 32K CBM, disk, printer | 200 |
| WordPro 4 Plus - 8032, disk, printer | 300 |
| OZZ Data Base System for CBM 8032 | 335 |
| VISICALC for PET, ATARI, or APPLE | 155 |
| SM-KIT - Super PET ROM Utilities | 40 |
| Programmers Toolkit - PET ROM Utilities | 35 |
| PET Spacemaker II ROM Switch | 36 |
| 2 Meter PET to IEEE or IEEE to IEEE Cable | 40 |
| Dust Cover for PET | 7 |
| IEEE-Parallel Printer Interface for PET | 110 |
| IEEE-RS232 Printer Interface for PET | 120 |
| The PET Revealed | 17 |
| Library of PET Subroutines | 17 |

RAM/ROM for PET/CBM

4K or 8K bytes of soft ROM with optional Battery Backup.
 Adds extra RAM which can be write protected like ROM.
4K Version - \$80 8K Version - \$120 Battery Backup - \$30

EPROM Programmer for CBM/PET 79
 Branding Iron with software/hardware for 2716 and 2532

Watanabe Intelligent Plotter



WATANABE WX4671 Plotter 1195
WATANABE WX4675 8-pin Plotter 1445

DISK SPECIALS



| | | | |
|--|---------|---------|----------|
| SCOTCH (3M) 5" | 10/2.75 | 50/2.65 | 100/2.60 |
| SCOTCH (3M) 8" | 10/2.80 | 50/2.70 | 100/2.65 |
| Verbatim 8" Double Dens. | 10/3.45 | 50/3.35 | 100/3.20 |
| Verbatim 5" Datalife | 10/2.45 | 50/2.40 | 100/2.35 |
| (add 1.00 for Verbatim 5" plastic storage box) | | | |
| BASF 5" soft | 10/2.40 | 20/2.35 | 100/2.30 |
| Wabash 5" in Plastic Box | 10/2.70 | 50/2.60 | 100/2.50 |
| Wabash 8" in Plastic Box | 10/2.75 | 50/2.65 | 100/2.55 |

WE STOCK MAXELL SPECIALS

| | | |
|------------------------|------------------|------------------|
| Diskette Storage Pages | | 10 for 3.95 |
| Disk Library Cases | 8" - 2.85 | 5" - 2.15 |
| Disk Hub Rings | 8" - 50 for 7.50 | 5" - 50 for 6.00 |

CASSETTES - AGFA PE-611 PREMIUM

High output, low noise, 5 screw housings.

| | | | |
|------|--------|--------|---------|
| C-10 | 10/5.6 | 50/5.0 | 100/4.8 |
| C-30 | 10/7.3 | 50/6.8 | 100/6.6 |

All other lengths available. Write for price list

SPECIALS

| | |
|--|------|
| EPSON MX-80 Printer | |
| EPSON MX-80 FT Printer | |
| EPSON MX-70 Printer | |
| EPSON MX-100 Printer | |
| Centronics 739 Printer with dot graphics | 675 |
| STARWRITER Delay Wheel Printer | 1445 |
| Zenith ZVM-121 Green Phosphor Monitor | 115 |
| Amdek Color Monitor | 355 |

ALL BOOK and SOFTWARE PRICES DISCOUNTED
 OSBORNE/McGraw-Hill, HAYDEN, SYBEX, etc

ZENITH DATA SYSTEMS

| | |
|---------------------------------------|------|
| Z19 Video Terminal (VT-52 compatible) | 725 |
| ZVM-121 Green Phosphor Monitor | 115 |
| Z89 with 48K | 2150 |
| Extra 16K RAM Board | 115 |
| Z47 Dual 8" Drive | 2775 |

Synertek Systems

| SYM-1 Microcomputer | SALE | 205 |
|--------------------------------------|------|-----|
| SYM BAS-1 BASIC or RAE 1/2 Assembler | | 85 |
| KTM-2/80 Synertek Video and Keyboard | | 349 |
| KTM-3/80 Synertek Tubeless Terminal | | 385 |



ATARI SPECIALS

| | | | |
|------------------|-----|-----------------|---------|
| 800 Computer | 749 | DOS 2 | 21 |
| 400 - 16K | 329 | Pilot | 68 |
| 810 Disk Drive | 449 | Microsoft BASIC | 68 |
| 825 Printer | 629 | Educ. Series | 20% off |
| 850 Interface | 139 | MISSILE COMMAND | 32 |
| 822 Printer | 359 | ASTEROIDS | 32 |
| Paddle Pair | 17 | STAR RAIDERS | 32 |
| Joystick Pair | 17 | Space Invaders | 17 |
| 16K RAM | 85 | Music Composer | 45 |
| Assembler/Editor | 46 | Chess | 30 |
| TeleLink | 20 | Super Breakout | 30 |

Write for prices on other Atari items.

| | |
|---|-------|
| REVERSAL (Spracklen) 32K Apple | 28.00 |
| Data Manager (Lutus) 24K Apple | 40.00 |
| Energy Miser - PET, Apple, Zenith | 24.50 |
| Histo-Graph (Boyd) 48K Apple | 24.50 |
| Data-Graph (Boyd) 48K Apple | 40.00 |
| Apple II User's Guide (Osborne) | 12.00 |
| Introduction to Pascal (Sybex) | 10.30 |
| Pascal Handbook (Sybex) | 12.00 |
| Musical Applications of Micros (Chamberlin) | 20.00 |
| Basic FORTRAN (Coan) | 7.25 |


WRITE FOR CATALOG

Add \$1.25 per order for shipping. We pay balance of UPS surface charges on all prepaid orders. Prices listed are on cash discount basis. Regular prices slightly higher. Prices subject to change.

252 Bethlehem Pike
 Colmar, PA 18915

215-822-7727

A B Computers




Atari 800 16K.....810.00 16K RAM.....85.00
 Atari 800 48K.....950.00 Atari 850 Interface.....176.00
 Atari 810 Disk.....460.00 Atari 830 Modem.....156.00
 Atari 400 16K.....379.00 Microsoft Basic.....72.00

TELECOMMUNICATIONS PACKAGES
 Base Unit, A850, A830, TeleLink I
 with 800: \$1150.00 with 400: \$710.00
 PLUS FREE NOVATION SUPERMIKE!

The Bit Bucket is a company made up of computer professionals. We are able to provide low prices as well as technical support. Give us a call and find out why we consider the Atari the best home computer on the market today. You won't be disappointed.

The Bit Bucket
 Specializing in Atari Home Computers
 P.O. Box 365
 Newton Highlands, MA 02161
 (617) 964-3080



Circle 49 on inquiry card.

TRY! OUR \$99 PORT SELECTOR
 Good for APPLE, ATARI, PET, TRS 80, ALTOS... as well as IBM, DEC, H/P, WANG, UNIVAC etc..



Our \$99 switch will save you money and aggravation. Share your printer, modem etc. The selection is made by turning the front panel knob. Our 2 Pos. "SBAB" can connect one printer to two CPU's. It can also be used to connect one CPU to either a printer or a modem. We also have 3 Pos. units. In fact we have about 30 models to satisfy all the common applications. We offer a 5 year Warranty, and our units have a unique monitoring capability. Call us for a FREE colorful catalog.

DEALER INQUIRIES INVITED!
 Call (415) 493-1300




GILTRONIX, INC
 UNIVERSAL INTERFACE PRODUCTS

450 San Antonio Ave., Palo Alto, CA 94306

Circle 176 on inquiry card.

money and power

Two reasons more practicing accountants choose AMI: mainframe power at a micro price. We are looking for selected dealers to market this new generation of accountants micro computer software. Call or write.



Dept. BT
 1404 140th Pl. N.E.
 Bellevue, WA 98007
 (206) 643-2050

ACCOUNTANTS MICROSYSTEMS INC.

Circle 5 on inquiry card.

FULL ELIZA FOR YOUR MICRO!

AT LAST! A FULL IMPLEMENTATION of the original ELIZA program is now available to run on your microcomputer!

Created at MIT in 1966, ELIZA has become the world's most celebrated artificial intelligence demonstration program. ELIZA is a non-directive psychotherapist who analyzes each statement as you type it in and then responds with her own comment or question — and her remarks are often astoundingly appropriate!

Designed to run on a large mainframe, ELIZA has hitherto been unavailable to personal computer users except in greatly stripped down versions lacking the sophistication which made the original program so fascinating.

Now, our new microcomputer version possessing the FULL power and range of expression of the original is being offered at the introductory price of only \$25. And if you want to find out how she does it (or teach her to do more) we will include the complete Source Program for only \$30 additional!

Order your copy of ELIZA today and you'll never again wonder how to respond when you hear someone say "Okay, let's see what this computer of yours can actually do!"

ELIZA IS AVAILABLE IN THE FOLLOWING DISK FORMATS:

- 1 Standard 8 inch single density for all CP/M based computers \$25 for ELIZA COM - add \$30 for Microsoft BASIC-80 Source
- 2 5 1/4 inch CP/M for Apple II equipped with 2-80 SoftCard \$25 for ELIZA COM - add \$20 for Microsoft BASIC-80 Source
- 3 5 1/4 inch for 48K Apple II with Applesoft ROM and DOS 3.3 \$25 for Protected File - add \$30 for Unprotected Source

ARTIFICIAL INTELLIGENCE RESEARCH GROUP
 921 NORTH LA JOLLA AVENUE
 LOS ANGELES, CALIFORNIA 90046
 (213) 856-7368 (213) 654-2214
 MC, VISA and CHECKS ACCEPTED

Circle 33 on inquiry card.

ZENITH/Heath Users



Double Your 5 1/4" disk storage capacity without adding a drive.

Get twice as much from your H88 or H89 microcomputer. Our FDC-880H floppy disk controller, in conjunction with your 5 1/4" drives, for example, expands memory capacity from 256 bytes to 512 bytes per sector.

And it handles single and double-sided, single and double-density, 8" and 5 1/4" drives — simultaneously.

Call 714/275-1272 today or write for details.



C.D.R. Systems Inc.
 Controlled Data Recording Systems, Inc.
 7667 Vickers St., San Diego, CA 92111

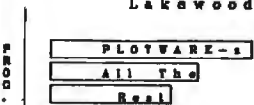
Circle 63 on inquiry card.

PLOTTING SOFTWARE

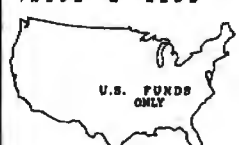
Calcomp compatible, for EPSON and HILOT with CP/M, FORTRAN, and BASIC

PLOTWARE-z 8" used399
 Manuals only35
 PLOTWARE-z samples6
 * Refundable on order

E N E R C O M P
 P.O. BOX 28014
 Lakewood, Colo. 80228
 303-966-1648



VALUE & EASE



U.S. FUNDS ONLY

PLOTWARE-z draw this ad

OPTIONS:
 Maps, Charts, Drafting, Self-Defining Characters, Terminal Emulation

Circle 166 on inquiry card.

QUAD SERIAL I/O CARD

S-100 Solder-Masked four-serial-channel I/O Interface Card with

- > 4 "hardware" UARTS (no software initialization required).
- > RS-232 printer handshaking on all four channels.
- > Occupies any 8 consecutive ports starting at any eight port boundary from 0 to F8 hex.
- > Individually selected baud rate, word size, parity, number of stop bits, polarity of status word.
- > Timed, latched interrupt generator for system clock or type-ahead or multi-user polling system—ideal for Z80 mode 1 interrupt operation. Uses SINTA to clear interrupt.
- > Pre-jumpered for 9600 baud, emulating 8251 status, 8 bit data with 2 stop bits, no parity. Full documentation supplied to custom configure the card.

\$250.00 wired and tested.
 Oklahoma Buyers add 4%

Micronics, Inc.
 2834 N.W. 39th
 Oklahoma City, OK 73112

Circle 270 on inquiry card.

MINI-DISK DRIVES NOW \$219



Mini-Disk Drives as shown \$219 each + shipping & sales tax where applicable

Manufacturer's Overstock of Tandon Model TM 100 5-1/4" Single Sided Floppy Disk Drives

- Shugart SA 400 connector compatible
- Rated for single and double density operation
- 1724K bits (215.6K bytes) capacity (unformatted MFMM)
- 6 msec track-to-track step rate
- Write protect option included
- 48 tracks per inch
- Plus more....



CALDISK
 Box 555, Provo, UT 84603
 (801) 376-0000
 TWX 9109715889

Phone orders welcome with MasterCharge and Visa.

Circle 48 on inquiry card.



QAE's PP-Series EPROM Programmers plug directly into any vacant EPROM socket and allow you to transfer data directly from RAM to EPROMs. No additional power supplies are required. All timing & control sequences are handled by the programmer. Each unit includes internal DC to DC switching regulator, ZIF socket and 4 ft. ribbon cable terminated with a 24 pin plug. Programmers are available for all EPROMs from 2708's thru 2532's.

Oliver Advanced Engineering, Inc.
 676 W. Wilson Ave., Glendale, CA 91203
 (213) 240-0080 or Telex 194773.
 PP SERIES PROGRAMMERS

Circle 473 on inquiry card.

KIT-80 INC.



E-Z-80 ENTRY KIT

A Z-80 Micro Computer with CPU: CTC:
PIO: Prom Programmer: Read Outs: Key Pad:
Onboard ROM & RAM: Wire Wrap: DC
Regulator: Manual & Instructions.

Kit Price \$390⁰⁰

P.O. BOX 501—KAUFMAN, TEXAS (USA)—7:142
A Subsidiary of Patrick Computer Systems, Inc., manufac-
turer of the Ict36 integrated business computer.

Circle 217 on inquiry card.

Do you need software? Call a Specialist!

Computer Software Specialists will write
custom-designed software to meet your
exact application needs. We deal with CP/M
and other micro-mini operating systems.

Applications include:

- Diagnostics, Utilities, Software Tools
- Operating System Implementation
- Custom Device Drivers
- Unique User Applications

All software is written according to your
specifications, and is reviewed by our
qualified staff of computer professionals.

For a free evaluation and time/cost
analysis, send your design specifications
and requirements to:

**COMPUTER
SOFTWARE
SPECIALISTS**

PO Box 57 Linthicum Md 21090
(301)789-2988

Circle 93 on inquiry card.

INTRODUCING



Epson® MX70/MX80 Replacement Ribbon Cartridge

Aspen Ribbons, Inc. now
manufactures the Epson®
MX70/MX80 ribbon cartridge which
is available in standard black and
new colors: blue, green, red, and
brown. Call for color details.

- Fast delivery
- Low price
- Order Toll Free
1-800-525-0646

aspen ribbons inc. • 1700 n. 55th
boulder, colorado 80301-2796
(303)444-4054 or 1-800-525-0646

Circle 453 on inquiry card.

STD BUS

TIMER/COUNTER CARD

- Real Time Clock
- Event Counters
- Programmable Time Delays
- Stepping Motor Controllers
- Programmable Rate Generator

The Arcturus 8053 timer/counter card
features nine 16-bit programmable
registers. Each register may be used for
timing or counting. The card also pro-
vides RS-232 receivers and transmitters
for serial communications with ter-
minals, printers, data loggers, and
other computers.

\$175

Arcturus

P.O. Box 271, Wayland, MA 01778
(617) 358-4319

Circle 8 on inquiry card.

CALL FOR QUALITY COMPONENTS SLIDER

BODBOUT
ELECTRONICS

ORDERS CALL 8-5 PST
TECHNICAL CALL 8-10

ALL ASSEMBLED & TESTED

| | | | |
|--|--------------------|--------------------|--------|
| CPU Z 6MHz CSC | \$308 | CPU Z 4MHz | \$ 179 |
| CPU 8085/88 CSC | 394 | DISK 1 | 371 |
| CP/M80 FOR D1 | 135 | CP/M86 FOR D1 | 235 |
| SYSTEM SUPPORT 1 | 297 | 4MHz 9511 (INTEL) | 235 |
| INTERFACER I, II | 187 | INTERFACER 3 (5) | 467 |
| RAM 20 32K | 425 | RAM 17 64K | 821 |
| ENCLOSURE 2 DESK | 619 | ENCLOSURE 2 RACK | 671 |
| 6MHz CPU Z SYSTEM | 64K DUAL 8" DRIVES | | 3895 |
| 6MHz CPU 8085/88 SYSTEM | 64K DUAL 8" | | 3995 |
| SYSTEMS HAVE 48 HOUR BOARD EXCHANGE 1 YEAR | | | |
| EPSON M8000 | 765 | VISTA V1000 DR CAB | 375 |
| TELEVIDEO 910, 920, 950, SYSTEM I, II, III | CALL | | |
| AMPEX DIAL. 80 | 950 | ADDS VIEW POINT | 549 |
| WORD STAR | 290 | SORCIM SUPERCALC | 235 |

ALL PRICES AND SPECS SUBJECT TO CHANGE
*CPM IS A TRADEMARK OF DIGITAL RESEARCH
SHIPPING EXTRA — P.O. BOX 951 \$3.00 MIN
WESTMINSTER, CA 92783
714 895 1746

Circle 381 on inquiry card.

☆☆ SUPER ☆☆ ISA's DATABASE

The only DBMS with all these features:

- ★ PROVEN in one year of test marketing
- ★ TOUGH, reliable file structure
- ★ MENU driven for simplicity and easy use
- ★ ARITHMETIC with stored calculations
- ★ FAST set-up and report formatting
- ★ CLEAR user-oriented documentation
- ★ PRINTS totals & subtotals - mail labels
- ★ REFORMATS and merges data files
- ★ MULTI-DISK files: Up to 128K records
- ★ SORTS full disks on up to 40 fields
- ★ PRODUCTION input of repetitive data
- ★ COUPLES to word processor & statistics
- ★ POSTS transactions to master file
- ★ SEARCH by strings, ranges, comparisons
- ★ DATA COMPRESSION: Over twice as many labels as the other system

For TRS-80® Models I, II, & III - 250.00

Ask your Dealer or Write:

Institute for Scientific Analysis, Inc.
P. O. Box 7186, Dept. B-1
Wilmington, DE 19803 (215) 358-3735

*T.M. Tandy Corp.

Circle 446 on inquiry card.

EPSON

DOT MATRIX PRINTERS SUPER DISCOUNTS ON

MX-80F/T ^{\$699} **NOW**
_{LOWER!}
MX-80 ^{\$495} **IN**
_{LOWER!}
MX-100 ^{\$890} **STOCK**
_{LOWER!}

We also stock direct connect cables for
TRS-80, Apple, Atari, Pet or RS 232

CALL TOLL FREE

1-800-344-7493

In CA and for service (209) 667-2888



GRAPHICS ROM'S
AVAILABLE

MACROTRONICS, Inc.
10540 Golden State Blvd
Lubbock, California 95302



Circle 236 on inquiry card.

DRV ELECTRONICS

FLOPPY DISK DRIVE SYSTEMS

CANADA'S No. 1 DISK DRIVE
CENTRE

Personal Computer Users—TRS80

DRV Electronics Offers

MP1 Drive 51 with power supply & case. Can \$499
Percom Doubler II Can \$250
Percom Data Separator Can \$49.95
Percom Drive Kits for Model III also available.
Full Warranty. Complete repair service.
Immediate delivery on all mail orders.



Authorized Percom
Dealer and Service Centre

15100 - 40TH AVE., SURREY
B.C. CANADA V3S 4N7

(604) 578-8533

JOE COMPUTER PRESENTS WORD GRINDER

80,000 WORDS!

WORD GRINDER IS A DATA BASE OF OVER
80,000 ENGLISH WORDS IN ALPHABETICAL
ORDER WITH SPACES DELIMITING EACH
WORD. THE TRS-80† AND APPLE VERSIONS
INCLUDE A BASIC EDITOR FOR DISPLAYING
OR EDITING THE DATA FILES USING RAND-
OM ACCESS. WORD GRINDER IS AVAIL-
ABLE FOR TRS-80 MODEL I, II, OR III, APPLE
CP/M, RT-11/HT-11 OR ANSI TAPES PRODUC-
ED ON A PDP-11. PRICES START AT \$89.95
FOR MODEL I, III OR APPLE. \$124.95 FOR
MODEL II, CP/M, RT-11 OR ANSI TAPES.

MAKE CHECKS PAYABLE TO:
JOE COMPUTER — PHONE ORDERS AND
INFORMATION (213) 992-0514 SEND TO:
JOE COMPUTER, 22713 VENTURA BLVD.,
SUITE F, WOODLAND HILLS, CA. 91364

CALIF. RESIDENTS ADD 6% SALES TAX.
†TRS-80 IS A TRADEMARK OF TANDY CORP.

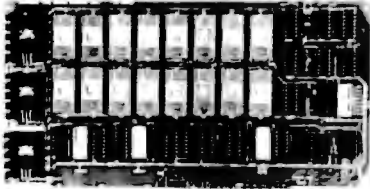
Circle 215 on inquiry card.

DIGITAL RESEARCH COMPUTERS

(214) 271-3538

32K S-100 EPROM CARD

NEW!



\$79.95
KIT

USES 2716's
Blank PC Board - \$34
ASSEMBLED & TESTED
ADD \$30

SPECIAL: 2716 EPROM's (450 NS) Are \$8.95 Ea. With Above Kit.

KIT FEATURES

- 1 Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
- 3 IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks
- 5 Cromemco extended or Northstar bank select
- 6 On board wait state circuitry if needed.
- 7 Any or all EPROM locations can be disabled
8. Double sided PC board, solder-masked, silk-screened.
- 9 Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
- 11 Fully buffered and bypassed.
12. Easy and quick to assemble.

32K SS-50 RAM

\$299⁰⁰ KIT

For 2MHZ
Add \$10

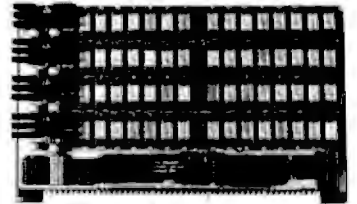
Blank PC Board
\$50

For SWTPC
6800 - 6809 Buss

Support IC's
and Caps
\$19.95

Complete Socket Set
\$21.00

Fully Assembled,
Tested, Burned In
Add \$30



At Last! An affordable 32K Static RAM with full 6809 Capability.

FEATURES:

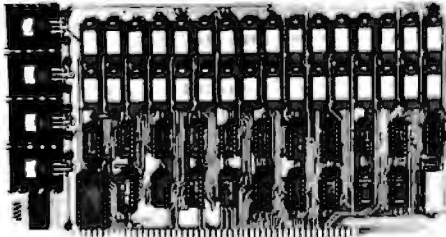
1. Uses proven low power 2114 Static RAMS.
2. Supports SS50C - EXTENDED ADDRESSING.
3. All parts and sockets included.
4. Dip Switch address select as a 32K block.
5. Extended addressing can be disabled.
6. Works with all existing 6800 S950 systems.
7. Fully bypassed. PC Board is double sided, plated thru, with silk screen.

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

\$169⁹⁵
KIT

FOR 4MHZ
ADD \$10



KIT FEATURES

- 1 Addressable as four separate 4K Blocks.
- 2 ON BOARD BANK SELECT circuitry. (Cromemco Standard!) Allows up to 512K on line!
- 3 Uses 2114 (450NS) 4K Static Rams.
- 4 ON BOARD SELECTABLE WAIT STATES.
- 5 Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers
6. All address and data lines fully buffered
- 7 Kit includes ALL parts and sockets.
- 8 PHANTOM is jumpered to PIN 67
- 9 LOW POWER under 1.5 amps TYPICAL from the +8 Volt Buss
- 10 Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-\$33
LOW PROFILE SOCKET SET-\$12
SUPPORT IC'S & CAPS-\$19.95
ASSEMBLED & TESTED-ADD \$35

**OUR #1 SELLING
RAM BOARD!**

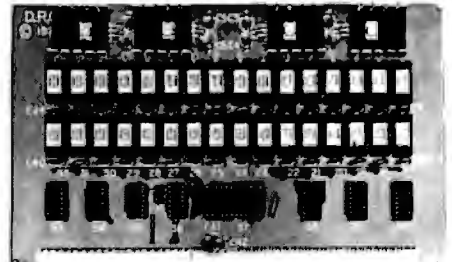
16K STATIC RAM SS-50 BUSS

PRICE CUT!

\$159 KIT

FULLY STATIC!

FOR 2MHZ
ADD \$10



KIT FEATURES

- 1 Addressable on 16K Boundaries
- 2 Uses 2114 Static Ram
- 3 Fully Bypassed
- 4 Double sided PC Board Solder mask and silk screened layout
- 5 All Parts and Sockets included
- 6 Low Power Under 1.5 Amps Typical

FOR SWTPC
6800 BUSS!

ASSEMBLED AND
TESTED - \$35

BLANK PC BOARD-\$35 COMPLETE SOCKET SET-\$12
SUPPORT IC'S AND CAPS-\$19.95

NEW! STEREO! S-100 SOUND COMPUTER BOARD NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

KIT FEATURES:

- TWO GI SOUND COMPUTER IC'S.
- FOUR PARALLEL I/O PORTS ON BOARD
- USES ON BOARD AUDIO AMPS OR YOUR STEREO
- ON BOARD PROTO TYPING AREA.
- ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS
- EASY, QUICK, AND FUN TO BUILD WITH FULL INSTRUCTIONS
- USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY

Both Basic and Assembly Language Programming examples are included

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M™ compatible diskette or 2708 or 2716. Diskette - \$24.95 2708 - \$19.95 2716 - \$29.95. Diskette includes the source. EPROM'S are ORG at E000H (Diskette is 8 Inch Soft Sector)

COMPLETE KIT!

\$84⁹⁵

(WITH DATA MANUAL)

BLANK PC
BOARD W/DATA
\$31

4K STATIC RAM

National Semi. MM5257. Arranged 4K x 1. +5V, 18 PIN DIP. A Lower Power, Plug in Replacement for TMS 4044. 450 NS. Several Boards on the Market Will Accept These Rams. SUPER SURPLUS PURCHASE! PRIME NEW UNITS!

8 FOR \$16 32 FOR \$59.95

SPECIAL PURCHASE!

UART SALE!

TR1602B - SAME AS TMS6011,
AY5-1013, ETC. 40 PIN DIP

TR1602B

\$2⁹⁵ EACH

4 For \$10⁰⁰

CRT CONTROLLER CHIP

SMC #CRT 5037. PROGRAMMABLE FOR 80 x 24, ETC. VERY RARE SURPLUS FIND. WITH PIN OUT. \$12.95 EACH.

NEW! G.I. COMPUTER SOUND CHIP

AY3-8910 As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator! Perfect for use with any 8 Bit Microprocessor. Contains 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control 16 bit Envelope Period Control, 2-8 Bit Parallel I/O, 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses. **\$11.95** PRICE CUT!

SPECIAL OFFER: ~~\$14.95~~ each Add \$3 for 60 page Data Manual

TERMS: Add \$2.00 postage. We pay balance. Orders under \$15 add 75¢ handling. No C.O.D. We accept Visa and MasterCard. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over \$50, add 85¢ for insurance.

Digital Research Computers

(OF TEXAS)

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

ZAP STATIC!



Eliminate static electricity with **Stat-Zap** mats and matting. Permanent anti-shock feature in carpet-top, vinyl back mats and matting. Great colors.

Call or write today for complete information.

J. Hubbard, Inc.

Box 1274 — Nashua, NH 03061
(603) 882-3231

Circle 189 on inquiry card.

SOFT WARE

APPLE, PET, ATARI, TRS 80

• **BUSINESS** • **GAMES**
• **EDUCATION**

You know there is an alternative to Retail Software Prices. We offer a fast, easy method of buying quality software at excellent discounts. Your software needs are our only business.

Circle reader service number for our current catalog.

Software Supply Corp.

P.O. Box 24322
Tampa, Fla. 33623

Circle 489 on inquiry card.

Smartmodem



- Auto-Answer • Auto-Dial • Repeat
- Programmable - Use Any Language
- Touch-Tone and Pulse Dialing
- Audio Monitor - Listen to Connection
- FCC-Approved Direct-Connect
- Full or Half Duplex, 0-300 Baud
- RS-232C Interface • 7 Status LED's
- Two Year Limited Warranty

\$249

Send certified check or money order
Allow two weeks for personal check
Florida residents add 4% sales tax

ACE COMPUTER PRODUCTS

of Florida Inc.

1640 N.W. 3rd STREET
DEERFIELD BEACH, FLA. 33441

Circle 8 on inquiry card.



FOR UCSD PASCAL* SYSTEMS

\$125 - **DISPEL***** - your spelling woes. An interactive spelling corrector with on-line word look up, and dictionary maintenance.

\$75 - **INTELLECT-UL**** LISP - Complete LISP interpreter.

\$1000 - **PDBASE***** - Entity Relational Data-base. To be released soon. Info. available.

IOTC Inc.

910/Sully/Laramie, WY 82070

*Trademark Regents University of Calif.

**Trademark AIIS Inc.

***Trademark IOTC Inc.

(307) 721-5818

Circle 208 on inquiry card.



The Computer Co-op will NOT be undersold on

TCS Software

General Ledger Payroll Accounts Payable Accounts Receivable

\$75 ea. OR **\$250** all 4

NEW! Inventory Management Order Entry \$ Call

Co-Op also has best prices on required Z80, 80-column, and CP/M (Digital Research's trademark) products.

FREE Shipping

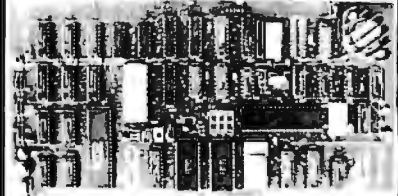
2795 Southwood, East Lansing, MI 48823
(517) 351-2632



Circle 84 on inquiry card.

NEW! S-100 BUS COMPATIBLE

SINGLE BOARD COMPUTER WITH VIDEO OUTPUT



USES:

This unit will fit into a standard single board computer or a 3 1/2" floppy disk drive.

FEATURES:

1MB 2 1/2" floppy disk drive (FDD) with 5 1/4" floppy disk drive (5 1/4" FDD) and video output port with high resolution video output. Includes video attributes (vertical sync, blanking), graphic capabilities.

PRICE:

Basic board with documentation \$44.95
Monitor and video terminal software (in FDD) \$49.95
Source listings (with Master purchase) \$19.95
Hard to find Parts Kit (crystal and base link PROM) \$19.95

EMS Standard Microcomputer Systems
P.O. BOX 1012 IRVINE, CA 92714-0112

Circle 155 on inquiry card.

DIGITAL SPEECH PROCESSORS

FROM \$25 TO \$250
BARE BOARDS TO COMPLETE
PLUG-IN SYSTEMS

- *Newly Patented Technique
- *Highly Intelligible Speech
- *Low Data Rates
- *Standard Components
- *Quick Delivery

Major Applications Include...

- *User-Recorded Voice
- *Speech Playback
- *Speech Recognition
- *Music Synthesis

Interfaces for...

- *Radio Shack TRS-80
- *STD Bus
- *Cromemco TU-ART
- *S-100 Bus
- *Apple II Plus
- *Sinclair ZX-80
- *TTL Parallel Port
- *More to Come

Call or Write.

MIMIC

Mimic, Inc.
P.O. Box 921
Acton, MA 01720
(617) 263-2101

Circle 280 on inquiry card.

Heath/Zenith 89 Users

16K MEMORY EXPANSION CARD



to make a H/Z89 a 64K machine. Assembled and Tested **\$100.00**

COMPUTER TABLES

60 x 28 x 28

\$186.40

48 x 28 x 28

\$162.40

Shelves Available

PRINTER STAND **\$75.00**



SECURED COMPUTER SYSTEMS

12011 Aclare St. • Cerritos, CA 90701
(213) 924-6741 Shipping not included

Circle 377 on inquiry card.

MSI-8085

Complete System!

A totally integrated system complete & ready to run. Nothing Else to Buy.

List #5937⁰⁰

Special Introductory Price

\$4950⁰⁰ Qty discounts available

Dealers inquiries invited features:

- 8085 Based Computer with 64K Memory and 3 Serial RS-232 Ports
- Dual 8" floppy 1 Meg Storage
- 120 CPS 132 Col. Matrix line printer
- 80 x 24 Crt • CP/M[®] includes manual
- Microsoft Basic[®] includes manual
- Full Accounting Software with sources

For full information call:

618 277-7990

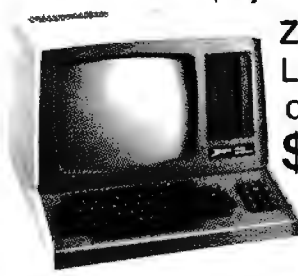
MAYBERRY SYSTEMS, INC.

1710 Boul Avenue—Belleville, IL 62221

Circle 242 on inquiry card.

Computers, Disk Systems

ZENITH data systems



Z89-FA
List \$2895
OUR PRICE
\$2395



Z-89GA
List \$2595, Less Disk \$2149
A-87 Two Drive
Minifloppy System List \$1195. \$989
Z-47DA..... \$3695
8" Two Megabyte Disk System
List \$3695 \$3059

INTERSYSTEMS

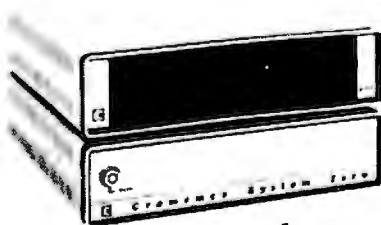
formerly ITHACA AUDIO

The new Series II CPU Board features a 4 MHz Z-80A CPU and a full-feature front panel. 20-slot actively terminated motherboard, with 25 amp power supply (50/60 Hz operation, incl. 68 cfm fan). DPS-1. List \$2195 **CALL FOR PRICE**



COMPLETE SYSTEM with InterSystem 64K RAM I/O Board and double density disk controller board. List \$3795

CALL FOR PRICE



NEW!
Cromemco

SYSTEM ZERO/D

A complete 64K Computer with Double Density Disk Controller List \$2995

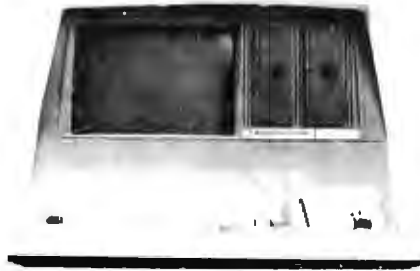
OUR PRICE \$2545

Companion Disk drive for above — **Quad Density** — Total of 780 Kilobytes of storage on the two drives. List \$1295

OUR PRICE \$1099

Only \$3644 for a complete 64K Disk System

SUPERBRAIN



64K Double or Quad Density units available. Uses two Z-80 CPU's. Commercial-type terminal with 12" monitor. Dual double density minifloppies. Over 350 kilobytes of storage (twice that with quad density drives). Two serial RS232 ports, I/O ports standard. Comes with CP/MTM 2.2 operating system. MiniMicroMart can supply a wide range of CP/M development and application software.

w/64K Double Density, List \$3495 .. \$2869
w/64K Quad Density, List \$3995..... \$3395

DYNABYTE

DB 8/1



DB 8 1 64 64K RAM SYSTEM WITH Z80 CPU and 2 serial and 1 parallel I/O. List \$3395.

OUR PRICE \$2695



hp HEWLETT PACKARD

HP-41CV \$259

HP-41C
\$189

HP-125...\$3149



HP-85A

List \$3250

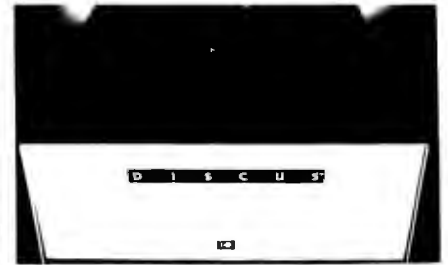
\$2749

HP-83
Special \$1749

F.O.B. shipping point. All prices subject to change and all offers subject to withdrawal without notice. Advertised prices are for prepaid orders. Credit card and C.O.D. 2% higher. C.O.D. may require deposit.

MORROW THINKER TOYS® DISCUS M26™

26 megabytes of formatted storage **NEW LOW \$3795**
List \$4495



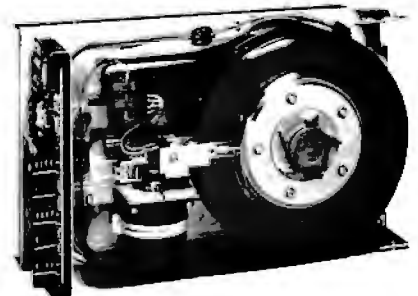
THINKER TOYS® DISK SYSTEMS

Now includes CP/M® 2.2

Discus 2D, List \$1095. \$898
Discus 2D, dual-drive, List \$1875. \$1549
Discus 2 + 2, A&T, List \$1495. \$1239
Dual Discus 2 + 2, A&T, List \$2575. \$2137

All Morrow floppy disks include CP/M® 2.2 and Microsoft Basic 80

MORROW



List \$3695

DISCUS M-10 **OUR PRICE**
10 Megabyte **\$3095**
Wirchester

NEW! CROMIX FROM CROMEMCO

A New UNIX Like Disk Operating System.

With true multi-user, multi-tasking capabilities

List \$295 **OUR PRICE \$249**

NEW! DOUBLE DENSITY CONTROLLER BOARD FROM CROMEMCO

With built-in diagnostics

16 FDC Controller.

List \$595 **OUR PRICE \$499**

— WRITE FOR FREE CATALOG —

943 W. Genesee St. Syracuse, N.Y. 13204

(315) 422-4467 TWX 710-541 0431

Mini Micro Mart, Inc.

Circle 283 on inquiry card.

RAMAGANZA MULTIBUS SALE

| | | | |
|------------|--------|---------------------|--------|
| RAM | 100+up | SBC 86/12A | \$1500 |
| 2104A | \$.65 | SBC 80/30 | \$450 |
| 4116 | 2.00 | SBC 604 or 615 | \$85 |
| 4164 | 13.00 | BLC 556 | \$150 |
| 2114 (450) | 1.85 | BLC 80/11 | \$475 |
| 2114 (300) | 2.00 | SBC 204 | \$475 |
| 4044-25NL | 2.75 | Much more in stock. | |
| 6104-3 | 1.50 | We Buy/Swap/Sell | |
| 5101L | 2.75 | Multibus and other | |
| 2147 | 3.15 | computer gear. Send | |

All goods subject for brochure.
to prior sale & prices. Can be changed without notice. MC/VISA O.K.
Add 2% for shipping/handling.

Note: We have a large qty of commercial video equip. for sale (refurbished). Send for complete listing.

Oracle Electronics & Trading Co., Inc.

2257 Mora Drive
Mountain View, CA 94040
(415) 961-4920

Circle 323 on inquiry card.

STD BUSS CARDS \$210
64K RAM
6MHz Z80 CPU
Ippy controller card

QUME 45 KSR \$1650
45 char/sec daisywheel printer/terminal.
RS232; ideal for word processing; will support TRS-80 and NEC protocols

QUME \$700
45 char/sec OEM printer mechanism

SHUGART 8" FLOPPY DISK DRIVES — USED \$250
SAB00 soft-sectored
Single/double density

MICROSWITCH KEYBOARDS \$85
Half effect. ASCII MOD. 74SW12

INTERFACE KIT \$180
OEM daisywheel printer interface.
Interfaces diablo or Qume OEM printer to RS232 or centronics parallel

COMPUTER DYNAMICS, INC.
105 S. Main St.
Greer, S.C. 29651 * (803) 877-7471

Circle 86 on inquiry card.

IPEX **NEW!**

"ELF" Interface
Converts Your
Typewriter Into Printer



- Finest print quality
- Low cost
- Easy installation
- Quick delivery
- Fits IBM Selectric® and Electronic Typewriters
- Models for all popular computers
- Call or write for more information, today!

IPEX INTERNATIONAL INC.
5115 Douglas Fir Rd.
Calabasas, CA 91302 U.S.A.
Tel: (213) 710-1444 TLX/TWX: 910 494 2100

- We export to all countries -

Circle 207 on inquiry card.

RS-232 PROBLEMS?

Need to keep a hard copy of the data on a RS-232 line? Need to look at the data for trouble shooting? Use the DATA TAP to tap a CRT or printer into any RS-232 line.

DATA TAP \$34.95 postpaid

Do you have a set of Modems that may not be working? Bypass them with the NULL MODEM adapter and find out.

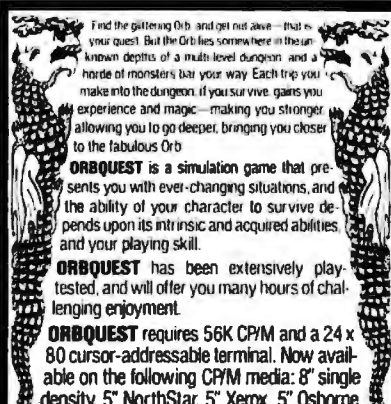
NULL MODEM \$24.95 postpaid

Send for literature on these and other RS-232 problem solvers.

Pay by: VISA, M/C, Check, PO.

B & B ELECTRONICS
BOX 475 / MENDOTA, IL 61342
IL Residents add 5% Tax.

Circle 47 on inquiry card.



Find the glittering Orb and get out alive — that is your quest! But the Orb lies somewhere in the un-known depths of a multi-level dungeon and a horde of monsters bar your way. Each trip you make into the dungeon, if you survive, gains you experience and magic — making you stronger, allowing you to go deeper, bringing you closer to the fabulous Orb.

ORBQUEST is a simulation game that presents you with ever-changing situations, and the ability of your character to survive depends upon its intrinsic and acquired abilities, and your playing skill.

ORBQUEST has been extensively play-tested, and will offer you many hours of challenging enjoyment.

ORBQUEST requires 56K CP/M and a 24 x 80 cursor-addressable terminal. Now available on the following CP/M media: 8" single density, 5" NorthStar, 5" Xerox, 5" Osborne.

ORBQUEST™
\$35 for diskette and manual from
ALTERNATE WORLD SIMULATIONS
P.O. Box 941, Milpitas, California 95035
CALIFORNIA RESIDENTS ADD 6% SALES TAX
CP/M IS A REGISTERED TRADEMARK OF DIGITAL RESEARCH

MAGIC WAND® (1.1) THE BEST word processing package — there's nothing as powerful, useful or as easy to use. Requires 32K CP/M®, MP/M®, CDOS® or Gasis® and CRT terminal with addressable cursor 8" soft-sectored or 5" NorthStar®, Vector Graphic®, Micropolis®, SuperBrain® disks. Apple® II & II-Plus w/ Microsoft Z80, specify SuperTerm or Videoterm board, 13 or 16 sectors. TRS 80® Mod II, specify your CP/M version. Delivered ready to run — custom configured to your CPU, terminal, printer and disk; includes lesson files on disk, fully illustrated Users' Manual and a Reference Card. \$275.

10,000 WORDS PROOFREAD IN 1 MINUTE

SPELLGUARD® THE BEST, most useful spelling package available. Requires 32K CP/M®, MP/M®, or CDOS®. Works with any console device. Compatible with Magic Wand®, WordStar, Electric Pencil® and many more. Fully tested. Ready to run 8" soft-sectored or 5" DD NorthStar®, Micropolis®, SuperBrain® disk \$189.

Spellguard® and Magic Wand®, only \$474.



We rigorously select, use and support the software we sell. Orders promptly acknowledged. Checks must clear before shipment. Our low prices reflect full cash discount while maintaining quality customer service. Export orders welcome.
* = trademark

PELICAN PROGRAMS
49 Pelican Court, Syosset, NY 11781
(516) 921-3083

Circle 341 on inquiry card.

COMPUTIE TIE



Elegant Neckwear
for the
Computer Enthusiast

\$9.95

Order:
Blue Grey Brown

Send \$9.95 plus \$1.00 postage and handling to **COMPUTIE, P.O. BOX 87 ROCKTON, ILLINOIS 61072**
Illinois residents include 5 1/2% sales tax

Circle 403 on inquiry card.

ECONO-KIT™

ARE YOU DESPERATELY LOOKING FOR SOME SOPHISTICATED TEST / AUXILIARY EQUIPMENT IN THE FIELD OF MICROCOMPUTER TECHNOLOGY? CONSIDER FOUR OF OUR NEW PRODUCTS, EITHER IN KIT FORM / OR FULLY ASSEMBLED & TESTED:

CLIP-ON ANALYZERS \$1299
~~\$299~~

EPROM PROGRAMMER \$599
~~\$999~~

ALSO WILL BE AVAILABLE SOON

LOGIC ANALYZER \$399
~~\$799~~

PLA PROGRAMMER \$499
~~\$899~~

YOU WILL FIND OUR PRICES UNBELIEVABLE AS COMPARED TO THE TECHNICAL LEVEL OF THESE FEATURE-LOADED PRODUCTS. THERE IS NOTHING EQUIVALENT ON THE MARKET! SEND FOR DETAIL INFORMATION TODAY!

MICRO ENGINEERING ASSOC.
3527 GOLDEN STATE DR SANTA CLARA CA 95051

Circle 457 on inquiry card.

NORTHSTAR USERS

Add our **SCAN COMMAND** to your copy of NORTHSTAR BASIC and you can instantly display or print

- All lines that contain a selected variable
- All occurrences of GOTO or GOSUB statements to a particular line number
- All references to any program line number
- All occurrences of any character, number, line number, group of characters or anything that is contained in any basic line

ONLY \$29.95 ON DISK

Add our enhanced **RENUMBER** capability to your copy of NORTHSTAR BASIC and you will be able to

- Renumber only selected line numbers and move the entire group to another area of your program
- Keep specific line number sequences associated with designated areas of a program
- Append program modules and rearrange them within your program
- Make subroutines out of selected lines and move the subroutines to a designated area of the program

ONLY \$39.95 ON DISK

Both programs automatically load to any copy of NORTHSTAR BASIC your BASIC can be SINGLE DENSITY, DOUBLE DENSITY or QUAD DENSITY and be located at any address above 65536 HEX. These programs use machine language additions to NORTHSTAR BASIC. After your copy of BASIC is modified to include these new features, you can save the NEW BASIC and have a permanent copy with "SCAN" and/or "RENUMBER". Complete documentation included on each disk.

Please Add \$2.00 shipping charge for each program or order both programs and save \$4.00 plus shipping charges. Both only \$69.90 ppd

California residents should add 6% sales tax

Order Today! — Send check, money order or credit card data to

SOFTWARE SERVICES
1072 Castles Pass Road
Carpinteria, CA 93013
(805) 684-8259

Circle 456 on inquiry card.

**WE HAVE
MOVED TO**

943 W. Genesee St. Syracuse, N.Y. 13204

Thank you . . .

. . . for making our expansion possible and for helping make us the leading distributor of microprocessor systems, terminals and printers.

We are showing our appreciation by producing a special catalog with thousands of items at greatly reduced prices.

Call or write today.

***JOIN US IN OUR
PRE-INVENTORY CLEARANCE***

.....

Mini Micro Mart, Inc.

943 W. Genesee St.

PO Box 2847

Syracuse, N.Y. 13220

[315] 422-4467 TWX 710-541-0431

database manager for TRS-80 Model I

- CREATE random access disk files 15 fields or 255 bytes/record
- Files can span 4 disk drives
- Password protected file access
- Database DIRECTORY displays all user files and their attributes
- Powerful TRANSACTIONS—add, edit, read, delete & list records
- Efficient binary tree sorts
- Sophisticated QUERY with multi-key relational & logical operations
- REPORT formatter requires only for user to select desired fields
- Automatic sub & grand totals
- May be used with lower case
- Entirely MENU DRIVEN operation
- Extensive error trapping routines
- User oriented instruction manual
- Requires 32k—2 disk drives

Introductory price \$59.95

mentor software®
816 McLane Ave—Morgantown, WV 26505

Tandy Corp. Trademark

Circle 250 on inquiry card.

50¢ TRS-80* Cassette Duplication

1000 Qty. Minimum
Guaranteed to Load

MICROSETTE CO.
475 Ellis St., Mt. View, CA
94043 (415) 962-0220

*Trademark of Tandy Corp.

Circle 271 on inquiry card.

LABELS

299

perM

15/16" x 3 1/2" white pressure
1 up - pin feed sensitive

PRICE INCLUDES SHIPPING
Packed 5M per box - Min. order 1 box - \$14.95
Check with order Mass Residents add 5% Sales Tax



CHECK-MATE™

P.O. Box 103, Randolph, MA 02368
Telephone: 617-963-7694

Circle 64 on inquiry card.

256K RAM

New 256K dynamic RAM card for S-100 bus. Meets IEEE 696 standard. Full parity, either 8/16 bit data path. Includes acknowledge line for use with asynchronous processors, such as the MC68000. Plus many more advanced features. 200nsec standard, 150 nsec optional.

\$3795

OEM pricing available

**Empirical Research
Group, Inc.**
PO Box 1176
Milton, WA 98354
206-631-4855

Circle 165 on inquiry card.

PRINTER SALE! SAVE 20-40%

| | |
|-------------------------------------|--------|
| Anadex 9500 | \$1295 |
| C. Itoh Comet I 125cps | \$455 |
| C. Itoh Comet II 15" parallel | \$795 |
| C. Itoh Comet II 15" serial | \$875 |
| Diablo 630 | \$2070 |
| Tractor Option | \$245 |
| Epson MX-70 | \$353 |
| Epson MX-80 | \$477 |
| Epson MX-80 FT | \$599 |
| Epson MX-100 16" paper | \$799 |
| Serial board for MX-80 | \$58 |
| Integral Data Systems 460G | \$840 |
| Okidata Microline 80 | \$403 |
| Okidata Microline 82 | \$522 |
| Okidata Microline 83 | \$648 |
| Starwriter 25cps parallel | \$1395 |
| Starwriter 25cps serial | \$1495 |
| Starwriter 45cps parallel | \$1795 |
| Tractor option | \$199 |

CHECKS — VISA — MASTER CARD
Shipping extra. Michigan Add 4%

LYBEN COMPUTER SYSTEMS
27204 Harper — P.O. Box 131
St. Clair Shores, MI 48080

Circle 234 on inquiry card.

FREE DATA BASE

On Computing* magazine article data base (1978 and 1980) FREE with purchase of IC-IRS Information Retrieval System. The best menu driven, multiple key word indexing, filing and retrieval system for the money. (65 "and" ed; 32 "or" ed key words per query—search time in seconds.)

For 8080/280 computers with CP/M compatible op. system, 32K memory and 2 disks.

DATA BASES available to run on IC-IRS:

Computer magazine article abstracts, 6 data bases
8 major computer magazines from Vol. 1 thru 1980.

CP/M Users Group Programs - indexes of 50 discs.

Software Vendors — 950 names & add. with products.

IC-IRS w/manual & free data base \$59.95
DATA BASES \$29.95 - \$49.95

8" SD and most 5 1/4" formats.

MC/VISA (512) 258-6310

FYI, INC.™

P.O. Box 10988 #615
Austin, Texas 78766

*Trademark of McGraw-Hill Inc.
†Registered trademark of Digital Research

Circle 173 on inquiry card.



| | |
|----------------------------|--------|
| 800 16K | \$740. |
| 400 16K | 319. |
| 410 Recorder | 59. |
| 810 DISK | 449. |
| 850 Interface | 169. |
| 830 Modem | 159. |
| 16KRAM | 75. |
| 820 Printer | 260. |
| 822 Printer | 349. |
| 825 Printer | 570. |
| 483 The Programmer | 55. |
| 484 The Communicator | 330. |

Call or write for discount on software.
EMPIRE SYSTEMS CORPORATION
18604 Rolling Acres Way
Olney, Maryland 20832
774-7330 948-8588
Prices subject to change

Circle 162 on inquiry card.

Rings of Saturn™ LEVEL-10 SOFTWARE
As the commander of your spaceship on assignment to save your stranded crew near Saturn's rings, you will face assault by enemy ships, ice chunks and other dangers. You have a limited fuel supply and only a short time before their space station blows up. Rings of Saturn has 4 skill levels, 3-D animation, Hi-Res color graphics and sound effects.

Dragon™ LEVEL-10 SOFTWARE
Fight. Slay the dragon Salmadon and accumulate a vast fortune™ as the Wizard, the Elf, the Warrior, the Samurai or the Dwarf, you enter a maze of dungeons which are actually the ruins of 10 civilizations built on top of one another. During your quest, you will encounter monsters guarding rooms and passages, each with his own treasure. Be on the lookout for red keys — a magical key is the only way to defeat Salmadon! There is a random key which automatically selects a character, a popular feature for children. There are 5 skill levels.

Keys of Kingdom™ LEVEL-10 SOFTWARE
Save the world from the venomous Madamara! All the characters from Dragon Fire are reunited in a brand new mission. During his travel through the dungeon, the Dwarf discovered a gem. By bringing it to the surface, a malevolent force escapes from the gem and tries to take over the world. The only way to quell Madamara is to place a piece of the gem on a bear at the top of Mt. Karkham. You choose a character, hire a crew and begin your ascent. Hi-Res color graphics and 3-D animation simulate walking up one down stairs and through passages. DON'T PLAY IT IN THE DARK!

Call us about our complete range of AUSTRALIAN SOFTWARE products
COMPTON/IBILL INTERNATIONAL, INC.
Suite 133, P. O. Box 81
Wheat Ridge, Colorado 80036-0081
(303) 425-4411



Circle 454 on inquiry card.

Sprint 68 Microcomputer



CONTROL COMPUTER DEVELOPMENT SYSTEM
6800 MPU, serial I/O, 48K RAM, dual 8" drives, WIZRD multitasking DOS, editor, assembler, 16K BASIC, all for \$3949.

OPTIONS
C, PL/W, PASCAL, FORTRAN, EROM programming, analog I/O, parallel I/O, 488 GPIB interface, CMOS RAM/battery, power fail detect/power on reset



Wintek Corp.
1601 South Street
Lafayette, IN 47904
317-742-8428

Circle 431 on inquiry card.

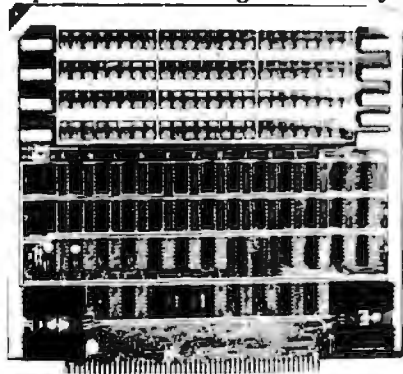
Here we grow again!!!

Grand Opening Sale

We're celebrating the latest addition to Jade's Retail Division - our new store located in Woodland Hills at 21800 Ventura Blvd.

New from Jade The Bus Probe

Inexpensive S-100 Diagnostic Analyzer



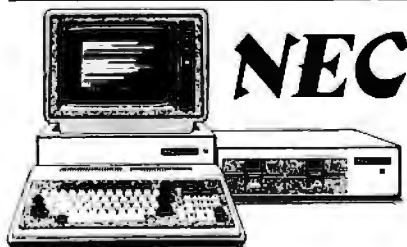
So your computer is down. And you don't have an oscilloscope. And you don't have a front panel... You're not alone - most computers have their occasional bad days. But without diagnostic equipment such as an oscilloscope (expensive!) or a front panel (expensive!), it can be very difficult to pinpoint the problem. Even if you have an extender board with a superfast logic probe, you can't see more than one signal at a time. You're stuck, right?

Not anymore; Jade is proud to offer our cost-effective solution to the problems mentioned above: THE BUS PROBE.

Whether you're a hobbyist with a cantankerous kluge or a field technician with an anxious computer owner breathing down your neck, you'll find THE BUS PROBE speeds your repair time remarkably. Just plug in THE BUS PROBE and you'll be able to see *all* the IEEE S-100 signals in action. THE BUS PROBE allows you to see inputs, outputs, memory reads and writes, instruction fetches, DMA channels, vectored interrupts, 8 or 16 bit wide data transfers, plus the three bus supply voltages.

An on-board pulse generator can provide repetitive resets, interrupts, or wait states, for trouble shooting.

TSX-200B Bare board \$59.95
TSX-200K Kit \$119.95
TSX-200A A&T \$149.95



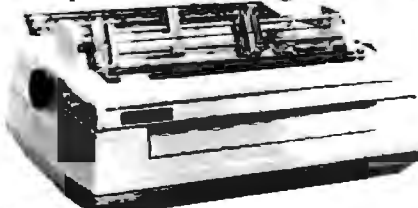
1 MHz Z80 CPU, 80 x 25 display with graphics and 8 colors, 32K RAM, 24K ROM, parallel/serial cassette interface, upper/lower case, numeric keypad, 10 special function keys, user CP/M 2.2.

NEC-8001A 32K CPU/keyboard ... \$1095.00
NEC-8012A I/O with 32K RAM ... \$695.00
NEC-8031A Dual disk unit \$1095.00
VDM-651200 12" green CRT \$269.95
VDC-1202D Hi-res RGB color CRT \$1045.00
VDC-651212 12" color monitor \$479.95
NEC-9010S CP/M 2.2 for NEC ... \$150.00
NEC-90005 Gen. acting softwr ... \$375.00

Circle 210 on inquiry card.

Intersell Sellum I

NEC Spinwriter w/ Intelligent Controller



Standard serial, Centronics parallel, and current loop interfaces • Selectable baud rates 50 to 19,200
• Automatic bidirectional printing • Logic seeking • 650 character buffer with optional 16K buffer • 55 characters per second print speed • Comes with vertical forms tractor, ribbon, thimble and cable • Diablo compatible software • Available with or without optional front panel

PRD-55511 1K no front panel ... \$2795.00
PRD-55512 16K no front panel ... \$2895.00
PRD-55515 1K w/ front panel \$2995.00
PRD-55516 16K w/ front panel ... \$3095.00

Intersell NEC 3500Q

Intersell has announced that, available in September, they will offer a version of the new NEC Model 3500Q Spinwriter (30 cps) that will bring to the customer the same standard features as the Sellum I (except the tractor assembly which is optional on the 3500Q) but incorporating the added features of the NEC Model 3500Q

PRD-55351 3500Q 1K \$1995.00

PRD-55352 3500Q 16K \$2095.00

PRA-55100 Deluxe tractor option .. \$300.00

JADE Disk Sub-Systems

Shugart, Siemens, Qume



Handsome metal cabinet with proportionally balanced air flow system • Rugged dual drive power supply • Power cable kit • Power switch, line cord, fuse holder, cooling fan • Never-Mar rubber feet • All necessary hardware to mount 2-8" disk drives, power supply, and fan • Does not include signal cable

Dual 8" Subassembly Cabinet

END-000420 Bare cabinet ... \$59.95
END-000421 Cabinet kit ... \$225.00
END-000431 A & T \$359.95

8" Disk Drive Subsystems

Single Sided, Double Density

END-000423 Kit w 2 FD100-8Ds ... \$924.95
END-000424 A & T w 2 FD100-8Ds \$1124.95
END-000433 Kit w 2 SA-801Rs ... \$999.95
END-000434 A & T w 2 SA-801Rs \$1195.00

8" Disk Drive Subsystems

Double Sided, Double Density

END-000426 Kit w 2 DT-8s ... \$1224.95
END-000427 A & T w 2 DT-8s ... \$1424.95
END-000436 Kit w 2 SA-851Rs ... \$1495.00
END-000437 A & T w 2 SA-851Rs \$1695.00



-Special
Sale Price-

QUME DT-8

8" Double-Sided, Double-Density Disk Drive

1 Drive ... \$524.95 each
2 Drives . \$499.95 each
10 Drives \$479.95 each

Jade Part Number MSF-750080

SIEMENS 8"

8" Single-Sided, Double-Density Disk Drive

1 Drive ... \$384.95 each
2 Drives . \$349.95 each
10 Drives \$324.95 each

Jade Part Number MSF-201120

Shugart 801R

8" Single-Sided, Double-Density Disk Drive

1 Drive ... \$394.95 each
2 Drives . \$389.95 each

Jade Part Number MSF-10801R

MPI B-51

5 1/4" Single-Sided, Double-Density Disk Drive

1 Drive ... \$234.95 each
2 Drives . \$224.95 each
10 Drives \$219.95 each

Jade Part Number MSM-155100

END-000213 Case & power supply \$74.95

Micro-Sci

Apple Disk Drives

Increased Capacity - Decreased Price

40 or 70 track drives • operates with DOS 3.2 and 3.3, Language System, and the Z80 Softcard • 40 and 70 track drives may be mixed on your Apple II • With two 40 track drives you get a 12.5% increase in capacity, 300% improvement in track-to-track access, and save about 15%. • With two 70 track drives instead of four 35 track drives you get the same capacity, 300% improvement in track-to-track access time, and save about 45%.
IOD-2340A A-40 with cable \$399.95
IOD-2370A A-70 with cable \$529.95
IOD-2300A Micro-sci controller \$89.95

Grand Opening Sale

***** San Diego ***** Hawthorne ***** Woodland Hills *****

Printers



BETTER THAN EPSON! - Okidata

Microline 82A 80/132 column, 120 CPS, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (removable), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking, both serial & parallel interfaces included, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics
PRM-43082 with FREE tractor \$544.95

Microline 83A 132/232 column, 120 CPS, handles forms up to 15" wide, plus all the features of the 82A.
PRM-43083 with FREE tractor ... \$774.95

PRA-27081A Apple card \$39.95
PRA-27082A Apple cable \$19.95
PRA-27087A TRS-80 cable \$24.95
PRA-43080 Extra ribbons pkg. of 2 ... \$9.95

INEXPENSIVE PRINTERS - Epson

MX-70 80 column, 80 CPS, 5 x 7 dot matrix, adjustable tractor feed, & graphics
PRM-27070 List \$459 \$399.95

MX-80 80 column, 80 CPS, bi-directional/logic seeking printing, 9 x 9 dot matrix, adjustable tractor feed, & 64 graphics characters
PRM-27080 List \$645 \$474.95

MX-80FT same as MX-80 with friction feed added.
PRM-27082 List \$745 ... \$574.95

MX-100 132 column, correspondence quality, graphics, up to 15" paper, friction feed & adjustable tractor feed, 9 x 9 dot matrix, 80 CPS.
PRM-27100 List \$945 \$795.00

PRA-27084 Serial interface \$69.95
PRA-27088 Serial intf & 2K buffer .. \$144.95
PRA-27081 Apple card \$74.95
PRA-27082 Apple cable \$22.95
PRA-27086 IEEE 488 card \$52.95
PRA-27087 TRS-80 cable \$32.95
PRA-27085 Grafrax II \$95.00
PRA-27083 Extra ribbon \$14.95

Dual-Mode 200 - Malibu

200 CPS 9 x 9 matrix or 70 CPS, 19 x 18 matrix for letter quality, stores up to 12 different fonts, hi-res dot graphics, single sheet and tractor feed, RS-232C and parallel interfaces
PRM-35200 Dual-Mode 200 \$2695.00

16K Atari ... \$359.95

ATARI 800 - Atari

(Complete personal computer with high resolution color graphics, built in RF modulator, 4 controller ports, internal speaker, 16K RAM & 8K ROM)
SYO-2080A 16K Atari 800 \$759.95
Atari 800 with 32K of RAM \$799.95
Atari 800 with 48K of RAM \$849.95
SYO-2040A 16K Atari 400 \$359.95
MSM-330810 Disk drive \$595.00
MSM-330815 Dual drive \$1395.00
IOX-5050A 850 interface \$199.95
MEX-16853K 16K RAM module \$69.95
SFI-241011005 Visicalc \$184.95

Accessories for Apple

16K MEMORY UPGRADE

Add 16K of RAM to your TRS-80, Apple, or Exidy in just minutes. We've sold thousands of these 16K RAM upgrades which include the appropriate memory chips (as specified by the manufacturer), all necessary jumper blocks, fool-proof instructions, and our 1 year guarantee.
MEX-16100K TRS-80 kit \$25.00
MEX-16101K Apple kit \$25.00
MEX-16102K Exidy kit \$25.00

16K RAM CARD - for Apple II

Expand your Apple to 64K, 1 year warranty
MEX-16500A Save \$70.00 !!! \$129.95

Z-80* CARD for APPLE

Two computers in one, Z-80 & 6502, more than doubles the power & potential of your Apple, includes Z-80* CPU card, CP M 2.2, & BASIC-80
CPX-30800A A & T \$299.95

8" DISK CONTROLLER

New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2 3.3, Pascal, & CPM 2.2, Shugart & Qume compatible
IOD-2700A A & T \$499.95

8" DRIVES for APPLE

Controller, DOS, two 8" double density drives, cabinet, power supply, & cables
Special Package Price Kit \$1399.95

CPS MULTICARD - Mtn. Computer

Three cards to one! Real time clock, calendar, serial interface, & parallel interface - all on one card.
IOX-2300A A & T \$199.95

APPLE CLOCK - Cal Comp Sys

Real time clock w/ battery back-up
IOK-2030A A & T \$109.95

PRINTER INTERFACE - C.C.S.

Centronics type I I/O card w/ firmware
IOI-2041A A & T \$99.95

AIO, ASIO, APIO - S.S.M.

Parallel & serial interface for your Apple (see Byte pg 11)
IOI-2050K Par & Ser kit \$139.95
IOI-2050A Par & Ser A & T \$169.95
IOI-2052K Serial kit \$89.95
IOI-2052A Serial A & T \$99.95
IOI-2054K Parallel kit \$69.95
IOI-2054A Parallel A & T \$89.95

A488 - S.S.M.

IEEE 488 controller, uses simple basic commands, includes firmware and cable, 1 year guarantee, (see April Byte pg 11)
IOX-7488A A & T \$399.95

Accessories for TRS-80

DISK DRIVES for TRS-80

23% more storage, 8 times faster, 40 track with free patch, 120 day warranty.
MSM-12410C Save \$125.00 !!! \$325.00

8" DISK DRIVES for MODEL II

2 double density drives with cabinet, power supply, & cables
END-000433 Kit \$1050.00
END-000434 Assembled \$1250.00
WCA-5036A Cable (required) \$29.95

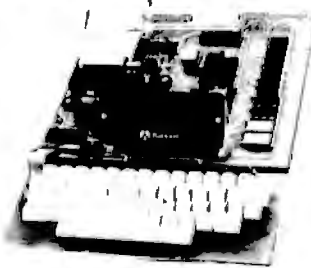
EPROM ERASERS

L.S. Engineering UV eraser for up to 48 EPROMs
XME-3200 A & T \$39.99

Spectronics hi intensity industrial eraser

XME-3100 Without timer \$69.50

Single Board Computers



AIM-65 - Rockwell

6502 computer with alphanumeric display, printer, & keyboard and complete instructional manuals
CPK-50165 1K AIM \$424.95
CPK-50465 1K AIM \$474.95
SFK-74600008E 8K BASIC ROM \$69.95
SFK-84600004E 4K assembler ROM \$39.95
PSX-030A Power supply \$64.95
ENX-000002 Enclosure \$54.95
1K AIM, 8K BASIC, power supply, & enclosure
Special package price \$659.95

Z-80* STARTER KIT - SD Systems

Complete Z-80* computer with RAM, ROM, I/O, display, keyboard, manual, and huge area.
CPS-30010K Kit \$369.95
CPS-30010A A & T \$459.95

SYM-1 - Synertek Systems

Single board computer with 1K of RAM, 1K of ROM, keypad, keyboard, manual, & cassette interface on board.
CPK-50020A A & T \$249.95

Video Terminals

AMBER SCREEN - Volker Craig

Detachable keyboard, amber on black display, 7 x 9 dot matrix, 10 program function keys, 14 key numeric pad, 12" non-glare screen, 50 to 19,200 baud, direct cursor control, auxiliary bi-directional serial port
VDT-351200 List \$795.00 \$645.00

VIEWPOINT - ADDS

Detachable keyboard, serial RS232C interface, baud rates from 110 to 19,200, auxiliary serial output port, 24 x 80 display, LED display, 20ma & cassette interface on board.
VDT-501210 Sale Price \$639.95

TELEVIDEO 950

Detachable keyboard, split screen with hilt lock, etched CRT, programmable function keys, on-screen status line, buffered auxiliary port, 11 x 40 dot matrix, self test, serviced nationwide by General Electric
VDT-901250 List \$1195.00 \$995.00

Video Monitors

HI-RES 12" GREEN - Zenith

15 MHz bandwidth, 700 lines, inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.
VDM-201201 List price \$150.00 \$118.95

Leedex / Amdek

Reasonably priced video monitors
VDM-801210 Video 100 12" B&W .. \$139.95
VDM-801230 Video 100-80 12" B & W \$179.95
VDM-801250 12" Green Phosphor .. \$169.95
VDC-801310 13" Color I \$379.95

12" COLOR MONITOR - NEC

Hi-res monitor with audio & sculptured case
VDC-651212 Color Monitor \$479.95

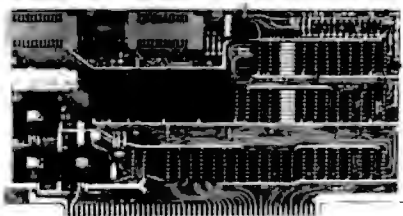
12" GREEN SCREEN - NEC

30 MHz, P31 phosphor video monitor with audio, exceptionally high resolution - A fantastic monitor at a very reasonable price
VDM-651200 12" monitor \$269.95

Grand Opening Sale

★★★★★ San Diego ★★★★★ Hawthorne ★★★★★ Woodland Hills ★★★★★

S-100 PROM Boards



PB-1 - S.S.M.

2708, 2716 EPROM board with built-in programmer
MEM-99510K Kit \$154.95
MEM-99510A A & T \$219.95

PROM-100 - SD Systems

2708, 2716, 2732, 2758, & 2516 EPROM programmer
MEM-99520K Kit \$219.95
MEM-99520A Jade A & T \$269.95

EPROM BOARD - Jade

16K or 32K uses 2708's or 2716's, 1K boundary
MEM-16230K Kit \$79.95
MEM-16230A A & T \$119.95

S-100 Video

VB-3 - S.S.M.

80 characters x 24 lines expandable to 80 x 48 for a full page of text, upper & lower case, 356 user defined symbols, 160 x 192 graphics matrix, memory mapped, has key board input
IOV-1095K 4 MHz kit \$349.95
IOV-1095A 4 MHz A & T \$439.95
IOV-1096K 80 x 48 upgrade \$39.95

VDB-8024 - SD Systems

80 x 24 I/O mapped video board with keyboard I/O, and on board Z-80A*
IOV-1020K Kit \$399.95
IOV-1020A Jade A & T \$459.95

VIDEO BOARD - S.S.M.

81 characters x 16 lines, 128 x 48 matrix for graphics, full upper lower case ASCII character set, numbers, symbols, and Greek letters, normal reverse blinking video, S-100.
IOV-1051K Kit \$149.95
IOV-1051A A & T \$219.95
IOV-1051B Bare board \$34.95

Motherboards

ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard
6 Slot (6 1/4" x 8 1/2")
MBS-061B Bare board \$19.95
MBS-061K Kit \$39.95
MBS-061A A & T \$49.95
12 Slot (9 1/4" x 8 1/2")
MBS-121B Bare board \$29.95
MBS-121K Kit \$69.95
MBS-121A A & T \$89.95
18 Slot (14 1/2" x 8 1/2")
MBS-181B Bare board \$49.95
MBS-181K Kit \$99.95
MBS-181A A & T \$139.95

Mainframes

MAINFRAME - Cal Comp Sys

12 slot S-100 mainframe with 30 amp power supply
ENC-112105 Kit \$329.95
ENC-112106 A & T \$399.95

DISK MAINFRAME - N.P.C.

Holds 2 8" drives and a 12 slot S-100 system. Attractive metal cabinet with 12 slot motherboard & card cage, power supply, dual fans, lighted switch, and other professional features.
ENS-112325 with 25 amp p.s. \$699.95

Circle 211 on inquiry card.

S-100 Memory

MEMORY BANK - Jade

4 MHz, S-100, bank selectable, expandable from 16K to 64K
MEM-99730B Bare board \$49.95
MEM-99730K Kit, no RAM \$109.95
MEM-16730K 16K kit \$219.95
MEM-32731K 32K kit \$239.95
MEM-48732K 48K kit \$259.95
MEM-64733K 64K kit \$279.95
Assembled & tested add \$50.00

EXPANDORAM II - S D Systems

4 MHz RAM board expandable from 16K to 64K
MEM-16630K 16K kit \$275.95
MEM-32631K 32K kit \$295.95
MEM-48632K 48K kit \$315.95
MEM-64633K 64K kit \$335.95
Assembled & tested add \$50.00

64K RAM - Calif Computer Sys

4 MHz bank part bank byte selectable, extended addressing, 16K bank selectable, PHANTOM line allows memory overlay, 8080 Z-80 front panel compatible.
MEM-64565A A & T \$575.00

64K STATIC RAM - Mem. Merch.

64K static S-100 RAM card, 4-16K banks, up to 8 MHz
MEM-84400A A & T \$825.00

32K STATIC RAM - Jade

2 or 1 MHz expandable static RAM board uses 2114L's
MEM-16151K 16K 4 MHz kit \$169.95
MEM-32151K 32K 4 MHz kit \$299.95
Assembled & tested add \$50.00

16K STATIC RAM - Mem Merchant

1 MHz 16K static RAM board, IEEE S-100, bank selectable. Phantom capability, addressable in 4K blocks, "disableable" in 1K segments, extended addressing, low power
MEM-16171A A & T \$174.95

S-100 Disk Controller

DOUBLE-D - Jade

Double density controller with the inside track, on-board Z-80A*, printer port, IEEE S-100, can function on an interrupt driven bus
IOD-1200K Kit \$299.95
IOD-1200A A & T \$375.00
IOD-1200B Bare board \$59.95

VERSAFLOPPY II - SD Systems

New double density controller for both 8" & 5 1/4"
IOD-1160K Kit \$339.95
IOD-1160A A & T \$379.95

DOUBLE DENSITY - Cal Comp Sys

5 1/4" and 8" disk controller, single or double density, with on-board boot loader ROM, and free CP/M 2.2* and manual set.
IOD-1300A A & T \$369.95

S-100 I/O

S.P.I.C. - Jade

Our new I/O card with 2 SIO's, 4 CTC's, and 1 PIO
IOI-1045K 2 CTC's, 1 SIO, 1 PIO .. \$179.95
IOI-1045A A & T \$239.95
IOI-1046K 4 CTC's, 2 SIO's, 1 PIO .. \$219.95
IOI-1046A A & T \$299.95
IOI-1045B Bare board w/ manual ... \$49.95

I/O-4 - S.S.M.

2 serial I/O ports plus 2 parallel I/O ports
IOI-1010K Kit \$179.95
IOI-1010A A & T \$249.95
IOI-1010B Bare board \$35.00

S-100 CPU



CB-2 Z-80 CPU - S.S.M.

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.
CPU-30300K Kit \$239.95
CPU-30300A A & T \$299.95

2810 Z-80* CPU - Cal Comp Sys

2 4 MHz Z-80A* CPU with RS-232C serial I/O port and on board MOSS 2.2 monitor PROM, front panel compatible.
CPU-30400A A & T \$269.95

SBC-200 - SD Systems

4 MHz Z-80* CPU with serial & parallel I/O ports, up to 8K of on-board PROM, software programmable baud rate generator, 1K of on-board RAM, Z-80 CTC.
CPC-30200K Kit \$339.95
CPC-30200A Jade A & T \$399.95

THE BIG Z* - Jade

2 or 4 MHz switchable Z-80* CPU with serial I/O, accommodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600
CPU-30201K Kit \$139.95
CPU-30201A A & T \$189.95
CPU-30200B Bare board \$35.00

Novation Cat Modem

CAT MODEMS - Novation

CAT 300 baud, acoustic, answer originate
IOM-5200A List \$189.95 \$149.95
D-CAT 300 baud direct connect, answer originate
IOM-5201A List \$199.95 \$169.95
AUTO-CAT Auto answer originate, direct connect
IOM-5230A List \$299.95 \$239.95

Apple-CAT - Novation

Software selectable 1200 or 300 baud, direct connect, auto answer auto dial, auxiliary 3 wire RS-232C serial port for printer.
IOM-5232A Save \$50.00!!! \$325.00

SMARTMODEM - Hayes

Sophisticated direct-connect auto-answer auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable
IOM-5400A Smartmodem \$269.95

Place Orders Toll Free

Continental U.S. Inside California
800-421-5500 800-262-1710
For Technical Inquiries or Customer Service call
213-973-7707

JADE

Computer Products

4901 W. Rosecrans, Hawthorne, Ca 90250

TERMS OF SALE: Cash, checks, credit cards, or Purchase Orders from qualified firms and institutions. Minimum Order \$15.00. California residents add 6% tax. Minimum shipping & handling charge \$3.00. Pricing & availability subject to change.

4K STATIC RAM 8/\$20.00

2114 LOW POWER 200 NS

74LS00

| | | | | | |
|---------|------|---------|------|----------|-------|
| 74LS00 | .25 | 74LS123 | .90 | 74LS259 | 2.80 |
| 74LS01 | .25 | 74LS124 | 2.95 | 74LS260 | .60 |
| 74LS02 | .25 | 74LS125 | .90 | 74LS261 | 2.45 |
| 74LS03 | .25 | 74LS126 | .80 | 74LS266 | .50 |
| 74LS04 | .25 | 74LS132 | .75 | 74LS273 | 1.80 |
| 74LS05 | .25 | 74LS136 | .50 | 74LS275 | 3.30 |
| 74LS06 | .30 | 74LS138 | .75 | 74LS279 | .50 |
| 74LS09 | .25 | 74LS139 | .75 | 74LS280 | 1.95 |
| 74LS10 | .25 | 74LS145 | 1.10 | 74LS283 | .95 |
| 74LS11 | .30 | 74LS147 | 2.25 | 74LS290 | 1.20 |
| 74LS12 | .30 | 74LS148 | 1.25 | 74LS293 | 1.80 |
| 74LS13 | .40 | 74LS151 | .75 | 74LS296 | 1.00 |
| 74LS14 | .75 | 74LS153 | .75 | 74LS298 | .95 |
| 74LS15 | .30 | 74LS155 | .90 | 74LS299 | 2.50 |
| 74LS20 | .25 | 74LS156 | .90 | 74LS323 | 3.95 |
| 74LS21 | .30 | 74LS157 | .75 | 74LS324 | 1.75 |
| 74LS22 | .25 | 74LS158 | .75 | 74LS347 | 1.95 |
| 74LS26 | .30 | 74LS160 | .90 | 74LS348 | 1.95 |
| 74LS27 | .35 | 74LS161 | .90 | 74LS352 | 1.50 |
| 74LS28 | .36 | 74LS162 | .90 | 74LS363 | 1.50 |
| 74LS30 | .25 | 74LS163 | .90 | 74LS363 | 1.35 |
| 74LS32 | .36 | 74LS164 | .90 | 74LS365 | .90 |
| 74LS35 | .55 | 74LS165 | .90 | 74LS366 | .90 |
| 74LS37 | .50 | 74LS166 | 2.00 | 74LS367 | .85 |
| 74LS38 | .36 | 74LS168 | 1.70 | 74LS368 | .85 |
| 74LS40 | .25 | 74LS169 | 1.70 | 74LS373 | 1.15 |
| 74LS42 | .50 | 74LS170 | 1.70 | 74LS374 | 1.75 |
| 74LS47 | .75 | 74LS173 | .75 | 74LS375 | .65 |
| 74LS48 | .75 | 74LS174 | .90 | 74LS377 | 1.40 |
| 74LS49 | .75 | 74LS175 | .90 | 74LS385 | 1.85 |
| 74LS51 | .25 | 74LS181 | 2.10 | 74LS386 | .60 |
| 74LS54 | .36 | 74LS189 | 8.85 | 74LS390 | 1.85 |
| 74LS55 | .35 | 74LS190 | .95 | 74LS393 | 1.85 |
| 74LS63 | 1.20 | 74LS191 | .95 | 74LS396 | 1.60 |
| 74LS73 | .36 | 74LS192 | .80 | 74LS399 | 1.65 |
| 74LS74 | .40 | 74LS193 | .90 | 74LS424 | 2.95 |
| 74LS75 | .50 | 74LS194 | .95 | 74LS447 | .35 |
| 74LS76 | .40 | 74LS195 | .90 | 74LS490 | 1.90 |
| 74LS78 | .50 | 74LS196 | .80 | 74LS5630 | 75.00 |
| 74LS83 | .75 | 74LS197 | .80 | 74LS5640 | 3.00 |
| 74LS86 | 1.10 | 74LS221 | 1.15 | 74LS5641 | 3.00 |
| 74LS88 | .40 | 74LS240 | 1.15 | 74LS5642 | 3.00 |
| 74LS90 | .60 | 74LS241 | 1.15 | 74LS5645 | 3.00 |
| 74LS91 | .80 | 74LS242 | 1.85 | 74LS5668 | 1.65 |
| 74LS92 | .65 | 74LS243 | 1.85 | 74LS5669 | 1.85 |
| 74LS93 | .80 | 74LS244 | 1.00 | 74LS5670 | 2.15 |
| 74LS95 | .80 | 74LS245 | 1.95 | 74LS5674 | 9.60 |
| 74LS96 | .80 | 74LS247 | .75 | 74LS5682 | 3.15 |
| 74LS107 | .40 | 74LS248 | 1.20 | 74LS5683 | 2.25 |
| 74LS109 | .40 | 74LS249 | .95 | 74LS5684 | 2.35 |
| 74LS112 | .40 | 74LS251 | 1.25 | 74LS5685 | 2.35 |
| 74LS113 | .40 | 74LS253 | .80 | 74LS5688 | 2.35 |
| 74LS114 | .50 | 74LS257 | .80 | 74LS5689 | 2.35 |
| 74LS122 | .45 | 74LS258 | .80 | | |

74S00

| | | | |
|--------|------|--------|-------|
| 74S00 | .40 | 74S163 | 3.70 |
| 74S02 | .45 | 74S168 | 4.60 |
| 74S03 | .45 | 74S169 | 5.40 |
| 74S04 | .75 | 74S174 | 1.05 |
| 74S05 | .75 | 74S175 | 1.05 |
| 74S08 | .45 | 74S181 | 4.45 |
| 74S09 | .75 | 74S182 | 2.90 |
| 74S10 | .65 | 74S188 | 3.90 |
| 74S11 | .80 | 74S189 | 14.90 |
| 74S15 | .65 | 74S194 | 2.90 |
| 74S20 | .65 | 74S195 | 1.85 |
| 74S22 | .75 | 74S196 | 4.85 |
| 74S30 | .45 | 74S197 | 4.20 |
| 74S32 | .95 | 74S201 | 14.90 |
| 74S37 | 1.85 | 74S225 | 8.90 |
| 74S38 | 1.65 | 74S240 | 3.95 |
| 74S40 | .40 | 74S241 | 3.70 |
| 74S51 | .75 | 74S251 | 1.85 |
| 74S64 | .75 | 74S253 | 7.40 |
| 74S65 | 1.20 | 74S257 | 1.35 |
| 74S74 | .65 | 74S258 | 1.45 |
| 74S85 | 2.35 | 74S280 | 1.80 |
| 74S86 | 1.40 | 74S274 | 19.90 |
| 74S112 | 1.55 | 74S275 | 19.90 |
| 74S113 | 1.95 | 74S280 | 2.85 |
| 74S114 | 1.45 | 74S287 | 4.70 |
| 74S124 | 2.75 | 74S288 | 4.40 |
| 74S132 | 1.20 | 74S289 | 6.95 |
| 74S133 | .95 | 74S301 | 6.90 |
| 74S134 | .65 | 74S373 | 3.40 |
| 74S135 | 1.45 | 74S374 | 3.40 |
| 74S138 | 1.05 | 74S381 | 7.90 |
| 74S139 | 1.20 | 74S387 | 5.70 |
| 74S140 | 1.40 | 74S412 | 2.95 |
| 74S151 | 1.15 | 74S471 | 8.90 |
| 74S153 | 1.15 | 74S472 | 18.80 |
| 74S157 | 1.15 | 74S474 | 17.80 |
| 74S158 | 1.40 | 74S482 | 15.50 |
| 74S161 | 2.80 | 74S570 | 7.75 |
| 74S162 | 3.70 | 74S572 | 7.75 |

74C00 CMOS

| | | | |
|--------|------|--------|-------|
| 74C00 | .35 | 74C195 | 2.20 |
| 74C02 | .35 | 74C221 | 2.20 |
| 74C04 | .35 | 74C240 | 2.20 |
| 74C08 | .35 | 74C244 | 2.20 |
| 74C10 | .36 | 74C374 | 2.70 |
| 74C14 | 1.45 | 74C374 | 2.70 |
| 74C20 | .35 | 74C801 | .80 |
| 74C30 | .35 | 74C802 | .80 |
| 74C32 | .50 | 74C803 | .80 |
| 74C42 | 1.70 | 74C804 | .80 |
| 74C48 | 2.05 | 74C805 | 10.90 |
| 74C73 | .85 | 74C806 | .90 |
| 74C74 | .85 | 74C807 | .90 |
| 74C76 | 1.90 | 74C808 | 2.00 |
| 74C83 | 1.90 | 74C809 | 2.70 |
| 74C86 | .90 | 74C810 | 9.90 |
| 74C88 | 4.50 | 74C811 | 9.90 |
| 74C90 | 1.70 | 74C812 | 9.90 |
| 74C93 | 1.70 | 74C814 | 1.90 |
| 74C95 | 1.70 | 74C815 | 1.80 |
| 74C107 | .95 | 74C817 | 2.70 |
| 74C150 | 5.70 | 74C818 | 1.90 |
| 74C151 | 2.20 | 74C820 | 16.00 |
| 74C154 | 3.20 | 74C822 | 5.90 |
| 74C157 | 1.75 | 74C823 | 5.90 |
| 74C180 | 1.95 | 74C825 | 6.70 |
| 74C181 | 1.95 | 74C826 | 7.90 |
| 74C182 | 1.95 | 74C827 | 7.90 |
| 74C183 | 1.95 | 74C828 | 7.90 |
| 74C184 | 1.95 | 74C829 | 7.90 |
| 74C185 | 1.95 | 74C830 | 7.90 |
| 74C173 | 1.95 | 74C832 | 1.95 |
| 74C174 | 2.20 | 74C941 | 2.75 |
| 74C175 | 2.20 | 74C899 | 9.80 |
| 74C192 | 2.20 | 80C95 | .85 |
| 74C193 | 2.20 | 80C96 | .90 |
| 80C97 | .90 | 88C30 | 3.95 |
| 82C19 | 4.95 | 88C29 | 3.95 |

4000CMOS

| | | | | | |
|------|------|------|------|------|------|
| 4000 | .35 | 4040 | .95 | 4501 | .50 |
| 4001 | .35 | 4041 | .95 | 4502 | .95 |
| 4002 | .35 | 4042 | .75 | 4503 | .65 |
| 4006 | .95 | 4043 | .85 | 4505 | 8.95 |
| 4007 | .35 | 4044 | .85 | 4506 | 1.25 |
| 4008 | .95 | 4046 | .95 | 4507 | .95 |
| 4009 | .45 | 4047 | .95 | 4508 | 1.85 |
| 4010 | .45 | 4048 | .75 | 4510 | .95 |
| 4011 | .35 | 4049 | .55 | 4511 | .95 |
| 4012 | .35 | 4050 | .55 | 4512 | .95 |
| 4013 | .45 | 4051 | .95 | 4514 | 2.25 |
| 4014 | .95 | 4052 | .95 | 4515 | 2.25 |
| 4015 | .95 | 4053 | .95 | 4516 | 1.50 |
| 4016 | .45 | 4055 | 2.75 | 4518 | 1.25 |
| 4017 | .95 | 4056 | 2.75 | 4519 | 1.25 |
| 4018 | .95 | 4059 | 9.95 | 4520 | 1.25 |
| 4019 | .45 | 4060 | 1.25 | 4522 | 1.25 |
| 4020 | .95 | 4066 | .75 | 4526 | 1.25 |
| 4021 | .95 | 4068 | .40 | 4527 | 1.75 |
| 4022 | .95 | 4069 | .40 | 4528 | 1.25 |
| 4023 | .35 | 4070 | .40 | 4531 | .95 |
| 4024 | .75 | 4071 | .30 | 4532 | 1.75 |
| 4025 | .35 | 4072 | .30 | 4539 | 1.75 |
| 4026 | 1.95 | 4073 | .30 | 4543 | 1.95 |
| 4027 | .65 | 4075 | .30 | 4553 | 4.95 |
| 4028 | .80 | 4076 | .95 | 4555 | .95 |
| 4029 | .95 | 4078 | .50 | 4556 | .95 |
| 4030 | .45 | 4081 | .40 | 4558 | 2.25 |
| 4031 | 1.50 | 4082 | .40 | 4568 | 5.95 |
| 4032 | 2.75 | 4085 | .95 | 4581 | 1.95 |
| 4033 | 2.75 | 4086 | .95 | 4582 | 1.95 |
| 4034 | 2.75 | 4093 | .95 | 4584 | .95 |
| 4035 | .85 | 4094 | 3.95 | 4585 | .95 |
| 4037 | 2.50 | 4099 | 1.75 | 4702 | 9.95 |

LINEAR

| | | | | | |
|--------|------|--------|------|---------|------|
| 7805CT | .85 | LM301V | .75 | LM567V | 1.25 |
| 7812CT | .85 | LM308V | .75 | LM723 | .50 |
| 7815CT | .95 | LM309K | 1.50 | LM733 | .95 |
| | | LM311V | .60 | LM741V | .30 |
| | | LM317T | .90 | LM747 | .75 |
| 7805KT | 1.40 | LM317K | 3.75 | LM748V | .60 |
| 7812KT | 1.40 | LM318N | 1.50 | LM1414 | 1.50 |
| 7815KT | 1.40 | LM323K | 3.75 | LM1458V | .65 |
| 78L05 | .65 | LM324N | .60 | DS1488N | 1.00 |
| 78L12 | .65 | LM337K | 3.95 | DS1489D | 1.00 |
| 7905CT | .95 | LM339 | .75 | LM1889 | 2.45 |
| 7912CT | .95 | LM377 | 2.25 | LM3900 | .60 |
| 7915CT | 1.15 | LM380 | 1.25 | LM3909 | .90 |
| | | LM386V | 1.25 | LM3914 | 3.75 |
| 7905K | 1.50 | | | LM3915 | 3.75 |
| 7912K | 1.50 | LM555V | .40 | LM3916 | 3.75 |
| 78L05 | .75 | LM556 | .70 | DS75451 | .40 |
| 78L12 | .75 | LM565 | .95 | DS75452 | .40 |
| 79L15 | .75 | LM568V | 1.50 | DS75453 | .40 |

HANLEY ENGINEERING CORP

13400 Northrup Way #20

Bellevue, WA. 98005

1-800-426-2668

1-206-643-0792

Include 3.00 for Ups Ground

Include 4.00 for Ups Blue

Include 4.00 for 1st Class Mail

Washington State add 5.4% Sales Tax

16K Memory 8/\$16.00

4116 200NS

8200

| | |
|-----------|-------|
| 8155 | 11.25 |
| 8185 | 29.95 |
| 8202 | 45.00 |
| 8205 | 3.95 |
| 8212 | 1.90 |
| 8214 | 3.85 |
| 8216 | 1.80 |
| 8224 | 2.50 |
| 8228 | 1.80 |
| 8228 | 4.90 |
| 8238 | 4.90 |
| 8243 | 4.50 |
| 8251A | 5.45 |
| 8253 | 9.80 |
| 8255A - 5 | 5.20 |
| 8257 - 5 | 8.95 |
| 8258A | 6.95 |
| 8271 | 90.00 |
| 8272 | 39.95 |
| 8275 | 29.95 |
| 8279 - 5 | 10.00 |
| 8282 | 6.80 |
| 8283 | 6.80 |
| 8284A | 5.75 |
| 8286 | 6.80 |
| 8287 | 6.80 |
| 8288 | 25.00 |
| 8289 | 49.95 |
| 8755A | 45.00 |

Z80

| | |
|--------------|-------|
| Z80 | 6.70 |
| Z80A | 7.25 |
| Z80B | 19.00 |
| Z80 PIO | 6.00 |
| Z80A IO | 7.10 |
| Z80B PIO | 15.50 |
| Z80 CTC | 6.00 |
| Z80A CTC | 7.10 |
| Z80B CTC | 15.60 |
| Z80 DMA | 18.50 |
| Z80A DMA | 22.50 |
| Z80 SIO / 0 | 18.50 |
| Z80A SIO / 0 | 22.50 |
| Z80 SIO / 1 | 18.50 |
| Z80A SIO / 1 | 22.50 |
| Z80 SIO / 2 | 18.50 |
| Z80A SIO / 2 | 22.50 |

6800

| | |
|-------|-------|
| 3242 | 8.00 |
| 3480 | 9.00 |
| 6800 | 5.75 |
| 6802 | 11.00 |
| 6809 | 25.00 |
| 6810 | 3.50 |
| 6821 | 3.50 |
| 6840 | 9.00 |
| 6843 | 41.00 |
| 6845 | 22.00 |
| 6847 | 12.25 |
| 6850 | 3.50 |
| 6852 | 3.50 |
| 6875 | 7.00 |
| 6880 | 1.80 |
| 6882 | 4.70 |
| 6885 | 1.80 |
| 6888 | 1.80 |
| 6889 | 1.80 |
| 68488 | 12.50 |

6502

| | |
|-----------|-------|
| 6502 | 7.80 |
| 6502A | 10.00 |
| 6504 | 8.45 |
| 6504A | 9.30 |
| 6512 | 8.20 |
| 6512A | 10.00 |
| 6520 | 4.40 |
| 6521 | 6.15 |
| 6521A | 6.70 |
| 6522 | 8.75 |
| 6522A | 11.70 |
| 6532 | 11.25 |
| 6532A | 12.40 |
| 6545 - 1 | 22.50 |
| 6545A - 1 | 28.95 |
| 6551 | 11.95 |
| 6551A | 12.95 |

CPU

| | |
|-----------|-------|
| 8080A | 3.95 |
| 8085A | 8.95 |
| 8085A - 2 | 11.95 |
| 8088 | 99.95 |
| 8088 | 39.95 |
| 8748 | 30.00 |

CALL
HANLEY FIRST
800-426-2668
206-643-0792

EPROMS

| | | | | |
|-----------|-----------|----------|-------|-------|
| 2708 | AMD | 3 Supply | 45ONS | 3.50 |
| 2718 | Hitachi | +6 | 45ONS | 7.00 |
| 2718 | National | +5 | 45ONS | 7.00 |
| 2718 | Intel | +5 | 45ONS | 7.00 |
| 2718-1 | Intel | +5 | 35ONS | 9.50 |
| 2718 | T.I. | 3 Supply | 45ONS | 7.50 |
| 2718 | Motorola | 3 Supply | 45ONS | 7.50 |
| 2732 | NEC | +6 | 45ONS | 16.00 |
| 2732 | Mitsubish | +6 | 45ONS | 16.00 |
| 2732 | Intel | +5 | 45ONS | 17.00 |
| 2732A | Intel | +6 | 25ONS | 17.00 |
| 2732A - 3 | Intel | +6 | 30ONS | 16.00 |
| 2732A - 2 | Intel | +6 | 20ONS | 20.00 |
| 2532 | Hitachi | +5 | 45ONS | 18.00 |

AUGAT LOW PROFILE SOCKETS

These Are High Reliability Industry Standard Sockets

| | | |
|-------|-----------|-----|
| 8PIN | 208-AG29D | .10 |
| 14PIN | 214-AG29D | .16 |
| 16PIN | 216-AG29D | .18 |
| 18PIN | 218-AG29D | .20 |
| 20PIN | 220-AG29D | .22 |
| 22PIN | 222-AG29D | .24 |
| 24PIN | 224-AG29D | .26 |
| 28PIN | 228-AG29D | .28 |
| 40PIN | 240-AG29D | .42 |

4K x 1 STATIC RAM

MOTOROLA MCM6641-20
4044-200NS EQUIV.

\$4.50

4164

64 x 1

200 NS

\$21.00

SOLID STATE SCIENTIFIC

256 x 4 CMOS RAM 450NS
SCM5101E-1

\$3.75

HITACHI

2K x 8 CMOS RAM 150NS
Pin Compatible with 2716
HM6116P-3

\$19.00



Prices subject to
change without notice

We reserve the right to
substitute manufactures

HANLEY ENGINEERING CORP

13400 Northrup Way #20

Bellevue, WA. 98005

1-800-426-2668

1-206-643-0792

Include 3.00 for Ups Ground

Include 4.00 for Ups Blue

Include 4.00 for 1st Class Mail

Washington State add 5.4% Sales Tax

ok PRODUCTS



JUST WRAP KIT

Just Wrap tool for daisy chain wiring. Tool strips as it wraps and cuts. Includes one 50 foot spool of wire.

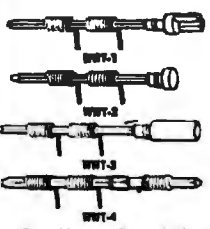
| Part No. | Description | Price |
|----------|--------------------------|---------|
| JW-1* | Just Wrap Tool | \$14.95 |
| JWK-6 | Tool w/4 Spools and JUW1 | 24.95 |
| R-JW* | 50 Ft. Replacement Wire | 3.49 |
| JUW-1 | Unwrapping Tool | 3.49 |

*Specify Color: Red, Blue, White or Yellow.



HAND WRAP TOOL

| Part No. | Description | Price |
|----------|-------------|--------|
| WSU30 | Regular | \$6.95 |
| WSU30M | Modified | 7.95 |



TERMINALS

- .025 (0.83mm) Square Post
- 3 Level Wire-Wrapping
- Gold Plated
- 25 PER PKG.

| Part No. | Description | Price |
|----------|--------------------------|--------|
| WWT-1 | Slotted Terminal | \$4.98 |
| WWT-2 | Single Sided Terminal | 2.98 |
| WWT-3 | IC Socket Term. | 4.98 |
| WWT-4 | Double Sided Terminal | 1.98 |
| INS 1 | Insertion Tool for above | 2.49 |

SOCKET WRAP - ID



Slipped onto socket before wrapping to identify pins.

Wrap-ID
Pat. Pend.



| Part # | Price | Bulk Price | Part # | Price | Bulk Price |
|--------|---------|------------|--------|--------|------------|
| 14ID | 1.49/10 | 5.50/100 | 22ID | 1.49/5 | 5.95/50 |
| 16ID | 1.49/10 | 5.95/100 | 24ID | 1.49/5 | 5.95/50 |
| 18ID | 1.49/10 | 5.00/50 | 28ID | 1.49/5 | 6.50/50 |
| 20ID | 1.49/5 | 5.00/50 | 40ID | 1.49/5 | 5.00/25 |



P.C.B. TERMINAL STRIPS

The TS strips provide positive screw activated clamping action, accommodate wire sizes 14-30 AWG (1.8-0, 25mm). Pins are solder plated copper, .042 inch (1mm) diameter, on .200 inch (5mm) centers.

| Part No. | Description | Price |
|----------|---------------------|--------|
| TS- 4 | 4-Pole | \$1.89 |
| TS- 8 | 8-Pole | 2.59 |
| TS-12 | 12-Pole | 3.49 |
| TS6MD | 2-Pole Interlocking | 3/1.79 |



DESOLDERING PUMP

Easy one hand operation.

Rugged all metal construction. Replaceable TEFLON® Tip. Self cleaning on each stroke.

Suction precisely regulated for reliable desoldering without damage to delicate circuitry.

| | | |
|------|------------------|--------|
| DSPI | Desoldering Pump | \$9.95 |
|------|------------------|--------|

LOGIC PROBE



Compatible with all logic families using a 4 to 15V power supply. Thresholds automatically programmed. Visual indication of logic levels to show high, low, bad level or open circuit logic pulses.

- 10 N sec. pulse responses
- 120 K input impedance.
- Automatic resetting memory.
- Includes tip with protective cap & coiled cord.

PRB-1 \$36.95

LOGIC PULSER

Superimposes a pulse train (20 pps) or a single pulse onto the circuit node under test without un-soldering IC's.

- Automatic polarity sensing
- 2 us pulse width
- Finger tip push button actuated
- Includes tip with protective cap & coiled cord.

PSL-1 \$48.95

VACUUM VISE

Unique vacuum-based light duty vise for precision handling of small components and assemblies. Rugged ABS construction. 1 1/2" (32mm) travel for maximum versatility. Also features screw lugs for permanent installation.



VV1 Vacuum Vice \$3.49



HOBBY-WRAP TOOL BW2630

- Auto-Indexing
- Anti-Overwrap
- Modified Wrap

| Part No. | Description | Price |
|----------|---------------------|---------|
| BW2630 | Tool | \$19.85 |
| BT30 | #30 Bit (not incl.) | 3.95 |
| BT2628 | #28 Bit (not incl.) | 7.95 |
| BC1 | Batteries & Charger | 14.95 |

INSERTION/EXTRACTION TOOLS

| Part No. | Description | Price |
|----------|-----------------------------|--------|
| INS1416 | 14-16 pin Insertor | \$3.49 |
| MOS1416 | 14-16 pin MOS Safe Insertor | 7.95 |
| MOS2428 | 24-28 pin MOS Safe Insertor | 7.95 |
| MOS40 | 40 pin MOS Safe Insertor | 7.95 |
| EX1 | 14-16 pin IC Extractor | 1.49 |
| EX2 | 24-40 pin IC Extractor | 7.95 |



WK-7 IC INSERTION KIT

Complete IC Insertor/ Extractor Kit Individual Components (listed above) \$22.95

IC DISPENSER

Allows IC's to be dispensed from their tube 1 at a time and picked up by insertion tools above.

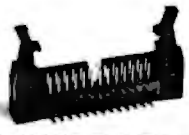
- Dispenses 8-42 pin IC's • Compatible with all IC carrying tubes • Use with WK7 for MOS safe insertion.

| Part No. | Description | Price |
|----------|--------------------|---------|
| MDD1 | 1 Chan. Dispenser | \$21.85 |
| MDD5 | 5 Chan. Dispenser | 83.43 |
| MDD10 | 10 Chan. Dispenser | 160.45 |

* * *No Discount.

TOLL FREE ORDERING NUMBER 1-(800) 423-7144

IDC CONNECTORS



RIGHT ANGLE HEADERS
SOLDER TAIL WIRE WRAP

| Size | Part No. | Price | Part No. | Price |
|------|----------|--------|----------|--------|
| 10 | IDH10SRB | \$1.20 | IDH10WRB | \$2.60 |
| 20 | IDH20SRB | 1.90 | IDH20WRB | 4.15 |
| 26 | IDH26SRB | 2.75 | IDH26WRB | 5.35 |
| 34 | IDH34SRB | 3.75 | IDH34WRB | 6.25 |
| 40 | IDH40SRB | 3.75 | IDH40WRB | 7.35 |
| 50 | IDH50SRB | 4.75 | IDH50WRB | 9.20 |

.1" Spacing. Mounts on PC Board & Mates with IDS Socket below. Ejector Bars - 4/1.00.



EDGE CARD CONNECTORS

| Size | Part No. | Price |
|------|----------|--------|
| 10 | IDE10B | \$3.95 |
| 20 | IDE20B | 4.35 |
| 26 | IDE26B | 5.00 |
| 34 | IDE34B | 6.05 |
| 40 | IDE40B | 6.90 |
| 50 | IDE50B | 7.50 |

.1" Spacing. Crimps onto cable with ordinary vise & mates with standard .062" Card Edge.

RIBBON CABLE

| Size | Solid Color | | Color Coded | |
|------|-------------|---------|-------------|---------|
| | 10 ft. | 100 ft. | 10 ft. | 100 ft. |
| 10 | 2.90 | 17.00 | 4.00 | 30.00 |
| 14 | 3.40 | 23.80 | 5.00 | 42.00 |
| 16 | 3.70 | 27.20 | 5.60 | 48.00 |
| 20 | 4.40 | 34.00 | 7.00 | 60.00 |
| 24 | 5.00 | 40.80 | 8.00 | 72.00 |
| 26 | 5.40 | 44.20 | 8.60 | 78.00 |
| 34 | 6.80 | 57.80 | 11.00 | 102.00 |
| 40 | 7.80 | 68.00 | 13.00 | 120.00 |
| 50 | 9.50 | 85.00 | 16.00 | 150.00 |



25 PIN "D" CONNECTORS

| Solder Style | Part No. | Price |
|--------------|----------|--------|
| Male | DB25P | \$2.95 |
| Female | DB25S | 3.95 |
| Cover | DB25C | 1.50 |

| IDC Style | Part No. | Price |
|-----------|----------|-------|
| Male | IDB25P | 6.25 |
| Female | IDB25S | 6.60 |
| Cover | IDB25C | 1.60 |

Solder Style solders onto cable, IDC Style crimps onto cable with vise. 9, 15, 37 and 50 pin available also.



CABLE PLUGS

| Size | Part No. | Price |
|------|----------|--------|
| 14 | IDP14B | \$1.45 |
| 16 | IDP16B | 1.85 |
| 24 | IDP24B | 2.50 |
| 40 | IDP40B | 4.15 |

.1" Spacing. Crimps onto cable with ordinary vise & plugs into standard IC Socket.



SOCKETS

| Size | Part No. | Price |
|------|----------|--------|
| 10 | IDS10B | \$1.88 |
| 20 | IDS20B | 2.75 |
| 26 | IDS26B | 3.50 |
| 34 | IDS34B | 4.50 |
| 40 | IDS40B | 5.40 |
| 50 | IDS50B | 6.50 |

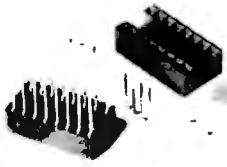
.1" Spacing. Crimps onto cable with ordinary vise & mounts to header sold above.

WIRE WRAP WIRE

| Length | #30 Wire Wrap Wire | | |
|--------|--------------------|---------|--------|
| | 100/Bag | 500/Bag | 1K/Bag |
| 2.5" | \$1.38 | \$3.94 | \$6.81 |
| 3.0" | 1.43 | 4.25 | 7.48 |
| 3.5" | 1.51 | 4.57 | 8.11 |
| 4.0" | 1.56 | 4.88 | 8.73 |
| 4.5" | 1.83 | 5.21 | 9.39 |
| 5.0" | 1.89 | 5.54 | 10.04 |
| 5.5" | 1.74 | 5.92 | 10.69 |
| 6.0" | 1.82 | 6.23 | 11.34 |
| 6.5" | 2.11 | 7.08 | 12.99 |
| 7.0" | 2.19 | 7.44 | 13.68 |
| 7.5" | 2.29 | 7.78 | 14.40 |
| 8.0" | 2.35 | 8.12 | 15.10 |
| 8.5" | 2.40 | 8.46 | 15.80 |
| 9.0" | 2.46 | 8.92 | 16.51 |
| 9.5" | 2.53 | 9.15 | 17.22 |
| 10.0" | 2.63 | 9.58 | 17.91 |

All lengths are overall, including 1" strip on each end. Choose from colors; Red, Blue, Black, Yellow, White, Green, Orange, and Violet.

WIRE WRAP SUPPLIES



| Size | Part No. | Each | Tube |
|------|------------|------|--------------------|
| 08 | ICN083WBSG | .44 | 52x .39 = \$20.28 |
| 14 | ICN143WBSG | .53 | 30x .46 = \$13.80 |
| 16 | ICN163WBSG | .58 | 26x .50 = \$13.00 |
| 18 | ICN183WBSG | .78 | 23x .68 = \$15.64 |
| 20 | ICN203WBSG | 1.00 | 21x .85 = \$17.85 |
| 22 | ICN224WBSG | 1.07 | 19x .92 = \$17.48 |
| 24 | ICN246WBSG | 1.09 | 17x 1.09 = \$15.98 |
| 28 | ICN286WBSG | 1.43 | 15x 1.23 = \$18.45 |
| 40 | ICN406WBSG | 1.85 | 10x 1.60 = \$16.00 |

Selective Plating provides gold in contact where it counts. 3-level wrap. Save by buying sockets by the tube. All gold available at 1/2¢/pin extra charge.

* * * No Discount

WIRE KITS

| | | | |
|----------------------------|--------|------|--------|
| Kit No. 1 - \$9.95 | | | |
| 250 | 3" | 100 | 4 1/2" |
| 200 | 3 1/2" | 100 | 5" |
| 100 | 4" | 100 | 6" |
| Kit No. 2 - \$24.95 | | | |
| 250 | 2 1/2" | 250 | 5" |
| 500 | 3" | 100 | 5 1/2" |
| 500 | 3 1/2" | 100 | 6" |
| 500 | 4" | 100 | 6 1/2" |
| 250 | 4 1/2" | 100 | 7" |
| Kit No. 3 - \$34.95 | | | |
| 250 | 2 1/2" | 500 | 4 1/2" |
| 500 | 3" | 500 | 5" |
| 500 | 3 1/2" | 500 | 5 1/2" |
| 500 | 4" | 500 | 6" |
| Kit No. 4 - \$59.95 | | | |
| 500 | 2 1/2" | 1000 | 4 1/2" |
| 1000 | 3" | 1000 | 5" |
| 1000 | 3 1/2" | 1000 | 5 1/2" |
| 1000 | 4" | 1000 | 6" |

ORDERING INFORMATION

Prepaid orders over \$50 shipped prepaid via UPS. All others add \$3.00 for handling. VISA, MC, COD's and open account orders will be charged freight. \$15 minimum order. \$100 minimum open account order.

DISCOUNT SCHEDULE

| Order Amount | Discount |
|--------------|----------|
| \$15 - 99 | Net |
| 100 - 199 | less 10% |
| 200 - 499 | less 15% |
| 500 - 999 | less 20% |
| 1000 up | less 25% |

Discount and the name of this magazine must be mentioned at time of order to get discount. Discount applies on all items except as noted, "No Discount."

16K Memory

4116-200ns

8/15.95

ALL MERCHANDISE 100% GUARANTEED!

CALL US FOR VOLUME QUOTES

JDR MICRODEVICES, INC IS PROUD TO
ANNOUNCE THE OPENING OF OUR
NEW RETAIL SHOWROOM
BAY AREA RESIDENTS
STOP BY 1224 BASCOM AVE.

LS SERIES

| | | | |
|---------|------|---------|------|
| 74LS00 | 25 | 74LS184 | .95 |
| 74LS01 | 25 | 74LS185 | .95 |
| 74LS02 | 25 | 74LS188 | 2.40 |
| 74LS03 | 25 | 74LS189 | 1.75 |
| 74LS04 | 25 | 74LS170 | 1.75 |
| 74LS05 | 25 | 74LS173 | .60 |
| 74LS08 | 35 | 74LS174 | .95 |
| 74LS10 | 25 | 74LS175 | .95 |
| 74LS11 | 35 | 74LS181 | 2.15 |
| 74LS12 | 35 | 74LS189 | 9.85 |
| 74LS13 | 45 | 74LS190 | 1.00 |
| 74LS14 | 100 | 74LS191 | 1.00 |
| 74LS15 | 35 | 74LS192 | .85 |
| 74LS20 | 25 | 74LS193 | .95 |
| 74LS21 | 35 | 74LS194 | 1.00 |
| 74LS22 | 25 | 74LS196 | .95 |
| 74LS28 | 35 | 74LS186 | .85 |
| 74LS27 | 35 | 74LS197 | .85 |
| 74LS28 | 35 | 74LS221 | 1.20 |
| 74LS30 | 25 | 74LS240 | .95 |
| 74LS32 | 35 | 74LS241 | .95 |
| 74LS33 | 55 | 74LS242 | 1.85 |
| 74LS37 | 55 | 74LS243 | 1.85 |
| 74LS38 | 35 | 74LS244 | .95 |
| 74LS40 | 25 | 74LS245 | 1.90 |
| 74LS42 | 55 | 74LS247 | .75 |
| 74LS47 | 75 | 74LS248 | 1.25 |
| 74LS48 | 75 | 74LS249 | .95 |
| 74LS49 | 75 | 74LS251 | .85 |
| 74LS51 | 25 | 74LS253 | 1.30 |
| 74LS64 | 35 | 74LS257 | .85 |
| 74LS65 | 35 | 74LS268 | .85 |
| 74LS63 | 1.25 | 74LS269 | 2.85 |
| 74LS73 | 40 | 74LS280 | .85 |
| 74LS74 | 45 | 74LS286 | .95 |
| 74LS75 | 60 | 74LS273 | 1.85 |
| 74LS78 | 40 | 74LS275 | 3.35 |
| 74LS78 | 50 | 74LS279 | .55 |
| 74LS83 | 75 | 74LS280 | 1.90 |
| 74LS85 | 1.15 | 74LS283 | 1.00 |
| 74LS86 | 40 | 74LS290 | 1.25 |
| 74LS90 | 95 | 74LS293 | 1.85 |
| 74LS91 | 89 | 74LS295 | 1.05 |
| 74LS92 | 70 | 74LS298 | 1.30 |
| 74LS93 | 68 | 74LS324 | 1.75 |
| 74LS95 | 85 | 74LS352 | 1.55 |
| 74LS96 | 95 | 74LS353 | 1.55 |
| 74LS107 | 40 | 74LS363 | 1.35 |
| 74LS109 | 40 | 74LS364 | 1.95 |
| 74LS112 | 45 | 74LS385 | .95 |
| 74LS113 | 45 | 74LS386 | .95 |
| 74LS114 | 50 | 74LS387 | .70 |
| 74LS122 | 45 | 74LS368 | .70 |
| 74LS123 | 95 | 74LS373 | .90 |
| 74LS124 | 2.89 | 74LS374 | 1.75 |
| 74LS126 | .95 | 74LS377 | 1.45 |
| 74LS126 | 85 | 74LS378 | 1.15 |
| 74LS132 | 75 | 74LS379 | 1.35 |
| 74LS138 | 55 | 74LS385 | 1.90 |
| 74LS137 | 99 | 74LS386 | .85 |
| 74LS138 | 75 | 74LS390 | 1.90 |
| 74LS139 | 75 | 74LS393 | 1.90 |
| 74LS145 | 1.20 | 74LS395 | 1.85 |
| 74LS147 | 2.48 | 74LS399 | 1.70 |
| 74LS148 | 1.35 | 74LS447 | .37 |
| 74LS151 | 75 | 74LS490 | 1.85 |
| 74LS153 | 75 | 74LS688 | 1.80 |
| 74LS154 | 2.35 | 74LS689 | 1.80 |
| 74LS165 | 1.15 | 74LS670 | 2.20 |
| 74LS156 | 95 | 74LS674 | 9.65 |
| 74LS157 | 75 | 74LS682 | 3.20 |
| 74LS158 | 75 | 74LS683 | 2.30 |
| 74LS180 | 90 | 74LS684 | 2.40 |
| 74LS181 | 95 | 74LS685 | 2.40 |
| 74LS182 | 95 | 74LS686 | 2.40 |
| 74LS183 | 95 | 74LS688 | 2.40 |

8200

| | |
|--------|-------|
| 8202 | 45.00 |
| 8205 | 3.50 |
| 8212 | 1.65 |
| 8214 | 3.65 |
| 8216 | 1.80 |
| 8224 | 2.50 |
| 8226 | 1.80 |
| 8228 | 4.90 |
| 8237 | 19.95 |
| 8238 | 4.85 |
| 8243 | 4.45 |
| 8250 | 14.95 |
| 8251 | 5.40 |
| 8253 | 9.85 |
| 8253-5 | 8.95 |
| 8256 | 5.15 |
| 8256-5 | 5.25 |
| 8257 | 8.75 |
| 8259 | 6.90 |
| 8272 | 39.95 |
| 8276 | 29.95 |
| 8279 | 10.50 |
| 8279-5 | 10.50 |
| 8282 | 6.85 |
| 8283 | 6.85 |
| 8284 | 5.70 |
| 8285 | 6.85 |
| 8287 | 6.50 |
| 8288 | 25.00 |
| 8289 | 49.95 |

MPU'S

| | |
|--------|-------|
| 8035 | 16.95 |
| 8039 | 19.95 |
| 8060A | 3.95 |
| 8085 | 12.95 |
| 8086 | 99.95 |
| 8088 | 39.95 |
| 8155 | 11.95 |
| 8156 | 11.95 |
| 8185 | 29.95 |
| 8185-2 | 39.95 |
| 8741 | 39.95 |
| 8748 | 69.95 |
| 8755 | 49.95 |

Z80

| | |
|------------|-------|
| Z80 | 8.95 |
| Z80A | 6.00 |
| Z80B | 18.95 |
| Z80-PIO | 6.50 |
| Z80A-PIO | 5.95 |
| Z80-CTC | 5.95 |
| Z80A-CTC | 8.95 |
| Z80-DART | 15.25 |
| Z80A-DART | 18.75 |
| Z80-DMA | 17.50 |
| Z80A-DMA | 27.50 |
| Z80-SIO/0 | 23.95 |
| Z80A-SIO/0 | 28.95 |
| Z80-SIO/1 | 23.95 |
| Z80A-SIO/1 | 15.00 |
| Z80-SIO/2 | 22.95 |
| Z80A-SIO/2 | 28.95 |
| Z80-SIO/8 | 17.95 |
| Z80A-SIO/8 | 22.95 |

MISC.

| | | | |
|--------|------|----------|-------|
| BT26 | 1.89 | 3242 | 7.95 |
| BT28 | 2.49 | AVS-1013 | 3.95 |
| BT95 | .99 | TR1802 | 4.95 |
| BT95 | .99 | IM6402 | 7.95 |
| BT97 | .99 | 1771 | 24.95 |
| BT98 | .99 | 1791 | 36.95 |
| 1488 | .99 | 1793 | 49.95 |
| 1489 | .99 | UPD765 | 39.95 |
| DMR131 | 2.99 | 8272 | 39.95 |
| 14411 | 9.95 | 74C923 | 5.95 |

TRANSISTORS

| | | |
|--------|---------|----------|
| PN2222 | 10/1.00 | 100/8.99 |
| 2N3904 | 10/1.00 | 100/8.99 |
| 2N3906 | 10/1.00 | 100/8.99 |
| 2N3055 | .79 | 10/6.99 |
| IN4148 | | 25/1.00 |
| IN4004 | | 10/1.00 |

T.V. CIRCUITS

| | |
|--------|------|
| MC1330 | 1.89 |
| MC1350 | 1.29 |
| MC1358 | 1.79 |
| LM380 | 1.29 |
| LM388 | 1.50 |
| LM565 | .99 |
| LM741 | .29 |
| LM1310 | 2.90 |
| LM1800 | 2.99 |
| LM1889 | 2.49 |

6502

| | |
|-------|-------|
| 6502 | 6.95 |
| 6502A | 12.95 |
| 6504 | 6.95 |
| 6505 | 8.95 |
| 6520 | 4.35 |
| 6522 | 6.95 |
| 6523 | 14.95 |
| 6551 | 11.85 |

CALL JDR BEFORE YOU BUY!
WE WILL BEAT ANY COMPETITOR PRICES.

800-538-5000

800-662-6233

(CALIFORNIA RESIDENTS)

6800

| | |
|------|-------|
| 6800 | 5.70 |
| 6802 | 11.95 |
| 6809 | 37.95 |
| 6810 | 4.80 |
| 6820 | 4.85 |
| 6821 | 3.45 |
| 6828 | 9.95 |
| 6834 | 18.95 |
| 6840 | 14.95 |
| 6843 | 42.95 |
| 6844 | 44.95 |
| 6845 | 39.95 |
| 6847 | 15.95 |
| 6850 | 3.50 |
| 6852 | 5.75 |
| 6860 | 10.95 |
| 6862 | 11.85 |
| 6871 | 35.95 |
| 6875 | 6.95 |
| 6880 | 1.75 |

EPROMS

| | | | |
|---------|----------------------|-------|-------|
| 1702 | 256 x 8 (1us) | 4.95 | 4.50 |
| 2708 | 1024 x 8 (450ns) | 3.95 | 3.50 |
| 2758 | 1024 x 8 (450ns)(5v) | 9.95 | 8.95 |
| TMS2516 | 2048 x 8 (450ns)(5v) | 7.95 | 6.95 |
| 2716 | 2048 x 8 (450ns)(5v) | 5.50 | 5.00 |
| 2716-1 | 2048 x 8 (350ns)(5v) | 12.95 | 11.95 |
| TMS2716 | 2048 x 8 (450ns) | 9.95 | 8.95 |
| TMS2532 | 4096 x 8 (450ns)(5v) | 19.95 | 17.95 |
| 2732 | 4096 x 8 (450ns)(5v) | 16.50 | 15.95 |

STATIC RAMS

| | | | |
|-----------|----------------------|---------|------|
| 2101 | 256 x 4 (450ns) | 1.95 | 1.85 |
| 2102-1 | 1024 x 1 (450ns) | .89 | .85 |
| 21L02-1 | 1024 x 1 (450ns)(LP) | 1.29 | 1.15 |
| 2111 | 256 x 4 (450ns) | 2.99 | 2.49 |
| 2112 | 256 x 4 (450ns) | 2.99 | 2.79 |
| 2114 | 1024 x 4 (450ns) | 8/17.95 | 2.10 |
| 2114L-2 | 1024 x 4 (200ns)(LP) | 8/22.95 | 2.45 |
| 2114L-3 | 1024 x 4 (300ns)(LP) | 8/18.95 | 2.25 |
| 2114L-4 | 1024 x 4 (450ns)(LP) | 8/18.95 | 2.25 |
| TMS4044-4 | 4096 x 1 (450ns) | 3.49 | 3.25 |
| TMS4044-3 | 4096 x 1 (300ns) | 3.99 | 3.75 |
| TMM2016 | 2048 x 8 (200ns) | CALL | |
| HM6116 | 2048 x 8 (200ns) | CALL | |

DYNAMIC RAMS

| | | | |
|----------|--------------------|---------|------|
| 4027 | 4096 x 1 (250ns) | 2.50 | 2.00 |
| 4116-150 | 16,384 x 1 (150ns) | 8/18.95 | 1.95 |
| 4116-200 | 16,384 x 1 (200ns) | 8/15.95 | 1.80 |
| 4116-300 | 16,384 x 1 (300ns) | 8/14.95 | 1.75 |
| 4164 | 65,536 x 1 (200ns) | CALL | |

LP=LOW POWER

DIP SWITCHES

| | |
|------------|-----|
| 4 position | .85 |
| 5 position | .90 |
| 6 position | .90 |
| 7 position | .95 |
| 8 position | .95 |

CONNECTORS

| | |
|--------------|------|
| RS232 MALE | 3.25 |
| RS232 FEMALE | 3.75 |
| RS232 HOOD | 1.25 |
| S-100 ST | 3.95 |
| S-100 WW | 4.95 |

LEDS

| | |
|----------------|---------|
| Jumbo Red | 10/1.00 |
| Jumbo Green | 8/1.00 |
| Jumbo Yellow | 8/1.00 |
| 5082-7760.43°C | .79 |
| MAN74 3°C | .99 |
| MAN72 3°C | .99 |

IC SOCKETS

| | |
|------------------|-----------|
| 1-100 100pcs | |
| 8 pin ST | 13 .11 |
| 14 pin ST | 15 .12 |
| 16 pin ST | 17 .13 |
| 18 pin ST | 20 .16 |
| 20 pin ST | 29 .27 |
| 22 pin ST | 30 .27 |
| 24 pin ST | 30 .27 |
| 28 pin ST | 40 .32 |
| 40 pin ST | .49 .38 |
| ST = SOLDER TAIL | |
| 8 pin WW | .59 .49 |
| 14 pin WW | .69 .52 |
| 16 pin WW | .69 .58 |
| 18 pin WW | .99 .90 |
| 20 pin WW | 1.09 .98 |
| 22 pin WW | 1.39 1.28 |
| 24 pin WW | 1.49 1.35 |
| 28 pin WW | 1.89 1.49 |
| 40 pin WW | 1.99 1.80 |
| WW = WIREWRAP | |

VOLTAGE REG'S

| | | | |
|--------|------|--------|------|
| 7805T | .89 | 7908T | .99 |
| 7808T | .99 | 7912T | .99 |
| 7812T | .99 | 7815T | 1.19 |
| 7815T | .99 | 7924T | 1.19 |
| 7824T | .99 | | |
| 7806K | 1.39 | 7908K | 1.49 |
| 7812K | 1.39 | 7912K | 1.49 |
| 7816K | 1.39 | 7916K | .78 |
| 78L05 | .69 | 78L12 | .78 |
| 78L12 | .69 | 78L15 | .79 |
| 78L15 | .69 | LM317K | 3.95 |
| LM309K | 1.49 | LM323K | 4.95 |
| LM317T | 1.95 | LM337K | 3.95 |

T=TO-220 K=TO-3 L=TO-82

LINEAR

| | | | |
|--------|------|---------|------|
| LM301V | .34 | LM741V | .29 |
| LM309V | .99 | LM747 | .79 |
| LM309K | 1.49 | LM748V | .59 |
| LM311 | .64 | LM1310 | 2.90 |
| LM317T | 1.95 | MC1330V | 1.89 |
| LM317K | 3.95 | MC1350V | 1.29 |
| LM318 | 1.49 | MC1358 | 1.79 |
| LM323K | 4.95 | LM1414 | 1.59 |
| LM324 | .89 | LM1488V | .99 |
| LM337K | 3.95 | LM1488 | .99 |
| LM338 | .99 | LM1489 | .99 |
| LM377 | 2.29 | LM1800 | 2.99 |
| LM380 | 1.29 | LM1889 | 2.48 |
| LM386V | 1.60 | LM3900 | .59 |
| LM555V | .99 | LM3909V | .99 |
| LM556 | .69 | LM3914 | 3.95 |
| LM556V | .99 | LM3915 | 3.95 |
| LM557V | 1.29 | 75451V | .39 |
| LM723 | .49 | 75452V | .39 |
| LM733 | .99 | 75453V | .39 |

T=TO-220 V=8 PIN K=TO-3

JDR MICRODEVICES, INC.

1224 So. Bascom Ave.
San Jose, CA 95128
800-538-5000 • 800-662-6233 (Callif.)
408-247-4852

New Location

TERMS For shipping include \$2.00 for UPS Ground, \$3.00 for UPS Blue Label Air \$10.00 minimum order. Bay Area Residents add 6 1/2% sales tax. California Residents add 6% sales tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.



2716 EPROMS 450NS (5V)

8/5.00 ea.

ALL MERCHANDISE 100% GUARANTEED!

CALL US FOR VOLUME QUOTES

CMOS

| | | | | | | | |
|--------|------|--------|-------|------|------|-------|-------|
| 74C00 | .35 | 74C374 | 2.75 | 4019 | .45 | 4098 | 2.49 |
| 74C02 | .35 | 74C901 | .80 | 4020 | .95 | 4099 | 1.95 |
| 74C04 | .35 | 74C902 | .85 | 4021 | .95 | 14409 | 8.95 |
| 74C08 | .35 | 74C903 | .85 | 4022 | 1.15 | 14410 | 8.95 |
| 74C10 | .35 | 74C905 | 10.95 | 4023 | .35 | 14411 | 9.95 |
| 74C14 | 1.50 | 74C906 | .95 | 4024 | .75 | 14412 | 12.95 |
| 74C20 | .35 | 74C907 | 1.00 | 4025 | .35 | 14419 | 2.95 |
| 74C30 | .35 | 74C908 | 2.00 | 4026 | 1.65 | 4502 | .95 |
| 74C32 | .50 | 74C909 | 2.75 | 4027 | .85 | 4503 | .85 |
| 74C42 | 1.75 | 74C910 | 9.95 | 4028 | .80 | 4508 | 1.95 |
| 74C48 | 2.10 | 74C911 | 10.00 | 4029 | .95 | 4510 | .95 |
| 74C73 | .85 | 74C912 | 10.00 | 4030 | .45 | 4511 | .95 |
| 74C74 | .85 | 74C914 | 1.95 | 4034 | 2.95 | 4512 | .95 |
| 74C76 | .80 | 74C915 | 2.00 | 4035 | .85 | 4514 | 1.25 |
| 74C83 | 1.95 | 74C918 | 2.75 | 4040 | .95 | 4515 | 2.25 |
| 74C85 | 1.95 | 74C920 | 17.95 | 4041 | 1.25 | 4516 | 1.55 |
| 74C86 | .95 | 74C921 | 15.95 | 4042 | .75 | 4518 | 1.25 |
| 74C88 | 4.50 | 74C922 | 5.95 | 4043 | .85 | 4519 | 1.25 |
| 74C90 | 1.75 | 74C923 | 5.95 | 4044 | .85 | 4520 | 1.25 |
| 74C93 | 1.75 | 74C925 | 6.75 | 4046 | .95 | 4522 | 1.25 |
| 74C95 | 1.75 | 74C926 | 7.95 | 4047 | .95 | 4526 | 1.25 |
| 74C107 | 1.00 | 74C927 | 7.95 | 4049 | .55 | 4527 | 1.95 |
| 74C150 | 5.75 | 74C928 | 7.95 | 4050 | .55 | 4528 | 1.25 |
| 74C151 | 2.25 | 74C929 | 19.95 | 4051 | .95 | 4531 | .95 |
| 74C154 | 3.25 | 74C930 | 19.95 | 4053 | .95 | 4532 | 1.95 |
| 74C157 | 1.75 | 4000 | .35 | 4080 | 1.45 | 4538 | 1.95 |
| 74C160 | 2.00 | 4001 | .35 | 4086 | .75 | 4539 | 1.85 |
| 74C161 | 2.00 | 4002 | .25 | 4088 | .40 | 4543 | 2.70 |
| 74C162 | 2.00 | 4006 | .95 | 4069 | .35 | 4555 | .95 |
| 74C163 | 2.00 | 4007 | .29 | 4070 | .35 | 4556 | .95 |
| 74C164 | 2.00 | 4008 | .95 | 4071 | .30 | 4581 | 1.95 |
| 74C165 | 2.00 | 4009 | .45 | 4072 | .30 | 4582 | 1.95 |
| 74C173 | 2.00 | 4010 | .45 | 4073 | .30 | 4584 | .95 |
| 74C174 | 2.25 | 4011 | .35 | 4075 | .30 | 4585 | .95 |
| 74C175 | 2.25 | 4012 | .25 | 4076 | .95 | 4702 | 12.95 |
| 74C192 | 2.25 | 4013 | .45 | 4078 | .30 | 4724 | 1.50 |
| 74C193 | 2.25 | 4014 | .95 | 4081 | .30 | 80C07 | .95 |
| 74C195 | 2.25 | 4015 | .95 | 4082 | .30 | 80C95 | .85 |
| 74C200 | 5.75 | 4016 | .45 | 4085 | .95 | 80C96 | .95 |
| 74C221 | 2.25 | 4017 | 1.15 | 4086 | .95 | 80C97 | .95 |
| 74C373 | 2.75 | 4018 | .95 | 4093 | .95 | 80C98 | 1.20 |

7400 SERIES

| | | | |
|-------|------|-------|-------|
| 7400 | .19 | 74128 | .55 |
| 7401 | .19 | 74132 | .45 |
| 7402 | .19 | 74136 | .50 |
| 7403 | .19 | 74141 | .85 |
| 7404 | .19 | 74142 | 2.95 |
| 7405 | .22 | 74143 | 2.95 |
| 7406 | .22 | 74144 | 2.95 |
| 7407 | .22 | 74145 | .90 |
| 7408 | .24 | 74147 | 1.75 |
| 7409 | .19 | 74148 | 1.20 |
| 7410 | .19 | 74150 | 1.35 |
| 7411 | .25 | 74151 | .65 |
| 7412 | .30 | 74152 | .85 |
| 7413 | .35 | 74153 | .55 |
| 7414 | .55 | 74154 | 1.40 |
| 7416 | .25 | 74155 | .75 |
| 7417 | .25 | 74156 | .85 |
| 7420 | .19 | 74157 | .55 |
| 7421 | .35 | 74159 | 1.85 |
| 7422 | .29 | 74160 | .85 |
| 7423 | .29 | 74161 | .70 |
| 7425 | .29 | 74162 | .85 |
| 7426 | .29 | 74163 | .85 |
| 7427 | .29 | 74164 | .85 |
| 7428 | .45 | 74165 | .85 |
| 7430 | .19 | 74166 | 1.00 |
| 7432 | .29 | 74167 | 1.95 |
| 7433 | .45 | 74170 | 1.65 |
| 7437 | .29 | 74172 | 5.95 |
| 7438 | .29 | 74173 | .75 |
| 7440 | .19 | 74174 | .89 |
| 7442 | .49 | 74175 | .89 |
| 7443 | .85 | 74176 | .89 |
| 7444 | .89 | 74177 | .75 |
| 7445 | .89 | 74178 | 1.15 |
| 7446 | .59 | 74179 | 1.75 |
| 7447 | .69 | 74180 | .75 |
| 7448 | .69 | 74181 | 2.25 |
| 7450 | .19 | 74182 | .75 |
| 7451 | .23 | 74184 | 2.00 |
| 7453 | .23 | 74185 | 2.00 |
| 7454 | .23 | 74186 | 18.50 |
| 7458 | .23 | 74190 | 1.15 |
| 7464 | .39 | 74191 | 1.15 |
| 7465 | .39 | 74192 | .79 |
| 7470 | .35 | 74193 | .79 |
| 7472 | .29 | 74194 | .85 |
| 7473 | .34 | 74195 | .85 |
| 7474 | .35 | 74196 | .75 |
| 7475 | .49 | 74197 | .79 |
| 7476 | .35 | 74198 | 1.35 |
| 7480 | .59 | 74199 | 1.35 |
| 7481 | 1.10 | 74221 | 1.35 |
| 7482 | .95 | 74246 | 1.35 |
| 7483 | .50 | 74247 | 1.25 |
| 7484 | .50 | 74248 | 1.85 |
| 7485 | .65 | 74249 | 1.95 |
| 7486 | .35 | 74251 | .75 |
| 7489 | 4.95 | 74259 | 2.25 |
| 7480 | .35 | 74265 | 1.35 |
| 7491 | .40 | 74273 | 1.95 |
| 7492 | .50 | 74276 | 1.25 |
| 7493 | .49 | 74278 | .75 |
| 7494 | .65 | 74283 | 2.00 |
| 7495 | .55 | 74284 | 3.75 |
| 7496 | .70 | 74285 | 3.75 |
| 7497 | 2.75 | 74290 | .95 |
| 74100 | 1.00 | 74293 | .75 |
| 74107 | .30 | 74298 | .85 |
| 74109 | 45 | 74351 | 2.25 |
| 74110 | 45 | 74385 | .65 |
| 74111 | .55 | 74386 | .65 |
| 74116 | 1.55 | 74387 | .65 |
| 74120 | 1.20 | 74388 | .65 |
| 74121 | .29 | 74376 | .65 |
| 74122 | .45 | 74390 | 1.75 |
| 74123 | .55 | 74393 | 1.75 |
| 74125 | .45 | 74425 | 3.15 |
| 74126 | .45 | 74426 | .85 |
| | | 74490 | 2.55 |

74S00 SERIES

| | | | | | | | |
|-------|------|--------|------|--------|-------|--------|-------|
| 74S00 | .44 | 74S74 | .69 | 74S163 | 3.75 | 74S258 | 1.49 |
| 74S02 | .48 | 74S85 | 2.39 | 74S168 | 4.85 | 74S260 | 1.83 |
| 74S03 | .48 | 74S88 | 1.44 | 74S169 | 5.44 | 74S274 | 19.95 |
| 74S04 | .79 | 74S112 | 1.59 | 74S174 | 1.09 | 74S275 | 19.95 |
| 74S05 | .79 | 74S113 | 1.98 | 74S175 | 1.09 | 74S280 | 2.90 |
| 74S08 | .48 | 74S114 | 1.50 | 74S181 | 4.47 | 74S287 | 4.75 |
| 74S09 | .98 | 74S124 | 2.77 | 74S182 | 2.95 | 74S288 | 4.45 |
| 74S10 | .69 | 74S132 | 1.24 | 74S188 | 3.95 | 74S289 | 6.98 |
| 74S11 | .88 | 74S133 | .98 | 74S189 | 14.95 | 74S301 | 6.95 |
| 74S15 | .70 | 74S134 | .69 | 74S194 | 2.95 | 74S373 | 3.45 |
| 74S20 | .68 | 74S135 | 1.48 | 74S195 | 1.89 | 74S374 | 3.45 |
| 74S22 | .98 | 74S138 | 1.08 | 74S196 | 4.90 | 74S381 | 7.95 |
| 74S30 | .48 | 74S139 | 1.25 | 74S197 | 4.25 | 74S387 | 5.75 |
| 74S32 | .98 | 74S140 | 1.45 | 74S201 | 14.95 | 74S412 | 2.98 |
| 74S37 | 1.67 | 74S151 | 1.19 | 74S225 | 8.95 | 74S471 | 9.95 |
| 74S38 | 1.68 | 74S153 | 1.19 | 74S240 | 3.98 | 74S472 | 16.85 |
| 74S40 | .44 | 74S157 | 1.19 | 74S241 | 3.75 | 74S474 | 17.85 |
| 74S51 | .78 | 74S158 | 1.45 | 74S251 | 1.90 | 74S482 | 15.60 |
| 74S84 | .79 | 74S161 | 2.85 | 74S253 | 7.45 | 74S570 | 7.80 |
| 74S65 | 1.25 | 74S162 | 3.70 | 74S257 | 1.38 | 74S571 | 7.80 |

PROMS

| | | | | |
|--------|----------|----|---------|-------|
| 74S188 | (82S23) | OC | 32 x 8 | 3.95 |
| 74S287 | (82S129) | TS | 256 x 4 | 4.75 |
| 74S288 | (82S123) | TS | 32 x 8 | 4.45 |
| 74S387 | (82S126) | OC | 256 x 4 | 5.75 |
| 74S471 | | TS | 256 x 8 | 9.95 |
| 74S472 | (82S147) | TS | 512 x 8 | 16.85 |
| 74S474 | (82S141) | TS | 512 x 8 | 17.85 |
| 74S570 | (82S130) | OC | 512 x 4 | 7.80 |
| 74S571 | (82S131) | TS | 512 x 4 | 7.80 |

NEED FAST PARTS?

DYNAMIC RAMS

| | | | |
|------|-------|---------|---------|
| 4116 | 150NS | 16K x 1 | 8/18.95 |
| 4116 | 120NS | 16K x 1 | 8/29.95 |

STATIC RAMS

| | | | |
|------|-------|--------|------|
| 2147 | 55NS | 4K x 1 | 9.95 |
| 6116 | 150NS | 2K x 8 | CALL |
| 6116 | 120NS | 2K x 8 | CALL |

EPROMS

| | | | |
|---------|-------|--------|-------|
| 2716-1 | 350NS | 2K x 8 | 12.95 |
| 2732A | 250NS | 4K x 8 | 25.95 |
| 2732A-2 | 200NS | 4K x 8 | 32.95 |

MPU's

| | | | |
|---------|------|------|-------|
| Z-80B | CPU | 6mHz | 18.95 |
| Z-80B | CTC | 6mHz | 17.95 |
| Z-80B | PIO | 6mHz | 17.95 |
| 68B00 | CPU | 2mHz | 10.95 |
| 68B21 | PIA | 2mHz | 12.95 |
| 68B50 | ACIA | 2mHz | 12.95 |
| 8085A-2 | CPU | 5mHz | 16.95 |

APPLE OWNERS

EXPAND YOUR 48K COMPUTER TO 64K

SUPER RAM • II

- PLUG IN SLOT II
- GOLD PLATED CONTACTS
- INCLUDES 5 JUMPER OPTIONS
- INCLUDES 5 RAM-ROM OPTIONS
- ENJOY THE BEST OF BOTH WORLDS
- 18K RAM (RANDOM ACCESS MEMORY)
- THIS IS SOPHISTICATED FIRMWARE
- EXPANDS YOUR 48K APPLE TO 64K OF PROGRAMMABLE MEMORY
- ELIMINATES THE NEED FOR APPLESOFT™ OR INTEGER BASIC ROM CARD
- ALLOW YOU TO RUN APPLE'S NEW FORTRAN PACKAGE, ALSO PASCAL AND PILOT
- KEYBOARD CONTROL SELECTION OF RAM OR MOTHER BOARD ROM LANGUAGE
- INCLUDES INSTALLATION INSTRUCTIONS AND APPLICATIONS NOTES
- THE SOFTWARE DEVELOPED BY VARIOUS VENDORS FOR YOUR (64K) SHOULD NOW WORK AS THEY ADVERTISED
- THE MOST VERSATILE RAM EXPANSION ON THE MARKET TODAY



UNIQUE 1 YEAR WARRANTY! \$168.00

APPLE FAN

- "COOL-IT"
- TAN COLOR
- SAVE DOWN TIME
- LONG LIFE MOTOR
- LOW NOISE IS A MUST
- SAVE REPAIR CHARGES
- INCREASES RELIABILITY
- CLIPS ON—NO HOLES OR SCREWS
- MINIMUM QUIETNESS IS DUE TO THE DRAW EFFECT OF AIR THROUGH YOUR COMPUTER AND A SPECIAL FAN AND MOTOR DESIGN
- THOSE EXTRA PLUG IN CARDS CAN CAUSE EXTRA HEAT



1. Clip it on your APPLE
2. Unplug your 120V cable (you won't need it)
3. Plug short 120V cable from Super Fan II to the back of your computer
4. Plug the supply cable from Super Fan II to your 120V power source
5. Turn on the rocker switch and a built-in red ready light comes on
6. You are all set "COOL IT"

UNIQUE 1 YEAR WARRANTY! \$69.00

*APPLE IS A TRADEMARK OF APPLE COMPUTER INC

JDR MICRODEVICES, INC.

1224 So. Bascom Ave.
San Jose, CA 95128

800-538-5000 • 800-662-6233 (Calif.)

408-247-4852



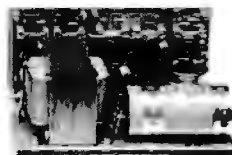
New Location

TERMS For shipping include \$2.00 for UPS Ground \$3.00 for UPS Blue Label Air \$10.00 minimum order Bay Area Residents add 6 1/2% sales tax California Residents add 6% sales tax We reserve the right to limit quantities and substitute manufacturer Prices subject to change without notice Send SASE for complete list

**SUNNY LOW LOW COST
POWER SUPPLIES
FOR S-100, FLOPPY DISKS.**



KIT 1, 2 & 3 For S-100



R3 For Three 8" or 5 1/4" Disk Drives



S3 2 in 1 Unit for S-100 and two 8" or 5 1/4" Disk Drives. It fits most Disk System Mainframes.

S-100 POWER SUPPLY KITS (OPEN FRAME WITH BASE PLATE, 3 HRS. ASSY. TIME)

| ITEM | USED FOR | @ + 8 Vdc | @ - 9 Vdc | @ + 16 Vdc | @ - 16 Vdc | @ - 28 Vdc | SIZE W x D x H | PRICE |
|-------|-----------------|-----------|-----------|------------|------------|------------|-------------------|-------|
| KIT 1 | 15 CARDS SOURCE | 15A | | 2.5A | 2.5A | | 12" x 5" x 4 7/8" | 52.95 |
| KIT 2 | SYSTEM SOURCE | 25A | | 3A | 3A | | 12" x 5" x 4 7/8" | 59.95 |
| KIT 3 | DISK SYSTEM | 15A | 1A | 2A | 2A | 4A | 14" x 6" x 4 7/8" | 67.95 |

DISK DRIVE POWER SUPPLY "R3" REGULATED, OPEN FRAME, ASSY. & TESTED **67.95**
 SPECS + 5V @ 5A OVP 5V @ 1A + 24V @ 5A. SHORTS PROTECT 2 SIZES AVAIL. 1) 9" (W) x 6 1/4" (D) x 4 7/8" (H). 2) 9" (W) x 4 7/8" (D) x 5 1/4" (H)
 OPTION 1) REPLACE - 24V BY + 12V. 2) FOR SIZE 1 ONLY ADD + 12V @ 1A. AT AN ADDITIONAL \$12.00
 IDEAL FOR THREE 8" or 5 1/4" FLOPPY DISK DRIVES. SUCH AS SHUGART 801/851 SIEMANS FDD 100-B/200-B OR 100-5 ETC

DISK SYSTEM PWR SUPPLY "S3" OPEN FRAME, ASSY. & TESTED. COMPACT SIZE: 10 (W) x 6" (D) x 5 (H) **92.95**
 REGULATED OUTPUTS FOR DISK DRIVES +5V @ 4A. 5V @ 1A. +24V @ 4A (OR + 12V @ 4A) SHORTS PROTECT
 UNREGULATED OUTPUTS FOR S 100 +8V @ 14A + 16V @ 3A (OPTION ADD OVP FOR +5V. ADD \$5.00)
 A COMPLETE UNIT FOR DISK SYSTEM WITH THE MAINFRAME CONTAINING 12 SLOTS & TWO 8" or 5 1/4" DISK DRIVES

POWER TRANSFORMERS (WITH MOUNTING BRACKETS)

| ITEM | PRIMARY | SECONDARY #1 | SECONDARY #2 | SECONDARY #3 | SIZE W x D x H | PRICE |
|------|---------|----------------|------------------|----------------|--------------------------|-------|
| T1 | 110/120 | 2 x 8 Vac, 15A | 28 Vac, CT, 2.5A | | 3 3/4" x 3 3/8" x 3 1/2" | 21.95 |
| T2 | 110/120 | 2 x 8 Vac, 25A | 28 Vac, CT, 3.5A | | 3 3/4" x 4 3/8" x 3 1/2" | 27.95 |
| T3 | 110/120 | 2 x 8 Vac, 15A | 28 Vac, CT, 2.5A | 48 Vac, CT, 2A | 3 3/4" x 4 3/8" x 3 1/2" | 29.95 |
| T4 | 110/120 | 2 x 8 Vac, 6A | 28 Vac, CT, 1.5A | 48 Vac, CT, 3A | 3 3/4" x 3 3/8" x 3 1/2" | 22.95 |
| T5 | 110/120 | 2 x 8 Vac, 6A | 28 Vac, CT, 2A | | 3" x 3" x 2 1/4" | 14.95 |

SHIPPING For each power supply \$5.50 in Calif., \$7.50 in other states, \$14.00 in Canada
 For each Transformer \$5.00 in all States, \$10.00 in Canada. Calif. Residents add 6% Sales Tax.

MAILING ADDRESS:

P.O. BOX 4296
 TORRANCE, CA 90510
 TELEX: 830-5010
 ANSWER BACK FOR TELEX SUNYCO TRUC

SUNNY INTERNATIONAL

(TRANSFORMERS MANUFACTURER)
 (213) 328-2425 MON-SAT 9-6

SHIPPING ADDRESS:

22129 1/2 S. VERMONT AVE
 TORRANCE, CA 90502



**3 ALTERNATIVE INTERFACES
FOR THE TRS-80**

COMM-80..



Featured in May/June '80 BYTE

- RS-232-C port (50-19.2K baud) software/hardware selectable
- Centronics printer port 8-bit
- connects to keyboard or E. I.
- chain up to 16 units
- use with E. I. for 2nd printer
- includes terminal software
- only \$179.95 complete

ALL INTERFACES ARE RADIO SHACK HARDWARE AND SOFTWARE COMPATIBLE AND CARRY A 60 DAY WARRANTY INCLUDING PARTS AND LABOR. ALL UNITS INCLUDE USER'S MANUAL, POWER SUPPLY & AUXILIARY TRS-BUS CONNECTOR FOR FUTURE EXPANSION

DISK-80..



Featured in March '81 BYTE

- disk controller (4 drives)
- hardware data separator
- includes 16K of RAM provision for additional 16K
- buffered TRS-bus connector
- real-time clock
- printer port (optional)

ASSEMBLED & TESTED with 16K of RAM . . . \$329.95
 Centronics Printer Port add \$ 50.00
 with 32K RAM add. . . \$ 50.00
 DISK-80 pc board. . . . \$ 48.00
 Printer/Power Supply pc board. \$ 16.00
 Complete Kit with 16K RAM and Printer Port . \$275.00

Dealer inquiries invited.

TRS-80 is a trademark of Tandy Corp

CHATTERBOX..



Featured in Aug. '80 BYTE

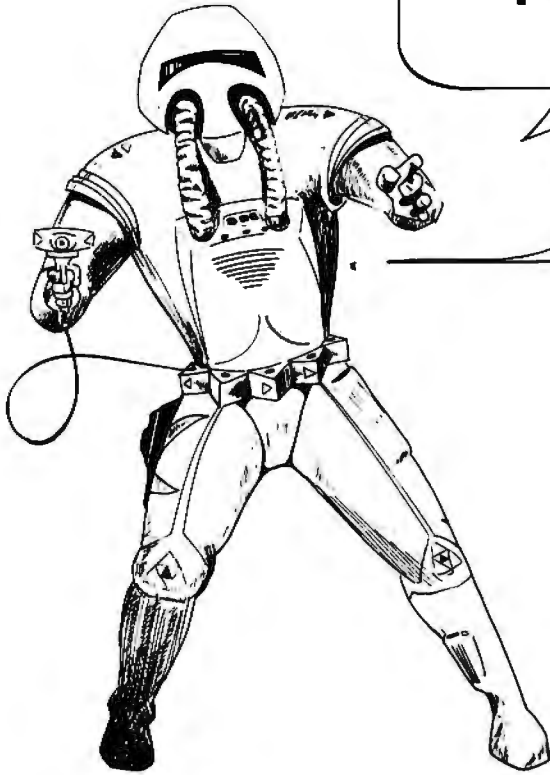
- 300 baud originate modem
- Centronics printer port 8-bit
- RS-232-C port (50-19.2K baud)
- connects to keyboard or E. I.
- received data automatically routed to printer ports
- includes terminal software
- only \$279.95 complete

Call 1-800-645-3479, in N.Y. 1-516-374-6793

or write: The MicroMint Inc.

917 Midway
 Woodmere, NY 11598





**YOU'VE GONE
TOO FAR!**

Go Back to Page 64
and

**SAVE
UP TO 10%***
on any prepaid U.S. Mail or
retail store order
OVER \$100.00
From our 60 Page Color **Detachable**
FALL 1981
ENGINEERING
SELECTION GUIDE

Just attach this coupon to the face of your order form

**DISCOUNT
COUPON**

from our **FALL 1981
ENGINEERING
SELECTION GUIDE**

✓ **Appropriate Box**

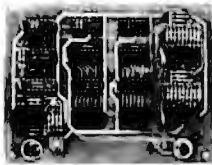
Valid on Prepaid U.S. Mail Orders Received Before
December 15, 1981
or Present This Coupon at Our Retail Store Before
December 15, 1981

1
PRIORITY ONE ELECTRONICS
9161 DEERING AVE., CHATSWORTH, CA 91311

- \$100 - \$149.99 Deduct \$10.00
- \$150 - \$199.99 Deduct \$15.00
- \$200 - \$299.99 Deduct \$20.00
- \$300 - \$399.99 Deduct \$30.00
- \$400 - \$499.99 Deduct \$40.00
- \$500 & UP Deduct \$ 10%

*Sorry, Discount Coupon Not Valid on Shipping Charges, Phone or Foreign orders

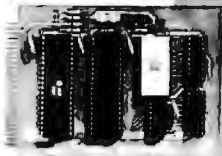
A-D & D-A CONVERTER



JBE one channel A-D & D-A Converter can be used with any system having parallel ports • Interfaces with JBE Parallel I/O Card • D-A conversion time — 5 μ s • A-D conversion time — 20 μ s • Uses JBE 5V power supply • Parallel inputs & outputs include 8 data bits, strobe lines & latches • Analog inputs & outputs are medium impedance 0 to 5 volt range.

79-287 ASSM. \$79.95
Bare Board \$39.95 Kit \$59.95

6502 MICROCOMPUTER



JBE's 4 1/2 x 3 1/4 dedicated controller features: • 1024 bytes RAM (two 2114s) • 2048 bytes EPROM (2716) • Uses one 6522 VIA (comp. doc. incl.) • Interfaces with JBE Solid State Switches & A-D & D-A Converter • Uses JBE 5V power supply • 2716 EPROM available separately (2716 can be programmed with an Apple II & JBE EPROM Programmer & Parallel Interface) • 50 pin connector included in kit & assm.

80-153 ASSM. \$110.95
Bare Board \$49.95 Kit \$89.95

SOLID STATE SWITCH



Your computer can control power to your printer, lights, stereo & any 120VAC appliances up to 720 watts (8 amps at 120VAC). Input 3 to 15VDC • 2-14MA TTL compatible • Isolation — 1500V • Non zero crossing • Comes in 1 or 4 channel version.

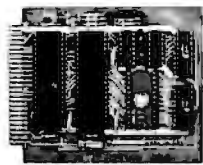
79-282-1 ASSM. \$13.95
Bare Board \$6.95 Kit \$10.95
79-282-4 ASSM. \$49.95
Bare Board \$24.95 Kit \$39.95

APPLE II DISPLAY BOARD



80-144 ASSM. \$49.95
Bare Board \$25.95 Kit \$42.95

Z80 MICROCOMPUTER



JBE's 4-1/8" x 3-1/4" single board dedicated computer is designed for control functions. It features: • A Z80 Microprocessor software compatible with the Z80, 8080 & 8085 Microprocessors • Uses a Z80 PIO chip for I/O which has 2 independent 8 bit bidirectional peripheral interface ports with handshake & data transfer control • Uses one 2716 EPROM (2K) & two 2114 RAM memories (1K) • Single 5V power supply at 300MA req. • Clock frequency is 2MHz, RC controlled • Board comes with complete doc. • 50 pin connector is included • 2716 EPROM available separately.

80-280 ASSM. \$129.95
Bare Board \$49.95 Kit \$119.95

PRINTER INTERFACE



JBE Parallel Printer Interface interfaces your Apple II® to Centronics® compatible printers. This 3" x 4" board features: on board ROM compatible with Integer Basic, Applesoft® and Pascal® • Has one 8 bit parallel latched output port with selectable positive or negative strobe and one bit input selectable for Ready or Ready • Cable and Connectors available separately.

80-297 ASSM. \$79.95
Kit \$69.95

4 ft. Std. Dip Jumpers 16 pin \$ 4.25
Champ Connector \$ 9.95

POWER SUPPLIES

• Use wall transformers for safety
• Protected against short circuit and thermal breakdown.

5 VOLT POWER SUPPLY

Rated at 5V 500MA • Operates JBE A-D & D-A Converter, Z80 & 6502 Microcomputers, 8085 & 8088 Microcomputers.

80-160 ASSM. \$20.95
Bare Board \$8.95 Kit \$16.95

± 12 VOLT POWER SUPPLY

Rated at ± 12V 120MA • Can be used as a single 24V power supply • Ideally suited to OP-AMP experiments.

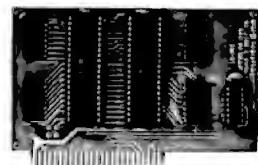
80-161 ASSM. \$22.95
Bare Board \$8.95 Kit \$18.95

ICS

| | |
|-----------------|---------|
| 6502 | \$9.95 |
| 6522 | \$9.95 |
| Z80 CPU | \$9.95 |
| Z80 PIO | \$9.95 |
| 2716 | \$14.95 |
| 2716 Programmed | \$19.95 |

• Has run-stop, single step switch • Has 16 address LEDs, 8 data LEDs & 1 RDY LED
• All lines are buffered.

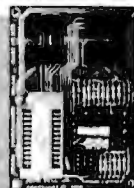
6522 APPLE II INTERFACE



• Interfaces printers, synthesizers, keyboards, JBE A-D & D-A Converter & Solid State Switches • Has handshaking logic, two 6522 VIAs & a 74LS05 for timing • Inputs & outputs are TTL compatible.

79-295 ASSM. \$69.95
Bare Board \$39.95 Kit \$59.95

2716 EPROM PROGRAMMER



JBE 2716 EPROM Programmer was designed to program 5V 2716 EPROMS • It can also read 2716s. It interfaces to the Apple II using JBE Parallel I/O Card & four ribbon cable connectors • An LED indicates when power is being applied to the EPROM • A textool zero insertion force socket is used for the EPROM • Comes with complete doc. for writing and reading in the Apple II or Apple II+ • Cables available separately.

80-244 ASSM. \$49.95
Bare Board \$24.95 Kit \$39.95
2 Ft. Ribbon Cable \$ 4.25

BARE BOARDS

APPLE II EXTENDER BOARD

3 1/2" x 2 1/2". Price includes 50 pin connector.

80-143 \$12.95

8085 3 CHIP SYSTEM

State-of-the-art system using an 8085, 8156 & either an 8355 or 8755 • Instruction set 100% upward compatible with 8080A.

Bare Board \$24.95

8088 5 CHIP SYSTEM

An 8086 family microcomputer system using an 8088 CPU, 8284, 8155, 8755A & an 8185.

Bare Board \$29.95

CRT CONTROLLER

This intelligent CRT Controller uses an 8085A CPU & an 8275 Integrated CRT Controller. It features: • 25 lines (80 Char./line) • 5x7 dot matrix • Upper & lower case • two 2716s (controller & char. generator) • serial interface RS232 & TTL • baud rates of 110, 150, 300, 600, 1200, 2400, 4800 & 9600 • keyboard scanning system • unencoded keyboard is req'd • uses +5V & ± 12V power supplies • Doc. includes program listing & composite video circuit.

Bare Board only (Doc. incl.) \$39.95
Programmed 2716s each \$19.95



JOHN BELL ENGINEERING, INC.

ALL PRODUCTS ARE AVAILABLE FROM JOHN BELL ENGINEERING • P.O. BOX 338
REDWOOD CITY, CA 94064 • ADD SALES TAX IN CALIFORNIA • ADD 5% SHIPPING & HANDLING
(415) 367-1137 10% OUTSIDE U.S.A.

MC

VISA

Unclassified Ads

FOR SALE: Technico Super Starter System (9900 processor) with schematic, SWTPC keyboard, Phi-Deck variable speed, control board, remote-control box, digital head, and power supply. Full documentation on them all. Looking for Sinclair ZX80 or PET (trade?). Paul Bergson, 1413 N 11th St. Superior WI 54880. (715) 394-3101

WANTED: TRS-80 Model II with read-only memory, expansion interface, disk drive[s], etc. R J Carlson, 1210 46 Ave. Meridian MS 39301. (601) 483-2459.

FOR SALE: Xerox 1730 (Diablo 6630) letter-quality printer with adjustable forms tractor and Teletype 912C video display. Both five months old and used only for a brief testing period. \$2750 or best offer. Steven Gelles, 112-41 72 Rd, Forest Hills NY 11375. (212) 544-7030 evenings.

FOR SALE: TRS-80 16 K Level II; all components (processor, monitor, cassette, power supply, cables), line filter, manuals, over thirty programs (EDTASM, games, utilities), and books and magazines related to TRS-80s. All in perfect condition (original Radio Shack seal intact). Original value over \$1000, sacrifice for \$600 plus shipping. Albert M Berg, 1914 Ave O, Brooklyn NY 11230. (212) 645-2397.

WANTED: Documentation for Processor Technology NKRA 64 K dynamic programmable-memory board. I need assembly instructions, schematic, and parts list. Please send a copy or I can copy and return your original. Michael Schripke, 6 Champa Rd, Billerica MA 01821.

FOR SALE: 1802 system, including Netronics 4 K programmable memory, Giant Board, processor board, 1702 and 270B EPROM board, SN76477N music board, two A-Ds, five extra I/Os, Hex-Dec decoder, address display, and processor status. Software includes CHIP-8, T BASIC, plus material from RCA, Quest, and Netronics. All for \$300. T Constable, 130E 24th St, New York NY 10010. (212) 533-5163 evenings.

WANTED: College student interested in computer experimentation. Due to limited funds, I would like information concerning used or discarded computer equipment and/or parts. If you have such, please send me your name and address with a list of the equipment. John M Hall, 1445 RoyalWyn Dr, Box 602 LWW, Macon GA 31210.

FOR SALE: Over 1000 boards from IBM System 1140 computer. All with gold-plated edge-connector pads. All boards loaded with parts. Other miscellaneous parts include edge connectors and card guides. Offers? Ken Cazakoff, RR #2, Bedford Rd, Nelson British Columbia, V1L 5P5 Canada. (604) 352-3898.

FOR SALE: CompuColor II Model 4 computer with 103-key keyboard. Cost \$2000, will sell for \$1300. Also, Olivetti teleprinter for \$300. Robert Meader, 17721 140 NE, Woodinville WA 98072. (206) 483-8600 days.

FOR SALE: SWTPC 6800 processor board, motherboard, 4 K programmable-memory board, 16 K programmable-memory board, MP-C serial board, parallel board, ACIA board, front-panel display, MIKBUG monitor, TSC BASIC, and Siemens 5-inch floppy disk. \$750, you pay UPS. Will ship COD. Steve Griffith, POB 791, Safford AZ 85546.

FOR SALE: OSI C4P-DMF computer with 48 K programmable memory and dual minifloppies includes color monitor, printer, modem, and joysticks. Includes the following languages: BASIC, Pascal, FORTRAN, FORTH, and assembly. Extensive documentation and over 200 software programs. Excellent condition. Cost almost \$6000, sell for \$2000. Kevin Mucha, 10445 W Kiehnau Ave, Milwaukee WI 53224. (414) 353-3683.

FOR SALE: 1-megabyte hard-disk drive with documentation and interface information. First \$350 takes it. I pay shipping. KSR35 ASCII Teletype. Excellent hard copy for Apple, TRS-80, etc. \$300 plus shipping. Would like to buy the following: Cromemco Z-2 system, 64 K 5-1/2" memory board with 16 K or less memory, I/O Selectric Heuristics Speechlab, Computerizer speech-synthesis board. All letters answered same day. Fred Aker, Farmers Way, Carlsbad Springs Ontario, K0A 1K0 Canada, (613) 822-1443.

FOR SALE: TRS-80 Model I, Level I computer with 4 K programmable memory. Includes video screen and recorder, in very good condition. Comes with books, manual, software, and graphics sheets. Am asking \$325 and will pay shipping cost anywhere in the continental US. Ron Campbell, 412 Wopdley Rd, Savannah GA 31406. (912) 925-6524.

FOR SALE: New Intel 58C 86/12A 16-bit, single-board computer with 32 K dynamic programmable memory, RS-232 serial port, three parallel data ports, PIC, and interval timer. Also includes schematics and documentation. List \$2600. Asking \$1300 or best offer. Helmar Ozolins, 59 Hageman Landing Rd, Rocky Point NY 11778. (516) 744-4204 after 6.

FOR SALE: Cleaned out ham/computer/electronics shack. Have two-page list of amateur radio equipment, automotive electronics, tools: scanner, paraphernalia; you name it, it might be there. All items for sale or trade, and purchasing list is included. SASE would be appreciated. Dave Miller, POB 9684, Birmingham AL 35215.

FOR SALE: 8 K PET with joystick, light pen, sound, RS-232 output, and seventy cassettes. \$900. First ten issues of BYTE: \$15. Bruce Beebe, 2580 E 2100 South, Salt Lake City UT 84109. (801) 584-1287.

WANTED: Schematic and parts list for a SEAL 32 K SC memory bare board. Will pay reasonable reproduction costs plus postage. G S Meader, Jr, 1601 Greenbrier Ct, Reston VA 22090.

WANTED: The MEI (Merlin Extended Intelligence) read-only memory and manual for the Mini Term Associates Merlin Board. I need a listing of the software, the instruction manual for the software, and the B316 mask read-only memory or a 2716 with the software or a Tarbell formatted cassette with the software. Dave Lamb, 3501 Kingston Cir, Ft Collins CO 80525. (303) 223-7131 collect.

FOR SALE: Expando Black Box (Mite) printer: 80-column, 10 cps, parallel I/F, friction/pen feed, and uses teletypewriter ribbons. Has seen light service. In very good condition. Runs on Sphere and TRS-80 processors. Manual included. Cost \$450, asking \$250. Chuck. (303) 986-9027 after 7 PM MT.

FOR SALE: Complete set of Popular Electronics from first issue (1954) to 1980; 3200. Also, various model-aircraft magazines, and assorted Scientific Americans. Send for full list. Bill Schweber, JAFFA Engineering, POB 543, Sharon MA 02067.

WANTED: Back issues of OMNI magazine in mint condition. William Blair III, 909 E Emerson, Morton IL 61550.

FOR SALE: H-8 computer, one year old. Recently configured for O-origin CP/M 2.2. Includes H-17 dual disk drive and controller card, Tronyk 64 K memory, and WH 8-4 4-port interface equipped with three RS-232 rear-panel D connectors. Complete documentation and \$600 worth of software, including CP/M 2.2, MAC, SID, FORTRAN 80, and space game. Best offer will be accepted and will ship at no charge anywhere in the US. Dennis Crause, 125 Conant Rd, Melrose MA 02176. (617) 964-8360 between 9 AM and 5 PM, call collect.

FOR SALE: Heathkit ET-3400 microprocessor trainer, ETA-3400 interface, and EE-3401 training course. Expertly constructed. Make offer. Doug DePrenger, 7800 Mockingbird Ln #139, Ft Worth TX 76180. (817) 485-2904 evenings.

COLOR PROGRAMS: Games, applications, and educational programs on cassette for the TRS-80 Color computer. Will trade for other original programs (or homebrew hardware designs) for the same machine. Send tape or information with your address and I will send my programs by return airmail. SW Lt. 154 Curzon St. Toronto Ontario, M4M 3B5 Canada.

FOR SALE: KIM single-board computer, George Risk keyboard, and XITEX SCT-100 terminal board with power supply plus video monitor. Package includes documentation for keyboard, terminal board, and monitor. Also included are several KIM manuals. Everything works perfectly. \$600 package, first offer over \$250 takes it. Sue Livingston, 601 Pinchot Ave, Madison WI 53716. (608) 221-8431 evenings.

FOR SALE: \$-100 boards removed from operating system. Documentation and shipping included. Ithaca Audio Z80 processor board, 4 MHz without read-only memory: \$150. W/MC FPB-1 front-panel board: \$100. DRC 8 K 200 ns static programmable-memory board: \$100. Electronic Systems TID-MA with system-monitor cassette: \$80. California Digital motherboard with eight connectors installed: \$45. Sunny International T3 transformer with capacitors: \$40. W/MC IOB-1, 2P+1S ports bare board: \$20. BYTE issues 1, 2, 3: best offer John Flegel, 112 Timberwood Dr, Mars PA 16046.

FOR SALE: TI-99/4 computer in excellent condition, with joysticks, tape recorder, large program library, light pen, three command modules, 16 K programmable memory, and 24 K read-only memory. \$699 or make offer. David Rockower, (714) 456-0861.

FOR SALE: OT SBC + Z/4 processor board: \$150 or best offer. TV interface from Electronic Systems part #107A: \$10. Both boards are assembled and include complete documentation. Stephen Beisle, 701 Cavu Rd, Georgetown TX 78626. (512) 863-6205.

WANTED: Prisoner wants to write to pen pals with shared interests: computers, digital electronics, calculus, and Fibonacci numbers. Please use SASE. Kearney, B-88913, San Quentin CA 94974.

FOR SALE: California Computer Systems parallel interface Model 7720B, complete with cable and sockets for interfacing between an Apple II and an IDS 460 printer. I could not figure out how to write software patches to allow the interface to run the printer. The hardware is in mint condition. \$80 will deliver the items plus manual. John Kundrat, 1622 21st St, Lewiston ID 83501. (208) 746-3487

FOR SALE: Heath H-8/4B K (16 Tronyk, 32 Heath) 4-port and H-8-5 serial with dual Heath cassette. H-9 video display with 24 lines uppercase/lowercase. All for \$888. Also, WH-14 printer, \$555. R Jackson, 201 Montimer Ave, Rutherford NJ 07070. (201) 939-2421

WANTED: Original IMSA 8080 system. Looking for mainframe with at least six connectors, 28 A power supply, original front panel, MPU-A 8080 processor board, SID 2-2 interface board, approximately 16 K of memory, and all necessary documentation. Keith Headley, 1161 Statter St, San Pedro CA 90731.

FOR SALE: DC 300A tape cartridges. I have six, mixed brands, that were used for archival storage. I have no way of checking them, but all should be good. Make offer for all six, if you don't get at least three good ones, refund guaranteed. A W Du Rea, 101 Indian Ln, Oak Ridge TN 37830

UNCLASSIFIED POLICY: Readers who are soliciting or giving advice, or who have equipment to buy, sell or swap should send in a clearly typed notice to that effect. To be considered for publication, an advertisement must be clearly noncommercial, typed double spaced on plain white paper, contain 75 words or less, and include complete name and address information.

These notices are free of charge and will be printed one time only on a space available basis. Notices can be accepted from individuals or bona fide computer users clubs only. We can engage in no correspondence on these and your confirmation of placement is appearance in an issue of BYTE.

Please note that it may take three or four months for an ad to appear in the magazine.

Reader Service

| Inquiry No. | Page No. | Inquiry No. | Page No. | Inquiry No. | Page No. | Inquiry No. | Page No. |
|-------------|------------------------------|-------------|------------------------------|-------------|---------------------------------------|-------------|------------------------------|
| 1 | 47th STREET PHOTO 383 | 79 | COMPUMART 46, 47 | 162 | EMPIRE SYS.CORP. 538 | 249 | MEMORY MERCHANT 145 |
| 2 | A B DIGITAL DESIGN 193 | 80 | COMPUPRO/GODBOUT 340, 341 | 164 | EMPIRICAL RESRCH GRP. 426 | 250 | MENTOR SOFTWARE 538 |
| 3 | AB COMPUTERS 529 | 81 | COMPUTER AGE 488 | 163 | EMPIRICAL RESRCH GRP. 458 | 251 | META TECHNOLOGIES 504 |
| 4 | ABM PRODUCTS 156 | 82 | COMPUTER AID 524 | 165 | EMPIRICAL RESRCH GRP. 538 | 252 | MICRO AGE COMP.STORE 105 |
| 5 | ACCOUNTANTS MICROSYS 530 | 83 | COMPUTER AID 528 | 166 | ENERCOMP 530 | 253 | MICRO APPL.GROUP 423 |
| 6 | ACE COMP.PROD 534 | 84 | COMPUTER COOPERATIVE 534 | 442 | EPIC COMPUTER 61 | 254 | MICRO BUSINESS WORLD 139 |
| 7 | ACKERMAN DIGITAL SYS 286 | 85 | COMPUTER DISC.OF AM. 150 | 443 | EPIC COMPUTER 451 | 255 | MICRO BUSN.ASSOC 524 |
| 8 | ACTION COMPUTER 77 | 86 | COMPUTER DYNAMICS 538 | 167 | EPSON AMERICA 137 | 256 | MICRO COM 307 |
| 9 | ADV.COMP.PROD. 544, 545 | 89 | COMPUTER FACTORY 403 | 188 | ESSEX PUBLISHING 427 | 258 | MICRO DATA BASE SYS 107 |
| 265 | ADV.MICRO DIGITAL COMP. 204 | 89 | COMPUTER FURN. & ACCESS. 300 | 189 | EXPOTEK 220 | 259 | MICRO DECISIONWARE 180 |
| 10 | ADVANCED TECH 528 | 90 | COMPUTER MAIL ORDER 375 | 170 | FAIRCOM 24 | 457 | MICRO ENGINEERING ASSOC. 536 |
| 11 | AFTERTHOUGHT ENG. 320 | 91 | COMPUTER PLUS 524 | 171 | FAIRCOM 24 | 280 | MICRO HOUSE 63 |
| 12 | ALL ELECTRONIC CORP 461 | 92 | COMPUTER SERV.CORP. 187 | 172 | FEDERICK COMP.PROD. 437 | 457 | MICRO MAGAZINE 429 |
| 92 | ALL SYSTEMS 187 | 93 | COMPUTER SFTW.SPECLTS. 532 | 172 | FUTRA CO. 275 | 127 | MICRO MANAGEMENT SYS. 461 |
| 13 | ALLENBACH IND. 108 | 94 | COMPUTER SHOPPER 417 | 173 | FYI INC. 538 | 475 | MICROMINT 550 |
| 14 | ALPHA BYTE STORAGE 50, 51 | 95 | COMPUTER SPCLTIES. 132, 139 | 174 | GENERAL ELECTRIC CO. 149 | 447 | MICRO MINT 291 |
| 15 | ALPHA BYTE STORAGE 227 | 96 | COMPUTER STOP, THE 519 | 178 | GILTRONIX 530 | 262 | MICRO PRO INT'L. 179 |
| 16 | ALPHA BYTE STORAGE 243 | 97 | COMPUTER STORE, THE 488 | 177 | GIMIX INC 285 | 263 | MICRO SOURCE OF TX 520 |
| 17 | ALSPA COMP.SYS. 526 | 97 | COMPUTER STORE, THE 488 | 178 | GIRAFFCOM SYS. 401 | 264 | MICRO WORKS, THE 459 |
| 18 | ALTERNATE WORD STIMUL. 536 | 98 | COMPUTER WHSE. 123 | 179 | H&E COMPUTRONICS 323 | 266 | MICRO-TECH IND. 454 |
| 19 | ALTOS COMP.SYS. 184, 185 | 482 | COMPUTERLAND 237 | 180 | H&E COMPUTRONICS 325 | 267 | MICROCOMP.TECH.INC. 171 |
| 19 | AMDEK CORP. 69 | 99 | COMPUTERROOM 526 | 480 | HAL COMPUTERS 259 | 268 | MICRODASP 279 |
| 20 | AMER.SQUARE COMP. 124, 125 | 441 | COMPUTERS ETC. 252 | 181 | HANLEY ENGRNGR 542, 543 | 269 | MICROMAIL 476 |
| 21 | AMERICAN COMP. & ENG. 351 | 101 | COMPUTERS ETC. 474 | 182 | HAPPY HANDS 452 | 270 | MICRONICS 530 |
| 22 | AMERICAN EXPRESS 96 | 282 | COMPUTERS WHOLESALE 527 | 183 | HAYDEN BOOK CO INC 393 | 271 | MICROPERIPH.CORP.THE 408 |
| 23 | ANADIX 232 | 103 | COMPUTERWORLD INT'L. 120 | 184 | HAYES MICROCOMP.PROD. 143 | 271 | MICROSETTE INC. 538 |
| 24 | ANADIX 233 | 454 | COMPUTERWORLD INT'L. 538 | 185 | HEATH COMPANY 16, 17 | 272 | MICROSOFT (CPD) 263 |
| 25 | ANCIE LABS 270 | 104 | COMPUTEX CORP 256 | 186 | HEWLETT-PACKARD 103 | 273 | MICROSOFT (CPD) 273 |
| 26 | ANCRONA 296 | 105 | COMPUTIQUE 353 | 445 | HOBBY ROBOTICS 526 | 274 | MICROSTUF, INC. 240 |
| 27 | ANDERSON JACOBSON 411 | 108 | COMPUVIEW PROD.INC. 66 | 187 | HOUSTON INSTRUMENTS 35 | 275 | MICROTAX 314 |
| 28 | APPARAT INC 265 | 107 | COMPUVIEW PROD.INC. 66 | 188 | HOUSTON INSTRUMENTS 35 | 276 | MICROTECH EXPORTS 458 |
| 28 | APPLE COMPUTER INC 12 | 108 | COMPUVIEW PROD.INC. 67 | 188 | HUBBARD, J. INC. 534 | 338 | MICROTEK 299 |
| 29 | APPLE COMPUTER INC 13 | 109 | CONCOMP IND. 205 | 190 | I.B.C. 260 | 277 | MIDDLETON, WILSON 430 |
| 30 | APPLIED ANALYTICS 424 | 110 | CONCORD COMP.PROD. 380 | 191 | I/O TECHNOLOGY 148 | 278 | MIKOS 522 |
| 31 | ARBA 214 | 465 | CONDOR COMPUTER 502 | 193 | IMS INTERNATIONAL 239 | 279 | MILLER MICROCOMP.SERV. 138 |
| 8 | ARCTURUS 532 | 111 | CONSUMER COMP. 146 | 193 | INDEPENDENT BUS.SYS.INC 209 | 280 | MIMIC, INC. 534 |
| 32 | ARTEC ELECTRONICS 419 | 112 | CONSUMER COMP. 147 | 195 | INNOVATIVE COMP.SYS. 528 | 281 | MINI COMP.SUPPLIERS 459 |
| 33 | ARTIFICIAL INT'L.RESRCH 530 | 113 | CONSUMER COMP. 517 | 196 | INNOVATIVE PROD. 100 | 102 | MINI MICRO MART 418 |
| 471 | ASAP COMP.PROD.INC 203 | 465 | CORNISOFT 344 | 197 | INNOVATIVE SFTW.APPL. 22 | 283 | MINI MICRO MART 537 |
| 34 | ASAP COMP.PROD.INC. 362, 363 | 114 | COVER CRAFT 128 | 448 | INSTITUTE FOR SCIENTIFIC ANALYSIS 532 | 284 | MINI MICRO MART 535 |
| 35 | ASC COMP.SYS. 388 | 116 | CPU SHOP, THE 523 | 198 | INT'L.MICRO SYS. 251 | 286 | MORROW DESIGNS 113 |
| 36 | ASHTON-TATE 390, 391 | 117 | CREATIVE LOGIC 122 | 199 | INTEC 526 | 287 | MORROW DESIGNS 20, 21 |
| 453 | ASPEN RIBBONS 532 | 118 | CROMEMCO C11. 1 | 200 | INTEGRAND 442 | 288 | MOUNTAIN COMPUTER 19 |
| 38 | ATARI, INC 127 | 119 | CROMEMCO 2 | 201 | INTELLIGENT SYS. CORP 110 | 289 | MOUNTAIN SOFTWARE 44 |
| 39 | ATLANTIC COMP.INC. 322 | 123 | CYBERNETICS INC 157 | 202 | INTELLIGENT SYS. CORP. 111 | 290 | MOUNTAIN VIEW PRESS 335 |
| 40 | ATON INT'L. 382 | 124 | CYBORG CORP. 25 | 203 | INTERACTIVE MICROWRE 497 | 291 | MPI 347 |
| 41 | AUSTIN E.BRYANT CONS. 404 | 257 | D & W DIGITAL 378 | 204 | INTERACTIVE MICROWRE 487 | 292 | MSD 414 |
| 42 | AUTOCENTRAL INC 432 | 125 | DANA INDUSTRIES 158 | 205 | INTERTEC DATA SYS. 153 | 294 | MTI, INC. 416 |
| 43 | AUTOMATED EQPTMNT. 78 | 126 | DATA DISCOUNT CTR 170 | 206 | IOTC 534 | 295 | MULTI BUSN.COMP.INC. 428 |
| 44 | AUTOMATED EQPTMNT. 142 | 126 | DATA-ED 221 | 207 | IPEX INT'L. 536 | 296 | MUSYS 405 |
| 46 | AVOCET 276 | 281 | DATAFACE 34 | 208 | ITHACA INTERSYSTEMS 8 | 437 | NASHUA CORP. 332 |
| 46 | B&B ELECTR. 432 | 128 | DATAMAC 176 | 209 | ITHACA INTERSYSTEMS 9 | 297 | NAT'L.DATA SUPPLIES 144 |
| 47 | B&B ELECTR. 536 | 128 | DATASOFT 131 | 478 | I-V ASSOC. 421 | 463 | NAT'L.MULTIPLX 484 |
| 438 | BAY TECHNICAL ASSOC 495 | 129 | DATASOUTH COMP.CORP. 73 | 210 | JADE COMP.PROD. 538 | 298 | NAT'L.TRICOR 412 |
| 48 | BELL, JOHN ENGR. 552, 553 | 130 | DATASOUTH COMP.CORP. 467 | 211 | JADE COMP.PROD. 540, 541 | 299 | NCL DATA INC. 480 |
| 49 | BETA COMP.DEVICES 245 | 131 | DELTA PRODUCTS 313 | 212 | JAMECO ELECTR. 554, 555 | 300 | NEBS 407 |
| 49 | BIT BUCKET, THE 530 | 132 | DESERT COMPUTER 394 | 213 | JDR MICRODEVICES 548, 549 | 301 | NEECO 337 |
| 50 | BLAT RESRCH & DEVELP. 450 | 134 | DESIGNER SOFTWARE 175 | 214 | JINI MICRO SYSTEMS 211 | 302 | NEGATIVE ENTROPY 330 |
| 51 | BOWER-STEWART 528 | 467 | DESK TOP 272 | 215 | JOE COMPUTER 532 | 303 | NETAR SYSTEMS INC. 195 |
| 52 | BURKE, JAMES C. 277 | 135 | DFS COMP.FORMS 52 | 216 | KADAK PRODUCTS 501 | 304 | NET PROFIT COMP. 80 |
| 53 | BUSINESS OPERATING SYS 183 | 136 | DIGITAL LABORATORIES 445 | 217 | KIT 80 INC. 532 | 305 | NETRONICS 102, 431, 433 |
| 54 | BUSINESS WEEK 387 | 137 | DIGITAL MARKETING 8 | 218 | KONAN CORP. 151 | 306 | NORTH AMER TECH 56 |
| 55 | BYTE BACK ISSUES 254 | 138 | DIGITAL MARKETING 303 | 219 | KV 33 528 | 307 | NORTH AMER TECH 225 |
| 56 | BYTE BOOKS 287, 489 | 139 | DIGITAL RESEARCH 58, 59 | 220 | LABORATORY MICROSYS. 528 | 308 | NORTH STAR COMPUTERS 199 |
| 57 | BYTE BOOKS 288 | 141 | DIGITAL RESEARCH 235 | 458 | LADCO 254 | 309 | NORTHEAST COMP.SALES 446 |
| 58 | BYTE BOOKS 289 | 140 | DIGITAL RESEARCH 281 | 221 | LANIER BUSN. PROD.INC 241 | 308 | NORTHWEST COMPUTER 402 |
| 59 | BYTE BOOKS 290 | 480 | DIGITAL RESEARCH COMP. 533 | 222 | LEADING EDGE PROD CIII | 310 | NOVELL DATA SYS 301 |
| 60 | BYTE SUB 495 | 142 | DIGATEK CORP. 421 | 223 | LEXINGTON BOOKS/D C | 311 | NRI SCHOOLS ELECTR.DIV. 369 |
| 61 | BYTE WATS 492 | 143 | DIP INC. 253 | 224 | LIFEAT 473 | 312 | OASIS SYSTEMS 470 |
| 429 | BYTEWRITER 72 | 143 | DISCOUNT SFTW.GRP.THE 490 | 225 | LIFEBEAT ASSOC. 155 | 311 | OHIO SCIENTIFIC INSTR. CIV |
| 58 | BYTEK COMP.SYS. 388 | 144 | DISKONNECTION, THE 528 | 226 | LIFEBEAT ASSOC. 283 | 312 | OKIDATA CORP. 317 |
| 48 | CALDISK 530 | 145 | DJ&"A"SYS.LTD. 349 | 227 | LIFELINES ASSOC. 355 | 473 | OLIVER ADV.ENG. 530 |
| 59 | CALIF DATA CORP 526 | 146 | DMA 294 | 228 | LJK ENTERPRISES INC. 309 | 313 | OLYMPIC SALES 473 |
| 60 | CALIF. DIGITAL 556, 557 | 147 | DRV ELECTRONICS 532 | 229 | LNW RESEARCH 267 | 314 | OMEGA MICROWARE, INC. 288 |
| 61 | CALIF.COMP.SYS. 109 | 148 | DUAL SYS.CONTROL CORP. 28 | 230 | LOGICAL DEVICES 528 | 316 | OMEGA SALES 229 |
| 62 | CALIF.MICRO COMP. 398 | 149 | DUAL SYS.CONTROL CORP. 30 | 231 | LOGO COMP.SYS. 371 | 315 | OMEGA SALES 288, 289 |
| 63 | CAMEO ELECTR. INC 191 | 150 | DUPRE ENTERPR. 446 | 112 | LONG ISL COMP GEN STORE 484 | 317 | OMEGA SALES 398 |
| 64 | CDR 530 | 151 | DYMARC IND. 410 | 233 | LYBEN COMP.SYS. 408 | 318 | OMEGA SALES 436 |
| 65 | CHECK-MATE 538 | 152 | DYNACOMP 310, 311 | 234 | LYBEN COMP.SYS. 538 | 319 | OMEGA SALES 456 |
| 66 | CHECKS-TO-GO 134 | 153 | ECLECTIC SYSTEMS 386 | 235 | MACROTRONICS 432 | 320 | OMEGA SALES 492 |
| 67 | CHIPS & DALE 430 | 154 | ECOSOFT 172 | 236 | MACROTRONICS 532 | 321 | OMNI RESOURCES 345 |
| 68 | CHRISLIN INDUSTRIES 295 | 155 | EDUCATIONAL MICROCOMP. 534 | 237 | MAGNOLIA MICROSYS. 524 | 322 | OPTIMIZED SFTW 319 |
| 69 | CHRISLIN INDUSTRIES 343 | 461 | ELCOMP PUBLISHING 420 | 239 | MARYMAC INDUSTRIES 202 | 323 | ORACLE ELECTR. 536 |
| 70 | CLEV.CONS.COMP. 521 | 156 | ELECTROVALUE IND. 524 | 241 | MATEK 329 | 324 | ORANGE MICRO 164, 165 |
| 70 | CLINICAL ANALYTICS, INC. 354 | 156 | ELECTROLABS 522 | 242 | MAYBERRY SYS. INC. 534 | 325 | ORANGE MICRO 381 |
| 71 | CMC, INT'L. 65 | 157 | ELECTRONIC CONTROL 502 | 243 | MCGRAW-HILL BOOKSTORES 392 | 470 | ORANGE MICRO 503 |
| 72 | CMC, INT'L. 219 | 158 | ELECTRONIC SPCLISTS 473 | 244 | MCGRAW-HILL BOOKSTORES 415 | 326 | ORION INSTRUMENTS 528 |
| 73 | CMC, INT'L. 442 | 159 | ELECTRONIC SYS.FURN 425 | 245 | MCS 224 | 327 | OSBORNE COMPUTERS 33 |
| 75 | CODEX CORP 409 | 456 | ELECTRONIC TECH SFTW 536 | 246 | MEADE DATA SYS. 524 | 328 | OSBORNE/MCGRAW-HILL 201 |
| 76 | COLONIAL DATA SERV. 293 | 160 | ELECTRONICS CENTER 520 | 247 | MEAS.SYS. & CONTROLS 31 | 328 | OSBORNE/MCGRAW-HILL 247 |
| 77 | COMMSOFT 350 | 161 | ELLIS COMPUTING 440 | | | 329 | OWENS ASSOC. 368, 367 |
| 468 | COMMUNICATIONS ELECT 513 | | | | | 329 | PACIFIC COMP BRK. 491 |
| 78 | COMPONENTS EXPRESS 394 | | | | | 331 | PACIFIC EXCHANGES 426 |

To get further information on the products advertising in BYTE, fill out the reader service card with your name and address. Then circle the appropriate numbers for the advertisers you select from the list. Add an 18-cent stamp to the card, then drop it in the mail. Not only do you gain information, but our advertisers are encouraged to use the marketplace provided by BYTE. This helps us bring you a bigger BYTE. The index is provided as an additional service by the publisher, who assumes no liability for errors or omissions. *Correspond directly with company.

Reader Service

| Inquiry No. | Page No. | Inquiry No. | Page No. | Inquiry No. | Page No. | Inquiry No. | Page No. |
|-------------|----------------------------|-------------|-----------------------------|-------------|------------------------------|-------------|----------------------------|
| 349 | PERSONAL SOFTWARE 216, 217 | 369 | S C DIGITAL 462 | 393 | STANDARD MICROSYS.INC 389 | 417 | TSE/HARDSIDE 348 |
| 343 | PHASE ONE SYS.INC. 385 | 370 | S&M SYSTEMS 471 | 384 | STATCOM CORP. 49 | 436 | U.S. MICRO SALES 332 |
| 344 | PICKLES & TROUT 284 | 371 | S-100 INC 414 | 395 | STATIC MEMORY SYS 315 | 418 | U.S. MICRO SALES 525 |
| 345 | PKAY CORP. 408 | 372 | SANDHU MACHINE DESN. 189 | | SUNNY INT'L. 550 | 419 | U.S. ROBOTICS 136 |
| 346 | POLY PAKS 524 | 373 | SCION CORP 5 | | SUPERSOFT 115, 117, 162, 308 | | UNITED SFTW.OF AMER. 101 |
| | POPULAR COMPUTING 257 | 374 | SCITRONICS 487 | 396 | SURVEYOR SUPPLY CO 292 | 420 | UVEON COMP.SYS. 23 |
| 347 | POTOMAC MICRO-MAGIC 469 | | SCOTTSDALE SYSTEMS 258 | 387 | SYBEX 85, 87, 89, 91, 93, 95 | 421 | VECTOR GRAPHICS 79 |
| 348 | POWER ONE INC. 213 | 375 | SCR ELECTR. 528 | 388 | SYNCTRONICS 64 | 422 | VERBATIM CORP 135 |
| 349 | PRIME SOURCE 173 | 376 | SEATTLE COMP PRODS 297 | 399 | SYS.INTERFACE CONS. 262 | | VERTICAL DATA SYS.INC. 161 |
| | PRIORITY ONE 60 pg. Insert | 377 | SECURED COMP.SYS. 534 | | SYSCON CORP. 210 | 423 | VIDEX 71 |
| | PRIORITY ONE 435, 494 | 378 | SELECT INFO SYS. 377 | 450 | SYSTEMS GROUP,THE 29 | 424 | VISTA COMPUTER CO 55 |
| 350 | PRIORITY ONE 551 | | SINCLAIR RESEARCH 74, 75 | 400 | SYSTEMS PLUS 361 | 425 | VITAL INFORMATION 197 |
| 351 | PROTECTO ENTERPR. 430 | 380 | SKP ELECTRONICS 526 | | SYSTEMS SUPPORT INC. 372 | 435 | VIXEL 451 |
| 352 | PURCHASING AGENT,THE 466 | 381 | SLUDER 532 | 401 | TAB BOOKS 321 | | VOTRAX 81 |
| 353 | QUALITY COMP.PARTS 526 | 382 | SMOKE SIGNAL BRDCSTG 231 | 402 | TARBELL ELECTR. 379 | 464 | WARRENS 130 |
| 354 | QUALITY SOFTWARE 119 | 474 | SMOKE SIGNAL BRDCSTG 231 | 402 | TECHNICAL SYS CONS 215 | 426 | WASHINGTON COMP.SERV. 331 |
| 355 | QUASAR DATA PROD.INC. 181 | 451 | SOFTWARE DISTRIBUTORS 305 | 403 | TECHNITIE 536 | 479 | westbrooke search 421 |
| 356 | QUEST ELECTR. 531 | 383 | SOFTWARE HOWS 223 | 404 | TECMAR INC 365 | | WESTICO INC. 141, 524 |
| 357 | R K S ENTERPRISES INC. 462 | 384 | SOFTWARE PROD.INT'L. 159 | 405 | TEI,INC. 225 | | WESTINGHOUSE 8 pg. Insert |
| 358 | R.C.ELECTRONICS 470 | 469 | SOFTWARE SUPPLY CORP 534 | 405 | TELERAM COMMUNC. 413 | 427 | WESTWARE 249 |
| 359 | R.R. SOFTWARE 461 | | SOLID STATE SALES 318 | 407 | TELEVIDEO INC 207 | 428 | WICAT SYSTEMS 82, 83 |
| 360 | RACET COMPUTES 154 | 385 | SORCIM 129 | 379 | TERRAPIN 54 | 430 | WINCHENDON GRP,THE 426 |
| 361 | RADGO 402 | 386 | SORRENTO VALLEY ASSOC 359 | 408 | TEXAS COMP.SYS. 396 | 431 | WINTEK CORP. 538 |
| 362 | RADIO SHACK 53 | 387 | SOURCE TELECOMM.CORP. 261 | 408 | TEXAS INSTRUMENTS 160 | 432 | X COMP 373 |
| 363 | RADIO SHACK-GLNW.SPR. 412 | 388 | SPECIALIZED BUSN SYS 455 | 409 | THREE M COMPANY 121 | 433 | ZILOG INC. 168, 169 |
| 364 | RADIO SHACK FRNC.#7079 447 | 389 | SPECTRUM SOFTWARE 333 | 410 | THREE-G CO. INC. 447 | 434 | ZOBEX 177 |
| 365 | RCA 68 | 468 | SPRINGER-VERLAG 339 | | TINNEY,RBT.GRAPHICS 397 | | |
| 366 | RCE ELECTR. 182 | 390 | SSM MICRO COMP PROD 11 | 411 | TNW CORP. 98 | | |
| 367 | REI 57 | 391 | STANDARD & POORS 163 | 414 | TRAK CO.,THE 327 | | |
| 459 | RENAISSANCE TECH 228 | 392 | STANDARD MICROSYS.CORP. 356 | 415 | TRANSNET CORP. 459 | | |
| 368 | ROBOTICS AGE 441 | | STANDARD MICROSYS.CORP. 357 | 416 | TRANSWAVE CORP. 255 | | |

BOMB **BYTE's Ongoing Monitor Box**

| Article # | Page | Article | Author(s) |
|-----------|------|---|--------------------------|
| 1 | 18 | Writing with a Data-Base Management System | Brent |
| 2 | 36 | Switching Power Supplies, An Introduction | Ciarla |
| 3 | 48 | Fundamentals of Relational Data Organization | Neeley, Stewart |
| 4 | 62 | Build a Bar-Code Scanner Inexpensively | Bennett |
| 5 | 76 | Reversal, Othello for the Apple II | Friedman |
| 6 | 84 | The Microcomputer as a Laboratory Instrument | Cosgrove |
| 7 | 97 | Data-Base Management Systems: Powerful Newcomers to Microcomputers | Gagle, Koehler, Whinston |
| 8 | 126 | The Exatron Stringy Floppy Data-Storage System | Carlson |
| 9 | 138 | The Datahandler from Miller Microcomputer Services | Richardson |
| 10 | 152 | Microsoft Softcard | Pelczarski |
| 11 | 166 | CourseWare Magazine | Holden |
| 12 | 174 | DIF: A Format for Data Exchange between Applications Programs | Kalish, Mayer |
| 13 | 208 | A Survey of Data-Base Management Systems for Microcomputers | Barley, Driscoll |
| 14 | 236 | PDO: A Data Manager for Beginners, Don't Reinvent the Wheel | Swanson |
| 15 | 264 | Orchestra-80 | Cooper, Kolya |
| 16 | 274 | Apple II File-Management Systems | Blochowiak |
| 17 | 312 | The Atari Tutorial, Part 3: Player-Missile Graphics | Crawford |
| 18 | 342 | ENHBAS | Kelly |
| 19 | 370 | Toward a Structured 6809 Assembly Language, Part 1: An Introduction to Structured Assembly Language | Walker |
| 20 | 384 | PROLOG, A Step Toward the Ultimate Computer Language | Ferguson |
| 21 | 400 | PS—A FORTH-Like Threaded Language, Part 2 | Motalygo |
| 22 | 434 | Five Spelling-Correction Programs for CPIM-Based Systems | Lemmons |
| 23 | 472 | Linking a Pascal Microengine to a Cyber 170 | Sedlet, Dust |
| 24 | 493 | Information Hiding in Pascal, Packages and Pointers | Feldman |

Ciarla Controls August BOMB

Steve Ciarla cops first place again with the second part of his article, "Build a Z8-Based Control Computer with BASIC." Steve will, of course, receive the \$100 purse. Second place goes to Stan Miastkowski for his report on "The Japanese Computer Invasion." (As a staff member, he is not eligible for the \$50 prize.) Third place goes to Adele Goldberg for her article, "Introducing the Smalltalk-80 System," an overview of the theme of BYTE's annual language issue.

"WORDSWORTH, TAKE A LETTER." ^{T.M.}



THE FIRST SUPER-SIMPLE LETTER QUALITY WORD PROCESSOR IN THE WORLD THAT CAN SIT NEXT TO YOUR SECRETARY— FOR LESS THAN \$5,000.

"Wordsworth™" removes the fear and loathing many people have about things called "computers" and "word processing." Because Wordsworth just sits at a desk and does what he's told. With unique new, simplified software, it can tell its typist what to do—step by simple step—to perform even the most complicated tasks.

It can not only "take a letter," but it can revise it, customize it in millions of ways (quite literally), personalize it, print it on your letterhead or business form so you can't tell it from hand-typed . . . in short, everything but put it in an envelope.

Moreover, it can perform all sorts of mundane business functions,

like general ledgers and accounting reports, using easily available industry-compatible CP/M™ software.

Installation? Plug it in. (Cable supplied.)

Size? Bigger than a breadbox—but not by much. It's about half as big, or less, than systems that can't do half as much. Definitely desktop—a sub-compact 20" by 40".

Service? Available everywhere.

Price? About \$4,995. Complete and ready to go.

For the name of your nearest dealer—and a free hands-on demonstration—just pick up the nearest telephone.

TOLL-FREE 1-800-343-6833.

In Massachusetts, call collect (617) 828-8150. Telex 951-624.

LEADING EDGE.™

Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021
DEALERS: For immediate delivery from the Leading Edge Inventory Bank™ on "Wordsworth" and other of the industry's most popular products, just give us a call.

Circle 222 on inquiry card.

SEEMS THE ONLY
THING EXPANDABLE
ABOUT MY COMPUTER
IS THE LINE OF
EMPLOYEES WAITING
TO USE IT.

I SHOULD HAVE BOUGHT OHIO SCIENTIFIC.

All too often, a small business will make a major investment in a computer system only to find out, a year or so later, that they have outgrown that computer. The system can't keep up with all that's being asked of it. There's a need for more work stations, for more job functions, for more multi-user operations. But the new computer is at full capacity, unable to expand to meet these new needs.

If you're a first time computer buyer, you should know that expandability is a big advantage of Ohio Scientific computer systems. Our engineers have worked hard to design systems that do not become obsolete as your workload grows.

A business can start with a modestly priced floppy disk based computer to handle many office functions. Later, as your business needs grow, you can easily and economically expand upward to our series of hard disk based computers, adding more users, more storage, faster processing, and state-of-the-art hard disk technology. In multi-user situations where many employees work simultaneously on accounts receivable, general ledger, payroll, inventory, word processing and much more — Ohio Scientific has the computer solutions you need.

There are dozens of different computer systems on the market today. Don't catch yourself second guessing the one you buy. Compare computers, and be sure that the computer you buy is expandable. We're convinced that the more you compare, the better Ohio Scientific looks. Ohio Scientific computer systems are sold by more than 400 dealers nationwide. For the one nearest you, call 1-800-321-6850 toll free.



OHIO SCIENTIFIC

a **MAXCOM** Company

1333 SOUTH CHILLICOTHE ROAD, AURORA, OH 44202 • (216) 831-5600

The expandable small business computer.

Circle 311 on inquiry card.