REMark®

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Official magazine for users of HEATH ZENITH computer equipment.

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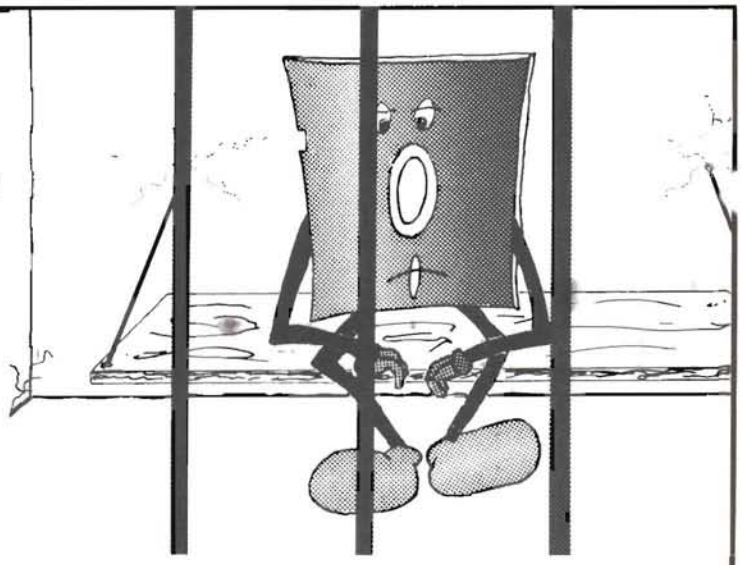

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- Zenith Z-89 (SSSD)*

*Not available on PC version
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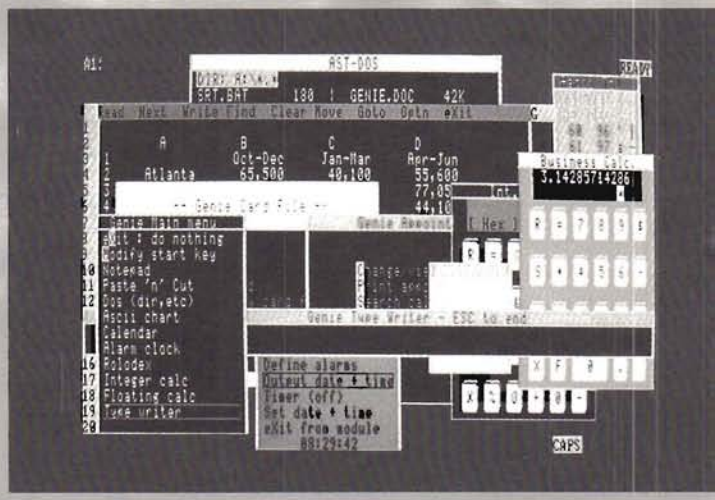

Shown here is Genie "popped up" on a Z-110 running Lotus 123. From the left are: The Genie main menu, the Genie rolodex style card file, the Genie notepad containing data cut from Lotus, the Genie DOS performing a directory command. the Genie alarm clock (at the bottom,) the Genie typewriter, Genie calendar, Genie Cut and paste, Genie Calculators, and the Genie Ascii table.

Genie is a memory resident application. This means that once you load Genie it is always available for you to use. Just hit the magic keys and Genie will appear (Shift-Shift: No function keys lost.) You can have Genie perform various tasks, and when you finish Genie goes away and you are back where you started.

Here is what you get with Genie:

- **KEY MAPPER** - Redefine any key on the fly, store long commands in a single key, and save many maps on disk.
- **TrueDOS**™ - Run any MS-DOS program inside the window. FORMAT, SORT, BACKUP, compile, all without leaving your application.
- **CALCULATORS** - you get two calculators, one regular floating point calculator, and programmer's calculator for base conversions and bit operations.
- **NOTE PAD** - you'll never have to hunt for paper and pen again. Simply call up Genie's Note Pad and jot down what you need. Or expand the buffer to 56K: Instant editor.
- **CUT AND PASTE** - Cut text from any place on the screen and output it later. Cut long commands off the screen and into your KEY MAPPER, move data from your spread sheet to your word processor: Instant integration.
- **CALENDAR** - schedule appointments for any year up to 9999 keep track of expenses, search and print the calendar.
- **ROLODEX** - a name address and telephone number list that you can search any time. No limit on the number of cards. You can even output an address directly to your word processor.
- **ALARM CLOCK** - Have your Genie remind you of appointments, set alarms to ring at any time on any day. A window appears with a reminder of what each of the 8 alarms is for.
- **ASCII Table** - programmers never have to leaf through big books to find the ASCII value of a character.
- **TYPEWRITER** - Knock out quick memos any time, even send ESCAPE codes to your printer. Cut a portion of a spread sheet and paste into the typewriter for quick printouts.
- **SCREEN SAVER** - Automatic phosphor protector for your tube. Genie will even let you blank the screen manually to discourage peepers.
- **COMMAND STACK** - Lets you access up to the last 2K worth of commands you typed.

Best of all with Genie you only have to load what you use. If you don't need to use an ASCII chart don't load it. Need extra alarms? then load two alarm clocks. Your own personal Genie.

And now Genie user's have the advantage of Genie accessories, which can be installed and accessed like any Genie function - any time:

- a **Scientific Calculator** more powerful than most real calculators. Has a full range of math, science and statistical function, and very high accuracy.
- a **Spelling Helper**™ To help you find the correct spelling without leaving your word processor.
- a **Print Spuffer**™ (spooler/buffer) to speed and manage all your printing.
- a development pack to let you write your own pop up programs, including many routines for windowing, and source code for our Rolodex. Writing pop ups is a snap. (Please call for details)

Only Genie Gives you so much for so little.

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_____	Print Spuffer(s)	24.95	_____
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_____	Genie pack (I want it all) Saving $40	$85	_____
		Sub total	_____
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* U.S. Funds

Limited back issues are available at $2.50, plus 10% shipping and handling — minimum $1.00 charge. Check HUG Product List for availability of bound volumes of past issues. Requests for magazines mailed to foreign countries should specify mailing method and appropriate added cost.

Send Payment to: Heath/Zenith Users' Group
Hilltop Road
St. Joseph, MI 49085
(616) 982-3463

Although it is a policy to check material placed in REMark for accuracy, HUG offers no warranty, either expressed or implied, and is not responsible for any losses due to the use of any material in this magazine.

Articles submitted by users and published in REMark, which describe hardware modifications, are not supported by Heathkit Electronic Centers or Heath Technical Consultation.

HUG is provided as a service to its members for the purpose of fostering the exchange of ideas to enhance their usage of Heath equipment. As such, little or no evaluation of the programs or products advertised in REMark, the Software Catalog, or other HUG publications is performed by Heath Company, in general and HUG, in particular. The prospective user is hereby put on notice that the programs may contain faults, the consequence of which Heath Company, in general and HUG, in particular cannot be held responsible. The prospective user is, by virtue of obtaining and using these programs, assuming full risk for all consequences.

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On The Cover: *Henry Tourneur (Brussels, Belgium), along with his son, made this cover shot on the Z-110, Hypad DT11 digitizer and a ZBASIC program with a Rolleiflex SL66.*

Welcome to the

Heath/Zenith Users' Group!

It is our pleasure to present the following information to fellow members and the newcomers to the National Heath/Zenith Users' Group. The January Issue of REMark will provide you with compiled material especially designed to update your records with a cross-reference index to all previous articles found in REMark during 1985, a listing of companies that provide Heath/Zenith related hardware and software products, a listing of Local Heath/Zenith Users' Groups, related publications information, and a variety of small, but useful, tips for contacting knowledgeable individuals who are familiar with Heath/Zenith equipment.

Bob Ellerton
HUG Manager

Margaret Bacon
HUG Secretary

For The New Member:

This Issue of REMark will be your first contact with the Heath/Zenith Users' Group. The material contained herein represents a good look at the number of people, clubs, and organizations supporting the Heath/Zenith Computer Product Line. Further, HUG has selected that information which you may find most helpful to get you familiar with our organization. This Issue, along with the Software Catalog, Software Catalog Update and following issues of REMark provided as a part of your membership, will help you explore the exciting and powerful world of micro-computing.

For The "Oldtimer":

The material contained in this Issue of REMark will help previous members stay current with new HUG policies, additional Local HUG Clubs, and the new support activities from companies that may be of particular interest. The HUG Software Catalog, HUG Software Catalog Updates, as well as the January Issue of REMark, are a permanent part of the HUG membership package provided to any user joining the HUG community.

General Heath/Zenith Users' Group Information

Membership Eligibility

A bona fide interest in Heath/Zenith computer related products is all that is necessary for membership eligibility. You need not be an owner of a Heath/Zenith product to join. Membership is open to any individual or company representative.

As a member, you will receive:

- A subscription to REMark, the official Heath/Zenith magazine (12 Issues/Yr.)
- A HUG binder
- A personal identification card
- HUG Software Catalog and Updates
- Access to the Heath/Zenith Users' Group Software Library
- Access to the HUG Bulletin Board via MicroNET *
- Discounts on a variety of Heath/Zenith computer products

* **Note:** Requires CompuServe membership available from the Heath Users' Group.

These benefits are described in the following paragraphs.

Pat Swayne
HUG Software Engineer

Nancy Strunk
HUG Software Coordinator

HUG Membership Rates

The following rate schedule applies as of January, 1985 for membership:

Type of Membership	U.S. Domestic	APO/FPO & All Others
Initial	$20.00	* $35.00
Renewal	$17.00	* $30.00

* **Note:** Must be in U.S. funds

The initial membership package includes the HUG binder, the HUG Software Catalog, Software Catalog Update, a Heath Parts Order Form, and a copy of the January Issue of REMark.

Identification Card

When your membership is accepted, a computer generated ID card is issued. The ID card is sent to you separately via first class mail. This card identifies you as a member of the Heath/Zenith Users' Group. It contains a unique number which can be verified for membership. **(Allow several weeks for the processing and delivery of your personal ID card.)** For multiple year memberships or renewals, you will receive a new ID card each month for the number of years you have paid for.

Your HUG ID Card entitles you to discounts on a variety of Heath/Zenith computer products. Please review and retain the following information for your records.

Jim Buszkiewicz
HUG Software Developer

Lori Lerch
REMark Editorial and Advertising Assistant

HUG Discount Rules and Regulations:

1. You must be a member of the Heath/Zenith Users' Group for a period of 90 days before you can use your HUG ID to participate in the discount program. If you renew your membership in the Heath/Zenith Users' Group, you may use your ID card immediately to participate.
2. Your ID card can only be used at your local Heath/Zenith Computers & Electronics Center or through mail order purchases placed with Heath Company. **Telephone orders will not be accepted.**
3. Your discount applies to the first $5,000 of products purchased per year. The $5,000 ceiling on purchases is based on the current list price of the products you purchase at the date shown on the invoice.
4. You may purchase only one of any given product per year, (e.g. one "Z" or "H" 100 series computer per year).

5. Your HUG ID card is not transferable. You will be required to show both your HUG ID and another suitable piece of identification to receive the benefits of the discount program.

6. You cannot make a purchase at the discounted rates without your HUG ID card.

7. Your HUG ID cannot be used to purchase individual parts or HUG software products under the discount program from the Heath/Zenith Computers & Electronics Centers or from Heath Company. **HUG products are considered parts.**

8. The ID card can be used for a 10% discount on Heathkit computer related items only.

9. The ID card can be used for a 20% discount on Zenith Data Systems (assembled) computer related items only.

10. Any item purchased which installs as a modification to the internal portions of the computer (i.e. boards, drives, ROMs, etc.) is considered a kit item.

11. Any item (unless purchased as a kit) which is an external addition to the computer as a system (e.g. complete wired drive enclosures, printers, etc.) is considered a wired item.

12. Heath or Zenith Data Systems software is considered a finished or assembled item and therefore, can be purchased at the 20% discount. Since HUG software is considered a part, it is not included in either program.

13. Multiple discounts do not apply. You can use either "special prices" or your HUG discount, whichever is greater. The HUG ID may not be used with any promotional certificates offered by Heath Company or the Heath/Zenith Computers & Electronics Center.

14. **Heathkit Mail Order Catalog purchases must be accompanied by your HUG ID card and a SELF-ADDRESSED STAMPED ENVELOPE for return of your ID once the order has been processed.**

15. If you lose your ID card, you can only receive a replacement by purchasing a new membership to HUG at the current renewal rate. You may, however, use this ID immediately if you have been a HUG member for more than 90 days.

16. To receive a replacement ID, send your request along with your **HUG ID number (found on your REMark mailing label) and renewal fee to:**

    Attn: HUG Secretary/New ID Card
    Heath/Zenith Users' Group
    Hilltop Road
    St. Joseph, MI 49085

Publications

REMark, the official magazine for users of Heath/Zenith computer products, is sent to each member 12 times a year. The January Issue is designed as a cross-reference to the previous issues and contains valuable information that you may need. Individual back issues may be obtained during the current year. However, at the end of each year, all twelve issues become a single bound REMark Volume which may be purchased as a separate item. There are currently six REMark Volumes available.

A subscription to REMark is included with your membership. The magazine is sent via bulk mail, as are most other organization's publications. Bulk mailing means **YOUR REMark WILL NOT BE FORWARDED SHOULD YOU MOVE.** Therefore, please notify the HUG Secretary of your address change and the date which you wish the change to take effect.

We encourage each member to use REMark to communicate with other users. You can do this by submitting articles for publication. We strongly encourage any comments which you feel would benefit other users. We welcome your letters, hardware descriptions, software enhancements, applications programs, and other material you may wish to share.

Major Article Program

Major articles are defined as articles containing 2000 words or more. Authors contributing major articles that are printed in REMark will receive a "Certificate of Recognition and Appreciation" from the Heath/Zenith Users' Group and their choice of any single Heath/Zenith software product **FREE or ONE HUG BUCK.** Educational programs or packages are not included in the Major Article Program.

The Heath/Zenith Users' Group is proud to announce the addition of the HUG BUCK as an incentive for authors contributing major articles to REMark. You can receive the HUG BUCK instead of free Heath/Zenith software. This award is worth $100.00 toward the purchase of **any** Heathkit or Zenith Data Systems product. HUG BUCKs can be collected to completely or partially purchase the product of your choice. Specifics regarding the use of the HUG BUCK accompanies the award itself.

Those individuals that contribute smaller articles will receive the "Certificate of Recognition and Appreciation" from the Heath/Zenith Users' Group. As you can see, we feel that any information you send us is important.

Certificates, software or HUG BUCKs are sent out after your article appears in REMark.

How to Submit Articles to REMark

What Subject?

Feel free to submit article manuscripts on any subject matter that you think will be of interest to the Heath/Zenith Users' Group community. Tutorial or How-To articles tend to be the most popular. Highly technical articles, although acceptable, do not have a broad readership base.

If you choose what might be considered a highly technical subject, try not to use terms which the average user would not be familiar with. If you should feel the need to use such terms, give a definition. Be kind to those who might not understand your application and explain your special programming tricks with a little extra detail. It's these "tricks" that help others to comprehend programming techniques and to be better programmers themselves.

If you feel that you have a unique program or hardware application, sit down and write about it. Do you have a special program for the bowling team, softball league, maybe a different business or farm program? Possibly you have interfaced your computer to some special machine to gather data for later evaluation. These are just some of the things other HUGgies are interested in reading about.

Following is only a sample list of possible subjects:

Software:

Application
Modification
New approaches
File handling
I/O handling
Enhancements
Reviews

Hardware:

Special applications
(Schools, Business, Handicap, etc.)
Enhancements
Interfacing
Problem solving

Review past issues of REMark. See what subjects have been covered. Try not to cover the same subject unless you have a better or totally different approach. Don't be a "me too" writer, open new doors.

How Big?

To qualify for the "Major Article Program," your manuscript must be 2,000 words or more (listings not included). Articles in excess of 5,000 words generally need to be broken into installments for separate publication.

Articles of less than 2,000 words and "Buggin' HUG" letters are acceptable. However, this type of submittal does not qualify for HUG reimbursement of a Heath/Zenith software product or HUG BUCK.

How About Photos?

If a photograph will help explain, include it. Clear, sharply focused, black and white photos reproduce best, but color photos can be used. Include a caption with each photo to help with the explanation. Any photographs become the property of REMark and cannot be returned.

What About Drawings?

If a drawing, like photographs, will help, include it. We request that you provide us with finished India Ink drawings suitable for reproduction. Should you feel you are not capable of supplying finished artwork, check with a local high school drafting class. Generally, these students are anxious to display their talent. REMark, in some cases, will provide artwork, but this will delay publication of your article.

Is Hardcopy Necessary?

Yes! We request that any submittal include a printout of all files. Also, we would like to know what you feel your article should look like in print. In some cases, we do not have the processor the author used to duplicate text provided on disk.

Is A Disk Copy Needed?

Yes! REMark uses the latest techniques for the preparation of copy. Submitting your manuscript on disk along with all pertinent files moves the information through our system faster. We can accept any **standard** Heath/Zenith disk format. Your text files should not have visible or hidden coding, since these codes can delay the production process.

Should you have questions about an article you would like to submit, please feel free to contact the REMark Manager. All materials received for publication in REMark become the property of the Heath/Zenith Users' Group.

Once you have completed your article, send it directly to:

The Heath/Zenith Users' Group
Attn: REMark Article
Hilltop Road
St. Joseph, MI 49085

How to Submit Programs To The Heath/Zenith Users' Group

After you have developed a program and before you submit it, check it thoroughly. Be reasonably sure that it is error free.

Three methods of submitting programs to the Heath/Zenith Users' Group are available for your selection based on your judgement of the finished program and its value to other members. Your program may be contributed under the following categories:

Public Domain Library — Free distribution to the membership via bulletin boards or other means available to HUG with the possibility of inclusion into the HUG Software Library.

HUG Software Library — For development by HUG as a finished software product to be offered for sale to other individuals as source for HUG income to further develop the users' group.

Royalty Software Library — Author supported, finished, reliable software with a signed contract paying the author for availability of the program to users of Heath/Zenith computer products.

Submit your program by completely filling out the submittal form included in this issue of REMark. Send your program on disk. Include with your submittal a complete listing of the contents on the disk and any additional documentation that you feel will be helpful for our records. Submit a sample "run" of your program from a hard copy terminal, when possible. If one is not available, hand copy as much as you feel necessary to give us an idea of how the program is supposed to perform. Be sure to sign and date the completed submittal form and check the category that you feel is appropriate for your program.

Once we receive your program, you will be notified. On the completion of the review, we will contact you with the status of your program. Remember, the person submitting the program is expected to handle any programming problems.

If your program is accepted and used by the Heath/Zenith Users' Group, you will be eligible for certain types of reward based on the category you have selected on the submittal form. **Please note, however, that no reward can be made until the product is released to the members of the user community through an announcement in the "New HUG Products" section of REMark.**

Rewards For Program Contributions:

Public Domain Software Library —

You will receive any HUG software package free once your program has been added to the public library. Your package will be made available through the HUG Bulletin Board system (616) 982-3956.

HUG Software Library —

One year extension of your HUG membership. One year membership if you are not already a member. A free copy of your program as released by HUG. Your choice of any single Heath/Zenith software product.

Royalty Software Library —

You are paid on a quarterly basis for the number of disks sold during a three month period. Checks are generally sent 30 days after the end of each quarter. Since you are paid for your program submittal, no other compensation applies.

Note: Multiple related programs on one disk is considered one submittal (e.g. GAME1, GAME2, GAME3, etc.). If your programs are released on one product, this is considered a single contribution to the Heath/Zenith Users' Group.

Notes On Software Submittals

HUG receives literally hundreds of programs each year for possible distribution to the user community. As you know, to review a software package requires learning the package. The review cycle is extremely time consuming. Therefore, we look for packages with the following attributes that are critical to the success of your program as a HUG Software Product:

We begin the review process as "beginners." In other words, your package must contain information that instructs the user through the set up and operation of the program from a very basic point of view. Remember to include information about your system that will enable the user (in this case, the reviewer) to duplicate the system requirements that made the software respond. Include operating system and version (e.g. CP/M 2.2.03), language and version (e.g. MBASIC 5.21), your machine type, and your memory requirements for the program.

Beyond set up and operation of the program itself, we look for thorough documentation as to what the program is going to do. If, for example, the program is a game; the user must know the rules, what is to be expected, what is the object of the game, and what input is required to make the game playable.

Next, we review the operation of the program. If the set-up and operational instructions are good, there should be no problem getting the program to perform as expected. In many cases, reviewers are stymied not because the program will not perform, but because the documentation for set-up and operation did not give sufficient detail to allow a thorough operational check.

A First-Time-Through-Section, although optional, is most advantageous for the reviewer and the end user. The First-Time-Through-Section should include the basics of setting up the program(s). It also should detail a mock run through your program with "dummy" data. This section should touch on most of the important options of your program. All option details should be explained in the documentation.

After we have made basic operational tests, we begin looking for undocumented "bugs" in the program itself. If a program defect is detected, the review process is ended. Any program fault that we find could be a reason for rejection of your program. Be sure to document operational peculiarities both for the reviewer and the end user. An example of one common program fault would be the lack of testing for both upper and lower case keys (e.g. "Y" or "y" for YES). There is nothing wrong with a program that only responds to upper case as long as the user is informed that the CAPS LOCK key should be down when operating the software. A good test for your program is to have another user in your area who is unfamiliar with your product attempt to operate it.

These points are some of the most important you should consider when generating software to be submitted to the Heath/Zenith Users' Group. As you can see, developing a solid software product requires a new attention to detail whether you intend your product to be released through HUG or whether you intend to offer it through other channels. We have found that software which was developed following the basic information supplied here generates fewer user problems and, in general, gains the acceptance and respect of a vast majority of the user community.

Once you feel that your software will meet the requirements of the various HUG Software Libraries, please submit your material to the following address:

The Heath/Zenith Users' Group
Attn: Software Coordinator
Hilltop Road
St. Joseph, MI 49085

Ordering Information

HUG Software Products are ordered as a standard Heath Company Part. The order can be mailed on a Heath Company Parts Order Form or on a separate sheet of paper. When ordering, include with your payment the following information:

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Hilltop Road
St. Joseph, MI 49085

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Note: HUG currently offers formats for CP/M, HDOS, ZDOS, MSDOS and CP/M-86 5-1/4 inch disks:

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ZDOS double sided
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CP/M-86 double sided

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The Heath Company Parts Department is NOT capable of answering questions regarding software. For additional information concerning any of the HUG software products, contact the Heath/Zenith Users' Group (616) 982-3463.

If you should have a problem with a HUG product, please call HUG to determine if you have a bad disk or another problem before you return the product for replacement. A call may save you a lot of time and money. If it is determined that your disk requires replacement, return the original disk along with the invoice directly to the Heath/Zenith Users' Group, Attention: Software Coordinator.

Change of Address

If you change your address, be sure to let us know. REMark is sent via bulk mail and is not forwarded. It takes approximately six weeks for our system to cycle through. Therefore, take this delay into consideration along with mail delays when notifying us. **Please tell us when the change is to take effect.**

Use the form in the back of this issue or a suitable copy to change your address. Send it directly to:

The Heath/Zenith Users' Group
Attn: HUG Secretary
Hilltop Road
St. Joseph, MI 49085

HUG Bulletin Board via MicroNET

MicroNET is a time-share system of CompuServe Inc., which most anyone, located near a major city, can access through a telephone link. The National HUG Bulletin Board or SIG (Special Interest Group) on MicroNET provides a way of sharing ideas, questions, and information with over 3000 other members, by simply dialing a number and leaving a message.

MicroNET membership applications are available through the HUG Library or through any Heath/Zenith Computers and Electronics Center. The package includes free modem software, as well as the necessary information about CompuServe and one hour of free time on the system (see HUG Price List for further details). This membership is separate from the HUG membership application. For further information about CompuServe, contact the Heath/Zenith Users' Group, or CompuServe Inc., 5000 Arlington Centre Blvd, Columbus, OH 43220, (614) 457-8600.

A booklet of the HUG Bulletin Board commands and command descriptions is now available from the Heath/Zenith Users' Group. This handy reference can be used while on the system to save you both time and money. Since changes are made to the system on occasion, the material contained in the booklet may require some modification by the user in the form of notes as the changes are implemented. The BB-Reference is available as HUG part number 885-4700.

New For 1986 — HUGPBBS System

The Heath/Zenith Users' Group has opened a public domain bulletin board system for those programs submitted to the Public Domain Library (See Program Submittals.) You may obtain public domain packages by signing up for access to the bulletin board system available at (616) 982-3956. You may become a member of the system simply by supplying your name and HUG ID number in a message to the SYSOP. Programs are available under HDOS, CP/M, ZDOS and MSDOS in convenient catalog areas.

Special Interest And Local HUG Groups

One of the best sources for information and help is the Local Heath Users' Groups which are becoming a major voice for the Heath/Zenith user community. Many of the local groups can be contacted through your nearest Heath/Zenith Computers & Electronics Centers. These stores can usually provide you the necessary contact information. A listing of known Local HUGs is published twice a year with new additions appearing under the category of "Local HUG News" found in most issues of REMark.

Heath/Zenith Related Publications

Of major importance to the new user is the availability of additional information for the Heath/Zenith computer products. Many of the Local HUGs publish newsletters on a regular basis. Using the Local HUG Club listing appearing in this issue, the user can select those clubs that may produce additional documentation.

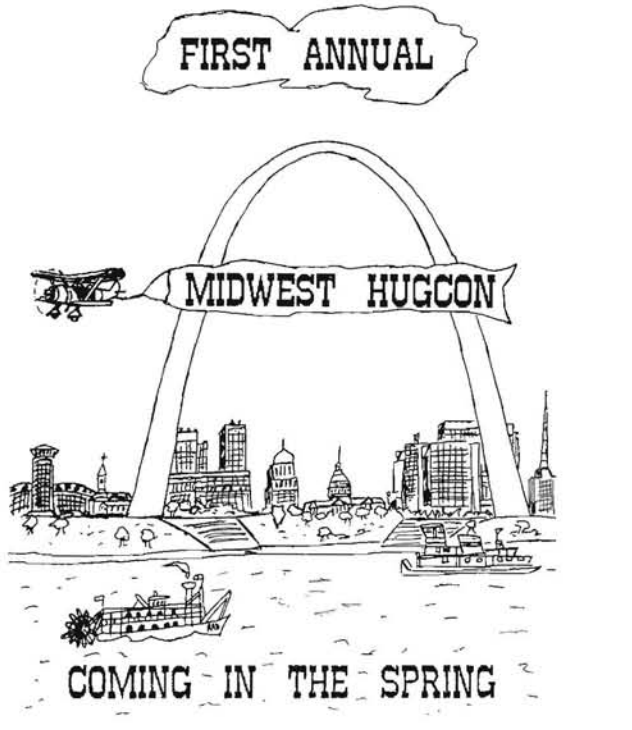
Three excellent independent publications are listed here:

BUSS Newsletter
Editor: Charles Floto
Phone: (202) 544-0900
Address: 716 E Street SE
Washington, DC 20003
Rates: 20 issues/year
U.S. $28.00
Others $40.00

Sextant
Editor: Charles Floto
Phone: (202) 544-0900
Address: 716 E Street SE
Washington, DC 20003
Rates: 6 issues/year
U.S. $14.97
Can. & Mex. $17.25
Other $21.00

H-Scoop
Editor: Henry Fale
Phone: (414) 452-4172
Address: 2618 Penn. Circle
Sheboygan, WI 53081
Rates: $24.00 /year ($32.00 overseas)

*



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PROGRAM SUBMITTAL and AGREEMENT FORM

Programmer: _____

Address: _____ City-State _____ Zip _____

Company (if any): _____

Telephone: _____

Program Name: _____

Please describe your program in sufficient detail so that other users may understand its intended purpose and use. The following outline is suggested as a guide to help you in preparing an abstract of your program(s), should your program(s) be selected as a future release of the HUG Software Library. Your outline of the abstract should be prepared and submitted on an attached sheet of paper with this Submittal Form. Be sure to fill out all the information requested on this form.

Suggested Outline:

Introduction:
Requirements:
  Software
  Hardware
List of the Programs:
Program Content:
  Include Special Notes
Comments:

Note: Refer to the HUG Software Catalog for examples and details in using this outline.

Brief information for the Software Evaluator of your program(s):

Prepared on/for computer model: _____

Special hardware/software configurations, if any: _____

_____

Program requires: _____ **bytes of memory**

Language: _____ **Version:** _____

I would like you to include the program(s) described on this aggreement in the (check one)

☐ Public Domain Library
☐ HUG Software Library
☐ Royalty Software Library

I understand and agree that HUG may distribute it at nominal cost to HUG members.

I assure you that the program is my own design, that I have run and de-bugged it, and that I will answer questions any library user may have about it. You may modify and adapt the program at your option to make it more suitable for your use and the library.

I represent that the program is mine to submit and that any necessary permissions for its use and sale have been obtained.

Date: _____ **Signed:** _____

DSKLBL.BAS Version 1.4

Roger Boehlein
6407 Velma Avenue
Parma, OH 44129

How many times have you fumbled through your disks and wondered which type of disk it is. Is it HDOS or CP/M, and is it hard sector or soft sector. If you're like me, you probably have quite a collection of disks, and at times, it can be frustrating trying to figure out which is which. Not everyone has the bad habit of not marking their disks, but for those of you who do, read on.

The following short program DSKLBL.BAS should help you keep your disks in order. The program, as is, was written in Microsoft BASIC under the CP/M operating system. For you HDOS users, see the note at the end of the article for converting it to HDOS.

The program itself is very simple and straight forward. After being asked for how many labels you wish to print, it simply enters a print loop until the proper number of labels have been printed. The only line that is hardware dependent is line 70. Currently, it is set up to put the H-25 printer in an 8LPI mode. The only thing needed is to change line 70 to the proper codes for your type of printer. If you do not need to set your printer to 8LPI, then just eliminate line 70.

The label size I use for this program is 1-3/8 by 3-1/2 inches. When done, you will have a handy label that will help you keep track of which type of disk you have. When all the information is filled in, you will be amazed at how simple it is to keep track of your disks. I hope someone can make use of this simple, but helpful program.

Notes For HDOS Users . . .

For those of you who only run HDOS, this program will work equally well. The changes are simple. Add line 55 as follows: 55 OPEN "O",1,"LP:" and change all the LPRINT statements to PRINT #1. Add the following line number 185 CLOSE #1. Remember to LOAD LP: before you run the program. Enjoy.

```
10 ' DSKLBL.BAS  VER 1.4    07/09/85      R. BOEHNLEIN
20 PRINT CHR$(27)+"E"
30 INPUT "How many labels do you wish to print? : ".A
40 PRINT:PRINT "Make sure printer is ready and
     labels are in position "
50 PRINT "Hit any key to start printing  ";:X$=INPUT$(1)
60 '  SETS H25 TO 8LPI
70 LPRINT CHR$(27)+CHR$(91)+CHR$(50)+CHR$(120)
80 FOR B=1 TO A
90 LPRINT"TYPE:____"TAB(20)"BOOTABLE:_"
100 LPRINT
110 LPRINT "VOLUME:___"
120 LPRINT
130 LPRINT "SECTORING:_   SIDES:_   TPI:__"
140 LPRINT
150 LPRINT "LABEL:_____________________":LPRINT
160 LPRINT TAB(7)"_____________________"
170 LPRINT:LPRINT:LPRINT
180 NEXT B
190 PRINT:PRINT:PRINT "MORE (Y/N) <N>: ";.X$=INPUT$(1)
200 IF X$="Y" OR X$="y" THEN 20 ELSE 210
210 PRINT CHR$(27)+"E":SYSTEM
```

Sample Output

```
TYPE:____              BOOTABLE:_
VOLUME:___
SECTORING:_   SIDES:_   TPI:__
LABEL:_____________________
      _____________________
```

*

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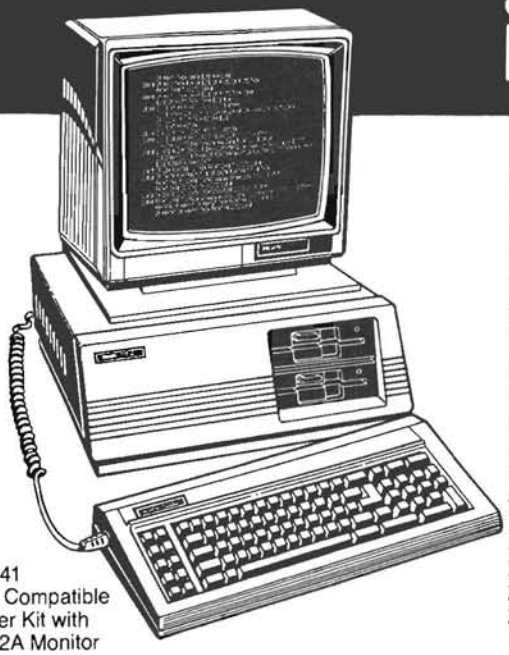

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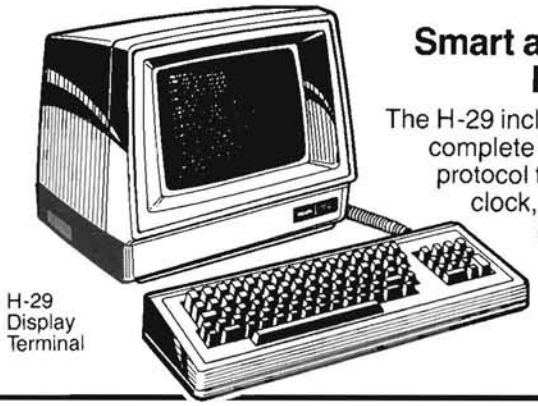

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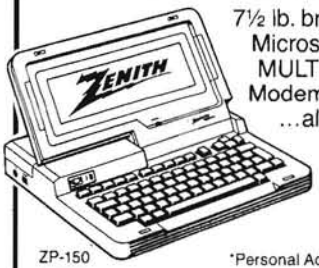

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A Tight C/80 Environment

Don Keller
1330 Eden Valley Road
Port Angeles, WA 98362

This is all about how to do big computer things on a little computer and a tiny budget. Specifically, how to run C/80 and the C/80 Mathpak on an H-89 with a single hard-sector drive and HDOS. For openers the C/80 compiler v3.1, the Mathpak enhancement and Pie editor from Software Toolworks in Sherman Oaks, California total about $112 postpaid. That's not bad for the powerful programming environment they provide. It's a lot of software and you won't even come close to packing it all on one disk. A certain amount of organization is called for.

First, grit your teeth and buy an extra box of disks. You'll need seven for this system. (As of Spring, 1985 they were only about fifteen dollars a box at the Heathkit Store.) This is in addition to backup copies of distribution disks. INITialize the following labels:

PIE — STANDALONE, onecopy, for C source

C — source files, ints and chars
C/80 — ints and chars, multi-source compiler
AS — ints and chars, multi-source C assembler

C — source files, floats and longs
C/80 — floats and longs, multi-source compiler
AS — floats and longs, multi-source C assembler

At this point, I made sure that both the coffee pot and my tobacco pouch were full. By the time all seven disks are ready to use, you'll be a ONECOPY expert.

PIE — STANDALONE, Onecopy, For C Source

Start with a system volume generated by SYSGEN/MIN. Bring in SET.ABS to SET HDOS STANDALONE, then delete SET.ABS. (This shouldn't be your first experience with HDOS STANDALONE if you're running a single drive; but if it is, don't be put off by the slightly strange warning message that appears on your screen. It's just Gordon Letwin's way of reminding you that you're using an unsupported feature of HDOS.) Reboot to make sure the disk remembers it's been SET to STANDALONE. System files and PIP.ABS will already be in place, from SYSGEN/MIN. You'll also need ONECOPY from the HDOS files and PIE from the Software Toolworks disk. You get a number of configuration choices for PIE, but I like it as is for writing C source code. Later on, we'll consider some optional files, but for now that's it for this disk. It provides a place to write programs along with the means to transfer them to the next process. It also supplies the operating system for the assembler, freeing up some desperately needed file space there.

C/80 — Ints And Chars, Multi-source Compiler

If the universe was truly benign, you would just RESET SY0: to swap from the PIE disk to this one; but you can't. The compiler needs the overlay space in RAM, so you'll just have to do another SYSGEN/MIN and do not SET HDOS STANDALONE, ONECOPY C.ABS to this volume.

Some of the C library files contain #ifneed directives to enable the compiler to include only those functions that are actually used in your program. STDLIB.C is one of these, and for that reason, should be on the compiler disk. PRINTF.C is another story; it can be assembled and placed on the AS disk to be incorporated into your program there. A couple of tricks are needed; here's how they work:

Compile PRINTF.C with the command line:

```
">C -L30000 PRINTF"
```

This will suppress inclusion of the C run time package and keep the intermediate file labels out of the way of the rest of your program. (See section II of your C/80 manual, "Multiple Compiles Using AS.") When a library function is included in this way, the header file PRINTF.H must reside on the compiler disk to be included by your source file. You might just as well save some typing later on with a small addition to PRINTF.H. Load it in PIE and add the following three lines to the end:

```
        #asm
        XTEXT   PRINTF.ASM
#endasm
```

If you don't put these three lines here you'll have to add them to every program that needs printf().

AS — Ints And Chars, Multi-source C Assembler

This is an easy volume to set up; all it needs — after INITializing — is the PRINTF.ASM you just compiled, PIP.ABS, AS.ABS, and CLIBRARY.ASM; no SYSGEN. The STANDALONE PIE disk will supply the operating system.

C — Source Files, Ints And Chars

Here's a place to park the source code for stuff you're working on, as well as all the handy utility functions you know you'll need sometime. There's no room on the working disks for anything but jobs in progress right now, but you'll still want those support files where you can find them easily. PIP.ABS is needed so you can tell what you have, and how much. I also use the MORE program (The version by W. S. Hall, REMark Volume 5, Issue 8, August 1984 p60) to browse through files. No need to SYSGEN this disk, you can RESET SY0: to this one from a STANALONE volume.

For a check on what you've accomplished so far, take a look at the directories of the disks you've set up. They ought to look something like this:

PIE — STANDALONE, Onecopy, For C Source

Name	.Ext	Size	Date	Flags	28-May-85
HDOS	.SYS	31	08-Feb-85	SLW	
HDOSOVL0	.SYS	26	08-Feb-85	SLW	
HDOSOVL1	.SYS	11	08-Feb-85	SLW	
SYSCMD	.SYS	12	08-Feb-85	SLW	
PIP	.ABS	19	08-Feb-85	SLW	
SY	.DVD	10	08-Feb-85	SL	
LP	.DVD	16	27-May-85		
PIE	.ABS	24	08-Feb-85		
ONECOPY	.ABS	20	10-Feb-85		
RGT	.SYS	1	08-Feb-85	SLW	
GRT	.SYS	1	08-Feb-85	SLW	
DIRECT	.SYS	18	08-Feb-85	SLW	

16 Files, Using 189 Sectors (192 Free)

C/80 — Ints And Chars, Multi-source Compiler

Name	.Ext	Size	Date	Flags	28-May-85
HDOS	.SYS	31	26-May-85	SLW	
HDOSOVL0	.SYS	26	26-May-85	SLW	
HDOSOVL1	.SYS	11	26-May-85	SLW	
SYSCMD	.SYS	12	26-May-85	SLW	
PIP	.ABS	19	16-May-85	S	
SY	.DVD	10	26-May-85	SL	
C	.ABS	152	26-May-85		
STDLIB	.C	21	27-May-85		
PRINTF	.H	1	26-May-85		
RGT	.SYS	1	26-May-85	SLW	
GRT	.SYS	1	26-May-85	SLW	
DIRECT	.SYS	18	26-May-85	SLW	

12 Files, Using 303 Sectors (78 Free)

AS — Ints And Chars, Multi-source C Assembler

Name	.Ext	Size	Date	Flags	28-May-85
SYSCMD	.SYS	12	26-May-85		
PIP	.ABS	19	26-May-85		
AS	.ABS	52	27-May-85		
CLIBRARY	.ASM	31	26-May-85		
PRINTF	.ASM	28	26-May-85		

```
/*      ---------- Listing 1 ----------
        ingrep.c                like a subset of the unix utility, grep.
     by Don Keller              except that it does not use command line
        1330 Eden Valley Road   arguments  (HDOS won't permit return of
        Port Angeles, WA 98362  lower case characters from command lines)
     */

#include <printf.h>     /* the header file for PRINTF.ASM */
#define BELL 7          /* ASCII BEL */
#define EOF -1          /* end of file indicator */
#define MAXLEN 100      /* maximum length of text lines */
#define MAXFIL 20       /* maximum length of file names */

char fil_ln[MAXLEN],    /* array for line from compared file */
char line[MAXLEN];      /* array for string to search for */
char filnam[MAXFIL];    /* array for name of file to search */
int f, flag;            /* channel number and match flag */

main()
{
    printf("\nEnter name of file to search: ");
    getline(filnam,MAXFIL); /* get name of file to search */
    printf("Enter search string:\n"),
    getline(line,MAXLEN);   /* get string to search for */
    f = file(filnam),       /* assign channel number */
    flag = 0;               /* flag will be 0 until a match is found */
    read_fil(),             /* search the file, print matches if any */
    if (flag == 0) printf("%c\nNo match found\n",BELL);
    /* all done   run off the end, back to HDOS */
}

file(name)      /* open file, return channel number */
char *name;     /* or print error message and exit  */
{               /* if file not found                */
    int chan,   /* channel number */
    chan = fopen(name,"r"); /* open named file for read */
    if (chan > 0) return chan; /* successful open returns channel number,*/
    printf("%cFile \"%s\" not found\n",BELL,name),  /* else ring BELL,    */
                                                    /* print error message*/
    exit();                                         /* and go back to HDOS*/
}

read_fil()      /* read lines from file and print any that match */
{
    int i;  /* index for line array */
    int c;  /* character from file */
    i = 0,

    while ((c = getc(f)) != EOF) {  /* Read line, one character at a time.*/
            switch (c) {            /* If end of line or end of file must */
                case '\n':          /* be end of line array  Make last    */
                case EOF:           /* byte a null to terminate array and */
                    fil_ln[i] = '\0';       /* go print the line          */
                    printit();              /* if it's a match            */
                    i = 0;  /* reset line array index */
                    break;
                default:                    /* If not end of line, not    */
                    fil_ln[i++] = c;/* end of file, put character         */
                    break;                  /* in line array — then       */
                                            /* increment index            */
            }
    }
```

RGT	.SYS	1	26-May-85	SLW
GRT	.SYS	1	26-May-85	SLW
DIRECT	.SYS	18	26-May-85	SLW

8 Files, Using 162 Sectors (222 Free)

C — Source Files, Ints And Chars

Name	.Ext	Size	Date	Flags	28-May-85
SYSCMD	.SYS	12	27-May-85		
PIP	.ABS	19	27-May-85		
MORE	.ABS	14	27-May-85		
RGT	.SYS	1	27-May-85	SLW	
GRT	.SYS	1	27-May-85	SLW	
DIRECT	.SYS	18	27-May-85	SLW	

6 Files, Using 65 Sectors (320 Free)

Assuming everything is there, it's time to try it out. This part of the system is for programs that do not use the MATHPAK enhancement. After it's been proven to work, there will be time enough to go on to the remaining three disks which support 32 bit data types, transcendental functions and the like.

A Functional Demo Program

Listing 1 is the source code for a limited imitation of the UNIX utility, grep. It looks to see if a specified ASCII string exists in a named file. This is handy if you should forget which files contain what. Like, "Is this the version that has my bookie's name and address in it?" Run ingrep and find out. The original grep gets the string to search for and the name of the file to search in from the command line. That's not too useful in HDOS — or C/PM either, by the way — since our operating system won't return lower case letters from the command line; it converts them to upper case, making it impossible to ask for a string that uses both cases. Instead, ingrep prompts the user for the search string and the file name.

Boot the volume labeled:

PIE — STANDALONE, Onecopy, C Source

Bring up PIE and type in the source code for ingrep.c. ONECOPY the source file to the disk labeled:

C/80 — Ints And Chars, Multi-source Compiler

and reboot this compiler disk. At the HDOS prompt, type "c ingrep" and <RETURN>. If there are no compiler errors, reboot the PIE disk to get ONECOPY, so you can copy ingrep.asm to the disk labeled:

AS — Ints And Chars, Multi-source C Assembler

When the copy operation is complete and you get the :OC: prompt, type /MOU and put the assembler disk back in the drive. Now hit Control-D and both the assembler and ingrep .asm are ready to go. At the HDOS prompt, type "as ingrep" and <RETURN>. When assembly is complete, without errors, you have ingrep.abs. You can try it out right away by typing "ingrep" and <RETURN>. Answer the prompts, telling the program to search ingrep.asm for the string, "read_fil". (Don't type the quotation marks or the period.) Try asking ingrep to find the string, "doodle," in ingrep.asm just to see what it says. Play with ingrep until you get tired of it, then get out the last three disks for the Tight C/80 Environment.

```
}       /* go back to main() */

printit()       /* print file line if it contains search string */
{
        int i;  /*
                                                                  */
        i = 0;                                                    /*
        if (index(fil_ln,line) >= 0) {  /* if line contains string then.  */
                flag = 1;               /* set flag to 1,                 */
                while ((putchar(fil_ln[i++])) != '\0'); /* print the line,*/
                putchar('\n');                          /* and add a newline.*/
        }
        /* go back to read_fil() */
}

#include <stdlib.c>     /* including stdlib.c here insures that only those  */
                        /* functions actually called will be compiled       */
/* end */
```

```
/*      _______ Listing 2 ________

        try2.c          just to try out the new method
        by      Don Keller      of organizing the C/80 system
                1330 Eden Valley Road
                Port Angeles, WA 98362
*/

#include <printf.h>

main()
{
        static float v[] = {0, .1666666666, 25, .3333333333, 5, 1};
        static float pi = 3.141592654;
        float sin(), cos();
        int i;

        for (i = 0; i <= 5; i++) {

        printf("\n\n");
        printf("The sine of %g is %g\n", v[i] * pi, sin(v[i] * pi));
        printf("The cosine of %g is %g\n", v[i] * pi, cos(v[i] * pi));
        }
}

#include <mathlib.c>
```

```
        _______ Listing 3 ________

                                        Don Keller
                                        1330 Eden Valley Road
                                        Port Angeles, WA 98362
A Tight C/80 Environment

The sine of 0 is 0
The cosine of 0 is 1


The sine of  .523599 is  .5
The cosine of  .523599 is  .866025
```

```
The sine of  785398 is .707107
The cosine of  785398 is .707106


The sine of 1.047198 is .866025
The cosine of 1.047198 is .5


The sine of 1.570796 is 1
The cosine of 1.570796 is 0


The sine of 3.141593 is 0
The cosine of 3.141593 is -1
```

C/80 — Floats And Longs, Multi-source Compiler

ONECOPY C.ABS and CCONFIGF.ABS from the C/80 distribution disk. Run CCONFIGF and type "N" to enable floats and longs. Now you can delete CCONFIGF.ABS and bring in copies of MATHLIB.C and FPRINTF.C from the MATHPAK distribution disk. Compile FPRINTF.C with the command line:

```
>C -L30000 FPRINTF
```

ONECOPY FPRINTF.ASM to the floats and longs assembler disk and delete both FPRINTF.C and FPRINTF.ASM from the compiler disk. Put STDLIB.C on the compiler disk and FPRINTF.H, from MATHPAK, on your PIE disk and add the following lines to the end of FPRINTF.H:

```
#asm
        XTEXT FPRINTF.ASM
#endasm
lfdum()
{
        float fdum;
        long ldum;

        fdum = 1.5 + .5;
        ldum = 70000 + 7;
}
```

The dummy function guarantees that the long and float libraries will be loaded, avoiding some possible errors on assembly. (On one occasion, I managed to generate 1881 assembler errors complaining of undefined labels. If you can top this, you have my sympathy. With lfdum() in place, that sort of disaster is less likely.) The only external identifier here is the function name, so you shouldn't use it anywhere else; but the variable names are local and can't interfere with anything.

FPRINTF.H can now be ONECOPYed to the compiler disk. I RENAMEd it PRINTF.H. You don't have to; but so help me, sometimes I start to write source code before I know whether I'll need floats and longs. Then, I usually forget to change printf.h to fprintf.h at the top of the program. Suit yourself. Your compiler for 32 bit math should look about like this:

C/80 — Floats And Longs, Multi-source Compiler

Name	.Ext	Size	Date	Flags	28-May-85
HDOS	.SYS	31	26-May-85	SLW	
HDOSOVL0	.SYS	26	26-May-85	SLW	
HDOSOVL1	.SYS	11	26-May-85	SLW	
SYSCMD	.SYS	12	26-May-85	SLW	
PIP	.ABS	19	26-May-85	S	
SY	.DVD	10	26-May-85	SL	
C	.ABS	152	27-May-85		
MATHLIB	.C	18	27-May-85		
PRINTF	.H	2	27-May-85		
STDLIB	.C	21	27-May-85		
RGT	.SYS	1	26-May-85	SLW	
GRT	.SYS	1	26-May-85	SLW	
DIRECT	.SYS	18	26-May-85	SLW	

13 Files, Using 328 Sectors (62 Free)

AS — Floats And Longs, Multi-source C Assembler

FPRINTF.ASM should already be here, copied as soon as it was compiled. You also need FLOATLIB.ASM, LGFLTLIB.ASM and LONGLIB.ASM from MATHPAK along with AS.ABS and CLIBRARY.ASM from the C/80 compiler distribution disk. The floats and longs assembler disk ought to look like this:

AS — Floats And Longs, Multi-source C Assembler

Name	.Ext	Size	Date	Flags	28-May-85
SYSCMD	.SYS	12	26-May-85		
PIP	.ABS	19	26-May-85		
FPRINTF	.ASM	38	27-May-85		
FLOATLIB	.ASM	44	27-May-85		
LGFLTLIB	.ASM	9	27-May-85		
LONGLIB	.ASM	15	27-May-85		
AS	.ABS	52	27-May-85		
CLIBRARY	.ASM	31	27-May-85		
RGT	.SYS	1	26-May-85	SLW	
GRT	.SYS	1	26-May-85	SLW	
DIRECT	.SYS	18	26-May-85	SLW	

11 Files, Using 246 Sectors (144 Free)

C — Source Files, Floats And Longs

The only difference between this volume and its ints and chars counterpart is the name.

Transcendentals And 32 Bit Arithmetic

The tight C/80 Environment is now complete and it's time to try the MATHPAK enhancement. Listing 2 won't earn a place in your library of utilities, but it does show how C/80 handles 32 bit math. You can go through the same sequence of operations you did for ingrep.c; just use the floats and longs versions of the compiler and assembler.

TRY2.C computes and prints the sine and cosine of 0, pi/6, pi/4, pi/3, pi/2 and pi. Notice that the program begins with, "#include <printf.h>." If you didn't rename fprintf.h you'll have to remember which one to use. The array is declared static so it can be initialized. Values in the array will be multipliers for pi. Inversions were used because I wanted to include an angle of 0 radians and pi/0 won't work, will it? To give you something to check against, Listing 3 shows the output of TRY2.C.

Additional C/80 Library Functions

Earlier, I mentioned some optional files for the PIE disk. That's where I keep SEEK.C and EXEC.C. They can be copied temporarily to a compiler disk whenever they're needed. You could, for instance, compile a module that does nothing but file housekeeping; then incorporate it into your object code in the AS assembler. Since AS will work under HDOS STANDALONE, there is more disk space to combine modules with the assembler than with the compiler.

You can't spend too much time studying the C/80 manual, especially section 11, "Multiple Compiles Using AS." Section 15.4, "Defining Globals in Header Files," describes a particularly useful trick. The Tight C/80 Environment will give you room to work. You can put together programs that are quite large; and C/80 certainly provides the power.

About The Author

Don Keller, *a middle-aged tech bum, graduated in 1960 from DeVry Technical Institute and wandered all over the United States ever since, working sometimes as an electronic technician and sometimes as a musician. In 1977, he began a series of heart attacks restricting his activities. In 1980, a Silicon Valley entrepeneur gave him a laid-back, part-time job in a California coast village. The work forced him to learn something about programming and he discovered that he liked it. He, eventually, moved back to his hometown of Port Angeles, WA where he attends Peninsula College trying for a math major.*

Money is darned hard to come by so I want to express my appreciation to Heath/Zenith, for making older computer models available at much reduced prices; and to The Software Toolworks for programmer's tools at such reasonable prices.

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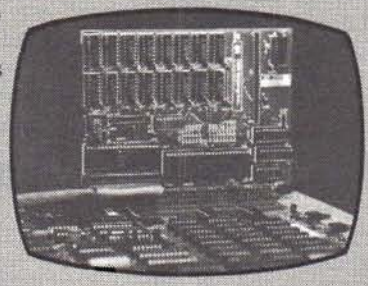

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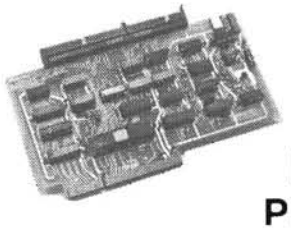

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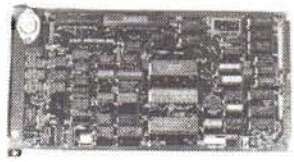

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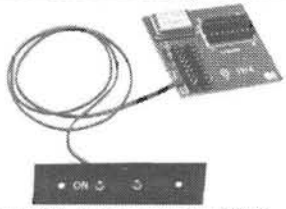

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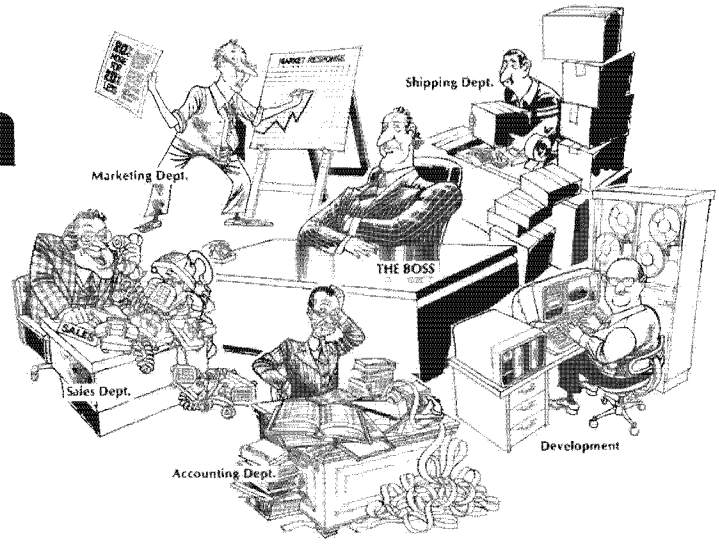

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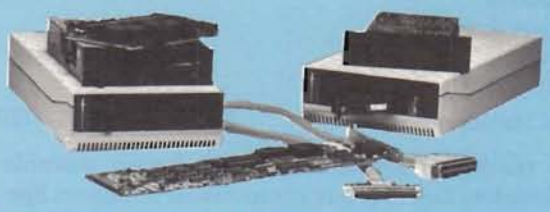

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Austin, TX 78728

Contact: Kylon Gustin — Phone: (512) 835-7981 (512) 251-7541

Comments: Software and consultation available. Products: THE WORD processor: The complete Bible on computer disks; two versions — King James, New Int'l. with a program that allows direct search access to any verse in the Bible. THE GREEK transliterator: Allows study of original word usage in scripture without special training in Greek. KJV New Testament with Strong's reference numbers assigned to English text. Special Notes: There are three add-on products: 1) Topics, 2) People, 3) ASCII Utility. Zenith 150 MSDOS must have GWBASIC, Zenith 151 MSDOS.

Bit Zero
1413 Redeker Road
Des Plaines, IL 60016

Contact: Hank La Barbara — Phone: (312) 298-1504

Comments: Hardware, software and consultation available. Products: Low cost 8" Floppy Controllers H-8/H-89, Disk Drive Repair, H-89 Real Time Clock, H-89/H-19 CRT Video Blankers, RS-232 Line Monitor.

Blaise Computing Inc.
2034 Blake Street
Berkeley, CA 94704

Phone: (415) 540-5441

Comments: Software available. Products: Pascal TOOLS — A package of Pascal units extending the capability of IBM and Microsoft Pascal compilers. C TOOLS — A powerful package of C functions which enable the user to augment the libraries of existing compilers. View Manager — A screen management system, comprising four components, developed explicitly for the IBM Personal Computer. EXEC — Implements program chaining using the standard DOS program loader. And many more!

Borland International
4585 Scotts Valley Drive
Scotts Valley, CA 95066

Contact: Sally Myers — Phone: (408) 438-8400 Ext. 458

Comments: Software available. Products: Turbo Editor Toolbox is all you need to build your own text editor or word processor. SuperKey lets you customize and automate your software, streamline your keystrokes, and protect your confidential files. Turbo Lightning provides instant access to the electronic versions of the Random House Dictionary and Thesaurus. SideKick for the Macintosh is a multitasking office manager program that operates in the "background" concurrently with any other Macintosh programs. And many more! Call for information.

Buccaneer Software Ltd
P.O. Box 502
Oakdale, NY 11769

Contact: Peter Ruber — Phone: (516) 567-2374 After 6 PM

Comments: Software available. Products: Publishes software for Heath/Zenith computer systems. CP/M SCREEN DUMP UTILITIES, Z-TERM/89 (full featured terminal/BBS communications, HOUSEHOLD INVENTORY, Z-DRAW/89, Z-EDIT/89 (replacement editor for HDOS). Descriptive catalog available.

Budget Software
P.O. Box 221
Berrien Springs, MI 49103-0221

Contact: Charlynne Clark — Phone: (616) 471-4830

Comments: Software and consultation available. Products: Interlaced GRAPHICS for the H-100, CRTSAVER, SWAPTALK, STRIP, CALENDAR programs for the H-100 and the H-150, source included. Send self-addressed stamped envelope for free catalog, or call bulletin board (616) 471-4830. Special Notes: Telephone line is a computer bulletin board except Sunday afternoon from 1:00 to 4:00 for voice consultation.

Business Support Services, Inc.
705 Butternut Avenue
Royal Oak, MI 48073

Contact: Evelyn S. Kennedy — Phone: (313) 585-4736

Products: Ribbons, printwheels and thimbles for letter quality printers and electronic typewriters. Ribbons for computer printers. Printwheel/Thimble modification service. Ziyad PersonalFeeder, cut sheetfeeder. Special Notes: Free catalog has ribbons and printouts of printwheel or thimble typestyles. Include printer model.

ByteSize Concepts, Inc.
18101 Euclid Avenue
Cleveland, OH 44112

Contact: Michael R. Nelson — Phone: (216) 486-1114

Comments: Software and consultation available. Products: Home Budget Manager — Complete checkbook manager for home user. ($49.95); Home Data Manager — Easy-to-use database manager for home use. ($49.95); Home Mechanic — Track auto expenses, includes fix-it guide. ($49.95); Electronic Typewriter — Turns computer and printer into electronic typewriter. ($29.95) Special Notes: All products menu controlled. Versions for all Heath/Zenith computers (CP/M and DOS).

C & C Engineering
Route 4, Box 364
Lexington, NC 27292

Contact: Carol or Charles Bernhardt — Phone: (704) 787-4131

Comments: Hardware, software and consultation available. Products: Plotter Scribe — Allows plotter to print fancy text, any size/direction. Attorney's Deed Check — Checks closure and plots deed on plotter. Land surveying and Earthwork computation programs. AU2 Mapping — A comprehensive computer mapping and design system using interactive screen graphics. All programs designed on Z-100. Available for Z-100 PCs.

CCM Company, The
1308 E 8th Street
Tucson, AZ 85719

Contact: Peter Halverson
Phone: Days (602) 621-6800
Eves, Weekends (602) 622-2796

Comments: Hardware, software and consultation available. Products: Autoclok is a high reliability timekeeping system for the Z-100 computer. This clock/calendar board keeps the date and time and automatically sets the system clock every time the computer is turned on. Special Notes: Uses one slot in S-100 bus. Nicad battery never needs replacing. MS-DOS 2.0 required. Price: $185.00.

C.D.R. Systems, Inc.
7210 Clairemont Mesa Boulevard
San Diego, CA 92111

Contact: Marc D. Brooks
Phone: (619) 560-1272
Bulletin Board: (619) 560-8929

Comments: Hardware, software and consultation available. Products: H/Z-89/90 Megabyte RAM Drive System, RTC and SCSI Hard Disk options. Double Density 8"/5.25" Floppy Drive Controller. ZS-100 7.5 MHz Speed Module. 2.4Meg. 5.25" Floppy package. Special Notes: C.D.R. Systems has manufactured quality products for the Heath/Zenith community for many years.

CLEO Software
Division of Phone 1, Inc.
461 N. Mulford Road
Rockford, IL 61107

Contact: Kim Hagemeyer
Phone: (800) 233-CLEO

Comments: Hardware, software and consultation available. Products: CLEO 3270 SNA or BSC allows your Z-100 PC to emulate a remote cluster of IBM 327x terminal devices anywhere a 3274/76 cluster might be used. 3780Plus is for fast, accurate file transfers using IBM's bisync protocol. CLEO 5251/12 supports remote SYSTEM 3x terminal emulation for the Z-100 PC. Now you can share mini-frame resources, such as high speed printers, with PC-users at remote sites. SYNCmodem is an internal synchronous auto-dial/auto-answer modem for the Z-100 bus. It comes fully integrated with your choice of CLEO 3270 SNA, BSC, 3780Plus, or CLEO-5251/12 software for easy dial-up operation.

CPAids, Inc.
1061 Fraternity Circle
Kent, OH 44240

Contact: Cary Parker
Vice President
Phone: (216) 678-9015
(800) 227-2437

Comments: Software and consultation available. Products: The Master Tax program provides the tax preparer with the ability to bring computerized tax preparation in-house. The Client Write-Up is a comprehensive accounting system designed for the accounting professional doing write-up work and for the small to medium business performing general ledger work. The Tax Planner is a comprehensive stand alone program that provides the user the ability to do "what if" tax planning applications. The CPAids 1120 Corporation program prepares the 1120 corporate tax return and performs associated functions.

William N. Campbell, M.D.
855 Smithbridge Road
Glen Mills, PA 19342

Contact: William N. Campbell, M.D.
Phone: (215) 459-3218

Comments: Software and consultation available. Products: "Getting Started With MS-DOS & BASIC Random File Handling" — for Z-150/160, MS-DOS & GWBASIC. Price $25.00. "Getting Started With CP/M & MBASIC Random File Handling" — for H-89 CP/M or Z-100 CP/M-85 and ZDOS. Price $25.00. Both above products include disk (specify hard or soft sector) with ready to run mail list programs and demo programs, and manual of detailed tutorials and extensive instructions. "Getting Started With HDOS & Assembly Language Programming" — 36 page tutorial. Price $15.00. All items sent first class upon receipt of check.

Central Point Software
9700 SW Capitol Highway #100
Portland, OR 97219

Contact: Catherine McGreevey
Phone: (503) 244-5782 X204

Comments: Software and consultation available. Products: Copy II PC is a backup utility for the IBM PCs though user reports of compatibility on the Zenith are excellent. Backs up most protected software quickly and easily, even allows several to be run from the hard disk without a key disk in drive A! PC Tools combines the popular features of Norton Utilities with a DOS Interface and makes them MEMORY RESIDENT! Fast and user friendly! Also excellent compatibility reports.

Chuck Atkinson Programs
Lake Benbrook Drive
Fort Worth, TX 76126

Contact: Chuck
Phone: (817) 249-0166

Comments: Hardware, software and consultation available. Products: Quick Check — $49.95. Simplified bookkeeping. Enter (or print) checks, deposits, cash spent, and income, and more. Add Accounts Payable for $45.05 and Accounts Receivable for $100.00. Quick Register — $395.00. Enter the quantity and item number as you make a sale. Print the invoice (or quote) and do the totals, sales tax, sales records, analysis, and inventory control at the same time. Does more. Add customer Records and Mail Management for $200.00. Sell-A-Matic (SAM) $995.00. All of the above, and serialized inventory and a quick letter writer. Available for IBM — CP/M and MSDOS.

Church-Related Computer Programming
305 SE Terrace
Roseburg, OR 97470

Contact: Larry Monk
Phone: (503) 673-6689
INA (503) 672-1629

Comments: Software and consultation available. Products: Church administration software for congregations under 350 members: Treasurer, Contributions, Membership data. H/Z-89, H/Z-100, IBM-PC, Apple II+. Needs 64K, MBASIC, and a printer. Special Notes: Quality user-customized software at affordable prices.

COMMSOFT
2257 Old Middlefield Way
Mountain View, CA 94043

Contact: Robin Platts
Phone: (415) 967-1900

HUG Members only!

HUGE HUGGER DISCOUNTS now available on these selected products...exclusively for members only!

That's right. We're offering HUG members these close-out, last call and limited quantity specials from Heath Company.

The items listed are not necessarily representative of complete systems. Please call your nearest Heath/Zenith Computers & Electronics Center or Heath Company toll-free at 1-800-253-7057 for more information before ordering.

Watch for additional MEMBER ONLY discounts in upcoming issues of REMark®!

REMark Discount List

	ITEM	LAST ADV'D PRICE	HUG MEMBER PRICE
H-19-3	H-19 to H-88 Mod Kit	220.00	199.95
H-88-1	Floppy Disk Accessory	150.00	99.95
H-88-5	Cassette I/O Card	25.00	24.95
H-88-9	Drive Mounting & Inst.	25.00	24.95
H-125	Dot Matrix Printer	750.00	499.95
HCA-5-77	H-77 Dust Cover	14.00	9.95
HCA-5-89	H-89 Dust Cover	14.00	9.95
HCA-9	Print Stand For H-125	99.00	89.95
HDC-100	H/Z-100 Dust Cover	16.00	9.95
HDC-125	H/Z-125 Dust Cover	16.00	9.95
PC-140	DG Magic RAM Expn. OK	129.00	99.95
PC-300	MMS CP/M+ & 128K Mem	395.00	395.00
PC-310	DG Super '89 CPU	699.00	499.95
PCA-120-1	6-Pak Plus Game Acc'y.	39.95	34.95
PP-110	Trippe Emer. Power System	349.00	299.95
PP-260	DTC 380Z Daisy Printer	1295.00	899.95
PPA-260-2	Cut-Sheet Feeder /380Z	574.95	399.95
PPA-260-3	Ribbons (3PK) /380Z	9.95	5.99
PPA-260-4	Cable - RS232 /380Z	49.95	34.95
PPA-260-5	Cable - Parallel /380Z	49.95	34.95
PPA-270-1	Trac Feed - Stylewriter	149.95	99.95
PPA-270-2	Sheet Feed - Stylewriter	249.95	174.95
ZA-100-4	S-100 Extender Board	59.00	29.95
ZA-219	Amber CRT /H-121	75.00	19.95
ZG-219	Green CRT /H-121	75.00	19.95
ZW-219	White CRT /H-121	75.00	14.95

Heathkit®

Heath Company

A subsidiary of Zenith Electronics Corporation
Some items may not be available at all store locations
Prices, product availability and specifications subject to change without notice.

CP-236

Comments: Software and consultation available. Products: ROOTS series of genealogy programs for Heath, CP/M and ZDOS computers. ROOTS II for advanced genealogists (ZDOS): $195 (key), $295 (keyless); ROOTS/M (CP/M): $49.95; ROOTS89 (HDOS): $39.95. Special Notes: Independent ROOTS Users' Group: Bill Johnson, 7304 Mariposa Drive, Manassas, VA 22110.

Compewterware
700 Milford Road
East Stroudsburg, PA 18301

Contact: H. Dean Moxness Phone: (717) 421-0367

Comments: Hardware, software and consultation available. Products: Full line of Zenith computers, Star Micronics printers, Gusdorf computer furniture, software and supplies. Special Notes: "Let Us Show You Productivity."

Computer Associates
Micro Products Division
2195 Fortune Drive
San Jose, CA 95131

Contact: Leanna Gaskins Phone: (408) 942-1727

Comments: Software and consultation available. Products: Products available through regular channels: H/Z-89 — SuperCalc2; H/Z-150 — SuperProject, EasyBusiness Systems, EasyWriter II System. Products available through Zenith Dealers only: H/Z-100 —*SuperCalc3; H/Z-150 — *SuperCalc3 Release 2 (*SuperCalc3 Release 2.1 soon) *These are special OEM versions.

Computer Covers
P.O. Box 551
Chagrin Falls, OH 44022

Contact: Sue Hanson Phone: (216) 247-3983

Comments: Consultation available. Products: Contoured covers are made of simulated leather vinyl with double stitched seams and custom made to client's special configuration in Brown or Black. Vinyl is fabric backed and cover has handy self loop for hanging when using unit.

Computer Smyth Magazine
P.O. Box 176
Peterborough, NH 03458

Contact: E.T. Dell Phone: (603) 924-9464

Products: Quarterly hardware construction journal. Hands-on microcomputer construction projects for the enthusiast. Special Notes: $15/year; 2 for $25.

CompuView Products, Inc.
1955 Pauline Boulevard
Ann Arbor, MI 48103

Contact: Bill Franki, Sales Rep. Phone: (313) 996-1299

Comments: Software and consultation available. Products: VEDIT PLUS: Program development, text editing, technical writing. V-SPELL: Spelling checker/corrector, soft hyphen help for work with a typesetter. V-PRINT: Text formatter. V-GRAPH: Tektronix 4010 or ANSI Standard emulator. Special Notes: Please call for information on pricing. Special dealer, distributor and OEM pricing available.

Condor Computer Corporation
2051 South State Street
Ann Arbor, MI 48104

Contact: Kathleen A. Fulton Phone: (313) 769-3988

Comments: Software and consultation available. Products: Condor 3 — Database Management Software. Condor 3 is the ONE that combines the simplicity of a file manager with the performance you expect from a relational database management system.

Conlon
71 Pardee Street
Bristol, CT 06010

Contact: Dale or Bob Conlon Phone: (203) 589-3824

Comments: Hardware, software and consultation available. Products: We provide custom accounting systems and currently market packages for churches, small manufacturing companies, blacksmiths, non-profit organizations, daycare centers and nursery schools, etc. Special Notes: We are ZDS dealers with a full line of peripherals, supplies, packaged software and custom programming.

Consumer Product Development
6242-B Rumford Lane
Houston, TX 77084

Contact: Michael Holcombe Phone: N/A

Comments: Hardware and consultation available. Products: Currently available is a CPU Clock Speed Enhancement for both Z-100 and Z-150 series computers. Plans for the new Zenith line. Special Notes: Possibly the above for the IBM PC. Also, a light pen for the Z-100.

Cover Craft
540 N. Commercial Street
Manchester, NH 03101

Contact: Joy Grant Phone: (603) 644-3555

Products: Anti-static dust covers, carrying cases, static control mats, high fashion Regatta protective covers. Special Notes: Cover Craft Anti-Static Dust Covers are the best selling U.S. brand.

Custom Software Services, Inc.
P.O. Box 65, 2500 Highway 79 South
Guntersville, AL 35976

Contact: Tyrus M. Dorman, Jr. Phone: (205) 582-4168

Comments: Software and consultation available. Products: Medical Billing Program, Dental Billing Program, Legal Office Management with time and billing. Written in dBASE-II. Special Notes: Source code provided. Menu driven. Custom modifications and more information on request.

D-G Electronic Developments Company, Inc.
700 S. Armstrong
Denison, TX 75020

Contact: Bruce Denton Phone: (214) 465-7805 (9 to 4 CST)

Comments: Hardware, software and consultation available. Products: D-G Heartbeat computer (H/Z-89 compatible), D-G Super 89 CPU for the H/Z-89, H-8 Static and Dynamic Memory

boards, H-8 Z-80 CPU Card, Super 89 BIOS, MP/M II for the Super 89 and Heartbeat. Special Notes: Above products, as well as a line of products for the H/Z-150 series available through many Heathkit Electronic Centers.

Data Management Associates, Inc.
24 E. King Street
Shippensburg, PA 17257

Contact: Dr. Gary L. Martz Phone: (717) 532-7493

Comments: Hardware, software and consultation available. Products: Church Conference (C) — DMA has developed various software applications for the central office of a church denomination. Dairy System (C) — Daily, monthly and yearly reports to assist in the decision-making process. Veterinary Clinic System (C) — Designed to provide the office manager and staff manager with a means to manage client information, patient records, financial records and reports, clients billing, hospital records, inventory control and analysis, and procedures records. And many more! Call for information. Special Notes: Contact DMA for more information on their products.

Data Transforms, Inc.
616 Washington
Denver, CO 80203

Contact: Margaret Devere Phone: (303) 832-1501

Comments: Software and consultation available. Products: Fontrix 2.5, graphics and typesetting software. Extended-screen graphics, merge text and graphics, typeset in 140-plus fonts. Automatic boldface, italics, etc. Print in color or greyscale on 60-plus supported printers.

Al Davis
187 Lake Chapin Road
Berrien Springs, MI 49013

Contact: Al Davis Phone: (616) 471-1792

Comments: Hardware available. Products: Heath/Zenith computer circuit boards — Z-100, Z-151 and H-89. Also, cabinets, etc. H-89 kits $150.00. HDOS H-89 operating system — $5.00/Box. Special Notes: I ship UPS and COD.

DelSoft
564 Calle Anzuelo
Santa Barbara, CA 93111

Contact: Gary Deley Phone: (805) 967-9566
Eves and Weekends

Comments: Software and consultation available. Products: WordKey makes WordStar the easy-to-use professional word processing program it should be. PSC-PRO graphics screen dump utility for the Prowriter printer. Special Notes: Programs are for H/Z-100 computers under Z-DOS and MS-DOS. WordKey $49.95, PSC-PRO $19.95, shipping included.

Digital Pathways, Inc.
1060 E. Meadow Circle
Palo Alto, CA 94303

Contact: Bob Lewin Phone: (415) 493-5544

Comments: Hardware, software and consultation available. Products: Digital Pathways SecureNet line of computer security products includes the Defender II computer access systems, personal identifiers and encryption products.

Dimensional Business Systems, Inc.
250 NW 4th Diagonal
Boca Raton, FL 33432

Contact: Ralph Avery Phone: (305) 368-0276

Comments: Software and consultation available. Products: A property and casualty insurance agency management and accounting system designed specifically by and for insurance agencies. The accounting is totally interactive; provides full daily and month end reports on customer history; customer coverage profile and full access to files for marketing. Requirements: Z-150 IBM compatible, minimum 128K memory, hard disk, one floppy plus 132 column printer. Price: $2000.00 plus options. Special Notes: Original design on the Z-90 using CP/M in 1980. 1982 converted to MS-DOS using the Z-151.

Disk Movers, Inc.
8534 McCormick Boulevard
Skokie, IL 60076

Contact: Miriam Campbell Phone: N/A

Comments: Hardware and consultation available. Products: Disk Movers sells to end users with special prices to Corporations and Institutions. Computer Diskettes: 5-1/4", 3-1/2", 8" and 14" removable disk pacs. Disk Storage Cases: We sell Control Data, Sentinal and other leading manufacturers' brands.

Diverse Systems
7916 S. Logan Drive
Littleton, CO 80122

Contact: Bob Gallagher Phone: (303) 798-3302

Comments: Hardware, software and consultation available. Products: 1.25 Megabytes, 5.25" floppy drives; hard disk systems. FoxBASE — dBASE II source compatible, multi-user, 3-5 times faster, 50% more fields than dBASE, runtime package. Special Notes: Custom software and consultation available.

Dixie Data Services
P.O. Box 4417
Columbus, GA 31904

Phone: (404) 323-7715

Comments: Software available. Products: Integrated Records System/DDS is a complete accounting computer software package for the small to medium-sized wholesale or retail business. All functions are selected from menu-type screens and data entries are solicited by friendly on-screen prompts. Some included functions: Accounts Receivable, Accounts Payable, Inventory Control, Payroll, Utilities, General Ledger.

Domino Computer Services, Inc.
108 N. Hickory Avenue
Arlington Heights, IL 60004

Contact: Doug Balut Phone: (312) 870-8707

Comments: Hardware, software and consultation available. Products: Have a large stock of 8-bit and Z-100 hardware and software priced to go. Also, top dealers in all new Zenith products, trade-ins are negotiable. Special Notes: Distributors of popular Genesis Menu Shell, call for pricing — Dealer inquiries welcome!

Dundee Software
499 Sierra Lane
State College, PA 16803

Contact: Henry Harpending Phone: (814) 234-7462

Comments: Software and consultation available. Products: ANTANA: Software for statistics, multivariate data analysis, and matrix algebra. Uses standard free-format ASCII files. Available for CP/M, MS-DOS microcomputers, includes 100 pp. tutorial manual. Price is $200, $120 in personal funds.

DynaComp, Inc.
1064 Gravel Road
Webster, NY 14580

Phone: (716) 671-6772

Comments: Software available. Products: Over 80 new programs and games for a large variety of computers. The largest Public Domain Library ever; The largest variety of software available; Quantity discounts and More! Call or write for more information.

Dysan Corporation
CE Division
1244 Reamwood Avenue
Sunnydale, CA 94089

Contact: Customer Service Phone: (408) 734-1624

Comments: Software and consultation available. Products: Drive alignment/diagnostic products including Interrogator consisting of menu-driven software program using Digital Diagnostic Diskette (DDD) to evaluate floppy drives for personal computers. Special Notes: Order Dysan P/N 201116 for H/Z-100 series or Dysan P/N 201131 for ZF-148 and ZF-150/160.

ETTS, Inc.
19224 SE 164th
Renton, WA 98058

Contact: Eric Therkelsen Phone: (206) 226-3916

Comments: Software and consultation available. Products: ZDRAFT is a graphics editor for making high-quality drawings for articles, reports. It includes ZFONT for creating/editing fonts and symbol sets. Special Notes: Unlike other low-cost graphics editors, ZDRAFT makes drawings much larger than the screen.

EWDP Software, Inc.
P.O. Box 40283
Indianapolis, IN 46240

Contact: Barbara Markowitz Phone: (317) 872-8799

Comments: Software and consultation available. Products: Variable length fields data manager. Comma delimited format for letter-merging with MailMerge, Multimate, WordPerfect, Freestyle. Powerful select features create subset files. Built-in computation and report generation. Special Notes: User Group Site Licenses available to aid clubs in raising funds.

EZWare Corporation
29 Bala Avenue, Suite 206
P.O. Box 620
Bala Cynwyd, PA 19004

Contact: Joyce Gerritsen Phone: (215) 667-4064

Comments: Software and consultation available. Products: TAX-PREP — Personal income tax preparation for individuals or accountants. EZTax-PLAN PRO — Individual & Corporate Tax Planning. EZTax-PLAN — Individual Tax Planning. Special Notes: All require Lotus 1-2-3 or Multiplan spreadsheet. Available for Zenith 100 (MSDOS) and some CP/M.

Eigenware Technologies
13090 La Vista Drive
Saratoga, CA 95070

Contact: Karl Remmler Phone: (408) 867-1184
After 5 PM and Weekends

Comments: Software and consultation available. Products: C Scientific Functions Library, C Getting Started Examples, C Compilers by Computer Innovations and The Software Toolworks, C Interpreter/Training Systems by Computer Innovations, Small C and Small MAC. Special Notes: RBBS (408) 867-6575 with C database, available 24 hours all 7 days.

Elliam Associates
24000 Bessemer Street
Woodland Hills, CA 91367

Contact: Bill Roch Phone: (818) 348-4278

Comments: Software and consultation available. Products: We specialize in CP/M products, our own and regular commercial programs. We also supply CP/M Public Domain software (375 volumes from the CP/M, SIG/M BDS-C and Pascal/Z User Groups). Special Notes: Disk copying is available supporting some 50 CP/M formats, as well as MS-DOS and DEC MS-DOS.

Enthusiastic Software
P.O. Box 510
St. Joseph, MI 49085-0510

Contact: Gregg Chandler Phone: (616) 927-8088

Comments: Software and consultation available. Products: GAC-PAC-1 — A diskette of 10 utility programs for DOS 2.0 or higher, $15.00. Special Notes: Enthusiastic Software has extensive background in systems programming.

FBE Research Company, Inc.
P.O. Box 68234
Seattle, WA 98168

Contact: Dave Brockman Phone:(206) 246-9815
After Noon

Comments: Hardware, software and consultation available. Products: Hardware/software enhancements for H/Z-100, H/Z-150, H/Z-89 series computers. ZMF100 puts 768K on old motherboard Z-100. MegaRAM-150 puts 1.2 megabytes on standard Z-150 memory card. Special Notes: Call or write for latest flyers. Look for our advertising in REMark!

FINA Software
16144 Sunset Boulevard #3
Pacific Palisades, CA 90272

Contact: Larry Fina Phone: N/A

Comments: Hardware and consultation available. Products: H/Z-25 Super Chip Set: Four Chips, 12 New Features, 256 Characters, Super/Sub Script, Double Strike, Underline, Italics and more. Special Notes: Compatible with any operating system.

First Capitol Computer
1106 First Capitol Drive
St. Charles, MO 63301

Contact: Tom Jorgenson
Craig S. Ware
Phone: (314) 946-1968

Comments: Software and consultation available. Products: Full line Zenith Data Systems dealer, and all major software and peripherals. Specialize in custom configured and enhanced Zenith Data Systems computers. Special Notes: Specialists in CAD and Novell network systems; also high capacity disk drive installation.

Floppy Disk Services, Inc.
39 Everett Drive, Building D
Lawrenceville, NJ 08648

Contact: Sales Dept.
Phone: Tech. Assist. (609) 799-4440
Sales (800) 223-0306

Comments: Hardware, software and consultation available. Products: Floppy and hard disk systems, add-on boards, color monitors, and data cables for Zenith computers. Mounting kits for internal half heights, dual density controllers, replacement drives, and hard disk systems for the H-89. Special Notes: HUG member discounts, excellent service and warranties provided. Call for free catalog.

Friendliware
P.O. Box 21206
Lansing, MI 48909

Contact: Bob Griewski
Phone: (517) 882-1675

Comments: Software and consultation available. Products: 8 CP/M Compuzzles(tm) include DISARM $35; ATLANTIS ($till un$olved, $uper $urpriZe for $omeone), $40. Also, interactive PID control-system instruction, $23. Hard/soft-sectored formats. Phosphor Essence(tm) interlaces for ZDOS, Z-100, 192K color option, and RGB monitor: COLORGEN, 8088 programmers' minimal-speed color synthesis tool (thousands of concurrent colors), $40. LACE, public domain demo application, $5. ED48, extraordinary full-screen text editor, 48 80-character lines plus soft CribStrip(tm), $135. General 640 X 480 RGB development. $2 ($3 overseas) S&H/order. Thanks '85 patrons!

Future Communications
210 West Benson Street
Atlanta, GA 30030

Contact: Todd Merriman
Phone: (404) 373-4831

Comments: Software and consultation available. Products: CHECKZ: A full-featured and inexpensive checking account maintenance package for small businesses and individuals. FRIENDZ: A large set of business and programming utilities and productivity aids. Special Notes: Software available for CP/M-80, MSDOS, and PCDOS.

FutureWare Systems
4839 - 52nd Street
Lubbock, TX 79414

Contact: Pat Parrish
Phone: (806) 795-7802

Comments: Hardware, software and consultation available. Products: Zenith products, most software including our own Future-Plot program for designing and drawing plots, graphs, and charts.

GEBEX GRUPPEN AB
Box 4070
S-182 04 ENEBYBERG
STOCKHOLM, SWEDEN

Contact: B. Schmidt
Phone: 08/768 09 45

Comments: Hardware, software and consultation available. Products: Management, consulting, computer strategies, marketing, sales and distribution, and export services. Distributor in Scandinavia for Zenith and Heath Products. Special Notes: Telex: 14238. U.S. Subsidiary GEBEX INTERNATIONAL INC., 5 Dunwoody Park, Suite 116, Atlanta, GA 30338 USA 0091 (404) 9577.

Gemini Technology Inc.
11 - 11151 Horseshoe Way
Richmond, B.C.
CANADA V7A 4S5

Contact: Julie McCorquodale
Sales Coordinator
Phone: (604) 274-1283

Comments: Hardware available. Products: 2+2 Numeric Data Processor Accessory Board — High performance Numeric Data Processor for the H/Z-100 family of computers. Gemini Emulator Board — Converts Z-100 computers to true IBM/PC compatibility. Special Notes: The above products have been developed by D.E.L. Professional Systems Ltd., a sister company of Gemini Technology Inc.

Generic Computer Products, Inc.
P.O. Box 790, Dept. RD-16
Marquette, MI 49855

Contact: Lyn Durant, Marketing
Phone: (906) 249-9801

Comments: Software and consultation available. Products: Peripheral hardware sales and support. Consultation available from 10 AM - 5 PM (EST) weekdays (except holidays). Offer wide range of data entry, database, business/financial, educational, game and utility software for H-8/H-19, H-89, Z-100, Z-150, Z-160 systems running HDOS, CP/M, ZDOS or MS-DOS. Also, market high-quality software from outside authors. Authors should request a FREE Software Author's Kit. Software available from Heathkit stores and many other Zenith dealers. Call or write for a FREE catalog. Dealer inquiries welcome.

GeoGraphics Corporation
1318 Alms Drive
Champaign, IL 61820

Contact: James Campbell
Phone: (217) 351-8591

Comments: Hardware and software available. Products: The GeoGraphics Drafting Board Digitizer, designed as a low cost, high performance digitizer for the microcomputer environment, adapts existing workspace for large area (42" X 36") digitizing. Specialized software applications for mapping, mining and designing. Special Notes: -Resolution up to 800 LPI; -Compatible with most computer families; -Attaches to top, right, or left edge of drafting board; -Portable.

Graphic Communications, Inc.
200 Fifth Avenue
Waltham, MA 02254

Contact: John Brock
Phone: (617) 890-8778

Comments: Software available. Products: FREELANCE(tm) is a new graphics software package that creates professional visuals for use in business reports and presentations. 35 mm slide, paper, or transparency visuals can be produced using the freeform drawing feature, or you can enhance and edit charts already created with GRAPHWRITER(r) (a business graphics package that produces charts and graphs for formal presentations), Lotus 1-2-3 and Symphony. FREELANCE can import Lotus PIC files and ASCII text files. Special Notes: Site License and Corporate Account programs are available.

Graven Image, The
970 North Meridian Road
Mason, MI 48854

Contact: Jim Scott Phone: (517) 676-4648

Comments: Hardware and consultation available. Products: Engraved plates, H-89 keys. Special Notes: Ask for a quote.

H-Scoop
2618 Penn Circle
Sheboygan, WI 53081

Contact: Subscription Dept. Phone: (414) 452-4172

Products: H-Scoop, the #1 rated independent newsletter for H/Z computer support is mailed monthly via first class mail. Contains general information on all H/Z computers (except for H-11 series), covering general information, new product news, technical information, good guys and bad vendors to deal with, tips and ideas, feedback, who's doing what with their systems, requests for help, classifieds, etc. $24 for a 12 issue year USA & Canada. $32 foreign AIR MAIL. 8 page (minimum) condensed print in each issue (equal to about 16 normal pages). Back issues and package deals available, VISA/MC accepted.

Hand Tool Industries, Inc.
1933 Lake Street
Kent, OH 44240

Contact: George G. Martin Phone: (216) 678-4737

Comments: Consultation available. Products: Hand and power tools, tool kits (standard and special), meters, and related items for electrical and electronic technicians. Special Notes: Company specializes in specialty hand tools and tool kits to customer specifications.

Helu Corporation
627 Kaiemi Street
Kailua, HI 96734

Contact: W. L. Rankin Phone: (808) 263-6323

Comments: Software and consultation available. Products: General Ledger, Accounts Receivable, Accounts Payable, Payroll, Sales Order, Inventory, Property Management Commercial, Property Management Residential.

Hilgraeve Inc.
P.O. Box 941
Monroe, MI 48161

Contact: Matt Gray Phone: (313) 243-0576

Comments: Software and consultation available. Products: ACCESS and HyperACCESS provide powerful support for communications with bulletin boards, dial-up services, remote microcomputers and mainframes. HyperACCESS emulates assorted terminals, including VT-100. Special Notes: HyperACCESS runs on Z-150s or Z-100s. The Z-100 version provides FULL support for Gemini and Easy PC boards.

InchSoft
64 Fanchers Street
Pickerington, OH 43147

Contact: Richard E. Lucka Phone: (614) 837-8446
Weekday Nights And Sundays

Comments: Software and consultation available. Products: EDT (HDOS), EDT-80 (CP/M-80), and EDT-85 (CP/M-85) — Full screen editor for H-8/H-89 and H-100. Special Notes: RTTY software available, packet software under development.

International Micro Systems, Inc.
6445 Metcalf
Shawnee Mission, KS 66205

Contact: Mark Guttu Phone: (913) 677-1137

Comments: Software and consultation available. Products: Medical Office Management and Dental Office Management are designed for small to medium size offices and clinics with up to 50 doctors and staff. The systems have data file maintenance, patient billing and receivables, patient history, insurance forms and reports, and office scheduler modules included.

Intersecting Concepts
4573 Heatherglen Court
Moorpark, CA 93021

Contact: Mark Graybill Phone: (805) 529-5073

Comments: Hardware, software and consultation available. Products: Media Master Plus — capable of converting eight bit CP/M software to run on 16 bit MS-DOS and PC-DOS machines. The ACCELER8/16 — A high performance version of Media Master Plus and is capable of converting eight bit CP/M software to run on 16 bit PC-DOS machines. Media Master — A direct disk-to-disk format conversion program that allows microcomputer users to read, write and format up to 70 different 5-1/4" diskettes from CP/M, MS-DOS, and PC-DOS operating systems. File Mate — A complete integrated file maintenance program.

Jay Gold Software
Box 2024
Des Moines, IA 50310

Contact: Jay H. Gold, M.D. Phone: (515) 279-9821

Comments: Software and consultation available. Products: A complete Home Finance System that keeps track of checking accounts, asset accounts and credit account payments. Writes checks, includes many reports. Requires H/Z-89/90 or H/Z-100, CP/M-80/85, MBASIC.

Performance.

Introducing EasyPC™ from UCI. The most advanced IBM PC emulator you can buy for your Z-100. First to provide the compatibility, speed and audio support to make your Z-100 run like a PC. Since the EasyPC provides complete PC circuitry, you actually run PC programs on PC hardware. Quite simply, it's like installing a PC right inside your Z-100. In the PC mode, your Z-100 can run virtually the entire library of PC programs, including LOTUS 1-2-3, dBase III, FLIGHT SIMULATOR, and most other copy-protected software. In the Zenith mode, your Z-100 is a Z-100, with no change in performance.

EasyPC is fast. In fact, it is noticeably faster than both the Z-150 and the IBM PC. And EasyPC can run at either 5 or 8 MHz. It supports both floppy and Winchester drives, provides crisp color video graphics, supports PC-compatible sound generation, and even comes with its own self mounting speaker.

Quality.

You already know and appreciate the kind of quality and reliability that is built into your Z-100. UCI matches that commitment to quality from first step to last. Sophisticated engineering and quality components combined with precision automatic assembly, component burn-in, and both in-circuit and full functional testing, mean superior performance and long term reliability.

EasyPC's advanced circuitry utilizes two, high quality, S-100 multilayer boards and a piggyback board. Yet its ingenious design requires only *one extra slot*. So you get all the advantages of PC compatibility, with room to spare.

Availability.

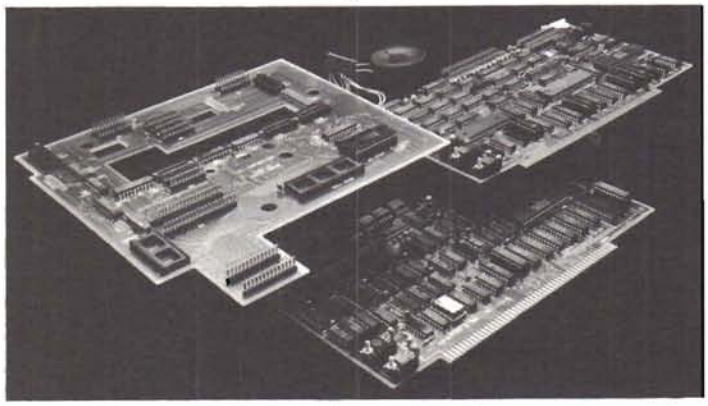
EasyPC is ready when you are. If you've been waiting too long for PC compatibility, your wait is over. EasyPC is here now. Complete documentation is included for quick and easy installation, so you'll be up and running fast. Your only problem will be which PC programs to get first.

EasyPC is available through your independent Zenith dealer. Ask him for a demonstration.

Price.

At $699, you'll pay a little more. But you'll get the best. Total compatibility. High speed performance. Unsurpassed quality and serviceability. In a word, value. You also get UCI's one year Solid Service Guarantee and full customer support. If you have any questions or problems with any UCI product, or need the name of your nearest dealer, just call 800-UCI-COMPUTER.

EasyPC™



Full IBM PC emulation for your Z-100.

UCI CORPORATION
948 Cherry Street, Kent, Ohio 44240
(216) 673-5155 / 800-UCI-COMPUTER

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KCK Enterprise
P.O. Box 492
Richmond, IN 47375

Phone: (317) 966-4052

Comments: Consultation available. Products: Unlimited possibilities for customized covers available in various colors and sizes without paying a premium for quality. We can fit your needs. Write for your brochure. Special Notes: Covers for Zenith, Apple, IBM, Sonyo, Epson, Okidata, etc. Commercial kitchen equipment included.

Kandueazy Computer Software Services (KCSS)
6218 Blossom Lane
Alexandria, VA 22310

Contact: James E. Kandul Phone: (703) 922-9450

Comments: Hardware, software and consultation available. Products: Disk-to-tape and tape-to-disk file backup/restore (TAPEIO). Text formatter with 36 commands (PRINTIT). Structured Programming preprocessor for assembly language (STRUCTUR). Line drop out and surge protector (GRAY BOX). Special Notes: All Heath/Zenith software/hardware discounted 10-30%. Custom made leatherette dust covers. Above software is for CP/M only; Hard or soft sectored.

Ken's Custom Bookbinding
P.O. Box 2247
East Chicago, IN 46312

Phone: N/A

Products: Bound Deluxe Editions of REMark. Volumes 1-4 $30.00 each. Volumes 5 & 6 $35.00 each. $2.00 per Volume shipping.

C. Kingston
P.O. Box 564
Elmsford, NY 10523

Contact: C. Kingston Phone: (914) 949-7870

Comments: Software and consultation available. Products: K-Base —A screen oriented file manager with indexing, string searching within fields, soundex search, report functions, mailing labels, input and output ASCII data, etc. Special Notes: for H/Z-100, 150 and 200 series computers (specify). $99.00

Kres Engineering
P.O. Box 1268
La Canana, CA 91011

Contact: Ken Smith Phone: (818) 957-6322

Comments: Hardware, software and consultation available. Products: H/Z-89 advanced 4 MHz speed module, 89 replacement back panel, 7 slot I/O expansion for 89, H/Z-89 supplemental cooling fans, enhanced 89 monitor ROM, dual drive kit mounts inside 89, H/Z-89/100 transportable conversion kits, 100 detached keyboard kit. H/Z-150 and 160 reset and font switch (150 front mount, 160 rear), H/Z-150 vertical floor and desk stands. Special Notes: All Kres products are available directly or from many authorized Heath store and ZDS dealers.

LWFW, Inc. Group
12700 Park Central, Suite 1805
Dallas, TX 75251

Contact: Bill Lloyd Phone: (214) 233- 5561

Comments: Software and consultation available. Products: The Work Management System(TM) supports maintenance and other field operations managers in developing preventive maintenance programs, analyzing infrastructure data, scheduling work, collecting costs, evaluating crew performance, and improving productivity. The PARTS Management System is material inventory control which provides inventory functions, charging material to jobs/work orders, tracking "truck stock" and multiple warehouses, reserving material, and providing material lists. Special Notes: The PARTS Management System interfaces with The Work Management System. MS-DOS; CP/M; 128K; 10 MB.

Lexicon Corporation
1541 N. W. 65th Avenue
Fort Lauderdale, FL 33313

Contact: Barry Sleight Phone: (305) 792-4400

Comments: Hardware and consultation (800-327-8913) available. Products: Lightweight, low-cost, high-performance, acoustically-coupled modem, "LEX-11" is available through Heathkit mail order and most stores as model WH-23 (part #800-1605). Special Notes: Call 800-327-8913 and ask for Customer Service concerning other Lexicon products including battery-portable modems.

Lifeboat Associates
1651 Third Avenue
New York, NY 10128

Contact: Sales Staff Phone: (800) 847-7078

Comments: Software available. Products: Software TOOLS for C programmers. Special Notes: Programs for Z-100, Z-100 PC and Z-200 under MSDOS.

LINKS COMM
11456 Links Drive
Reston, VA 22090

Contact: Dale Grundon Phone: (703) 437-3710

Comments: Software available. Products: TAXEZ 1985 is a series of income tax preparation worksheets that are designed to operate with MicroSoft's MultiPlan spreadsheet program. Over 20 IRS forms are supported. Special Notes: Price $30.00. Requires MicroSoft MultiPlan. Versions available for ZDOS, MS-DOS, CP/M, IBM PC-DOS. Dual drives recommended. Annual updates at reduced cost.

Lotus Development Corporation
55 Cambridge Parkway
Cambridge, MA 02142

Phone: (800) 447-4700

Comments: Software available. Products: 1-2-3 (R) is the world's most popular software for business and professional use. It combines three essential analytical functions in one fully-integrated program: spreadsheet, graphics and database. Symphony is the management tool that combines five business functions in one package: Spreadsheet, word processing, communications, database manager, graphics. Special Notes: Direct inquiries to (800) 447-4700 for information about nearest Zenith dealer.

MSW Company, The
P.O. Box 229
Penfield, NY 14526-0229

Contact: Dennis E. Hamilton Phone: (716) 586-6757

Comments: Software and consultation available. Products: EZCPR, SC80 Small-C Tools, and the Conclave RCP/M Construction kit for CP/M-80 and CP/M-85 systems. Special Notes: Free updates and notices distributed by CompuServe CP-MIG and network of RCP/M systems.

MARC Software International, Inc.
260 Sheridan Avenue
Palo Alto, CA 94306

Contact: Sheri Heffley Phone: (800) 835-2400
In CA (800) 854-9900

Comments: Software available. Products: WordMARC word processing for all applications. Composer(TM) for professional formatting of reports and technical documents. Author(TM), fully integrated with Composer designed for rapid idea communication. Special Notes: No codes or commands to memorize. Scientific typing and spelling checker included.

MELO Company
1462 62nd Street
Brooklyn, NY 11219

Contact: Jim Melville Phone: (718) 259-1104

Comments: Hardware available. Products: We provide soft protective cases for computer and related electronic gear and instruments. We also design cases and manufacture production runs for unique applications. Special Notes: We have the ability to design and manufacture small production runs at realistic prices.

Meridian Technical Associates, Inc.
2 Southboro Lane
Glen Rock, NJ 07452

Contact: J. Fitzpatrick Phone: (201) 445-8645

Comments: Software and consultation available. Products: Meta Input Controller (MIC) command file processor for HDOS batch, "submit" functions. Intelligent Modem Program (IMP) for terminal communication to mainframes, minis, other micros (CP/M or HDOS). Special Notes: Business applications, communications and integration into mini and mainframe environments our specialty.

Micro Data Base Systems, Inc. (mdbs)
P.O. Box 248
Lafayette, IN 47906

500 Sagamore Parkway
W. Lafayette, IN 47906

Contact: David R. Leininger Phone: (317) 463-4561

Comments: Software and consultation available. Products: The KnowledgeMan/2 family of products provide synergistically integrated knowledge management processes. Guru is artificial intelligence that means business. MDBS III is a post relational database management system for professional applications developers. Special Notes: All MDBS products run on Local Area Networks, as well as standalone PCs.

Micro Peripherals, Inc. (MPI)
4415 South 500 West
Salt Lake City, UT 84123

Contact: Kay Zaike Phone: (801) 263-6000

Comments: Hardware, software and consultation available. Products: PrintMate 99, Sprinter, Xprinter, SXprinter, PrintMate 350. High performance Dot Matrix Printers with speeds up to 300 cps, 80 column and wide carriage, Softswitch keypad eliminates DIP switches, IBM compatible. Special Notes: Print anything you can display on your CRT with MPI AP-Pak's. Z-89, Z-100, Z-150 compatible.

Microcomputer Games, Inc.
Division of The Avalon Hill Game Company
4517 Harford Road
Baltimore, MD 21214

Contact: Jackson Y. Dott Phone: (301) 254-9200

Comments: Software available. Products: Four adult strategy games for the H/Z-100 or Z-90: Telengard-fantasy, $28.00; B-1 Nuclear Bomber, $21.00; Football Strategy, $21.00; Stocks & Bonds, $25.00. Special Notes: Buy any two, get one free.

Micro-Doc
3108 Jackson Street
Bellevue, NE 68005

Contact: Fred Pospeschil Phone: (402) 291-0795

Comments: Software and consultation available. Products: Flexi-Graph graphics libraries. Routines are linkable with many C's, MS Pascal and FORTRAN. Provides support for writing graphics programs for Z-100s, Z-150s/IBM PCs, and the IDS PC graphics board. Special Notes: Call or write for additional information. Introductory price $89.00, demo disk $3.00.

Miracle Computing
313 Clayton Court
Lawrence, KS 66044

Contact: Richard E. Elliott Phone: (913) 843-5863

Comments: Software and consultation available. Products: We sell vertical market software. (About 30 programs in all.)

MMorroware
12503 Gristmill Cove
Austin, TX 78750

Contact: Mark Morrow Phone: (512) 250-1303

Comments: Software and consultation available. Products: MMORROWARE publishes software for the Heath/Zenith Z-100 series microcomputer. Categories are: Educational, Scientific, Engineering, disk file cataloging, and printer utilities. Special Notes: Contract programming is available in the above software areas.

Mountain View Press
P.O. Box 4656
Mt. View, CA 94040

Contact: Roy C. Martens Phone: (415) 961-4103

Comments: Software available. Products: FORTH Computer Language Software. Special Notes: MVP-FORTH is in the public domain.

Mycroft Labs, Inc.
2615 North Monroe Street
Tallahassee, FL 32303

Contact: Carla Markus Phone: (904) 385-1141

Comments: Software and consultation available. Products: MicroMite — Communications software with the basic facilities to originate calls and transfer readable text. MiniMite — Has standard sending and receiving capabilities including: password protection, pre-configured plus automatic logons, menu and command driven. MaxiMite — Multi-protocol asynchronous functions including auto-dialing, auto re-dialing, auto-answer, auto-logon, transfer of binary and text files, and 10 programmable function keys. MaxiMite + — All the functions of MaxiMite, plus a script file Command Language and Terminal Emulation. Special Notes: Fully staffed Technical Support department with Electronic Bulletin Board for on-line, 24 hour assistance.

NBI, Inc.
3450 Mitchell Lane
P.O. Box 9001
Boulder, CO 80301

Contact: Jerry M. Ruhl Phone: (303) 938-2795

Comments: Hardware and software available. Products: NBI, Inc. manufactures high performance office automation systems, including: cluster controllers; clustered and standalone personal computers (IBM compatible) and word processors; UNIX-based text and graphics workstations; optical character readers; laser and impact printers, and a variety of software packages and communications capabilities.

New Generation Systems, Inc.
1800 Michael Faraday Drive, Suite 206
Reston, VA 22090

Contact: Paul Beck Phone: (703) 471-5598

Comments: Software and consultation available. Products: Disk Maker I for the Z-100 allows copying between over 275 disk formats, including 48/96 tpi 5-1/4", 3-1/2", 8" and IBM PCAT diskettes. Special Notes: Options for word processing, phototypesetting, DEC/IBM mainframe and UNIX formats are available for Disk Maker.

New Orleans General Data Services, Inc.
7230 Chadbourne Drive
New Orleans, LA 70126

Contact: David or Jean Troendle Phone: (504) 241-9495

Comments: Hardware, software and consultation available. Products: HA-8-2 Music Synthesizer Boards, HA-8-3 and HA-89-3 Color Graphics Boards, PASCAL/MT+ for HDOS, Z-GRAPH-100 and FLEXI-GRAPH (graphics support packages for the Z-100, Z-150 and IBM PC). Special Notes: Full one-year warranty on parts and labor on our sound/color graphics boards.

Newline Software
P.O. Box 289
Tiverton, RI 02878

Contact: Ron Rocheleau Phone: (401) 624-3322

Comments: Software and consultation available. Products: Software and supplies for the H/Z-89, H/Z-100 series, and H/Z-100 PC series, IBM-PC, and DEC micros. Products include word processors, spelling checkers, business, educational games, and personal software. Special Notes: Call or write for catalog. Indicate computer type.

Next Systems, Inc.
P.O. Box 2671
Toledo, OH 43606-0671

Contact: Thomas J. Menacher, V. P.
Christopher W. Beroset, Pres. Phone: (419) 385-2523

Comments: Software and consultation available. Products: Next Systems develops custom data system software for MS-DOS based computers including manufacturing, engineering, and "expert" systems. Special Notes: Next will help develop special hardware needs.

NORCOM
9630 Hayes
Overland Park, KS 66212

Contact: Roger Lembke Phone: (913) 888-6237

Comments: Hardware and consultation available. Products: Replacement character generators for H/Z-89 and H/Z-19. G-Prom improves graphics resolution: $19.95. T-Prom improves text characters: $19.95. GT-Prom provides both functions: $24.95. (Prices include shipping & instructions.) Special Notes: Full details are available from NORCOM.

Northwest Analytical, Inc.
520 NW Davis
Portland, OR 97209

Contact: Lynn Theis Phone: (503) 224-7727

Comments: Software and consultation available. Products: NWA STATPAK (TM) is a multi-function statistics library. NWA Quality Analyst (TM) is a statistical quality control charting and analysis system for manufacturers. Special Notes: STATPAK and Quality Analyst are available in BASIC source code and interface with software producing ASCII, DIF, and SYLK files. In-house technical staff available during normal business hours.

OWI Inc.
1160 Mahalo Place
Compton, CA 90220

Contact: June Morioka Phone: (213) 638-4732

Comments: Hardware, software and consultation available. Products: MOVIT family of twelve educational electronic robot kits are a series of computerized (logic-controlled) battery robot kits that teach the basic principles of robotic sensing and locomotion. Special Notes: Three new members are now available: WAO, S-CARGO, and NAVIUS. MAKIT WITH MOVIT.

Old Colony Sound Lab
Division of Audio Amateur Publications
P.O. Box 576
Peterborough, NH 03458

Contact: Glen Birbeck Phone: (603) 924-6371

Comments: Hardware, software and consultation available. Products: Kits for the intermediate and experienced builder. Amplifiers, preamps, power supplies, active crossovers. The finest audio design for a fraction of list. Special Notes: We are beginning to offer computer items. Write for a catalog.

Paul F. Herman
Data Systems Consultant
P.O. Box 206
Safety Harbor, FL 33572

Contact: Paul F. Herman Phone: (813) 725-2728

Comments: Software available. Products: DOODLER Graphics Package for Z-100 and PC Compatibles. Pixel oriented color graphics design package with advanced features and custom fonts. Special Notes: DOODLER is available at Heath/Zenith Computer Centers nationwide for $79.95.

Dr. M. E. Pittman
Scientific/Engineering Programming
57 Emile Avenue
Kenner, LA 70065

Contact: Michael E. Pittman, Ph.D. Phone: (504) 443-2355

Comments: Software and consultation available. Products: "Map Projections of the World" in which very high-resolution color maps of either global (5000 points) or caribbean (12,000 points) coastlines are displayed with choice of scale, origin, window, rotation, grid, or any of seven different projections. One may also track hurricanes in animation, and more. $49.95 postpaid or at many H/Z Centers, with documentation and examples. Color graphics required, monitor recommended. Specify H/Z-100 or H/Z-150.

Pivar Computing Services, Inc.
47 W. Dundee Road
Wheeling, IL 60090

Contact: Gary Pivar Phone: (312) 459-6010

Comments: Consultation available. Products: Pivar Computing Services, a conversion services company, can convert to or from over 500 computer systems, including Magtapes, Micro Computers, Mini Computers, Word Processors and Typesetters.

Powerline Systems
131 Jumping Brook Road
Lincroft, NJ 07738

Contact: John W. Preusse Phone: (201) 747-2063

Comments: Software available. Products: JUPITER: Records Management program handling more than 25,000 records of personal information for H/Z-89, CP/M $49.95. COUPON: Grocery Coupon Management for the Z-100, Z-100 PC (Z-150) and IBM PC, MS-DOS $29.95. Special Notes: A Z-100/Z-150 version of JUPITER will be available in time for HUGCON 1986.

Professional Business Systems Of Pensacola, Inc.
221 E. Government Street
Pensacola, FL 32501

Contact: John Causey Phone: (904) 438-7805

Comments: Hardware and software available. Products: Zenith Data Systems computer sales, service, support and supplies.

Public Brand Software
P.O. Box 51477
Indianapolis, IN 46251

Contact: Bob Ostrander Phone: (800) 426-3475 Order Line

Comments: Software available. Products: Distributor of MS-DOS Public Domain Software. Suitable for Z-100, 151, 161 series, etc. All products are for MS-DOS 2.0 and above. Special Notes: Exclusive Public Brand Software Catalog available. All software is $5 per disk.

Quest Computing
P.O. Box 1323
Freeport Center Station, UT 84016

Contact: B. Hellewell Phone: N/A

Comments: Software available. Products: Complete Accounting System. An accounting system consisting of General Ledger, Accounts Receivable, Accounts Payable, Job Costing, and Payroll modules. Total system for only $55. Special Notes: The complete source code is available for an additional $125.

Quikdata, Inc.
2618 Penn Circle
Sheboygan, WI 53081

Contact: Sales Dept. Phone: Orders (414) 452-4172
Tech. & Questions (414) 452-6854

Comments: Hardware, software and consultation available. Products: Oldest independent H/Z vendor in the business, being a high-tech innovative mail order company with complete support and service facilities, handling a wide variety of lowest priced hardware and software products for H/Z computer systems (only), including computers. ZDS Dealer. Specialize in disk drives and winchester drives, memory chips, tape backup systems, drive cabinets, cables, printers, software and computers. Consulting and custom dBII and dBIII programming available. VISA/MC accepted.

Real Estate Agent Computer Service
10275 NE 23rd Avenue
Mitchellville, IA 50169

Contact: Harold Dykens Phone: (515) 967-6042

Comments: Software and consultation available. Products: Programs that will help both the Agent and Broker more easily qualify their buyers and sellers. (Investment Analysis, Depreciation, Rent vs Buy, Wrap Loan, etc.) Special Notes: 11 Software Utilities with Source Code Supplied. $35.00 Money Order or COD ONLY! Z-89, Z-90, Z-100, Z-150 formats.

Realty Software
1926 S. Pacific Coast Highway #229
Redondo Beach, CA 90277

Contact: David Wichmann Phone: (213) 372-9419

Comments: Software and consultation available. Products: Realty Software specializes in Property Management Software, Property Listings and comparables, and real estate investment analysis. Realty Software also produces many other real estate utilities. The software will run on IBMs and compatibles, MS-DOS machines, and CP/M machines. Special Notes: Realty Software produces user friendly up-to-date, cost-effective software.

Red Wing Business Systems, Inc.
610 Main Street
P.O. Box 19
Red Wing, MN 55066

Contact: Patricia B. Brown Phone: (612) 388-1106

Comments: Software and consultation available. Products: The Red Wing General Ledger is a flexible, easy-to-use system that makes keeping good records fast and easy. Produces the reports you need to manage to profit. Handles up to three partners and a multitude of enterprises. The cornerstone for good financial management.

Rex Service Company
6610 W. 111th Street
Worth, IL 60482

Contact: James Vallortigara Phone: (312) 448-5558

Comments: Consultation available. Products: Repair, upgrades, and modifications of more than 25 manufacturers of computers and peripherals; specializing in Heath/Zenith. Work done on-site (Chicagoland) or carry/mail-in. Special Notes: Mention your membership when contacting us for current specials.

Richmond Computerware
15807 Kenbrook
Missouri City, TX 77489

Contact: Jerome E. Banasik, P.E. Phone: (713) 437-8188

Comments: Hardware, software and consultation available. Products: Hardware — Disk Drive Shielding/Mounting Kit for H/Z-89. Panasonic 5-1/4" disk drives. R-67 internal hard disk system for H/Z-89. Software — Process control engineering programs. Special Notes: Accepts contractual hardware and software work.

Rick Lutowski (Formerly MICROTRAN)
76 Flintwell Way
San Jose, CA 95138

Contact: Rick Lutowski Phone: (408) 226-4122

Comments: Software and consultation available. Products: FORTRAN support for HDOS: library manager, "CORE" graphics package; AM9511/AM9512 math libraries; overlay package; console I/O, sorting, metric conversion, bit manipulation, and HDOS interface libraries. Special Notes: Most libraries are interdependent. All include source code, documentation, and sample program on H-17 disk.

Robert J. Stalder
3508 Furey Avenue
Madison, WI 53714

Contact: Bob Phone: (608) 241-5483

Comments: Software and consultation available. Products: Maps out, on your terminal, 8 lines of information on the computer byte or word. Input can be in octal numbers or decimal bit numbers. Special Notes: At $49.95, an aid to H-11 or PDP-11 assembler programmers, students and hobbyists.

Ross Custom Electronics
1551 Sandra Drive
Boulder City, NV 89005

Contact: J. D. Ross Phone: (702) 293-7426

Comments: Hardware, software and consultation available. Products: IntelliBurner EPROM, EEPROM, and 87XX Microcontroller Programmer $299.00 (or PC Board $99.00). NEW! IntelliBurner RAM option for standalone operation $89.00. Other RS-232 Serial Programmers from $149.00 — PC Boards from $39.00. Special Notes: Complete software support included — HDOS, CP/M, ZDOS, and MSDOS. UV lights and accessories available.

S&K Technology, Inc.
4610 Spotted Oak Woods
San Antonio, TX 78249

Contact: Steve Robbins Phone: (512) 492-3384

Comments: Software and consultation available. Products: WatchWord — Powerful word processor of the H/Z-100. The Resident Speller Z-100 Version — Designed for use with WatchWord to give as-you-type checking. The Resident Speller PC Version — Designed to be used with most word processors for as-you-type checking.

Sammamish Data Systems, Inc.
1413 - 177th Avenue, NE
Bellevue, WA 98008

Contact: Richard H. Schweitzer, Jr. Phone: (206) 644-2442

Comments: Software available. Products: Census Data System allows preparation of reports from 1980 Census data for microcomputers. DIDS prepares thematic maps of statistical data. QuickMap budget priced mapping software. Special Notes: Census Data System and DIDS available for Z-100, Z-150, Z-200. QuickMap available Z-150 and Z-200.

San Diego Scientific
815 Third Avenue #301
Chula Vista, CA 92011

Contact: Jack Stevenson Phone: (619) 425-2262

Comments: Hardware and software available. Products: Gemini Board, Z Power 150. Special Notes: Authorized Distributor for Gemini.

Secured Computer Systems
8575 Knott Avenue, Suite D
Buena Park, CA 90620

Contact: Linda, Lowell or Ken Phone: (714) 952-3930

Comments: Hardware, software and consultation available. Products: 16K RAM expansion card; 2 port serial, 3 port parallel interface and Real-Time Clock, all these modules are for the H/Z-88/89/90. Special Notes: We do module repairs for the Zenith product line.

Sextant Publishing Company
716 E Street, S.E.
Washington, DC 20003

Contact: Gabriele Burkhard Phone: (202) 544-0900

Products: Sextant magazine and Buss newsletter are independent publications for users of Heath/Zenith microcomputers. Sextant —$14.97/6 issues (1 year); Buss — $28.00/20 issues (1 year).

Sierra On-Line, Inc.
P.O. Box 485
Coarsegold, CA 93614

Contact: Sandy Crowe/John Williams Phone: (209) 683-6858

MEDIA MASTER

FORMATS SUPPORTED	VERSION	IBM PC	ZENITH Z-100	OSBORNE 1	OSBORNE 1/EXEC	KAYPRO 2X	KAYPRO 2/4	DEC RAINBOW	SANYO 55&5
Actrix (DSDD)		•	•				•		•
Actrix (SSDD)		•	•	•	•	•	•	•	•
Avatar TC10 (DSDD)		•	•				•		•
Casio FP 1000 (DSDD)		•	•				•		•
Chameleon CP/M-80		•	•				•		•
Columbia MPC CP/M-80		•	•				•		•
Cromemco CDOS (SSDD)		•	•	•	•	•	•	•	•
Cromemco CDOS (SSSD)				•	•	•	•		
Cromemco w/Int'l Term (DSDD)		•	•				•		•
Cromemco w/Int'l Term (SSDD)		•	•	•	•	•	•	•	•
DEC Rainbow CP/M-86/80								•	
DEC Rainbow MS-DOS								•	
DEC Mate II CP/M (SSDD)								•	
DEC VT180 (SSDD)		•	•	•	•	•	•	•	•
Davidge (DSDD)		•	•				•		•
Digilog (DSDD)		•	•				•		•
Epson Multifont (DSDD)		•	•				•		•
Epson QX-10 (DSDD)		•	•				•		•
Facit DTC (SSDD)								•	
Fujitsu Micro 16S (DSDD)		•	•				•		•
Groupil III CP/M (DSDD)		•	•				•		•
Heath w/Magnolia CP/M		•	•	•	•	•	•	•	•
Heath/Zenith Z-DOS (1.xx DSDD)		•	•		•		•		•
Heath/Zenith Z-DOS (1.xx SSDD)		•	•	•	•	•	•	•	•
Heath/Zenith Z-DOS (2.xx DSDD)		•	•		•		•		•
Heath/Zenith Z-DOS (2.xx SSDD)		•	•	•	•	•	•	•	•
Heath/Zenith Z-100 CP/M (DSDD)		•	•						•
Heath/Zenith Z-100 CP/M (SSDD)		•	•	•	•	•	•	•	•
Heath/Zenith Z90 40 track (1k block)		•	•	•	•	•	•	•	•
Heath/Zenith Z90 40 track (2k block)		•	•	•		•	•	•	•
IBM PC CP/M-86 (DSDD)		•	•				•		•
IBM PC CP/M-86 (SSDD)		•	•	•	•	•	•	•	•
IBM PC DOS (1.xx DSDD)		•	•		•		•		•
IBM PC DOS (1.xx SSDD)		•	•	•	•	•	•	•	•
IBM PC-DOS (2.xx DSDD)		•	•		•		•		•
IBM PC DOS (2.xx SSDD)		•	•	•	•	•	•	•	•
IDEA Bitelex (SSDD)		•	•	•		•	•	•	•
ISM CP/M (DSDD)		•	•				•		•
Ithaca (SSDD)								•	
Insght Dev IQ-120 (SSDD)		•	•	•		•	•	•	•
Kaypro 10 (DSDD)		•	•				•		•
Kaypro 2 (SSDD)		•	•	•	•	•	•	•	•
Kaypro 4 (DSDD) •		•	•				•		•
LNW-80 (SSDD)		•	•	•	•	•	•	•	•
Lobo MAX-80 (SSDD)		•	•	•	•	•	•	•	•
Lobo MAX-80 512 (SSDD)		•	•	•		•	•	•	•
Micral 90/50 CP/M-80 (DSDD)		•	•				•		•
Morrow MD11 (DSDD)		•	•						•
Morrow MD2 (SSDD)		•	•	•	•	•	•	•	•
Morrow MD1 (DSDD)		•	•						•
Mac Sym 450 (SSDD)								•	
Monroe OC8520 (SSDD)								•	
NCR Decision Mate 5 (DSDD)		•	•				•		•
NEC PC-8001A (DSDD)		•	•				•		•
NEC PC-8001A (SSDD)		•	•	•	•	•	•	•	•
Olympia ETX II (SSDD)		•	•	•		•	•	•	•
Olympia EX100 (DSDD)		•	•				•		•
Osborne 1 (SSDD)		•	•	•	•	•	•	•	•
Osborne 1 (SSSD)				•	•	•	•		
Osborne 1 Vixen (DSDD)		•	•		•		•		•
Osborne Executive (SSDD)		•	•	•	•	•	•	•	•
Osborne Osmosis (SSDD)		•	•	•		•	•	•	•
Otrona (DSDD)		•	•				•		•
Philips 3000 (SSDD)								•	
PMI Mercomate (DSDD)		•	•				•		•
Reynolds & Reynolds (SSDD)		•	•	•		•	•	•	•
Sanyo CP/M (DSDD)		•	•				•		•
Superbrain (DSDD)		•	•				•		•
Superbrain Jr (SSDD)		•	•	•		•	•	•	•
Systel II (SSDD)		•	•	•	•	•	•	•	•
Systel III (DSDD)		•	•				•		•
S-100 10 TRK (SSDD)				•		•	•	•	•
TI Professional CP/M-86 (DSDD)		•	•				•		•
TI Professional CP/M-86 (SSDD)		•	•	•	•	•	•	•	•
TRS-80 Model III FEC CP/M (SSDD)		•	•	•		•	•	•	•
TRS-80 Model III FEC (80S (SSDD)		•	•	•		•	•	•	•
TRS-80 Model III Burr Labs (SSDD)		•	•	•		•	•	•	•
TRS-80 Model III Mem Merch (SSDD)		•	•	•	•	•	•	•	•
TRS-80 Model I Omikron CP/M (SSDD)				•	•	•	•		
TRS-80 Model IV CP/M Plus (SSDD)		•	•	•	•	•	•	•	•
TRS-80 Model IV Montezuma Micro (SSDD)		•	•	•		•	•	•	•
Teletek 10 track (SSDD)		•	•	•		•	•	•	•
Teletek 80 track (SSDD)								•	
Toshiba T100 (DSDD)		•	•				•		•
Televideo TurboDOS (DSDD)		•	•				•		•
Televideo 802 CP/M							•		•
Wang Maxs CP/M (DSDD)		•	•				•		•
Xerox 820 II (SSDD)		•	•	•	•	•	•	•	•
Xerox 820 II (SSSD)				•	•	•	•		
Zorba 10 track (DSDD) •		•	•				•		•

• Requires access to "foreign" computer

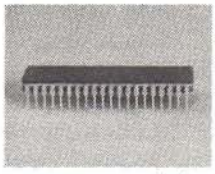
"MAKE YOUR Z-150 CP/M COMPATIBLE"

Intersecting Concepts Announces 3 Solutions To Solve Your Computer Incompatibility

But will it work on my computer? Yes! Finally, there are three easy ways to exchange information, transfer files, and run CP/M software on MS-DOS machines.

1. **MEDIA MASTER** is our direct disk-to-disk format conversion program. Already an accepted industry standard, this $39.95 program uses simple screen prompts that lets you read, write and format up to 70 different 5¼" diskettes from CP/M, MS-DOS and PC-DOS operating systems. So if you work on a IBM PCompatible at the office, but use a CP/M computer at home, now you can easily transfer files that would otherwise be "foreign" to your computer's operating system.

2. **MEDIA MASTER PLUS** goes one step further by converting 8-bit CP/M software to run on 16-bit MS-DOS and PC-DOS machines. This newly released $59.95 product combines our IBM-PC version of Media Master with ZP/EM, a powerful new emulation program. The results are amazing: CP/M programs using 8080 instructions *and* data can be transfered from popular computers like Osborne, Kaypro and Zenith to run on MS-DOS and PC-DOS machines!



3. **ACCELER-8/16** is also new and dramatically improves the performance of Media Master Plus by tailoring the CP/M emulation around a NEC V20 microchip. This chip simply replaces the 8088 processor in your MS-DOS computer. Once installed, it'll run your CP/M and MS-DOS software much faster. (Speed improvements are roughly 15% faster in MS-DOS and 350% faster in CP/M!) With ACCELER-8/16 your MS-DOS computer is now CP/M compatible for only $99.95!

The Choice Is Yours

So if you just need to exchange files between different computers using different operating systems, there's Media Master at $39.95.

If you're upgrading to an MS-DOS or PC-DOS machine or already have one but don't want to spend money buying "new" software programs you already own, there's Media Master Plus for $59.95.

And if the execution speed of your CP/M programs is important, there's ACCELER-8/16 for $99.95, which provides a simple hardware and software solution to making your MS-DOS computer CP/M compatible. All three solutions save you money by eliminating expensive modems and communications software.

To Order

To order Media Master, Media Master Plus, or ACCELER-8/16, call 800-824-7888, and ask for operator 251. For additional product and upgrade information contact:

Intersecting Concepts, Inc.,
4573 Heatherglen Ct., Moorpark, CA 93021
or call 805-529-5073.

INTERSECTING CONCEPTS

Comments: Software available. Products: Small business, Home Productivity, Entertainment, and Educational software available. Special Notes: Catalog available upon request or order direct from Sierra.

SigmaSoft and Systems
4488 Spring Valley, #107
Dallas, TX 75234

Contact: Clay D. Montgomery Phone: (214) 392-1024

Comments: Hardware, software and consultation available. Products: High Resolution Graphics, RAM Drive, and Print Spooler upgrade for the H/Z-89 and H/Z19-H8 systems $495. Complete 10 and 20 Megabyte Winchester hard disk subsystems for HDOS and CP/M with Z-37 floppy controller emulation priced from $945. Special Notes: We specialize in supporting the H/Z-89 and H-8 user. We have one of the broadest lines of high performance upgrade products for these systems.

Skycastle Computer Products
P.O. Box 1412
San Carlos, CA 94070

Contact: Mike Krivohlavek Phone: (415) 254-3931

Comments: Software and consultation available. Products: Offers software for dot matrix printers. Programs add an extra touch to your printed documents by combining graphics and custom fonts with standard text.

Softquest, Inc.
P.O. Box 3456
McLean, VA 22103

Contact: Susannah Rosenberg Phone: (703) 281-1621

Comments: Software and consultation available. Products: A personal and small-business financial management program, The Smart Checkbook, accommodates sophisticated financial needs while remaining simple enough for novices to use. It produces complete financial records, including budget reports, net worth statements, tax records, custom reports and summary tables. Money market, checking, savings, credit card and cash accounts can be organized with as many as 200 budget and 200 tax categories, and any amount split among 15 possible budget and tax categories. Special Notes: Available for Zenith Z-100 (Z-DOS and CP/M-80); Z-150, Z-160 (PC-DOS); Heath/Zenith 89 (CP/M 5-1/4" and 8").

Software Applications of Wichita
2204 Winstead Circle
Wichita, KS 67226

Contact: Nat Addleman Phone: (316) 684-0304

Comments: Software and consultation available. Products: TaxAide Plus — Prints ALL forms including 1040 and 1040A; 22 forms; worksheets $59.95. TaxAide Personal — Prints all forms except 1040 and 1040A; 12 forms; worksheets $29.95. Special Notes: Prints IRS submittable forms while using only 192K of memory. Requires Lotus 1-2-3, 360K drives.

Software Solutions, Inc.
12 Cambridge Drive
Trumbull, CT 06611

Contact: Andrea M. Bugen Phone: (800) 243-5123

Comments: Software available. Products: DATAEASE(TM) is a fully relational menu driven database management system. DATAEASE helps you gather, file, and maintain information about your business. It can fully automate every aspect of your business (accounting, personnel, sales, production) and integrate all these functions by providing information flow between them. You can also use DATAEASE with mainframe computers to distribute information to other departments or offices. Even the first time computer user can start using DATAEASE in minutes. However, it also offers significant productivity gains to the experienced programmer. Special Notes: DATAEASE runs on the Zenith Z-150 and Z-160.

Software Store, The
706 Chippewa Square
Marquette, MI 49855

Contact: Rod Aldrich Phone: (906) 228-7622

Comments: Software and consultation available. Products: We provide the following PC-DOS and CP/M-80 software: MasterCom for telecommunications; Disk Fix for File Recovery; Program Map for BASIC Cross Reference; and INFO-80 for Application Development. Special Notes: 30 day money back guarantee on all software. Quantity discounts available for multiple purchases.

Software Toolworks, The
14478 Glorietta Drive
Sherman Oaks, CA 91423

Contact: Susan Ann Hayes Phone: (818) 986-4885

Comments: Software available. Products: The Software Toolworks manufactures and sells software for all Heath/Zenith machines. Programs include word processors, programming languages, cookbook software, games, home utilities, spreadsheet, and educational software.

Software Wizardry, Inc.
1106 First Capitol Drive
St. Charles, MO 63301

Contact: Tom Jorgenson
Dale Wilson
Phone: (314) 946-1968

Comments: Software and consultation available. Products: Software and hardware enhancement products for Zenith Z-100 and PC series systems. RamPal memory upgrade; P-SST Multifunction board; Palette, Zlynk/II, ESP, Whiz, and Umenu software. Special Notes: Software submissions invited; call for preapproval before sending.

Spectrum Holobyte, Inc.
1050 Walnut, Suite 325
Boulder, CO 80302

Contact: Jeffrey Sauter Phone: (800) 621-8385 X262

Comments: Software and consultation available. Products: GATO —World War II submarine simulation; TellStar — Educational astronomy software; Art Studio — Graphics paint software; Executive Picture Show — Business presentation graphics. Special Notes: Our company is founded on the premise of graphics excellence. When you think of computer graphics, think of us.

St. Benedict's Farm
Box 366
Waelder, TX 78959

Contact: George Phone: (512) 540-4814

Comments: Software and consultation available. Products: BEEFUP —cow/calf herd management performance data system (9999 dows w/dual or hard disk). PEDIGREE constructs and dynamically maintains 5-generation pedigrees on any livestock.

Standard Computer & Leasing, Inc.
88 El Dorado
Little Rock, AK 72212

Contact: Sharon Stark Phone: (501) 224-6660

Comments: Hardware, software and consultation available. Products: Vertical software for Finance & Insurance Departments of Auto dealerships, loan calculations, form processing, inventory, sales tools and reports. Special Notes: Also Zenith Authorized Service Center with parts.

Studio Computers, Inc.
999 South Adams
Birmingham, MI 48011

Contact: Ray Massa Phone: (313) 645-5365
(10 AM - 5:30 PM weekdays) (313) 645-1272

Comments: Hardware, software and consultation available. Products: Authorized Zenith Data Systems dealer and MPI sales & service. Complete line of Z-100 and Z-150 PC computer systems & accessories, hard-disk drives, 8" and 5-1/4" 9 disk drive systems. Pro Driver communications software. Also, enclosures, cables, modems, synthesizers, disks, Panasonic printers and monitors, Canon Laser and bubble-jet printers, Okidata, Dataproducts and MPI printers. Free 24 page 1986 illustrated catalog on request.

Sunol Systems
1187 Quarry Lane
Pleasanton, CA 94566

Contact: Brad Baucus Phone: (415) 484-3322

Comments: Hardware, software and consultation available. Products: Universal Networking Mass Storage with capacities from 10 to 440 Megabyte Hard Disk with optional 26 Megabyte 1/4 inch tape drive, plus a fast and low cost LAN. Special Notes: Sun*Plus Networking Software allow single user application programs to be multi-user.

Symbiotics
431 Mishler Road
Mogadore, OH 44260

Contact: Bill Claxton Phone: (216) 699-4978

Comments: Hardware, software and consultation available. Products: APL services, Authorized STSC PLUS*WARE Dealer/custom APL programs & systems for IBM PCs/Z-150/other compatibles. BIBLE TOOLS/Weibull/Plot Software. Special Notes: VAR/APL microcomputer systems for STSC APL*PLUS/PC System phone calls/no charge except line.

T.D. Engineering
13941 Olive Mesa Court
Poway, CA 92064

Contact: Terry McNeill Phone: (619) 748-8529
Dell Auer (619) 271-1077

Comments: Hardware, software and consultation available. Products: "AT" H/Z-150 upgrade featuring 8 mega byte dynamic RAM board for H/Z-150 and Z-200, 80286 CPU board and an "AT" Buss board for H/Z-150. 1 Megabyte Dynamic RAM board for the H/Z-89, 512K byte dynamic RAM controller for the -H-8.

TEACO, Inc.
2117 Ohio Street
P.O. Box E
Michigan City, IN 46360

Contact: Paula D. Jacobs Phone: (219) 874-6234
Sales & Advertising Coordinator

Comments: Hardware and consultation available. Products: Floppy Disk Drive Exercisers for standard 5-1/4 and 8 inch drives; adaptors for other interfaces. RADIALIGNER radially aligns read-write head without a scope. CABL-SIMPL-CHEKR tests continuity of ribbon cables. Special Notes: Units available for various power sources and in sizes ranging from hand-held to bench models.

Taranto & Associates, Inc.
68 Mitchell Boulevard, Suite 125
P.O. Box 6216
San Rafael, CA 94903

Contact: Arlene Schaffer Phone: (415) 472-2670

Comments: Hardware, software and consultation available. Products: Completely integrated accounting software consisting of General Ledger, Accounts Receivable, Accounts Payable, Payroll and Inventory Control. Can stand alone or work together. Point-of-Sale systems. Special Notes: Our programs have been devised for the most efficient use of your time and the time on the computer.

Techland Systems Inc.
25 Waterside Plaza
New York, NY 10010

Contact: Susan Beningson Phone: (212) 684-7788

Comments: Hardware, software and consultation available. Products: Techland has developed 5250 and 3270 emulation products which act as micro-to-mainframe links to allow your PC and mainframe to communicate.

Techni Service Corporation
106 Arbuelo Way
Los Altos, CA 94022

Contact: Ken Barnes Phone: (415) 949-1765

Comments: Consultation available. Products: Typesetting from text files.

Technical Advisors, Inc.
861 Washington Avenue
Westwood, NJ 07675

Contact: Matt Baum Phone: (201) 666-0504

Comments: Hardware, software and consultation available. Products: For the H/Z-89, a parallel I/O card which installs in the LEFT SIDE, providing 64 lines total of input and output. Ideal for machine & special purpose controls. Special Notes: Consultation on special applications of all H/Z computer products — hardware and software.

Technical Micro Systems, Inc. (TMSI)
366 Cloverdale
Ann Arbor, MI 48105

Contact: Lee A. Hart Phone: (313) 994-0784

Comments: Hardware, software and consultation available. Products: The H-1000, a high performance replacement CPU board for your H/Z-89. Write-Hand-Man, a 'sidekick' for your H/Z-89. Z-89-37 soft-sector controller boards. Special Notes: TMSI specializes in support for the H-89 and Z-90 series of computers.

Technology Services, Inc.
5703-B General Washington Drive
Alexandria, VA 22312

Contact: Susan Da Re Phone: (703) 354-8668
(703) 642-2311

Comments: Hardware, software and consultation available. Products: TSI carries a complete line of the most popular, and also hard-to-find, ZDOS and MSDOS versions of software on GSA Schedule. Special Notes: TSI can also arrange for evaluation copies and/or product demonstrations.

Technology Services, Ltd.
P.O. Box 4276
Tallahassee, FL 32315

Contact: Bill Hill Phone: (904) 562-1412

Comments: Software and consultation available. Products: I sell and support the full line of Mycroft Labs products including: MITE, MyHost and COMPAT. I also have Checks & Balances for small business and personal record keeping. Special Notes: The new MITE series from Mini-MITE to Maxi-MITE+ allows you to buy just the level of communications software you need.

Teletek Enterprises, Inc.
4600 Pell Drive
Sacramento, CA 95838

Contact: Timothy E. Noxon Phone: (916) 920-4600
Sales Manager

Comments: Hardware, software and consultation available. Products: Teletek Z-150 Memory Board — The Teletek Z-150 MB offers 0K to 384K of parity checked RAM, "Timesavers" bundled utility software (which includes RAM Drive plus five other utility programs), and options of a battery backed up clock and/or a game port.

Tex-Matics Micro Systems
3059 W. 15th Street, Suite 100
Plano, TX 75075

Contact: Ken Patrick Phone: (214) 985-1811

Comments: Hardware, software and consultation available. Products: Authorized Zenith Data Systems Sales/Service. Business systems, multi-user, and 3rd party upgrades to ZDS. "RAM-Buddy" PALs for 100/150. Drive alignment/repair. Inexpensive ZDS hard disk upgrades for ALL models. Special Notes: Dealer for DRI, UCI, TANDON, OKIDATA, HAYES. Free newsletter subscription upon request.

J. J. Thompson
281 Warren Avenue
Kenmore, NY 14217

Contact: Jack Thompson Phone: (716) 873-0380
After 5PM EST

Comments: Software and consultation available. Products: Conversion programs between HDOS and CP/M, and from ZDOS to CP/M, RAMDRIVE/85 for CP/M-85 on Z-100 computers. Special Notes: Send SASE for product descriptions.

Thoughtware Publishing Company
P.O. Box 669
Grants Pass, OR 97526

Contact: William George Phone: (503) 476-1468

Comments: Software and consultation available. Products: 32 Business Management systems including Accounts Payable, Accounts Receivable, Payroll, General Ledger, Financial Statements, etc. For more information contact Thoughtware Publishing Company.

TIGERMARK Corporation
9369 Carroll Park Drive
San Diego, CA 92121

Contact: Steven Strull Phone: (619) 587-9999

Comments: Hardware available. Products: Parallel, Serial, Multifunction, Bubble Memory and Security plug-in cards for IBM Compatible Computers and 64K Universal Serial/Parallel Printer Buffer. Special Notes: TIGERMARK products are available through Heathkit, other computer stores and direct from the manufacturer.

Trionyx Electronics, Inc.
P.O. Box 5131
Santa Ana, CA 92704

Contact: Bill Perry Phone: (714) 830-2092

Comments: Hardware, software and consultation available. Products: Hardware for the H-8 computer: New 16-bit CPU card, 256 KB static memory, double density disk controller handles 8 drives (4 at 5 inch and 4 at 8 inch), 256 KB Dynamic memory, 64 KB Dynamic memory, Z-80 CPU card, Bank select card, reliable replacement motherboard and more.

USS Enterprises
6708 Landerwood Lane
San Jose, CA 95120

Contact: Louise Cate Phone: (408) 997-0264

Comments: Hardware, software and consultation available. Products: The Critical Connection (TM) is a hardware/software product which allows any computer that has a 19,200 baud serial port (and which is running CP/M) to be connected to an Atari 400, 800 or XL. The Atari can be then use the CP/M system's disk drives and printer.

Vertex Systems, Inc.
6022 W. Pico Boulevard #4
Los Angeles, CA 90035

Contact: Nick Stein Phone: (213) 938-0857

Comments: Hardware, software and consultation available. Products: Xeno-Copy — Read, write and format 220 foreign disks in your Z-150 or compatible computer. Xeno-Disk — Xeno-Copy with 8" and Compugraphic MCS typesetter formats, and powerful table driven text translation utility. Apple Turnover — Read, write and format Apple II disks in your Z-150 and Z-151. Pipeline — Translates between spreadsheets, Dbase II, DIF, and Comma Separated file formats. Power Trak - Computerized power monitor. Detects high and low voltage, spikes, sags, brownouts, and high frequency noise. 80Mate — Emulates CP/M environment while running under MS-DOS.

Viking C Systems
2243 South Belaire Drive
Salt Lake City, UT 84109

Contact: Grant Phone: (801) 466-6820
7-9 AM, 5-10 PM

Comments: Hardware, software and consultation available. Products: HISPEED C/80 Library for M80 under CP/M; PI Editor in portable C source; ZDOS and HDOS copy to CP/M; HDOS products with source; WordStar keys and printer sources; Disk Crash utility; Utility for making dual-format CP/M and PC-DOS disks; H-89 4MHz kit; H-89 Eprom Programmer. Special Notes: Free catalog. Source in C or assembler for ZDOS, HDOS, MS-DOS, CP/M-80, CP/M-68K.

Visual Communications Network, Inc.
238 Main Street
Cambridge, MA 02142

Contact: Allison Bartlett Phone: (617) 497-4000

Comments: Software and consultation available. Products: VCN Execuvision is a presentation graphics software product that allows users to combine multiple text fonts, business data, charts, graphics, and pictures into screens suitable for presentations. EV Capture Plus is a universal interface to VCN's presentation graphics program. It allows the user to "Capture" screens from application programs and store them in an ExecuVision graphic format which can then be enhanced with a variety of graphic functions.

Barry A. Watzman
Microcomputer Systems and Consulting
560 Sunset Road
Benton Harbor, MI 49022

Contact: Barry Watzman Phone: (616) 925-3136

Comments: Software and consultation available. Products: Perks Desktop Utility: CP/M-86, MP/M-86, CP/M Plus (CP/M 3.0) for the Z-100 computer. Consulting services and custom software also available.

Weitzman and Wood Associates
580 NW 99th Way
Pembroke Pines, FL 33024

Contact: Nancy Weitzman Phone: (305) 432-8025

Comments: Hardware, software and consultation available. Products: UN/emulator. Hardware and software which allows you to run CP/M 2.2 at machine speed in a Z-150, IBM-PC or PC clone. Special Notes: Both 5 and 8 MHz 8088/8086 versions available. Also a Z-100 Gemini package.

Westcomp
517 N. Mountain Avenue
Upland, CA 91766-5016

Contact: Dave or Russ Phone: (714) 982-1738

Comments: Hardware, software and consultation available. Products: Software and hardware support for H/Z-100 products and IBM-PC, XT, AT. Entertainment, utilities, language and AI products — Free product info and prices. Special Notes: Many of our products now include the source code at no additional charge!

Wong's Advanced Technologies, Inc.
114 Holy Cross Place
Kenner, LA 70065

Phone: (504) 464-7379

Comments: Hardware, software and consultation available. Products: RAMDRIVE: For Z-100/Z-150, MS-DOS 1.25 and 2.xx. Featuring command line installation/removal, size from 2K to more than 700K. Special Notes: Custom programming/Consulting available. Also discounted Hardware/Software sales.

Woolf Software Systems, Inc.
6754 Eton Avenue
Canoga Park, CA 91303

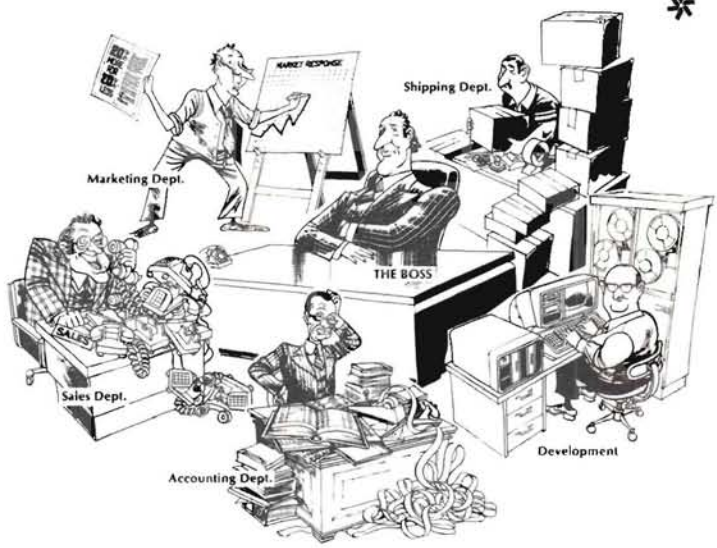
Contact: Torie Daves Phone: (818) 703-8112

Comments: Software and consultation available. Products: Move-It is a full feature communications program for use between micros and other micros, minis, mainframes, information utilities, bulletin board systems, and telex networks. Special Notes: Consultation by appointment.

Young Investment Research
P.O. Box 670
Glen Ellyn, IL 60138

Contact: Fredric S. Young Phone: (312) 469-1654

Comments: Software and consultation available. Products: Programs for daily stock market analysis and individual stock trading signals. Uses proven and original technical indicators. Demonstration disk $10.00. Special Notes: Young Investment Research is registered with the S.E.C. as an investment adviser.



The Power Of Z-System

Rick Swenton
19 Allen Street
Bristol, CT 06010

In the November, 1985 issue of REMark, I described the features of ZCPR3, an enhanced Z80-based replacement command processor for CP/M 2.2. ZCPR3 replaces CP/M's standard console command processor (CCP) and provides tremendous power and flexibility. We can now take what we know of the benefits and features of ZCPR3 and move ahead to even greater heights. What Richard Conn did in creating ZCPR3, Dennis Wright did in creating ZRDOS. ZRDOS is an enhanced Z80-based replacement disk operating system. ZRDOS replaces CP/M's standard basic disk operating system (BDOS). When you combine ZCPR3 and ZRDOS you get "Z-SYSTEM". This means that by upgrading your CP/M 2.2, you have replaced so much code that there is nothing written by Digital Research left in the system. The CCP was replaced by ZCPR3. The BDOS was replaced by ZRDOS. The only thing left is the basic input/output system (BIOS) which was written specifically for Heath 8-bit computers by Heath.

In this article, I will explain the features of ZRDOS and a few advanced features of ZCPR3, as well as some special considerations which arose while implementing Z-System on Heath computers.

ZRDOS

ZRDOS is fully compatible with the ZCPR3 command processor, ZCPR3 features and utilities. It is also fully compatible with CP/M's BDOS, but it does a few things differently to enhance system performance.

Differences Between BDOS And ZRDOS

The bdos err is DEAD! ZRDOS permits disk swapping without requiring a control-C to warm boot. ZRDOS automatically logs-in a new disk after it was changed. There are, however, two special circumstances which require special discussion. ZRDOS will normally handle a disk swap and perform the warm boot as required. But if a file was open at the time you did the swap and an attempt is made to write to the file on the swapped disk, you will see the error:

```
ZRDOS Error 5 on B:
```

There are a total of six ZRDOS Error messages which are explained later.

The second special situation involves swapping a disk with one of a different density or number of sides. ZRDOS can not cope with this because it is not the responsibility of ZRDOS to adjust itself to disks of different densities or number of sides. This function is performed by the BIOS. On warm boot, the BIOS determines the density and number of sides of the disk. So, in the case of disk swapping, unless the swapped disk is of the same density and number of sides, a control-C will always be required. Under CP/M, a drive may be made read-only using the STAT utility. However, this R/O status is lost after a warm boot. Under ZRDOS, the drives R/O status is remembered after warm boots for improved file security. System calls which reset the disks will reset the log-in vector, but will not change the drive's R/O status.

In ZRDOS, a change was made involving the Read Console Buffer. The Delete key is now always treated the same as the backspace key and the control-R (retype the command line) was not implemented since these were Teletype oriented commands. It is important to note here that Heath's CONFIGUR utility does not know that ZRDOS has replaced the CP/M BDOS. Therefore, do not alter option 'L' on the Terminal/Printer Sub-Menu of CONFIGUR which allows control of the Echo-On-Delete in the old BDOS. ZRDOS will always treat the delete key the same as the backspace key and changing option 'L' in CONFIGUR will poke an undesired byte into ZRDOS which will corrupt it and produce unpredictable results.

CP/M supported two file attributes: R/O or R/W, and DIR or SYS. ZRDOS supports two more file attributes: Archive and Wheel. The archive attribute, when set, is used to indicate that a given file has not been altered since the last time it was copied to a backup disk (the archive disk). You could set or reset the archive bit manually with a ZCPR3 utility, such as PROTECT. You could also use the public domain program NSWEEP or you could use the ZRDOS utility SFA (Set File Attributes). The real beauty of the archive bit shines when using the ZRDOS utility AC (Archive/Copy). When you use AC to archive (backup) a working disk to another disk, AC will copy only those files whose archive bit is not set. If the archive bit is not set, that means that the file has been altered since the last time it was archived. After AC copies

and verifies the file, it will set the archive bit to indicate that it was archived. Now your backup procedures will not needlessly copy all the files from disk to disk. Modern archiving procedures copy only those files which changed since the last time archiving was done.

The Wheel Byte is a feature of ZCPR3 which allows system security. Turning the wheel byte off will disable certain ZCPR3 features and utilities. Depending on how you implemented your ZCPR3 system, you could place many restrictions on the user when the wheel byte is off. He could be denied access to user areas above a certain number or drives above a certain letter, as well as being denied the privilege of erasing or renaming files.

ZRDOS takes this concept further by placing a wheel-protect attribute on a file. If the W/P file attribute is set, any attempt to change this file will result in the error message:

```
ZRDOS Error 6 on B:
```

Changing of the wheel byte is under password control using the ZCPR3 utility WHEEL.COM or the resident command WHL, if implemented in your resident command package (RCP).

ZRDOS Function Calls

ZRDOS supports all of CP/M's BDOS Function Calls. Function Calls are used by assembly language programmers to interface their programs to the operating system. In addition to the standard Function Calls, ZRDOS supports four new calls:

Function 47: Get Current DMA address
Function 48: Return ZRDOS Version Number
Function 50: Set Warm Boot Trap
Function 52: Reset Warm Boot Trap

Function 47 will return the current DMA address in HL. Function 48 would be used to test for the existence of ZRDOS by programs which require it to be present in order to utilize its features. The last two functions 50 and 52 provide a method of intercepting a warm boot and transfer control to a custom program, such as one which would print user defined error messages.

ZRDOS Error Messages

The following is a comparison of the error messages found in BDOS and ZRDOS:

ZRDOS Error Number	ZRDOS Meaning	BDOS Meaning
1	Read Error on A:	Bdos Err On A:Bad Sector
2	Drive Select Error on A:	Bdos Err on A:Select
3	Disk R/O Error on A:	Bdos Err on A:R/O
4	File R/O Error on A:	Bdos Err on A:File R/O
5	Disk Changed Error on A:	N/A
6	File W/P Error on A:	N/A

The error display of ZRDOS is in the form:

```
ZRDOS Error n on d
```

Where 'n' is the error number between 1 and 6 and 'd' is the drive letter on which the error occurred.

A utility is provided to expand the error message into screens of text data further describing the nature of the error.

Public

Using the "public" feature of ZRDOS, any drive from A through H and any user area from 1 through 8 can be designated public. Any files which are now placed in a public area are accessible from any other drive or user area on the system. This means that you can place commercial files like WordStar or dBASE-II in a public area, and those programs can be run while you are logged into a different drive and user area. The programs will have no trouble finding their overlays in the public area, and they will run as though they are in the current user area. This allows tremendous flexibility in organizing your files on your working disks.

Re-Entrance

This feature is used to permit assembly language programs to access the ZRDOS system calls in between the times that another program was using them without disturbing the other program's operation. It is as though your assembly language program is temporarily 'stealing' ZRDOS for a minute, but doing so in an orderly fashion so that the other program does not lose its place (pointers and parameters) during its own ZRDOS system call. The main reason why re-entrance is desirable is to allow greater flexibility in ZCPR3 I/O Packages. I/O Packages redirect console and printer activity to and from disk files so it is nice to do this disk accessing smoothly through ZRDOS without interfering with another program doing disk operations at the same time.

ZRDOS Utilities

The following utilities are included with ZRDOS and require ZRDOS to be present on the system in order to run:

COMP — File Compare Utility
Compares two files and reports in Hex and ASCII any differences in a full screen format.

AC — Archive Copy Utility
This powerful utility takes advantage of the file Archive Attribute to copy only those files to your backup disk which have changed since the last time that AC was run. Many options are available at run-time.

DFA and SFA — Display File Attributes
Set File Attributes
These utilities allow display and manipulation of the File Attributes.

DUMP — A HEX/ASCII file dump utility.

VIEW — A file display utility which allows paging backwards and searching for strings.

PUBLIC — Used to designate public drive/user areas.

VTYPE — A full screen, bi-directional file display utility which uses the ZCPR3 environment (TCAP) to determine the characteristics of your video terminal. It allows for string searches and displays a command menu.

DOSERR — This utility is used when the user receives a ZRDOS error. ZRDOS prints an error number. By invoking DOSERR followed by the error number, you will get a full explanation of the particular ZRDOS error.

Installation Of ZRDOS

Installation of ZRDOS is not very difficult. If you purchase the auto-install version of Z-System, everything is taken care of for you. If you purchase the manual install version, installation is still simple. ZRDOS will have to be installed after ZCPR3 has been installed. On the ZRDOS disk is a utility (ZRDINS.COM or some

similar name) which will relocate the ZRDOS binary image to its running address for your system and create a file containing the new ZRDOS. The utility obtains the old BDOS running address and location of the Wheel Byte from the SYS.ENV ZCPR3 environment descriptor. If it can't find SYS.ENV, it will prompt you to manually enter these addresses. The installation utility will then create the ZRDOS binary image (ZRDOS.BIN or some similar name). You will next run SYSGEN to copy the ZCPR3/BDOS from the system tracks into memory. Then you will **SAVE 38 CPM.SYS** to transfer the ZCPR3/BDOS from memory to a new disk file. Now you need DDT to overlay the new ZRDOS over the old BDOS. Here is a sample command dialog:

```
DDT CPM.SYS<cr>       (have DDT load CPM.SYS)
IZRDOS.BIN<cr>        (define the next file to read)
R1080<cr>             (read the new file with an offset)
^C

SAVE 38 Z.SYS         (save the changes to a new file)

SYSGEN Z.SYS          (place the new file on the system
                                  tracks)
```

A very important note about that offset 1080 regarding Heath systems: This offset is the standard offset for DDT to find the start of the BDOS. It is actually one page (100H or 256 bytes) less in value than the actual address of the BDOS in the SYSGEN image (CPM.SYS). This means that you will find the start of the BDOS at 1180H in a standard CPM SYSGEN image. On Heath systems, you will find the BDOS there if you booted your system from an H-17 hard sector drive. However, if you booted from an H-37 soft sector drive, the locations of the CCP and BDOS (as well as ZCPR3 and ZRDOS) will be 80H or 128 bytes higher in the SYSGEN image. Therefore, on an H-37 system, you will find ZCPR3 at 0A00H and ZRDOS at 1200H. So, if you are installing ZRDOS on an H-37 drive, you will use 1100 as the offset value instead of 1080.

Other Notes Regarding Z-System Running On Heath Z-80 Computers

The CONFIGUR utility may crash Z-System unless certain precautions are taken. As mentioned before, do not change the option of echo-on-delete on the Terminal/Printer options menu if ZRDOS is installed. ZRDOS always treats the delete key the same as the backspace key and changing this option with CONFIGUR will corrupt ZRDOS.

The other option which will surely crash Z-System (ZCPR3 in particular) is messing with menu screen D which allows set-up of automatic command lines on cold or warm boots. With the standard CP/M CCP, you could run a program automatically on cold or warm boot by placing the file name directly into the CCP at a known address and passing control to the CCP. Under ZCPR3, you could do the same thing, but the method is vastly different. The recommended ZCPR3 configuration calls for a Multiple Command Line Buffer (MCLB) external to ZCPR3. It is 200 bytes in length and stores multiple commands, separated by semicolons, up to 200 characters in length. If you wanted to automatically run a program on cold boot, you would place the file name in the MCLB. When control is passed to ZCPR3, it will execute that file. When ZCPR3 was installed, the BIOS was modified to insert the filename STARTUP.COM into the MCLB. This means that STARTUP.COM will be run every time the system is booted (if it can be found on the disk). To make matters more complex, STARTUP.COM is usually an ALIAS. It was created with the ALIAS utility and it is merely a list of other files to be executed. It is similar in operation to a submit file, except that an ALIAS looks just like a .COM file to ZCPR3. STARTUP.COM usually will load all of the ZCPR3 support files, such as the Flow Command Package (FCP), the Resident Command Package (FCP), the Environment Descriptor (ENV), Named Directories (NDR) and any other desired .COM file or terminal/printer initialization sequences.

Getting back to the original problem of crashing ZCPR3 with CONFIGUR, if you perform any changes to the D menu screen which specifies command lines to run on cold or warm boot, CONFIGUR will poke the file name into ZCPR3 instead of the MCLB where it belongs. This will corrupt ZCPR3. The only recovery is to SYSGEN the disk from your backup disk (you do have a backup, don't you?).

All other CONFIGUR screens and options will not cause a problem with Z-System. Other than the two problems mentioned, you can do no more harm to Z-System than you could have done to CP/M. You do realize that reckless use of CONFIGUR can render a disk useless in a matter of seconds regardless of the operating system used.

Looking For Available Memory For Manual Install

The following table outlines the page zero memory assignments for standard Heath CP/M 2.2. They will be the same under Z-System and you may assign unused bytes to Z-System functions. For example, I used address 3BH for the Wheel Byte. Many Z-System implementations use address 40H for the Path information. This area is used by the Heath BIOS so the Path will have to be located elsewhere (mine is at FFC0H).

Heath/Zenith CP/M 2.2 Page Zero Memory Assignments

```
Address        Contents    (INT)      Description
-------------------------------------------------------------
0000H-0002H    JMP  BIOS+3  (0)   ;Warm Boot, points to the
                                  ;BIOS Jump Table
0003H-0003H    DB   IOBYTE       ;Intel Standard IOBYTE
0004H-0004H    DB   DEFAULT DISK ;Current Default Disk
0005H-0007H    JMP  BDOS+6       ;BDOS Entry Point
0008H-000AH    JMP  CLOCK   (1)  ;Clock Interrupt
                                  ;Service Vector
000BH-000CH    DW   TICCNT       ;Two Byte counter
                                  ;incremented every 2 ms
000DH-000DH    DB   H88CTL       ;Current contents of the
                                  ;H89 Control Latch
000EH-000EH    DB   H8CTL        ;Current contents of the
                                  ;H8  Control Latch
000FH-000FH    DB   DEVCTL       ;Current Contents of the
                                  ;H17 Control Latch
0010H-0017H    DB   INT2    (2)  ;Interrupt 2 (Not Used)
0018H-001AH    JMP  CRTINT  (3)  ;CRT Interrupt Service
                                  ;Vector
001BH-001FH    DB   UNUSED       ,(Not Used)
0020H-0022H    JMP  H37INT  (4)  ;H37 Interrupt Service
                                  ;Vector
0023H-0023H    DB   DLYM03       ;H37 Motor turn-off delay
0024H-0024H    DB   DLYH37       ;H37 Deselect Delay Count
0025H-0025H    DB   H37CTL       ;Current contents of the
                                  ;H37 control latch
0026H-0026H    DB   H37IRET      ;Where to go after H37
                                  ,interrupt
0027H-0027H    DB   UNUSED       ;(Not Used)
0028H-002FH    DB   INT5    (5)  ;Interrupt 5 (Not Used)
0030H-0037H    DB   INT6    (6)  ;Interrupt 6 (Not Used)
0038H-003AH    JMP  DDT/SID (7)  ;Interrupt 7 contains a
                                  ;jump to DDT or SID when
                                  ;running in debug mode
003BH-003FH    DB   UNUSED       ,(Not Used, Reserved)
0040H-0047H    DB   DRIVEMAP     ;Logical/Physical
                                  ;drive map
0048H-0048H    DB   BOOTFLG      ;Boot Device Flag
0049H-0049H    DB   BOOTDEV      ;Boot Device Address
004AH-004CH    DB   BOOTBEGIN    ;Boot beginning of
                                  ,Partition (H67)
```

```
004DH-004DH     DB    BOOTLAST      ;Boot last sector of
                                    ;partition+1 (H67)
004EH-004FH     DB    ADDRBIOS      ;Address of start of BIOS
0050H-005BH     DB    UNUSED        ,(Not Used, Reserved)
005CH-007CH     DB    FCB           ;Default File Control Block
007DH-007FH     DB    RRP           ;Random Record Position
0080H-00FFH     DB    DISKBUF       ;Default 128 byte DMA
                                    ;Buffer
```

TPA And Memory Restrictions

Because ZCPR3 relies heavily on memory locations external to itself, the Transient Program Memory (TPA) is normally smaller than a standard Heath CP/M system. The TPA is that part of memory where your applications programs run. You can not take system memory and dedicate it to special functions without sacrificing somewhere else. The TPA is where the sacrifice occurs. In my H89 system running H17 and H37 disks with a full Z-System (not including I/O Package), I have approximately a 48K TPA available. Some users of certain very large applications programs will find that they run out of memory (TPA space) after changing over to Z-System. One case comes to mind regarding the Microsoft Basic Compiler and L80 Linking Loader. Under Z-System, you are limited to about a 20K COM file obtained from the Basic Compiler. Under CP/M you can obtain about 24K in a COM file. This means that if your Basic program causes the compiler to generate a COM file larger than 20K, under Z-System, you probably will run out of memory either compiling or linking the program. However, applications programs which are disk-oriented like WordStar and dBASE-II will run without any problems under Z-System since the disks are used for program data memory and the programs do not fully reside in memory all the time. They use overlays which are constantly manipulated in and out of memory.

Source For Z-System

Z-System, namely ZRDOS, is not in the public domain. The only source is Echelon, Inc. Z-System is offered in two versions. The first is a manual-install version using CP/M, MOVCPM, SYSGEN, MAC, and DDT. The second is an auto-install version called Z-COM. Echelon recommends that you not attempt the manual-install version unless you have at least two years of programming experience, especially in assembly language.

Z-COM is sold in either a single or four-disk set. The single disk is for those who already have the manual-install ZCPR3 running and now want to add auto-install capabilities to their collection. The four-disk set is a complete auto-install Z-COM system and includes over seventy utility files in object form.

The single disk for those who already have ZCPR3 running is priced at $69.95. It will enable you to use your manual-install ZCPR3 files to create a full auto-install Z-System. The four disk set is priced at $119.00 and is a complete auto-install Z-System which can be implemented by a novice.

Echelon also offers a complete line of development tools and applications, such as a relocating macro assembler, disassembler, debuggers, disk cataloging program, modem communications program and remote bulletin board program which all utilize the power of Z-System. Echelon also publishes a newsletter called Z-NEWS. This newsletter provides timely information for Z-System users from novice to expert. Since Digital Research all but totally abandoned support of their existing 8 bit products and discontinued development of new 8 bit programs, you would be foolish not to turn to Echelon for high-tech 8 bit products to keep your Z-80 humming. You may think that I own stock in Echelon the way I carry on about them. Actually, I am only one of their customers. However, Echelon is one of the few companies where you feel that you are important to them. You sense that they are excited about and believe strongly in the quality of their products. They support their customers more like personal friends. You can tell that they like what they are doing. Echelon is 'number one' in my book.

For more information and a current price list, contact:

Echelon, Inc.
101 First Street
Los Altos, CA 94022
(415) 948-3820

Z-NODE Central BBS: (415)-489-9005
300/1200/2400 baud

There are a number of Z-NODE remote access systems from coast-to-coast. They all support and maintain the latest ZCPR3 upgrades as well as provide Z-System question and answer sessions. Write to Echelon for a list of Z-NODE systems.

Z-System And Further Reading

I know that all this Z-System stuff sounds complex and I am sure that writing about it without the reader having hands-on experience does not do it justice. I only hope I have created an interest in Z-System so that you will seek it out and begin to learn about it. The system is vast in many ways. It has raw power itself. ZCPR3 source code is available so it has the power to teach you. It is almost impossible to exhaust its potential. You do need to put forth some effort yourself. Here are a few books and articles about ZCPR3 and ZRDOS.

Conn, Richard. *'ZCPR3 – The Manual'*, New York Zoetrope, 1985, 351 pages. This book was written by the creator of ZCPR3. This is the 'bible' of ZCPR3 and accompanies the many on-line help files which come with ZCPR3. Available for $19.95 from Echelon, Inc.

Conn, Richard. *'ZCPR3 and I/OP's'* Echelon, Inc, 1985, 50 loose-leaf page booklet. It details the implementation of I/O packages and how to modify your BIOS to include I/O redirection. Available for $9.95 from Echelon, Inc.

Swenton, Rick. *'Upgrade Your CP/M 2.2 With ZCPR3, A Z80-Based Command Processor'*, REMark, November 1985.

Allen, Richard. *'Installation of ZCPR3 For Heath Computers'*, REMark, November 1985.

Conn, Richard. *'Inside ZCPR3'*, Micro Cornucopia, October-November 1985.

Conn, Richard. *'The Evolution of ZCPR, Part 1'*, Computer Language, October 1984.

Conn, Richard. *'The Evolution of ZCPR, Part 2'*, Computer Language, November 1984.

McCord, David. *'Z-System reasserts 8-bit computing in 16-bit world'*, Electronic Products, March 15, 1985.

Ciarcia, Steve. *'Build the SB180 Single-Board Computer, Part 2, The Software'*, Byte, October 1985.

*

Now I Can Run 'FLIGHT SIMULATOR'!!

Jim Buszkiewicz
HUG Software Developer

I'm not sure if that's sufficient reason to make one's H/Z-100 PC compatible, but if you are looking for 'as close as possible' PC compatibility, UCI's EasyPC is the way to go. Almost a complete microcomputer system in itself, the EasyPC consists of three circuit boards: two S-100, and one 'system' board. Also included in the package was a wiring harness, a small speaker, and most important, a detailed installation manual.

Once your H/Z-100 is disassembled, and seven ICs removed from the motherboard, installing the EasyPC is quite simple, and the only tricky part is seating the 'system' board into those seven empty IC sockets on the H/Z-100 motherboard. Three of the ICs removed from the H/Z-100 motherboard are used on the EasyPC system board before it's installed. The remaining four are no longer used. The next two boards installed are the EasyPC video master and floppy controller boards into S-100 slots 2 and 1, respectively. Using the supplied wiring harness, the original video board output now goes to the EasyPC video master, and the video master's output gets routed to the back panel connectors. After the drives are reconnected to the floppy controller, the computer can then be reassembled.

Upon power up, the EasyPC system is in control and allows you to select between <I>BM or <Z>enith mode. If you choose <Z>, the system 'hand' prompt will appear, and the H/Z-100 will operate as if nothing was ever done to it. If <I> is selected, the UCI prompt will appear, and await your command to boot a disk. No other commands are available from the UCI prompt. When the boot command is given from the keyboard, the EasyPC tries to first boot the Winchester. If one doesn't exist, or the proper partition isn't found, it then goes to floppy drive A:.

Compatibility appears to be almost complete! All of the games (oops, I meant application software) I have, run without problems including, yes, even Flight Simulator! The success of this emulator is mostly due to the fact that it consists of almost an entire PC in itself. When it's installed in an H/Z-100, it's like having two different computers inside of one cabinet, and which one you use depends on whether you type the <I> or <Z> at turn on. Most programs operate somewhat faster on the EasyPC than on the H/Z-150. This may be because the H/Z-100 I'm using is running at 8 mhz (the EasyPC runs on either 5 or 8 mhz), or it may be the way the hardware is implemented. Since sound is supported, game playing (something most of us NEVER do with a computer) is more fun also. With the proper cable and monitor, all 16 colors can be displayed. Due to the 'dual' controller chip floppy disk controller board, you'll find that even 'copy protected' software will boot and execute properly, as well as copy properly (using the various copy protect override programs)!

I have noted some minor drawbacks in using the EasyPC emulator. Because of the positioning of the EasyPC system board, the PC-240 ZCLK will no longer fit. It might be possible to use a small 40 pin extender cable so it can be reinstalled. The Z-216 numeric co-processor must also be eliminated from the system due to space limitations. If you're using an RGB monitor other than those manufactured by Heath/Zenith, you may run into a sync signal compatibility problem. This occurs only in the <I>BM mode because the EasyPC generates its own video signals and they are not selectable on the EasyPC video master as they are on the H/Z-100 video board.

The current price of the UCI EasyPC Emulator is $699. Besides that cost, however, you will have to purchase the PC version of the MSDOS operating system. Presently, Heath is offering this software for $90 (regularly $150) with the purchase of the UCI Emulator.

I feel that if you want to keep the superior capabilities of your H/Z-100 and still come as close as possible to emulating an IBM PC (without actually buying one), then the UCI EasyPC Emulator is the only choice. *

S & K Technology Inc.
Quality Software for Heath/Zenith Microcomputers

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The ultimate in word processing with speed and power. See the reviews in Remark (Jul 1985) and Sextant (Jan-Feb 1985; Sep-Oct 1985). Requires 192K RAM.

Price: **$100**

Demo Disk: **$ 3**
(Includes the Resident Speller Demo.)

The Resident Speller™
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50,000 word expandable dictionary, requires 192K RAM (300K for use with WatchWord).

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(Demo Included on WatchWord Demo Disk.)

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PC Version for the Z150

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Demo Disk: **$ 2**

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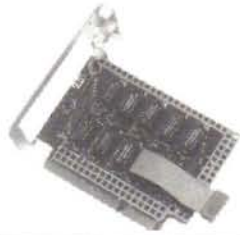

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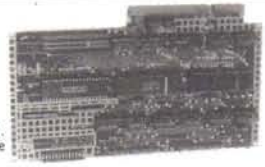

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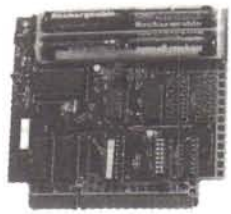

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HUG Price List

The following HUG Price List contains a list of all products not included in the HUG Software Catalog. For a detailed abstract of these products, refer to the issue of REMark specified.

Part Number	Description of Product	Selling Price	Vol. Issue

HDOS HARDCOPY SOFTWARE

885-1008	Volume I Documentation	9.00	
885-1013	Volume II Documentation	12.00	
885-1015	Volume III Documentation	9.00	
885-1037	Volume IV Documentation	12.00	8
885-1058	Volume V Documentation	12.00	

MISCELLANEOUS HDOS COLLECTIONS

885-1032	Disk V H8/H9	18.00	8
885-1044-[37]	Disk VI H8/H89	18.00	
885-1064-[37]	Disk IX H8/H89 Disk	18.00	
885-1066-[37]	Disk X H8/H89	18.00	10
885-1069	Disk XIII Misc H8/H89	18.00	

GAMES

HDOS

885-1010	Adventure Disk H8/H89	10.00	4
885-1029-[37]	Disk II Games 1 H8/H89	18.00	8
885-1030-[37]	Disk III Games 2 H8/H89	18.00	8
885-1031	Disk IV MUSIC H8 Only	20.00	25
885-1067-[37]	Disk XI H8/H19/H89 Games	18.00	12
885-1068	Disk XII MBASIC Graphic Games	18.00	10
885-1088-[37]	Disk XVII MBASIC Graph. Games	20.00	14
885-1093-[37]	D&D H8/H89 Disk	20.00	16
885-1096-[37]	MBASIC Action Games H8/H89	20.00	18
885-1103	Sea Battle HDOS H19/H8/H89	20.00	20
885-1111-[37]	HDOS MBASIC Games H8/H89	20.00	23
885-1112-[37]	HDOS Graphic Games H8/H89	20.00	23
885-1113-[37]	HDOS Action Games H8/H89	20.00	23
885-1114	H8 Color Raiders & Goop	20.00	23
885-1124	HUGMAN & Movie Animation Pkg	20.00	41
885-1125	MAZEMADNESS	20.00	41
885-1130	Star Battle	20.00	47
885-1133-[37]	HDOS Games Collection I	20.00	59
885-8009-[37]	HDOS & CP/M Galactic Warrior	20.00	32
885-8022	HDOS SHAPES	16.00	45
885-8026	HDOS Space Drop	16.00	49
885-8032-[37]	HDOS Castle	20.00	59

CP/M

885-1206-[37]	CP/M Games Disk	20.00	11
885-1209-[37]	CP/M MBASIC D&D	20.00	19
885-1211-[37]	CP/M Sea Battle	20.00	20
885-1220-[37]	CP/M Action Games	20.00	32
885-1222-[37]	CP/M Adventure	10.00	35
885-1227-[37]	CP/M Casino Games	20.00	38
885-1228-[37]	CP/M Fast Action Games	20.00	39
885-1236-[37]	CP/M Fun Disk I	20.00	55
885-1248-[37]	CP/M Fun Disk II	35.00	69

ZDOS

885-3004-37	ZDOS ZBASIC Graphic Games	20.00	37
885-3009-37	ZDOS ZBASIC D&D	20.00	50
885-3011-37	ZDOS ZBASIC Games Disk	20.00	52
885-3017-37	ZDOS Contest Games Disk	25.00	58

UTILITIES

HDOS

885-1022-[37]	HUG Editor (ED) Disk H8/H89	20.00	20
885-1025	Runoff Disk H8/H89	35.00	
885-1060-[37]	Disk VII H8/H89	18.00	
885-1061	TMI Load H8 ONLY Disk	18.00	
885-1062-[37]	Disk VIII H8/H89 (2 Disks)	25.00	
885-1063	Floating Point Disk H8/H89	18.00	
885-1065	Fix Point Package H8/H89 Disk	18.00	10
885-1075	HDOS Support Package H8/H89	60.00	
885-1077	TXTCON/BASCON H8/H89	18.00	
885-1079-[37]	HDOS Page Editor	25.00	15
885-1080	EDITX H8/H19/H89 Disk	20.00	
885-1082	Programs for Printers H8/H89	20.00	
885-1083-[37]	Disk XVI Misc H8/H89	20.00	11
885-1089-[37]	Disk XVIII Misc H8/H89	20.00	20
885-1090-[37]	Disk XIX Utilities H8/H89	20.00	22
885-1092-[37]	Relocating Debug Tool H8/H89	30.00	14
885-1098	H8 Color Graphics ASM	20.00	19
885-1099	H8 Color Graphics Tiny PASCAL	20.00	19
885-1105	HDOS Device Drivers H8/H89	20.00	24
885-1116	HDOS Z80 Debugging Tool	20.00	27
885-1119-[37]	BHBASIC Support	20.00	29
885-1120-[37]	HDOS 'WHEW' Utilities	20.00	33
885-1121	HDOS Hard Sec Sup Pkg 2 Disks	30.00	37
885-1123	XMET Robot Cross Assembler	20.00	40
885-1126	HDOS Utilities by PS:	20.00	42
885-1127-[37]	HDOS Soft Sector Support Pkg	30.00	45
885-1128-[37]	HDOS DISKVIEW	16.00	46
885-1129-[37]	HDOS CVT Color Video Terminal	20.00	46
885-8001	SE (Screen Editor)	25.00	28
885-8003	BHTOMB	25.00	28
885-8004	UDUMP	35.00	28
885-8006	HDOS SUBMIT	20.00	31
885-8007	EZITRANS.	30.00	30
885-8015	HDOS TEXTSET Formatter	30.00	42
885-8017	HDOS Programmers Helper	16.00	42
885-8024	HDOS BHBASIC Utilities Disk	16.00	46

CP/M

885-1210-[37]	CP/M ED (same as 885-1022)	20.00	20
885-1212-[37]	CP/M Utilities H8/H89	20.00	21
885-1213-[37]	CP/M Disk Utilities H8/H89	20.00	22
885-1217-[37]	HUG Disk Duplication Utilities	20.00	26
885-1223-[37]	HRUN HDOS Emulator 3 Disks	40.00	37
885-1225-[37]	CP/M Disk Dump & Edit Utility	30.00	40
885-1226-[37]	CP/M Utilities by PS:	20.00	40
885-1229-[37]	XMET Robot Cross Assembler	20.00	40
885-1230-[37]	CP/M Function Key Mapper	20.00	42
885-1231-[37]	Cross Ref Utilities for MBASIC	20.00	43
885-1232-[37]	CP/M Color Video Terminal	20.00	46
885-1235-37	CP/M COPYDOS	20.00	54
885-1237-[37]	CP/M Utilities	20.00	55
885-1245-37	CP/M-85 KEYMAP	20.00	63
885-1246[-37]	CP/M HUG File Manager & Utilities	20.00	64
885-1247-37	CP/M-85 HUG Bkgrd Print Spooler	20.00	67
885-5001-37	CP/M-86 KEYMAP	20.00	51
885-5002-37	CP/M-86 HUG Editor	20.00	52
885-5003-37	CP/M-86 Utilities by PS:	20.00	54
885-5008-37	CP/M 8080 To 8088 Trans. & HFM	20.00	64
885-5009-37	CP/M-86 HUG Bkgrd Print Spool	20.00	66
885-8018-[37]	CP/M Fast Eddy & Big Eddy	20.00	43
885-8019-[37]	DOCUMAT and DOCULIST	20.00	43
885-8025-37	CP/M-85/86 Fast Eddy	20.00	49

ZDOS

885-3005-37	ZDOS Etchdump	20.00	39
885-3007-37	ZDOS CP/EMulator	20.00	47
885-3008-37	ZDOS Utilities	20.00	47
885-3010-37	ZDOS Keymap	20.00	51
885-3022-37	ZDOS/MSDOS Useful Programs I	30.00	63
885-3023-37	ZDOS/MSDOS EZPLOT	20.00	63
885-3026-37	MSDOS SMALL C Compiler	25.00	65
885-3030-37	ZDOS/MSDOS Z-100 PC Emulator	40.00	68
885-3031-37	ZDOS/MSDOS Graphics	20.00	69
885-8029-37	ZDOS Fast Eddy	20.00	53
885-8035-37	MSDOS DOCUMAT and DOCULIST	20.00	70

H/Z100 ZDOS/MSDOS - H/Z150 PC MSDOS

885-3012-37§§	ZDOS HUG Editor	20.00	52
885-3014-37§§	ZDOS/MSDOS Utilities II	20.00	54
885-3016-37§	ZDOS/MSDOS Adventure	10.00	57
885-3020-37§	MSDOS HUG Menu System	20.00	62
885-3021-37§§	ZDOS/MSDOS Cardcat	20.00	63
885-3024-37§	ZDOS/MSDOS 8080 To 8088 Trans	20.00	64
885-3025-37§§	ZDOS/MSDOS Misc. Utilities	20.00	64
885-3029-37§§	ZDOS/MSDOS HUG Bg. Print Spool	20.00	66
885-3032-37§	MSDOS Halley's Comet Locater	20.00	70

§ All program files run on both
§§ Program files run partially on both

PC/IBM COMPATIBLE

885-6001-37	MSDOS Keymapper	20.00	59
885-6002-37	CP/EMulator II & ZEMulator	20.00	59
885-6003-37	MSDOS EZPLOT	20.00	65
885-6004-37	MSDOS CheapCalc	20.00	67
885-6005-37	MSDOS Skyviews	20.00	67
885-6006-37	MSDOS Cardcat	20.00	69
885-6007-37	MSDOS DND (Dung. & Dragons)	20.00	70
885-8033-37	MSDOS Fast Edit	20.00	62
885-8037-37	MSDOS Grade	20.00	70

PROGRAMMING LANGUAGES

HDOS

885-1038-[37]	Wise on Disk H8/H89	18.00	
885-1042-[37]	PILOT on Disk H8/H89	19.00	
885-1059	FOCAL-8 H8/H89 Disk	25.00	13
885-1078-[37]	HDOS Z80 Assembler	25.00	21
885-1085	PILOT Documentation	9.00	
885-1086-[37]	Tiny HDOS PASCAL H8/H89	20.00	13
885-1094	HDOS Fig-Forth H8/H89	40.00	18
885-1132-[37]	HDOS Tiny BASIC Compiler	25.00	59
885-1134	HDOS SMALL-C Compiler	30.00	63

CP/M

885-1208-[37]	CP/M Fig-Forth H8/H89 2 Disks	40.00	18
885-1215-[37]	CP/M BASIC-E	20.00	26

BUSINESS, FINANCE AND EDUCATION

HDOS

885-1047	Stocks H8/H89 Disk	18.00	
885-1048	Personal Account H8/H89 Disk	18.00	
885-1049	Income Tax Records H8/H89 Disk	18.00	
885-1055-[37]	MBASIC Inventory Disk H8/H89	30.00	
885-1056	MBASIC Mail List	30.00	
885-1070	Disk XIV Home Fin H8/H89	18.00	
885-1071-[37]	MBASIC SmBusPk H8/H19/H89	75.00	17
885-1091-[37]	Grade/Score Keeping H8/H89	30.00	14
885-1097-[37]	MBASIC Quiz Disk H8/H89	20.00	18
885-1118-[37]	MBASIC Payroll	60.00	30
885-1131-[37]	HDOS CheapCalc	20.00	47
885-8010	HDOS Checkoff	25.00	32
885-8021	HDOS Student s Statistics Pkg	20.00	44
885-8027	HDOS SciCalc	20.00	50

CP/M

885-1218-[37]	CP/M MBASIC Payroll	60.00	31
885-1233-[37]	CP/M CheapCalc	20.00	47
885-1239-[37]	Spread Sht. Contest Disk I	20.00	
885-1240-[37]	Spread Sht. Contest Disk II	20.00	
885-1241-[37]	Spread Sht. Contest Disk III	20.00	
885-1242-[37]	Spread Sht. Contest Disk IV	20.00	
885-1243-[37]	Spread Sht. Contest Disk V	20.00	
885-1244-[37]	Spread Sht. Contest Disk VI	20.00	
885-8011-[37]	CP/M Checkoff	25.00	32
885-8036-[37]	CP/M Grade	20.00	70

ZDOS

885-3006-37	ZDOS CheapCalc	20.00	47
885-3013-37	ZDOS Checkbook Manager	20.00	54
885-3018-37	ZDOS Contest Spreadsheet Disk	25.00	58
885-8028-37	ZDOS SciCalc	20.00	50
885-8030-37	ZDOS Mathflash	20.00	55

DATA BASE MANAGEMENT SYSTEMS

HDOS

885-1107-[37]	HDOS Data Base System H8/H89	30.00	23
885-1108-[37]	HDOS MBASIC Data Base Sys.	30.00	23

Continued on Page 99

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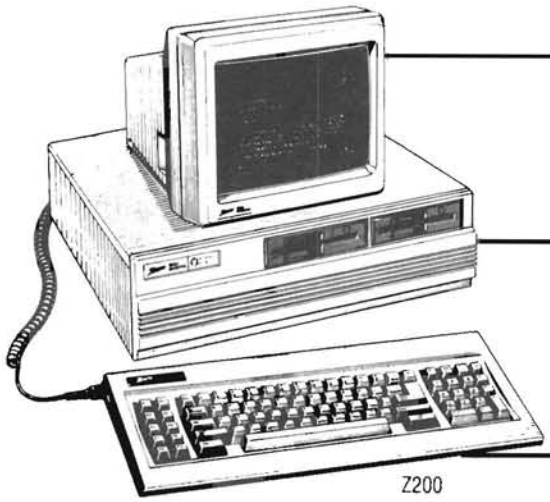

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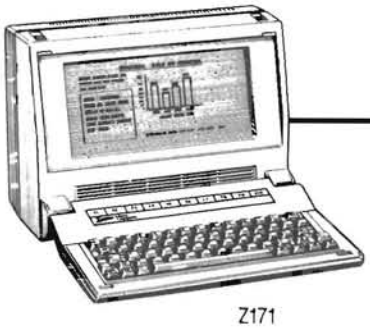

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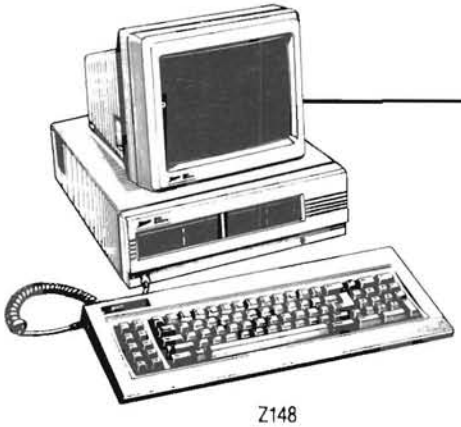

Z148

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HUG NEW PRODUCTS

HUG P/N 885-3034-37 MS-DOS
ZPC Support Disk $10.00

Introduction: The ZPC Support Disk contains files to help you make better use of the HUG Z-100 PC Emulator (HUG p/n 885-3030-37). This disk contains patches to update early releases of ZPC itself, patches for several popular software packages that enable them to run under ZPC, and an emulator for the ANSI.SYS device driver supplied with the Z-100 PC version of MS-DOS.

Requirements: To use this disk, you need ZPC itself, and an H/Z-100 (not PC) computer and MS-DOS version 2 or 3. All of the programs for which patches are supplied write directly to video memory when they are run on a real PC, which means that you need 768k of memory in your H/Z-100 to run them under ZPC.

This disk contains the following files:

README	.DOC	ANSI	.COM
FIXASM	.DOC	ANSISYS	.ASM
PREFIX	.BAT	ASCII	.DEF
REPLY	.COM	Z150ROM	.DEF
FIXZPC	.BAT	ANSI	.ASM
FIXZPC1	.DAT	LTSPCH	.BAT
FIXZPC2	.DAT	LTSPCH	.DAT
FIXZPC3	.DAT	DBPCH	.BAT
FIXZPC4	.DAT	DBPCH	.DAT
FIXZPC5	.DAT	DBCPCH	.BAT
FIX3A	.BAT	DBCPCH	.DAT
FIX3A	.DAT	FWPCH	.BAT
DOS3	.BAT	FWPCH	.DAT
DOS3A	.DAT	FW1PCH	.BAT
DOS3B	.DAT	FW1PCH	.DAT
DOS3C	.DAT	FW2PCH	.BAT
DOS3D	.DAT	FW2PCH	.DAT
DOS3E	.DAT	ENABPCH	.BAT
ANSISYS	.COM	ENABPCH	.DAT
MMPCH	.BAT	PALDPCH	.DAT
MMPCH	.DAT	MW1PCH	.BAT
VXPCH	.BAT	MW1PCH	.DAT
VXPCH	.DAT	MW2PCH	.BAT
EDIXPCH	.BAT	MW2PCH	.DAT
EDIXPCH	.DAT	SC3PCH	.BAT
PALPCH	.BAT	SC3PCH	.DAT
PALPCH	.DAT	SC3IPCH	.BAT
PALDPCH	.BAT	SC3IPCH	.DAT

Program Author: Patrick Swayne, HUG Software Engineer

Disk Content: The files on this disk are divided into three sections. The first section contains patches for ZPC itself. The

Continued on Page 99

TABLE C
Product Rating

10 - Very Good
9 - Good
8 - Average

Rating values 8-10 are based on the ease of use, the programming technique used, and the efficiency of the product.

7 - Has hardware limitations (memory, disk storage, etc.)
6 - Requires special programming technique
5 - Requires additional or special hardware
4 - Requires a printer
3 - Uses the Special Function Keys (f1,f2,f3,etc.)
2 - Program runs in *Real Time
1 - Single-keystroke input
0 - Uses the H19 (H/Z89) escape codes (graphics, reverse video)

Real Time — a program that does not require interactivity with the user. This term usually refers to games that continue to execute with or without the input of the player, e.g. p/n 885-1103 or 885-1211[-37] SEA BATTLE.

ORDERING INFORMATION

For Visa and MasterCard phone orders, telephone Heath Company Parts Department at (616) 982-3571. Have the part number(s), descriptions, and quantity ready for quick processing. By mail; send order, plus 10% postage and handling ($1.00 minimum charge, up to a maximum of $5.00. UPS is $1.75 minimum -- no maximum on UPS. UPS Blue Label is $4.00 minimum.), to Heath Company Parts Department, Hilltop Road, St. Joseph, MI 49085. Visa and MasterCard require minimum $10.00 order.

Any questions or problems regarding HUG software or REMark magazine should be directed to HUG at (616) 982-3463. REMEMBER-Heath Company Parts Department is NOT capable of answering questions regarding software or REMark.

NOTE

The [-37] means the product is available in hard-sector or soft-sector. Remember, when ordering the soft-sectored format, you must include the "-37" after the part number; e.g. 885-1223-37.

FOR YOUR EYES ONLY

Code Name: "Rambo" Real Name: "Turbo Lightning™"

User Groups find out Borland's secrets first, because you were the first to buy Borland products — and we'll never forget that. So we're telling you about Turbo Lightning before anyone else knows. (There isn't room here for the whole story, but you can read a fuller account in the COMDEX issue of PC Magazine).

We've had an astonishing product, code-named 'Rambo' under secret development for several months. Based on electronic versions of the Random House® Dictionary and the Random House Thesaurus, our new Turbo Lightning is the most amazing on-line information system since your brain.

It checks your spelling — as you type — and while you're running another program. More than that, it offers instant access to synonyms — and is intelligent enough to learn from you. In fact, the more you use Turbo Lightning, the smarter it gets.

Turbo Lightning is the 'engine' that powers what is also being announced on this page, the Turbo Lightning Library™. Soon-to-be-released volumes will include extended thesauruses, specialized dictionaries and other forms of electronic information.

Public announcement of Turbo Lightning will quickly follow this private announcement and we'll be shipping by November 15.

Reflex™ comes in from the cold.

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Using An MS-DOS Device Driver To Implement A Hard Disk

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Any computer owner who has sat with itchy finger, waiting for those two blinking floppy LED's to signal the end of another assembler iteration has dreamt of the day he will add a disk to his system.

There are a number of ways to add a hard disk to the Z-100 computer. Zenith Data Systems provides a turnkey system, as do a number of other computer dealers. If you are brave and good at assembly language (itchy finger time!), you can piece a system together and rewrite the Z-100 BIOS. The third method, and the subject of this article, is to use the MS-DOS device driver option and create your own system. Those of you still using ZDOS 1.XX are out of luck, since device drivers aren't supported. But fear not, MS-DOS 2.XX is available for the Z-100 and it does support device drivers.

The device driver solution described in this article is not meant as a direct replacement to the turnkey system. Instead, it is intended as an exercise in the use of device drivers. It has some inherent drawbacks. Because the driver is written for MS-DOS, it will not work with CPM. The MS-DOS operating system cannot be booted from the hard disk since the hard disk driver is installed from a floppy drive. And finally, the MS-DOS programs for Winchester drives are not applicable, since they were written for the Z-217 controller board.

The device driver solution has one advantage most computer hobbyists can identify with. It provides the hard disk speed and large storage size at a lower cost ($735 vs. $999 for 10Mb of disk storage) of the turnkey system. If you spend a lot of time with the MS-DOS operating system and need the advantages of a hard disk drive, READ ON!!

Device Drivers

Very little information regarding device drivers is given in the Zenith MS-DOS manual, however, an entire chapter is devoted to the subject in the Programmer's Utility Pack offered by Zenith. For those of you not already familiar with the structure of device drivers, the chapter will provide good reading. A little background information on device drivers and their uses might be helpful at this time.

The Z-100 computer, as purchased, already contains a number of device drivers for interfacing to floppy disk drives, printers (parallel and serial), the keyboard used to type this article and various other hardware interfaces. These drivers are contained in the BIOS software and are invisible to the user. But what if those ready made drivers won't interface to your hardware? That's where the device driver comes in. It provides a structured means of matching a hardware specific interface to the MS-DOS operating system. The driver is usually written in assembly language and linked into a .EXE (or .COM) file. You install the device driver in MS-DOS by placing the file on the system disk and creating another file called CONFIG.SYS which is merely an ASCII text file with the command:

```
DEVICE = Driver.EXE ( or  COM)
```

where Driver is the name of the device driver. The driver is then installed at system bootup (or reset) by the MS-DOS operating system.

Device Driver Types

Device drivers come in two types: Character and Block. Character drivers handle hardware interfaces which communicate to MS-DOS in a serial manner, i.e. a character at a time. Examples of such devices are: printers, keyboards and displays. Block drivers, on the other hand, transfer data in blocks (such as a disk sector) usually containing 256 to 512 bytes. Examples of such devices are: floppy, hard or RAM disks.

Character devices are given names (up to eight characters) like CON, AUX or PRN; device names familiar to MS-DOS users. In

fact, device drivers written utilizing these names actually replace the ones in BIOS. You can replace the keyboard and display on your Z-100 by writing a custom driver which interfaces a serial port to your favorite terminal and installing it on your system disk (Don't forget to name it CON!). Since character devices have only one name, they can only support one device.

Block devices don't have names. Instead, they are designated by letters (as are the Z-100 floppy disks). Since the letters A-H are already claimed by MS-DOS, any device driver installed will start at the letter I. Block drivers can support more than one device. Thus, a driver that supports two devices will claim drive letters I and J. The next block driver installed will claim K and so on. Up to 63 block drivers can be installed, but I doubt if anyone will ever need that many! So, now that you know what a device driver is, all you need to learn is the device driver structure.

Device Driver Structures

The device driver structure is detailed in Chapter 5 of the MS-DOS Programmer's Utility Pack. If you want a deep understanding of how the structure is utilized, I suggest you purchase that item and read it for yourself. If not, the brief discussion that follows will suffice.

Device Header

Every device driver includes a special header which identifies the file as a device driver (those MS-DOS guys think of everything). The device header defines the entry points for the two main routines contained in the driver: strategy routine and interrupt routine. In addition, the header contains various attributes of the device such as: character or block, name or number of devices supported, special attributes and a pointer to the next device header.

Strategy Routine

The Strategy Routine is called by MS-DOS with a pointer (ES:BX) to a request block which contains information concerning the function the driver is to perform. The format of the request block is determined by the function to be performed. In most cases, the Strategy Routine retreives this pointer and stores it for use by the Interrupt Routine.

Interrupt Routine

The Interrupt Routine is responsible for completing the function requested by the Strategy Routine. The request block pointed to by that routine contains the function number, the data transfer address, the number of bytes to transfer and other pertinent information. The Interrupt Routine is also responsible for returning status information back to MS-DOS on the success of carrying out the requested command. There are 13 functions available, 11 of which are utilized by character drivers and 8 of which are utilized by block drivers (Chapter 5 of the Programmer's Pack goes over these functions in great detail).

The Hard Disk Solution

A complete hard disk system for the Z-100 will consist of an S-100 controller board, a winchester disk drive, the interconnecting cables and a custom device driver. Also, since this device is unknown to the MS-DOS system and cannot be initialized with the FORMAT program, a special format program must be written.

Choosing a controller board for the hard disk system involved two criterion: price and performance. The winner: the DGC-100 single board controller by KONAN. It provides all the

```
        page    60,132
        title   Hard Disk Driver
         sall
;*****************************************************
;                                                     *
; Hard Disk Device Driver                             *
;                                                     *
; This is an installable device driver for the a Hard *
; Disk system for the Zenith Z-100 personal computer  *
;                                                     *
;*****************************************************
;
CSEG    SEGMENT BYTE     PUBLIC 'CODE'
;
;       M A C R O ( S )
;
STATUS MACRO    STATE,ERR,RC          ; Status return byte
       IFIDN    <STATE>,<DONE>        ; macro
        OR      ES:WORD PTR SRH_STA_FLD[BX],0100H
       ENDIF
       IFIDN    <STATE>,<BUSY>
        OR      ES:WORD PTR SRH_STA_FLD[BX],0200H
       ENDIF
       IFIDN    <ERR>,<ERROR>
        OR      ES:WORD PTR SRH_STA_FLD[BX],8000H
       ENDIF
       IFNB     <RC>
        OR      ES:WORD PTR SRH_STA_FLD[BX],RC
       ENDIF
       ENDM
page
;
;       E Q U A T E S
;
CR      EQU     13              ; CARRIAGE RETURN CHAR.
LF      EQU     10              ; LINE FEED CHAR
;
; READ/WRITE
;
SRH             EQU     0           ; STATIC REQUEST HEADER
                                      START
SRH_LEN         EQU     13          ; STATIC REQUEST HEADER
                                      LENGTH
SRH_LEN_FLD     EQU     0           ; STATIC REQUEST HEADER
                                      LENGTH FIELD.
SRH_UCD_FLD     EQU     SRH+1       ; STATIC REQUEST HEADER
                                      UNIT CODE FIELD
SRH_CCD_FLD     EQU     SRH+2       ; STATIC REQUEST HEADER
                                      COMMAND CODE FIELD.
SRH_STA_FLD     EQU     SRH+3       ; STATIC REQUEST HEADER
                                      STATUS FIELD
SRH_RES_FLD     EQU     SRH+5       ; STATIC REQUEST HEADER
                                      RESERVED AREA FIELD.
;
MD              EQU     SRH+SRH_LEN ; MEDIA DESCRIPTOR BYTE
MD_LEN          EQU     1           ; MEDIA DESCRIPTOR BYTE
                                      LENGTH
DTA             EQU     MD+MD_LEN   ; DISK TRANSFER ADDRESS.
DTA_LEN         EQU     4           ; DTA LENGTH.
COUNT           EQU     DTA+DTA_LEN ; BYTE/SECTOR COUNT
COUNT_LEN       EQU     2           ; BYTE/SECTOR COUNT
                                      LENGTH
SSN             EQU     COUNT+COUNT_LEN ; STARTING SECTOR
                                          NUMBER.
SSN_LEN         EQU     2           ; STARTING SECTOR NUMBER
                                      LENGTH
;
; MEDIA CHECK
;
RET_BYTE        EQU     MD+MD_LEN   ; BYTE RETURNED FROM
                                      DRIVER.
;
; BUILD BPB
;
BPBA_PTR        EQU     DTA+DTA_LEN ; POINTER TO BPB
```

basic functions, as well as some helpful additions; Error correction, software selectable sector interleaving, automatic retries upon error detection and automatic replacement of bad tracks during the format command. All this plus ST-506 compatibility at a reasonable price ($335 including shipping). No modification of the controller was necessary. I placed the DGC-100 in the second S-100 slot.

Choosing a winchester disk drive was a bit more complicated. In addition to price and performance criterion, compatibility with the Z-100 power supply must be considered. Hard disk drives can require large +12V currents at startup, and in general use more power than floppy drives. It was necessary, therefore, to choose a hard drive that most closely represented a floppy disk drive. The winner: the HH-612 10 MB 5.25" Half-Height from Microscience International Corp. It requires a mere 10 Watts of Z-100 power! I purchased the drive as part of an upgrade for an IBM PC (hard drive, controller and cables) and subsequently sold the controller board to a colleague. The drive and cables cost $400. I removed both drives from the Z-100 and then placed the A: drive in the lower slot. I removed the termination network from the B: drive and installed it on the A: drive. If this sounds confusing, consult your Z-100 Technical Manual. It has pictures of what I've just described. I then installed the HH-612 hard drive in the upper slot, plugged in the floppy power connector and made the necessary interconnections to the DGC-100 controller. The hardware was ready.

The Software

Listing 1 is the completed device driver. The listing is well commented and should be easy to follow. I've included the section of the DGC-100 manual which explains the host interface. Pay close attention to the SET__PARMS subroutine in the listing. Note the first 64 sectors on the disk are accessed without moving the heads (sectors 0 through 15 under head 0, sectors 16 through 31 under head 1, etc.). The next 64 sectors are accessed by moving the head forward one step. This method should prove more efficient (in terms of head steps) than, say, placing the sectors sequentially on a given disk surface. After entering the code with your favorite text editor, assemble the device driver as follows:

```
MASM hdisk,hdisk,hdisk,nul,
LINK hdisk,hdisk,hdisk,nul;
EXE2BIN hdisk.exe hdisk.com
```

Ignore the Stack warning error from the LINKer.

The device driver is made available to MS-DOS by placing the following statements in the CONFIG.SYS file on your boot disk (or creating one if none exists):

```
BUFFERS=10 (extra disk buffers)
DEVICE=hdisk.com /10 (or /20)
```

The driver is then loaded at power up or whenever the Z-100 is reset. If you inspect the DEVICE= line in the file as written, you will see the two switches, /10 and /20. Referring to the driver code in Listing 1, I have added the option to also use the Microscience HH-725 20MB hard drive. It has nearly identical specifications as the HH-612 and should be easily implemented.

Listing 2 is the special format program FHDISK. The program was written and compiled in TURBO Pascal. The program is executed by simply issuing the command

```
FHDISK /10 (or /20)
```

at the DOS command prompt. The program then formats the hard drive (it takes about 10 minutes for the HH-612 drive) and

```
BPBA_PTR_LEN EQU     4              ; POINTER TO BPB LENGTH.
;
; INIT
;
UNITS        EQU     SRH+SRH_LEN
UNITS_LEN    EQU     1
BR_ADDR_0    EQU     UNITS+UNITS_LEN
BR_ADDR_1    EQU     BR_ADDR_0+2
BR_ADDR_LEN  EQU     4
BPB_PTR_OFF  EQU     BR_ADDR_0+BR_ADDR_LEN
BPB_PTR_SEG  EQU     BPB_PTR_OFF+2
;
; HARD DISK EQUATES
;
HDBASEEQU     007DH  ; BASE ADDRESS FOR DGC-100
                                  I/O PORT
HD_ERR  EQU40H     , HARD DISK ERROR BYTE
page
;*****************************************************
;*                      Main Code                    *
;*****************************************************
;
            ASSUME CS:CSEG,ES:CSEG,DS:CSEG,SS:CSEG
BEGIN
START        EQU     $
;
;   S P E C I A L   D E V I C E   H E A D E R
;
NEXT_DEV     DD-1        ; POINTER TO NEXT DEVICE.
ATTRIBUTE    DW      2000H     , BLOCK DEVICE (NON-IBM
                                   FORMAT)
STRATEGY     DW      DEV_SPTR , POINTER TO DEVICE
                                   STRATEGY.
INTERRUPT    DW      DEV_IPTR , POINTER TO DEVICE
                                   INTERRUPT HANDLER
DEV_NAME     DB      1         , NUMBER OF BLOCK DEVICES
     DB      '*hdisk*'; 7 BYTES OF FILLER.
,
,        D A T A   A R E A
;
            DB'Written by Jim OConnor 1985'
                                   , MY CLAIM TO FAME
RH_OFF       DW      ?         , REQUEST HEADER OFFSET
RH_SEG       DW      ?         ; REQUEST HEADER SEGMENT.
,
,  BIOS PARAMETER BLOCK
,
BPB_TBL      LABEL   WORD
               DW      512       , SECTOR SIZE.
ALLOC          DB      8         ; SECTORS/ALLOCATION UNIT.
               DW      1         ; NUMBER OF RESERVED
                                   SECTORS
               DB      2         ; NUMBER OF FATS.
               DW      480       ; NUMBER OF DIRECTORY
                                   ENTRIES.
SECTORS        DW      19584     ; TOTAL NUMBER OF SECTORS.
               DB      0FDH      ; MEDIA DESCRIPTOR
               DW      12        ; NUMBER OF SECTORS
                                   OCCUPIED BY FAT
,
BPB_PTR        DW      BPB_TBL   ; BIOS PARAMETER BLOCK PTR
page
;
;  CURRENT HARD DISK INFORMATION
,
TOTAL          DW      ?         ; TOTAL SECTORS TO
                                   TRANSFER.
VERIFY         DB      0         , VERIFY 1=YES, 0=NO.
START_SEC      DW      0         ; STARTING SECTOR NUMBER.
USER_DTA       DD      ?         ; PTR TO CALLERS DISK
                                   TRANSFER AREA
UNIT_NO        DB      ?         ; HARD DISK UNIT #
HEAD_NO        DB      ?         ; HARD DISK HEAD #
TRK_LOW        DB      ?         ; TRACK LOW BYTE
TRK_HIGH       DB      ?         ; TRACK HIGH BYTE.
SEC_NO         DB      ?         , SECTOR #.
;
,       FUNCTION TABLE
```

maps any bad sectors to the last physical sector on the drive. After formatting the drive, the program initializes a boot sector, two FAT's and a directory. This program is only run when the hard disk is first installed (or when the urge to format strikes again).

Observations

In an effort to convince myself that all the time I spent creating the device driver and format program wasn't wasted, I attempted a simple benchmark. Using the DOS TIME function, I recorded the time it took to assemble (with listfile), link and convert to a .COM file the device driver of Listing 1. Using a two floppy system (MASM, LINK and EXE2BIN on one disk — source files on the other) it took 3 minutes 20:44 seconds. Using the HH-612 hard drive (all files in the same directory), it took 1 minute 40:54 seconds. Half the time!

Due to limits in my budget (I'm sure you can relate), I did not try an actual HH-725 hard drive. The possibility of a bug in the 20MB sections of the device driver and FHDISK exists, however, I have taken care to check at the code level to limit that possibility.

The use of a device driver to interface a hard drive to the Z-100 has also opened another option for speeding disk access. The RAM limit on the Z-100 is 768K of which 64k could be set aside for catching purposes. Ahhh, but that's a subject for another time!

References

1. Field, Tim. "Installable Device Drivers for PC-DOS 2.0", November 1983 BYTE, page 188.
2. "MS-DOS Version 2 Programmer's Utility Pack", Copyright 1982,1983 by Microsoft Corporation, Copyright 1984 by Zenith Data Systems, Chapter 5 pages 5.1-5.37.
3. "DGC-100 Reference Manual", Copyright 1982 Konan Corporation, Publication Date 11 November 1983, Publication No. R-DGC-001-D.


```
;
FUNTAB  LABEL       BYTE
                DW      INIT        , INITIALIZATION
                DW      MEDIA_CHECK , MEDIA_CHECK.
                DW      BUILD_BPB ; BUILD BPB.
                DW      IOCTL_IN  ; IOCTL INPUT
                DW      INPUT     , INPUT (READ).
                DW      ND_INPUT  ; NON-DESTRUCTIVE
                                    INPUT NO WAIT
                DW      IN_STAT   ; INPUT STATUS.
                DW      IN_FLUSH  , INPUT FLUSH.
                DW      OUTPUT    , OUTPUT (WRITE)
                DW      OUT_VERIFY ; OUTPUT (WRITE)
                                     WITH VERIFY
                DW      OUT_STAT  ; OUTPUT STATUS.
                DW      OUT_FLUSH , OUTPUT FLUSH.
                DW      IOCTL_OUT , IOCTL OUTPUT
page
;
; L O C A L   P R O C E D U R E S
;
;*****************************************************
;*                                                   *
;* Function  INSAVE - Saves callers Data Transfer Area,  *
;* # of sectors to transfer and the starting sector #.   *
;* Inputs: Callers DTA, Sector Count and Starting Sector # *
;* Outputs: Drivers DTA, Sector Count and Starting Sector #*
;* Calls: none                                       *
;* Destroys. AX                                      *
;*****************************************************
;
IN_SAVE PROC NEAR
        MOV     AX,ES:WORD PTR DTA[BX] ; SAVE CALLERS DTA.
        MOV     WORD PTR CS:USER_DTA,AX
        MOV     AX,ES:WORD PTR DTA+2[BX]
        MOV     WORD PTR CS:USER_DTA+2,AX
        MOV     AX,ES:WORD PTR COUNT[BX] ; GET NUMBER OF
                                           SECTORS TO TRANSFER.
        MOV     CS:TOTAL,AX
        MOV     AX,ES:WORD PTR SSN[BX]    ; GET STARTING
                                            SECTOR NUMBER.
        MOV     CS:START_SEC,AX
        RET
IN_SAVE ENDP
;
;*****************************************************
;* Function: CMD_OUT - Outputs a command to the DGC-100 *
;*                     Hard Disk controller.         *
;* Inputs: AL - command to be sent                   *
;* Outputs: Command sequence                         *
;* Calls  none                                       *
;* Destroys: AL,CX                                   *
;*****************************************************
;
CMD_OUT PROC NEAR
        PUSH    AX              , SAVE COMMAND.
        XOR     AL,AL           ; CLEAR DGC PORT (MAY NOT
                                  HAVE BEEN
        OUT     HDBASE,AL       , CLEARED PREVIOUSLY).
CMD1:   IN      AL,HDBASE       , WAIT FOR DGC-100 READY
                                  (PORT = A0).
        CMP     AL,0A0H
        JNZ     CMD1
        POP     AX              , OUTPUT THE COMMAND
        OUT     HDBASE,AL
CMD2:   IN      AL,HDBASE       ; WAIT FOR COMMAND TO BE
                                  RECEIVED (PORT
        CMP     AL,0A1H         ; = A1)
        JNZ     CMD2
        MOV     AL,0FFH         ; SEND EXECUTE COMMAND TO
                                  DGC-100
        OUT     HDBASE,AL
        MOV     CX,20           , WAIT 50 uS
        LOOP    $
        RET
CMD_OUT ENDP

page
;*****************************************************
;* Function. CMD_END - Completes a command transfer to  *
;*                     the DGC-100 Hard Disk Controller *
;* Inputs  none                                      *
;* Outputs: AL - contains command status.            *
;* Calls: none                                       *
;* Destroys: AL,CX                                   *
;*****************************************************
;
CMD_END PROC NEAR
        MOV     AL,0FFH         , START COMMAND END
        OUT     HDBASE,AL       ; SEQUENCE (PORT = FF)
        MOV     CX,20           ; DELAY 50 uS.
        LOOP    $
CMD3:   IN      AL,HDBASE       ; WAIT FOR DMA END STATUS
                                  (PORT = FF)
        CMP     AL,0FFH
        JNZ     CMD3
        MOV     AL,0FEH         ; INDICATE HOST READY FOR
                                  STATUS (PORT
        OUT     HDBASE,AL       , = FE).
CMD4:   IN      AL,HDBASE       ; WAIT FOR STATUS READY
        AND     AL,080H         , (PORT BIT 7 = 0)
        JNZ     CMD4
        IN      AL,HDBASE       ; GET STATUS.
        PUSH    AX              ; SAVE IT
        MOV     AL,0            , INDICATE STATUS ACCEPTED
                                  (PORT = 0).
        OUT     HDBASE,AL
        POP     AX              ; RESTORE STATUS
        RET
CMD_END ENDP
```

```
page
;*******************************************************
;* Function: CMD_PARMS - Outputs a string of eight para-*
;* meters required by the DGC-100 Controller during     *
;* command invocation.                                  *
;* Inputs: none                                         *
;* Outputs. Command parameters.                         *
;* Calls: none                                          *
;* Destroys: AL                                         *
;*******************************************************
;
CMD_PARMS PROC NEAR
        MOV     AL,CS:UNIT_NO    , OUTPUT THE UNIT #
        OUT     HDBASE,AL
        MOV     AL,CS:HEAD_NO    ; OUTPUT THE HEAD #.
        OUT     HDBASE,AL
        MOV     AL,CS:TRK_LOW    ; OUTPUT THE TRACK LOW BYTE
        OUT     HDBASE,AL
        MOV     AL,CS:TRK_HIGH   ; OUTPUT THE TRACK HIGH BYTE
        OUT     HDBASE,AL
        MOV     AL,CS:SEC_NO     , OUTPUT THE SECTOR #.
        OUT     HDBASE,AL
        XOR     AL,AL            , OUTPUT THE THREE RESERVED
                                   BYTES.
        OUT     HDBASE,AL
        OUT     HDBASE,AL
        OUT     HDBASE,AL
        RET
CMD_PARMS ENDP
page
;*******************************************************
;* Function: CMD_PARSE - Parses the DEVICE= input of the *
;* CONFIG.SYS file to determine the drive size          *
;* Inputs: ES:[BX+BPB_PTR_OFF] pointer to command line  *
;* Outputs: Carry Flag--> 0=10MB drive, 1=20MB drive    *
;* Calls: none                                          *
;* Destroys  DI, CX                                     *
;*******************************************************
;
CMD_PARSE PROC NEAR
        PUSH    ES               , SAVE REQUEST HEADER
                                   POINTER.
        PUSH    BX
        LES     DI,ES:[BX+BPB_PTR_OFF] ; LOAD THE COMMAND
                                         LINE POINTER
        MOV     CX,15            , CHECK NEXT 15 CHARACTERS
CMD_P1: CMP     BYTE PTR ES:[DI],"/" , IS IT A "/"?
        JZ      CMD_P2           , YES...JUMP
        INC     DI               , (next character)
        LOOP    CMD_P1           , NO.  TRY AGAIN
        JMP     CMD_PE           ; NO SIZE DESIGNATION
                                   ASSUME 10MB
CMD_P2. INC     DI               ; (next character)
        CMP     BYTE PTR ES:[DI],"2" ; IS CHARACTER AFTER
                                       "/" A "2"?
        JNZ     CMD_PE           , NO  .MUST BE A "1"  USE
                                   10 MB DRIVE
        STC                      ; YES.  USE 20MB DRIVE
        JMP     CMD_PP
CMD_PE: CLC                      , 10 MB DRIVE.
CMD_PP: POP     BX               , RESTORE REQUEST HEADER
                                   POINTER.
        POP     ES
        RET
CMD_PARSE ENDP
page
;*******************************************************
;* Function  SET_PARMS - Computes hard disk parameters *
;* for use with DGC-100 Read and Write Disk commands.   *
;* Inputs. Sector # to be written/read                  *
;* Outputs  Unit #, Head #, Track Low, Track High and   *
;* Sector data.                                         *
;* Calls: none                                          *
;* Destroys. AX,DX                                      *
;*******************************************************
;
SET_PARMS PROC NEAR
        MOV     AL,0             ; GET UNIT # AND
        MOV     CS:UNIT_NO,AL    , STORE IT
        MOV     AX,CS:START_SEC  , GET STARTING SECTOR #
SET1.   CMP     AX,640           ; COMPUTE HEAD #.
        JL      SET2             ; IS SECTOR < 640 ?
                                   YES...JUMP.
        SUB     AX,640           , NO. .REDUCE SECTOR BY 640.
        JMP     SET1
SET2:   CMP     AX,64
        JL      SET3             , IS SECTOR < 64 ?
                                   YES. .JUMP
        SUB     AX,64            , NO. .REDUCE BY 64
        JMP     SET2
SET3:   CMP     AL,15            , IS SECTOR < 16 ?
        JG      SET4             , NO. .JUMP.
        MOV     CS:HEAD_NO,0     ; YES...USE HEAD 0
        JMP     SET7
SET4    CMP     AL,31            ; IS SECTOR < 32 ?
        JG      SET5             ; NO. .JUMP
        MOV     CS:HEAD_NO,1     , YES. .USE HEAD 1
        JMP     SET7
SET5:   CMP     AL,47            ; IS SECTOR < 48 ?
        JG      SET6             , NO. .JUMP
        MOV     CS:HEAD_NO,2     ; YES. .USE HEAD 2
        JMP     SET7
SET6:   MOV     CS:HEAD_NO,3     ; USE HEAD 3
SET7    ADD     AL,64            ; COMPUTE SECTOR #
SET8:   CMP     AL,16            , IS SECTOR < 16 ?
        JL      SET9             ; YES  .JUMP
        SUB     AL,16            , NO  .REDUCE BY 16
        JMP     SET8
SET9    MOV     CS:SEC_NO,AL     , STORE SECTOR #.
        MOV     AX,CS:START_SEC  , COMPUTE TRACK #.
        XOR     DX,DX            , ZERO DX
        PUSH    BX               ; SAVE BX
        MOV     BX,64            , DIVIDE SECTOR# BY 64.
        DIV     BX
        POP     BX               , RESTORE BX
        MOV     CS:TRK_LOW,AL    , STORE TRACK #s
        MOV     CS:TRK_HIGH,AH
        RET
SET_PARMS ENDP
page
;*******************************************************
;* Function: DATA_RD - Reads the sector data from the   *
;* Hard Disk and places it in memory                    *
;* Inputs: none                                         *
;* Outputs: Carry Flag --> 0 = sucessful, 1 = error     *
;* Calls  CMD_OUT, CMD_END, SET_PARMS and CMD_PARMS     *
;* Destroys: AL, CX                                     *
;*******************************************************
;
DATA_RD PROC NEAR
        MOV     DI,WORD PTR CS:USER_DTA , SET DTA
        MOV     ES,WORD PTR CS:USER_DTA+2
        MOV     CX,CS:TOTAL        , GET TOTAL SECTORS TO
                                     XFER
RD1     PUSH    CX               ; STORE SECTOR COUNT
        CALL    SET_PARMS        , COMPUTE HARD DISK
                                   PARAMETERS.
        MOV     AL,21H           ; SEND READ DISK COMMAND
        CALL    CMD_OUT
        CALL    CMD_PARMS        ; SEND PARAMETERS
        CALL    CMD_END          ; CHECK COMMAND STATUS.
        TEST    AL,HD_ERR        ; ERROR OCCURRED?
        JNZ     RD_ERR           , YES. .JUMP
        MOV     AL,41H           ; NO. .READ THE DGC-100
                                   BUFFER
        CALL    CMD_OUT
        MOV     CX,512           ; READ 512 BYTES
RD2:    IN      AL,HDBASE
        STOSB
        LOOP    RD2
        CALL    CMD_END          , CHECK COMMAND STATUS.
        TEST    AL,HD_ERR        ; ERROR DETECTED?
        JNZ     RD_ERR           , YES...JUMP
        ADD     CS:START_SEC,1   ; NO. .POINT TO THE NEXT
                                   SECTOR
        POP     CX
        LOOP    RD1
        CLC                      ; CLEAR THE CARRY BIT
```

```
        RET
RD_ERR: STC                     ; SET THE CARRY BIT
        RET
DATA_RD ENDP
page
;*****************************************************
;* Function: DATA_WR - Writes the sector data from   *
;* memory and transfers it to the Hard Disk          *
;* Inputs  none                                      *
;* Outputs: Carry Flag --> 0 = succesful, 1 = error  *
;* Calls: CMD_OUT, CMD_END , CMD_PARMS and SET_PARMS *
;* Destroys: AL, CX                                  *
;*****************************************************
;
DATA_WR PROC NEAR
        MOV     SI,WORD PTR CS:USER_DTA , SET DTA.
        MOV     DS,WORD PTR CS:USER_DTA+2
        MOV     CX,CS:TOTAL             , GET TOTAL SECTORS TO
                                          XFER.
WR1     PUSH    CX                      ; STORE SECTOR COUNT
        MOV     AL,42H                  , WRITE TO THE DGC-100
                                          BUFFER
        CALL    CMD_OUT
        MOV     CX,512                  , WRITE 512 BYTES.
WR2:    LODSB
        OUT     HDBASE,AL
        LOOP    WR2
        CALL    CMD_END                 ; GET COMMAND STATUS.
        TEST    AL,HD_ERR               , ERROR DETECTED?
        JNZ     WR_ERR                  , YES. .JUMP
        CALL    SET_PARMS               , NO. .COMPUTE HARD DISK
                                          PARAMETERS
        MOV     AL,22H                  ; SEND WRITE DISK COMMAND
        CALL    CMD_OUT
        CALL    CMD_PARMS               , SEND PARAMETERS
        CALL    CMD_END                 , CHECK COMMAND STATUS.
        TEST    AL,HD_ERR               , ERROR OCCURRED?
        JNZ     WR_ERR                  , YES. .JUMP
        ADD     CS:START_SEC,1          , NO...POINT TO THE NEXT
                                          SECTOR.
        POP     CX
        LOOP    WR1
        CLC                             , CLEAR ERROR FLAG.
        RET
WR_ERR: STC                     ; SET ERROR FLAG
        RET
DATA_WR ENDP
page
;
;  D E V I C E   S T R A T E G Y
;
DEV_SPTR    LABEL   WORD
DEV_S       PROC    FAR
        MOV     CS:RH_SEG,ES    ; SAVE SEGMENT OF REQUEST
                                  HEADER POINTER
        MOV     CS:RH_OFF,BX    ; SAVE OFFSET OF REQUEST
                                  HEADER POINTER
        RET
DEV_S   ENDP
;
;  D E V I C E I N T E R R U P T   H A N D L E R
;
DEV_IPTR        LABEL    WORD
DEV_I PROC FAR
; PRESERVE MACHINE STATE ON ENTRY
        PUSH    AX
        PUSH    BX
        PUSH    CX
        PUSH    DX
        PUSH    DS
        PUSH    ES
        PUSH    SI
        PUSH    DI
;
; DO THE BRANCH ACCORDING TO THE FUNCTION PASSED
;
        MOV     AL,ES:[BX]+2    ; GET FUNCTION BYTE
        ROL     AL,1            , GET OFFSET INTO TABLE
        LEA     DI,FUNTAB       , GET ADDRESS OF FUNCTION TABLE
        XOR     AH,AH           , COMPUTE FUNCTION OFFSET
        ADD     DI,AX
        JMP     WORD PTR[DI]    , JUMP TO FUNCTION
;
; THE FOLLOWING ENTRIES ARE NOT SUPPORTED BY THIS DEVICE
;
IOCTL_IN.                       , UNUSED COMMANDS.
IOCTL_OUT:
ND_INPUT:
IN_STAT
IN_FLUSH:
OUT_STAT:
OUT_FLUSH.
;
        STATUS  DONE,ERROR,03
        JMP     EXIT
page
;*****************************************************
;* Function. Media Check - Media cannot be changed for *
;* a Hard Disk                                       *
;* Inputs. none                                      *
;* Outputs  none                                     *
;* Calls: none                                       *
;* Destroys                                          *
;*****************************************************
;
MEDIA_CHECK:
        MOV     ES:BYTE PTR RET_BYTE[BX],1 , STORE IN
                                             RETURN BYTE
        STATUS  DONE,NOERROR,0     , TURN ON THE DONE BIT
        JMP     EXIT
;
;*****************************************************
;* Function  BUILD BPB - Sets the pointer to the BIOS *
;* PARAMETER BLOCK for Media Change                  *
;* Inputs: none                                      *
;* Outputs  none                                     *
;* Calls: none                                       *
;* Destroys: DX                                      *
;*****************************************************
;
BUILD_BPB:
        LEA     DX,BPB_TBL      ; GET BPB ARRAY POINTER
        MOV     ES:BPBA_PTR[BX],DX ; SAVE PTR TO BPB TABLE
        MOV     ES:BPBA_PTR+2[BX],CS
        MOV     ES:DTA[BX],DX   , OFFSET OF SECTOR BUFFER
        MOV     ES:DTA+2[BX],CS
        STATUS  DONE,NOERROR,0
        JMP     EXIT
;
;*****************************************************
;* Function: DISK READ - Reads requested sectors from  *
;*                       the Hard Disk               *
;* Inputs: none                                      *
;* Outputs  none                                     *
;* Calls. IN_SAVE, DATA_RD                           *
;* Destroys                                          *
;*****************************************************
;
INPUT
        CALL    IN_SAVE         , CALL THE INITIAL SAVE
                                  ROUTINE
        CALL    DATA_RD         , GET THE DISK DATA
        MOV     BX,CS:RH_OFF    , RESTORE ES:BX AS REQUEST
                                  HEADER PTR
        MOV     ES,CS:RH_SEG
        JNC     IN1             , ERROR DURING READ?
        STATUS  DONE,ERROR,0BH  ; YES. .REPORT ERROR
        JMP     EXIT
IN1     STATUS  DONE,NOERROR,0  , NO. .REPORT SUCCESSFUL
                                  COMPLETION
        JMP     EXIT
page
;*****************************************************
;* Function: DISK WRITE - Writes requested sectors to  *
;* the Hard Disk. Verify option included             *
;* Inputs: none                                      *
;* Outputs: none                                     *
;* Calls: IN_SAVE, DATA_WR                           *
;* Destroys.                                         *
;*****************************************************
```

```
;
OUTPUT:
        CALL    IN_SAVE         ; CALL THE INITIAL SAVE
                                  ROUTINE
        CALL    DATA_WR         ; WRITE THE DISK DATA
        MOV     BX,CS:RH_OFF    , RESTORE ES:BX AS REQUEST
                                  HEADER PTR
        MOV     ES,CS:RH_SEG
        JNC     OUT1            , ERROR ON WRITE?
        STATUS  DONE,ERROR,0AH
        JMP     EXIT
OUT1    CMP     CS:BYTE PTR VERIFY,0 , WRITE VERIFY SET
        JZ      NO_VERIFY       , NO, NO WRITE VERIFY
        MOV     CS:BYTE PTR VERIFY,0 ; RESET VERIFY
                                       INDICATOR
        JMP     INPUT           , READ THOSE SECTORS BACK IN
NO_VERIFY
        STATUS  DONE,NOERROR,0 , YES, REPORT SUCCESSFUL
                                  COMPLETION
        JMP     EXIT
OUT_VERIFY:                     , OUTPUT (WRITE) WITH VERIFY
        MOV     CS:BYTE PTR VERIFY,1 ; SET THE VERIFY FLAG
        JMP     OUTPUT          , BRANCH TO OUTPUT ROUTINE
;
, COMMON EXIT
;
EXIT:
        POP     DI              , RESTORE ALL REGS
        POP     SI
        POP     ES
        POP     DS
        POP     DX
        POP     CX
        POP     BX
        POP     AX
        RET
DEV_I ENDP
E_O_P
;MACRO TO ALIGN THE HARD DISK DRIVER ON A PARAGRAPH BOUNDARY
IF ($-START) MOD 16
ORG     ($-START)+16-(($-START) MOD 16)
ENDIF
HDISK   EQU     $
page
,
,  T H R O W  A W A Y  C O D E
,
;*****************************************************
;* Function. INIT - Initializes the Hard Disc device  *
;* driver and the DGC-100 controller                  *
;* Inputs: none                                       *
;* Outputs  none                                      *
;* Calls: CMD_OUT, CMD_END                            *
;* Destroys. AL, CX, DX, DS, SI                       *
;*****************************************************
;
INIT:
        MOV     ES:WORD PTR BR_ADDR_0[BX],OFFSET HDISK
,
        MOV     ES:BR_ADDR_1[BX],CS ; SET BREAK ADDRESS
        MOV     ES:BYTE PTR UNITS[BX],1 , NUMBER OF DISK-
                                          ETTE UNITS.
        CALL    CMD_PARSE           , DETERMINE DISK SIZE
        JNC     INIA                ; IF 10MB PROCEED
        MOV     DX,OFFSET MS_20     , 20 MB DRIVE SELECTED
                                      ANNOUNCE
        MOV     AH,9                , IT IN THE SIGN ON
                                      MESSAGE.
        INT     21H
        MOV     CS:ALLOC,16         , SETUP 20MB PARAMETERS
        MOV     CS:SECTORS,39168
        MOV     CS:MTL,062H
        MOV     CS:SPL,062H
        MOV     CS:MTH,002H
        MOV     CS:SPH,002H
        JMP     INIB
INIA:   MOV     DX,OFFSET MS_10     , 10 MB DRIVE SELECTED.
                                      ANNOUNCE
        MOV     AH,9                ; IT IN THE SIGN ON
                                      MESSAGE
        INT     21H
INIB:   PUSH    CS                  ; LOAD DS WITH CS
        POP     DS
        MOV     SI,DISK_PTR         ; POINT TO PARAMETER
                                      TABLE
        MOV     AL,42H              , REQUEST A DGC-100
                                      WRITE BUFFER CMD
        CALL    CMD_OUT
        MOV     CX,16               ; OUTPUT THE DISK
                                      PARAMETERS
INI1    LODSB
        OUT     HDBASE,AL
        LOOP    INI1
        MOV     CX,496              , OUTPUT THE FILL ZEROES
        XOR     AL,AL
INI2:   OUT     HDBASE,AL
        LOOP    INI2
        CALL    CMD_END
        TEST    AL,HD_ERR
        JNZ     IN_ERR
        MOV     AL,02H              , SEND INIT. COMMAND
        CALL    CMD_OUT
        CALL    CMD_END
page
;*****************************************************
;* Function. INIT - Initializes the Hard Disc device  *
;* driver and the DGC-100 controller - cont           *
;*****************************************************
;
        TEST    AL,HD_ERR           , CHECK FOR INIT  ERROR
        JNZ     IN_ERR              ; ERROR? YES.  JUMP
        MOV     AH,25               ; NO.  .GET CURRENT DISK.
        INT     21H
        MOV     DL,AL
        MOV     AH,14               ; SELECT IT
        INT     21H
        ADD     AL,'A'              , CONVERT IT TO A LETTER
        MOV     LETTER,AL
        MOV     DX,OFFSET SO_MSG    , PLACE LETTER IN
                                      SIGN ON MESSAGE.
        MOV     AH,9                ; PRINT THE SIGN ON
                                      MESSAGE
        INT     21H
        STATUS  DONE,NOERROR,0      , SET STATUS WORD
                                      (DONE, NOERROR)
        JMP     IN_CMP
IN_ERR: MOV     DX,OFFSET ERRI_MSG  ; OUTPUT ERROR MESSAGE.
        MOV     AH,9
        INT     21H
        STATUS  DONE,ERROR,02H      ; SIGNAL DRIVE NOT
                                      READY ERROR
IN_CMP: LEA     DX,BPB_PTR          , GET ADDRESS OF BPB
                                      POINTER ARRAY
        MOV     ES:BPB_PTR_OFF[BX],DX ; SAVE OFFSET IN
                                        DATA PACKET
        MOV     ES:BPB_PTR_SEG[BX],CS , SAVE SEGMENT IN
                                        DATA PACKET
        MOV     DX,ES:WORD PTR BR_ADDR_0[BX]
        MOV     DS,ES:BR_ADDR_1[BX] ; SET DS:DX TO BREAK
                                      ADDRESS
        JMP     EXIT
page
,
,       HARD DISK INIT  PARAMETERS
;
DISK_PARM    LABEL      WORD
                DB      0FFH        ; PRE-COMP SWITCH.
                DB      080H        , PRE-COMP LOW ORDER
                                      ADDRESS
                DB      000H        , PRE-COMP HIGH ORDER
                                      ADDRESS
                DB      0FFH        ; REDUCE WRITE CURRENT
                                      SWITCH
                DB      000H        , REDUCE WRITE CURRENT
                                      LOW ORDER ADDRESS
                DB      001H        ; REDUCE WRITE CURRENT
                                      HIGH ORDER ADDRESS.
                DB      000H        , STEP MODE
MTL             DB      031H        ; MAX TRACK LOW ORDER
                                      ADDRESS
```

```
program FHDISK;

label   fhend;
var
        Buffer          :       array[1 .512] of Byte;
        Status,
        StepRate,Drive,
        Heads           :       Byte;
        I,J,
        WpcCyl,
        RwcCyl,
        Cylinders       :       Integer,
        Response        :       Char;

procedure CmdOut(Cmd : Byte);
var
        I       :       Integer;
        Inp     :       Byte;

        begin
          while Inp <> $a0 do Inp:= Port[$7d];  {Wait for DGC-100 ready.}
          Port[$7d]:=Cmd,                       {Output command.}
          while Inp <> $a1 do Inp:= Port[$7d];  {Wait for DGC-100 accept.}
          Port[$7d]:=$ff,                       {Output an 'FF' }
          for I:=1 to 50 do                     {Delay 50 uS.}
            begin
            end;
          end;

procedure CmdEnd(Status: Byte);
var
        I       :       Integer;
        Inp     :       Byte;

        begin
        Port[$7d]:=$ff;                         {Output an 'FF' }
          for I:= 1 to 50 do                    {Delay 50 uS.}
            begin
            end;
          while Inp <> $ff do Inp:= Port[$7d];  {Wait for command terminate.}
          Port[$7d]:=$fe,                       {Output an 'FE' }
          while (Inp and $80) <> 0 do Inp:= Port[$7d];
          Status:= Port[$7d];                   {Get status.}
          Port[$7d]:=0;                         {Output an '00' }
        end;

procedure WrtDisk(Sector,Status : Integer);

        begin
            CmdOut($22),                {Issue write disk command.}
              Port[$7d]:=0;             {Output unit #.}
      case Sector of            {Select head.}
               1..16: Port[$7d]:=0;  {If sector<17   head 0.}
              17..32  Port[$7d]:=1,  {If sector<33. .head 1.}
              33..48: Port[$7d]:=2;  {if sector<49.  head 2.}
              49..64: Port[$7d]:=3;  {if sector<65...head 3.}
            end;
      Port[$7d]:=0;             {Output track low.}
```

```
MTH             DB      01H             ; MAX TRACK HIGH ORDER
                                        ADDRESS
SPL             DB      031H            ; SPARE-1 LOW ORDER
                                        ADDRESS
SPH             DB      01H             ; SPARE-1 HIGH ORDER
                                        ADDRESS
                DB      0FFH            ; MAP SWITCH
                DB      00H             ; DRIVE TYPE
                DB      00H             ; RESERVED BYTES
                DB      00H
                DB      00H
DISK_PTR        DW      DISK_PARM
;
; I n i t  M e s s a g e s
;
SO_MSG          DB      "Hard Disk installed as drive "
LBBETTER        DB      ?,":",CR,LF,"$"
ERRI_MSG        DB      CR,LF,"Error on Hard Disk
                          installation!",CR,LF,"$"
MS_10           DB      CR,LF,"10MB $"
MS_20           DB      CR,LF,"20MB $"
;
CSEG    ENDS
END     BEGIN
```

```
        Port[$7d]:=0,           {Output track high.}
              case Sector of            {Output Sector #.}
                1 .16: Port[$7d]:=Sector-1;
             17..32. Port[$7d]:=Sector-17,
             33..48. Port[$7d]:=Sector-33;
             49 .64: Port[$7d]:=Sector-49;
            end,
              Port[$7d]:=0,             {Output reserved bytes )
              Port[$7d]:=0;
              Port[$7d]:=0;
             CmdEnd(Status),            {Check command status.}
             end;

procedure Parse(var Drive : Byte);
var
        Pointer,I,
        Slash           :       Integer;
        Value           :       Byte;

        begin
          Pointer:=$81,                 {Point to the PSP command}
          Slash:=0,                     {line area                }
          Drive:=2,                     {Assume the worst.}
          while Slash<>1 do
                begin
                  Value:=Mem[Cseg:Pointer]; {Search for a '/' }
                  if Value=$2F then Slash:=1;
                  Pointer:=Pointer+1;
                  if Pointer > $FF then Slash:=1 {End of command line.}
```

```
            end,
          if Pointer > $FF then      {No '/' found }
          Drive:=2
        else
          if Mem[Cseg:Pointer]=$31 then {A '1' found. .must be 10Mb.}
            Drive:=0
          else
            if Mem[Cseg:Pointer]=$32 then Drive:=1; {A '2' found...must be}
            Writeln('drive:',Drive);
        end,                         {20Mb.              }

begin
        ClrScr;                          {Clear Screen.}
        Writeln('Hard Disk Format Program Ver 1.0'), {Output Header.}
        Writeln('Written by Jim OConnor 1985');
        Writeln;
        Heads:=4;                        {Default drive parameters.}
        RwcCyl:=256,
        WpcCyl:=128;
        StepRate:=0;
        Parse(Drive);                    {Determine drive type.}
        Writeln('drive:',Drive),
        case    Drive   of               {No type given ..output error}
              0: begin
              Cylinders:=306;            {10Mb drive   set cylinders.}
              Write('Formatting 10Mb drive. .');
            end;
          1: begin
              Cylinders:=612;            {20Mb drive.  set cylinders.}
              Write('Formatting 20Mb drive.  ');
            end;
        else
          Writeln('No drive type. .use /10 or /20.');
          goto fhend,
        end;
        Write('Begin format [Y/N] ?');   {Allow operator termination.}
        Readln(Response),
        if (Response<>'Y') and (Response<>'y') then goto fhend,
        Buffer[1]:=$ff,                  {Setup buffer for Init.}
        Buffer[2]:=(WpcCyl-1) mod 256;
        Buffer[3]:=(WpcCyl-1) div 256;
        Buffer[4]:=$ff,
        Buffer[5]:=(RwcCyl-1) mod 256;
        Buffer[6]:=(RwcCyl-1) div 256,
        Buffer[7]:=StepRate;
        Buffer[8]:=(Cylinders-1) mod 256,
        Buffer[9]:=(Cylinders-1) div 256;
        Buffer[10]:=Buffer[8],
        Buffer[11]:=Buffer[9],
        for I:= 12 to 512 do
              begin
  Buffer[I]:=0,
end;
        CmdOut($42),             {Output write buffer command.}
        for I:= 1 to 512 do Port[$7d]:= Buffer[I];
        CmdEnd(Status);          {Get status.}
        CmdOut($02);             {Output Init command.}
        CmdEnd(Status),
        for I:=1 to 16 do        {Setup Interlace buffer.}
              begin
```

```
          Buffer[I]:=I-1;
        end,
for i.=17 to 512 do
        begin
          Buffer[I]:=0;
        end;
CmdOut($42);             {Issue write buffer command.}
for I:=1 to 512 do Port[$7d]:= Buffer[I],
CmdEnd(Status);          {Get status.}
Write('Formatting. .');
CmdOut($27);             {Issue format command.}
  Port[$7d]:=0;          {Output format parameters.}
  Port[$7d]:=127+Heads;
  Port[$7d]:=(Cylinders-1) mod 256;
  Port[$7d]:=(Cylinders-1) div 256,
  Port[$7d]:=15;
  Port[$7d]:=0,
  Port[$7d]:=0;
  Port[$7d]:=0;
CmdEnd(Status),
Writeln(' formatted ');
Writeln;
Write('Directory. . ');   {Zero FAT/directory area.}
for I:=1 to 512 do Buffer[I]:=0;  {Zero buffer }
for J:=1 to 55 do
begin
    CmdOut($42);           {Issue write buffer command.}
    for I:=1 to 512 do Port[$7d]:=Buffer[I];
    CmdEnd(Status);
    WrtDisk(J,Status);
end;
Writeln('created ');
Write('Boot Record  . ');  {Setup boot record buffer }
Buffer[4]:=74;
Buffer[5]:=71;
Buffer[6]:=79;
Buffer[7]:=83;
Buffer[8]:=32,
Buffer[9]:=49;
Buffer[10]:=46;
Buffer[11]:=48,
Buffer[13]:=2;
Buffer[14]:=8,
Buffer[20]:=128;
Buffer[21]:=76,
if Drive=1 then
  begin
    Buffer[14]:=16;
    Buffer[20]:=0;
    Buffer[21]:=153;
  end;
Buffer[15]:=1;
Buffer[17]:=2,
Buffer[18]:=224;
Buffer[19]:=1,
Buffer[22]:=$fd;
Buffer[23]:=12;
CmdOut($42);             {Issue write buffer command.}
for I:=1 to 512 do Port[$7d]:=Buffer[I];
CmdEnd(Status);
```

```
        WrtDisk(1,Status),
        Writeln('created ');
        Write('FATs  . '),          {Setup FAT buffer.}
        for I:=1 to 24 do Buffer[I]:=0,
        Buffer[1]:=$fd,
        Buffer[2]:=$ff,
        Buffer[3]:=$ff,
        CmdOut($42),                {Issue write buffer command.}
        for I:=1 to 512 do Port[$7d]:=Buffer[I],
        CmdEnd(Status),
        WrtDisk(2,Status);
        CmdOut($42);                {Issue write buffer command.}
        for I:=1 to 512 do Port[$7d]:=Buffer[I];
        CmdEnd(Status);
        WrtDisk(14,Status),
        Writeln('created '),
fhend:  end
```

*

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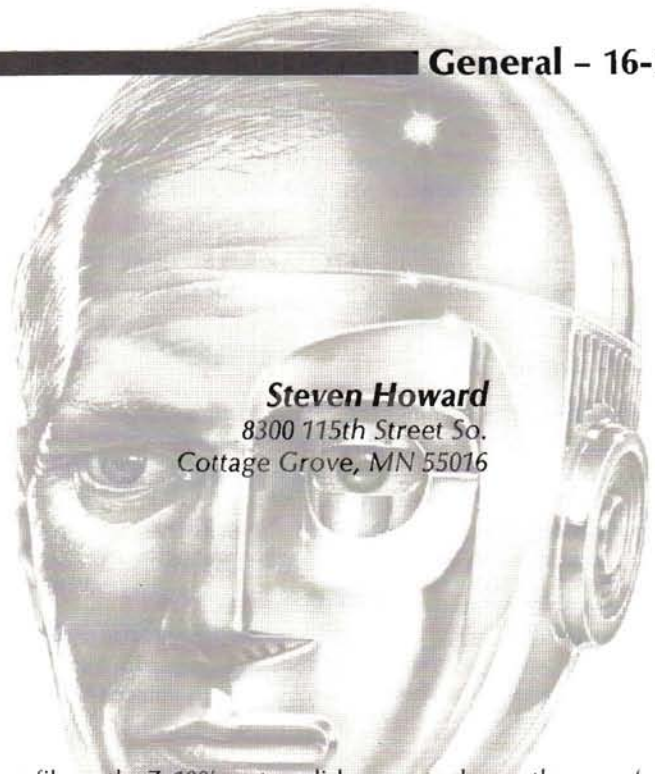

Steven Howard
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I have a confession to make. I love my Z-100 and believe it is one of the best computer values on the market today. But I have to say one thing for the IBM Personal Computer. I prefer its type font with serifs and easy-to-read characters.

This bothered me for quite a while. Then I heard people talking about the 'software-definable character set' and 'keyboard mapping' and became curious. I thought if these features were in existence, I could change the way my Z-100 screen looked.

One day I bought Lotus 1-2-3 and there was the IBM type font! Now I KNEW it was possible. But I still did not understand how I could change those characters into a form I could use in the rest of my software. The users manual which came with the Z-100 didn't really explain how to change fonts. It just sort of hinted at the fact that it was possible to do all the fancy sort of things I wanted to do. But I still didn't know how!

Background

Ever since cathode-ray-tubes (CRTs) replaced hex keypads on computers, the characters used on computer screens were normally the plain English characters we use in day-to-day writing and reading. These were the same characters as could be found on any typewriter. But as time went on, people began to demand more from their terminals. Many people wanted to know why they couldn't use special characters, such as math or foreign-language characters.

In the past, the characters generated on the screen were taken from an area of memory where a description of how the characters look was stored on a chip called a read-only memory (ROM). These chips worked just great, but they had one problem — the computer could only use what was already put in the chip; it could not allow changes or modifications to be made. This was the problem with custom character sets. They had to be put in a chip; and if you wanted to use it, you had to physically change the chips in the computer. Inconvenient, to say the least.

The New Day Dawns

One of the most fascinating powers of the Z-100 is the ability to change the character set through software. Simply by modifying a file on the Z-100's system disk, you can change the way a few of the characters look — or design an entirely new character set.

Being able to modify the character set through software, you can get around the problems associated with the ROM-based character sets, and gain great flexibility in the process. The math and scientific character sets are now easy to obtain.

Along with the ability to customize the character set, the Z-100 can be modified to allow typing any one of the keys on the keyboard to send the value of any one of the other keys, instead of its own. For example, an application program would be able to have both backspace and delete send the same code to a program when entered from the keyboard. Or, if you want another key (such as a function key) to be used for an ASCII escape code, it is now possible. This would make it a simple matter to create a Dvorak keyboard for the Z-100, if needed.

Where does all this magic come from? The secret of it all lies in the file called 'ALTCHAR.SYS': it should be on every bootable ZDOS disk.

The file is actually very simple to use. When the Z-100 is booted up, the internal character set in ROM (as I mentioned earlier) is used. This is called the default character set and is loaded into random-access (RAM) memory. The operating system then looks on the disk for a file called ALTCHAR.SYS. If it is found, it is loaded into memory, and the ALTCHAR table now in memory is used to modify the default character tables already stored in memory. This modified character set becomes the one used by the system. The tables are used until the computer is either rebooted or powered up again. Should the file not be found on the disk, the default character set from the ROM is used.

Application

When I first figured this out, I felt like, "big deal, I still don't know how I can use it." Then I did some experimenting with DDT under CP/M-85, and DEBUG under Z-DOS, and discovered how easy it is to change the tables used by the operating system. (I am assuming that anyone reading this is familiar with the operation of DDT or DEBUG, depending on which operating system you are trying to change.)

The ALTCHAR.SYS file consists of three separate sections: the keyboard mapper, the font plotter, and the display mapper. The file is identical for both CP/M-85 and ZDOS, as is the format of the ROM tables themselves. Each of the three sections has its own very distinct and special job to perform in the Altchar file.

Figure 1 is the dump of a sample ALTCHAR.SYS file using Debug. This is a sample file I will be using to explain the various features of the ALTCHAR file.

Keyboard Mapper

The keyboard mapper modifies the default keyboard layout. This will allow any key on the keyboard to be modified to act like any other key you want on the keyboard. For example, the 'HELP' key could be used to send a question mark or any other key desired to an application program. The user could then hit the 'HELP' key or the '?' and the software would only need to look for the '?'.

Another possibility would be to set up the BACKSPACE and the DELETE key to operate the same. This would prevent the problems from happening as they did under CP/M regarding backspacing without deleting. This way, whichever key you choose, it will do the same thing.

Layout

Depending on the number of keys being modified, the keyboard mapper is made up of one or more two-byte entries. The more keys being changed, the more entries in the table. For each key you want to map, there are two bytes in the table.

The keyboard mapper uses a code called a 'key code'. This is the value the computer receives when a key is struck. These are not necessarily the same as the ASCII value of the character. A description of the different key codes are shown in the back of the Z-100 Users Manual in Appendix B. The sections marked UP CODE and DOWN CODE do not apply here, however.

The first byte is the key code for the key you wish to modify. The second byte in the two-byte string is the key code for the value you want it to be mapped (changed) to. The keyboard mapper section is ended when two consecutive 0FFH bytes are found.

The first 6 bytes of our sample file make up the keyboard mapper section. The mapper is set to change the HELP key (95) to work the same as the ASCII question mark (3F). Whenever the HELP key is pressed, a question mark will be issued.

In the next two bytes, I have changed the DELETE key to operate in the same manner as the BACKSPACE key. In this instance, the 7FH is the key being mapped, the DELETE key. The next byte is 08H, which means that whenever the delete key is pressed, the computer will send 08H instead of the 7FH normally used. The two consecutive 0FFH bytes mark the end of the mapper section. If you wanted to map more keys, you would simply enter them before the two 0FFH bytes.

Font Plotter

The font plotter is the most fun and interesting section of the ALTCHAR file. This is the workhorse of the ALTCHAR file. This section allows you to design your own custom character sets or modify existing ones for display on the screen.

With this section, you can build special character sets such as mathematical, foreign-language or APL characters, or you can create just plain old special graphics — characters like diagonal arrows or any other shape you feel is missing from the standard graphics set. The GRAPHICS.CHR file on the ZDOS or CP/M-85 distribution disk is a good example of how the font plotter section works.

The font plotter allows a new shape to be specified for any of the various characters in the default font table which has been loaded in RAM. Both the font plotter and the display mapper use a display index to help them find the proper location in the font table.

The display index is simply a method of addressing a particular character by using the 'index' as an offset for a pointer to the character table. It works by taking the value of the index and adding it to a pointer to the beginning of the font table. By using this method, it is simple to point to any particular entry in the font table.

The display index for the ASCII character is found by subtracting 32 from the value of the character. This gives the proper bias for looking the character up in the font table. This puts the first printable ASCII character (a space; value 32) at position zero, the start of the table.

A graphics character is found by taking the value of its equivalent ASCII character and adding two to it. This places the graphics characters starting at 96 following the end of the standard upper case ASCII character set. For example, 33 (21H) would be the letter 'A' (65 – 32 = 33) and 56 (38H) would be the letter 'X' (88 – 32 = 56). As for the graphics set, the large dot would be 96 (94 + 2) and the graphics down arrow would be 109 (107 + 2).

Layout

The plotter consists of groups of ten bytes defining the way the character looks. The first byte is the display index described above for the character you want to define. The next 9 bytes are the actual definition of how the character is to look. Each character you wish to define will then take up an entry of ten bytes.

In each of the 9 definition bytes, for each bit that is turned on, a pixel on the screen is turned on. For each bit that is off, the pixel on the screen is turned off. When the font plotter section detects a display index of 0FFH, the font plotter ends and the display mapper begins.

Example

The following section shows how to determine the proper font description for the letter 'g', the number 7, and the graphics diagonal bar. These characters have a decimal ASCII value of 103, 55, and the graphics equivalent of 120. These translate to table index values of 103(067h), 55(037h), and 120 (078H).

The pixels wanted off are encodes as zeros, and the pixels wanted on are encoded as ones.

¦00000000¦	00	¦00000000¦	00	¦00000001¦	01
¦00000000¦	00	¦00111110¦	3E	¦00000011¦	03
¦00000000¦	00	¦00000010¦	02	¦00000110¦	06
¦00011110¦	1E	¦00000100¦	04	¦00001100¦	0C
¦00100100¦	24	¦00001000¦	08	¦00011000¦	18
¦00111000¦	38	¦00010000¦	10	¦00110000¦	30
¦00011100¦	1C	¦00010000¦	10	¦01100000¦	60
¦00100010¦	22	¦00010000¦	10	¦11000000¦	C0
¦00011100¦	1C	¦00000000¦	00	¦10000000¦	80

These values in combination with the display index, would create a font plotter with the following hex values: 67 00 00 00 1E 24 38 1C 22 1C 37 00 3E 02 04 08 10 10 10 00 78 01 03 06 0C 18 30 60 C0 80 FF.

Display Mapper

The display mapper is the section which allows you to change the relationship between the keys on the keyboard and the characters which are displayed on the screen.

For example, normally when you hit an "a" on the keyboard, an "a" shows up on the display. The display mapper modifies the default character map, which determines which characters are displayed. Now, when you hit an "a" on the keyboard, any other character you choose can show up on the screen.

You may not think this would be of much use, since it is rare that you will ever need to remap the letter 'z' for example, to appear on the screen as a letter 'Q'. You would be correct. However, the display mapper comes in very handy for mapping the H-19 graphics characters from the keyboard to the appropriate graphics characters.

The display map in the default file has all the graphics characters mapped to the their equivalent ASCII character. That is why you don't get any of the graphics characters with the standard ALTCHAR.SYS file. Instead, all you get is lower case characters. To see what I mean, boot your '100 without an ALTCHAR.SYS file. Run the CONFIGUR.COM program, and when the display of the computer backpanel is shown, you will see all lower case instead of the proper graphics characters.

When you use the GRAPHICS.CHR file as your ALTCHAR file, the graphics characters are then mapped back to themselves on a one-to-one relationship and graphic characters can then be displayed.

Layout

The display mapper is placed in the file immediately following the font plotter. The format of the display mapper is just like the key mapper section with one exception. Instead of a key code being used, a display index is used.

Designing Your Own Font

To make sure you understand the three sections of the ALTCHAR .SYS file, let's go through the motions of creating the example ALTCHAR.SYS file.

The first thing we need to do is set up the keyboard mapper for the HELP (95) and "?" (3F) keys. We then need to map the DELETE (7F) key to the BACKSPACE (08) key. The following 6 bytes do that for us:

```
95  3F  7F  08  FF  FF
```

The two consecutive FF bytes mark the end of the keyboard mapper section. It is important to remember that if you are not mapping the keyboard, you still put in the two FF bytes. This is necessary to tell the computer that this is the end of the keyboard mapper. If this was not done, and you started immediately with the font plotter, the system would read the font plotter as a keyboard mapper. It would be confusing to say the least.

The next thing we need to do is change the vertical bar (|) to an upward pointing arrow, and the tilde (~) to a copyright mark. Below is the result of the drawing on the graph paper.

The numbers to the right of each of the characters we have made is the hexadecimal value of each line of the character.

Now, using this information we will change the font plotter to draw these characters instead of the ones normally displayed. The data string to do all this would look like this: (hex values)

```
5C 18 5A 99 18 18 18 18 00 5E 3D 42 BD A1 A5 99 42 3C 00 FF
```

The 5C hex value is the display index of the ASCII vertical bar character. The next 9 bytes are the actual values which are plotted on the screen for this character. These are the values along side the figure above. 5E is the hex value of the display index for the ASCII tilde. The next 9 bytes are the bytes which are plotted on the screen for the copyright emblem. The last byte, the FF, is the terminator for the font plotter. This byte tells the system that this is the end of the font plotter section.

```
----------     ----------
|00011000| 18  |00111100| 3D
|01011010| 5A  |01000010| 42
|10011001| 99  |10111101| BD
|00011000| 18  |10100001| A1
|00011000| 18  |10100101| A5
|00011000| 18  |10011001| 99
|00011000| 18  |01000010| 42
|00011000| 18  |00111100| 3C
|00000000| 00  |00000000| 00
----------     ----------
```

The last thing we need to do is enable the graphics diagonal bar by using the display mapper. This will allow the diagonal bar to be used on the screen. The values needed for this are:

```
78  78  FF  FF
```

This simply maps the index of 78 back to the index of 78. Now whenever graphics mode is enabled, the diagonal bar can be used.

Let's see if you have been able to follow along. The sample file in Figure 1 is a complete file made up of all the features I have described. Use it as a starting point for your own file to add to, or change what I have already done.

As a recap, we have mapped the DELETE key to the BACKSPACE, and the HELP key to the QUESTION MARK. The ASCII vertical bar (|) is changed to an upward pointing arrow and the tilde (~) is changed to a copyright emblem. The last part of the file maps the graphic diagonal bar back to itself so that it can be used.

Now that you understand how the altchar file works, you should design your own font in order to fully understand the flexibility of this feature. Since the ALTCHAR.SYS file is a binary file, you will not be able to use a standard editor, such as PIE or EDLIN. One method of brute forcing the data in is to use Debug under Z-DOS or DDT under CP/M-85 and enter your own data.

To see how to make these these changes with Debug, look at Figure 2, which is a sample run of the installation using Debug under Z-DOS. Installation would be the same under CP/M-85, except you would need to use DDT.

The second way is to write your own program to do this for you, if you like to 'roll your own' as I do. For you programmers out there, all it takes is 9X9 array to carry the bit patterns and to allow you to enter your data for the font plotter.

The last way is the way to go if you are not a programmer or are in a hurry. There are several font editor programs already available that let you easily enter your new information and save it as a new altchar file.

Since I began writing this MSDOS 2.X has been released. It includes a Font editor called "FONT.EXE" appropriately enough. It will help you redefine your character sets, and remap any of the

keys on the keyboard just as I have described. However, even if you use this excellent editor, it is nice to understand what is really going on when you change your character sets.

Whichever way you choose to go, the first thing to do is to turn the computer off, sit down at a table with a pad of graph paper, and design the layout of your new characters.

You will have to decide how each character will look and which character on the keyboard it will replace. If you are mapping the keyboard, similar decisions must still be made. You must decide which key or keys you wish to map, the different values for those keys (available in the appendix of the Z-100 Users Manual), and the values you want the key or keys to be.

The operation of the ALTCHAR file is another of the many features which help to consistently make the Z-100 one of the most flexible computers on the market. It provides additional flexibility for use in specialty areas such as math, science, and languages. And most importantly, it can be done by you, the user of the computer.

```
DEBUG  version 1.00
>E100
0BCA:0100  C1.95  9F.3F  3B.7F  2B.08  CB.FF  49.FF  74 5C  07.18
0BCA:0108  8B 5A  FB.99  8B.18  F3.18  46.18  F3.18  A4 18  07 00
0BCA:0110  FF 5E  0E.3D  E8.42  2E.BD  E8.A1  13.A5  4C.99  F8.42
0BCA:0118  C3.3C  B0.00  0B.FF  E8.78  C4.78  C4.FF  F9.FF

(Now we set the CX register to the number of bytes we want to save)
>rcx
CX 0000
:1f

(Name the file to save it in )
>n test.chr
(Write the file to disk
>w
Writing 001F bytes
(Leave Debug)
>q

A>
```

Figure 2

Figure 1

```
d100
0BCA:0100  95 3F 7F 08 FF FF 5C 18-5A 99 18 18 18 18 18 00   .?....±.Z.......
0BCA:0110  5E 3D 42 BD A1 A5 99 42-3C 00 FF 78 78 FF FF 72   ²=B=!%.B<..xx..r
0BCA:0120  61 6C 6C 65 6C 29 0D 0A-42 2E 20 51 55 4D 45 20   allel)..B. QUME
0BCA:0130  53 70 72 69 6E 74 20 31-31 2F 4D 58 2D 38 30 20   Sprint 11/MX-80
0BCA:0140  53 65 72 69 61 6C 20 28-53 65 72 69 61 6C 20 41   Serial (Serial A
0BCA:0150  28 4A 31 29 2C 20 34 38-30 30 20 62 61 75 64 2C   (J1), 4800 baud,
0BCA:0160  20 44 54 52 20 50 6F 73-2E 20 28 70 69 6E 20 32    DTR Pos. (pin 2
0BCA:0170  30 29 29 0D 0A 43 2E 20-48 2F 5A 2D 32 35 20 28   0))..C. H/Z-25 (
>
```


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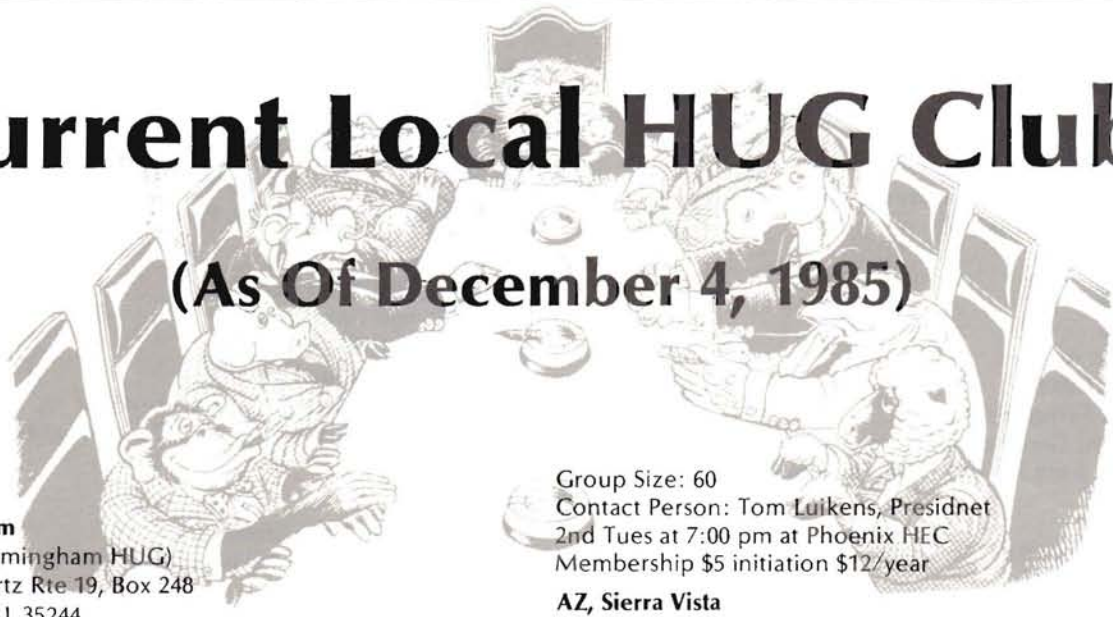

Alabama

AL, Birmingham
BEARHUG (Birmingham HUG)
C/O Jack Goertz Rte 19, Box 248
Birmingham, AL 35244
(205) 991-5519 Group Size: 20
Contact Person: Jack Goertz
Meeting time and place varies

AL, Huntsville
Club no longer in existence

AL, Mobile
MOBHUG (Mobile HUG)
354 Teakwood Drive
Satsuma, AL 36572
(205) 675-9742 Group Size: 20+
Contact Person: Bob Small
Meeting time and place varies

AL, Montgomery
HUG of Montgomery
2948 Willow Lane Drive
Montgomery, AL 36109
(205) 272-6964 Group Size: 50+
Contact Person: Ronald Travis
Meet 1st Tues 7:30 pm at AF Logs Mgt Ctr

Alaska

AK, Eagle River
Alaska HUG
PO Box 770951
Eagle River, AK 99577
(907) 276-5917 Group Size: 15
Contact Person: Roger Pickels or Ben Sevier
Meet 3rd Mon 7:00pm Grandview Baptist Church
RBBS 9pm-9am Pac Time (907) 276-5917

AK, Ft. Greely
Club no longer in existence

Arizona

AZ, Phoenix
PHUG (Phoenix HUG)
c/o Tom Luikens PO Box 37783
Phoenix, AZ 85069
Group Size: 60
Contact Person: Tom Luikens, Presidnet
2nd Tues at 7:00 pm at Phoenix HEC
Membership $5 initiation $12/year

AZ, Sierra Vista
HuacHUGa
1964 Viola Dr c/o Gerald King
Sierra Vista, AZ 85635
(602) 459-2119 Group Size: 30
Contact Person: Gerald King
Meet monthly at homes of members

AZ, Sun City
Sun Cities HUG
12739 Mesa Verde Drive
Sun City West, AZ 85375
(602) 584-9181 Group Size: 12+
Contact Person: Andrew Weilkeiwicz
Meet at 1st Fed Savings and Loan Meeting Room
Meet 3rd Fri at 1:00pm La Ronde Ctr

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SUNHUG (Tucson HUG)
7109 E Broadway
Tucson, AZ 85710
(602) 325-0096 Group Size: 40
Contact Person: Allan Anderson
Meet even months first Sunday 2:00 pm Tucson HEC
Meet odd months first Tues. 7:00

Arkansas

AR, Fayetteville
TRY-STATE HUG
2617 Country Way
Fayetteville, AR 72701
(501) 521-4818
Contact Person: Gil Hoellerich
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Little Rock H/ZUG
c/o David Schade 113 Dakota
Jacksonville, AR 72076
(501) 988-5273 Group Size: 30
Contact Person: David Schade
Meet 2nd Sat 12:00 noon at AR College of Tech.
Phone for Fri meeting time & place

California

CA, Anaheim
Anaheim Chptr Wstrn Rgnl HUG
330 E. Ball Road
Anaheim, CA 92805
(714) 529-7535 Group Size: 103
Contact Person: Al Solomon, President
3rd Thursday 7:30 PM at HEC
BB (714) 774-7860

CA, Campbell
San Jose HUG
2350 S. Bascom Avenue
Campbell, CA 95008
(408) 377-8472 Group Size: 70
Contact Person: Gerlene York, Sec.
Meet 1st Wed. from 7-8 PM at the Campbell HEC

CA, El Cerrito
ECHUG (El Cerrito HUG)
6000 Potrero Avenue
El Cerrito, CA 94530
(415) 236-8870
Contact Person: Alan Biocca
Meet 4th Tues

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ETUG (ET/ETA 3400 Users Group)
Club reorganizing as of 9/85

CA, Fresno
FresHUG (Fresno HUG)
4833 East Santa Ana
Fresno, CA 93726
(209) 291-6258 Group Size: 12
Contact Person: Harlen Collins

CA, Glendora
Southern CA H11 Users Group
430 W. Highland Avenue
Redlands, CA 92373
(714) 886-4766 Group Size: 40
Contact Person: Dr. M.J. Di Girolamo
Meets at 625 E. Palm, Glendora, CA

CA, Lancaster
AVZUG (Antelope Valley ZUG)
PO Box 4529
Lancaster, CA 93535
(805) 942-7576 Group Size: 25
Contact Person: Jerry Jones
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CA, Los Angeles
Los Angeles HUG
c/o Jim Price 12849 Millbank St.
Studio City, CA 91604-1354
(213) 675-4920 Group Size: 90
Contact Person: Doug Biddle, President
1st Thursday 7:00 PM at HEC

CA, Los Angeles
LAETUG (Los Angeles ET3400 GP)
2309 S Flower
Los Angeles, CA 90007
(213) 749-0261
Contact Person: Gilbert Murillo
Other contact Charlie at (213) 443-2237
Contact for meeting time and place

CA, Monterey
Naval Pstgrd Sch Hobby Com Clb
c/o Dave Smith 376 Bergin Dr #F
Monterey, CA 93940
(408) 373-4202 Group Size: 175
Contact Person: Dave Smith, President

CA, Pomona
Pomona Chptr Wstrn Rgnl HUG
1555 N Orange Grove Avenue
Pomona, CA 91767
(714) 985-5303 Group Size: 102
Contact Person: Herb Friedman, President
Meet 4th Thursday each month at 7:30p.m. at HEC
BB (714) 624-5191

CA, Redding
Redding Heath Users' Group
22526 Bridlewood Lane PO BOX 370
Palo Cedro, CA 96073
(916) 547-3461 Group Size: 6
Contact Person: Dave Ballard
Meet monthly various locations

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BAHUG Bay Area HUG
2001 Middlefield Road
Redwood City, CA 94063
(415) 365-8155 Group Size: 219+
Contact Person: Bob Bance, Sec.
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Club No Longer In Existence

CA, Sacramento
SHUG (Sacramento HUG)
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Sacramento, CA 95820
(916) 739-8074 Group Size: 55
Contact Person: Delven Hamric, President
Meet 2nd Wed 7:30pm at Sacramento HEC
Send mail ATTN: Delven Hamric

CA, San Diego
San Diego HUG
PO Box 33046
San Diego, CA 92103
(619) 484-5120 Group Size: 170
Contact Person: Clem Pepper
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San Diego Comp Soc H/Z SIG
PO Box 81444
San Diego, CA 92138
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Contact Person: Jon Melby, Chairperson
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24hr. RC System (619) 461-5117

CA, San Rafael
Bay Area Zenith Users' Group
4 G Street

San Rafael, CA 94901
(415) 454-2445 Group Size: 25+
Contact Person:
Meet 3rd Thurs 7:30 pm at above address
BB (415) 454-2446

CA, Santa Maria
4168 Glenview Drive
Santa Maria, CA 93455
(805) 937-6938 Group Size: 24
Contact Person: Raymond S. Isenson
Meet 1st Mon 7:00 pm at Vandenburg Air Force Base
Meet in Base Library

CA, Santee
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CA, Visalia
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Meeting time and place not on regular schedule

CA, Woodland Hills
LUVAHUG
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Woodland Hills, CA 91364
(818) 906-7425 Group Size: 80
Contact Person: Rick Gaitley
Meet 2nd Thurs. 7:00 pm at HEC

Colorado

CO, Colorado Springs
CSHUG (Colorado Springs HUG)
c/o Innovative Computer Service
125 E Arvada St Colorado Spg,CO 80906
(303) 632-3019
Contact Person: Richard Evers
Group is reforming - meeting times not set
24hr BB (303) 598-4662

CO, Denver
DENHUG (Denver HUG)
PO Box 449 Contract Station 22
Denver, CO 80221
(303) 426-7404 Group Size: 160
Contact Person: Bob Eson Sec/Tres
BB (303) 423-3224 24hrs Support newsltr exchange
Meet 2nd Monday 7:00 pm at HEC

CO, Denver
Club no longer in existence

CO, Ft. Collins
FT.HUG (Fort Collins HUG)
3317 Buckskin Trail
Laporte, CO 80535
(303) 493-2987 Group Size: 30+
Contact Person: Charles McJilton
Meet 3rd Tue 7:00 pm at members homes
$6.00 dues, Newsletter

Connecticut

CT, Avon
CONNHUG (Connecticut HUG)
c/o Bob Conlon 71 Pardee
Bristol, CT 06010
(203) 589-3824 Group Size: 50+
Contact Person: Bob Conlon, President
Meet at Greater Hartford Chapter Amer. Red Cross
Meet 1st Wed at 7:00 pm

CT, Mystic
Mystic ZDS/HUG
PO Box 279
Mystic, CT 06355
(203) 536-6953 Group Size: 45
Contact Person: Larry Moxon
Meet last Thurs 7:00pm at 11 Allen St. Mystic, CT

Florida

FL, Cocoa Beach
Brevard Heath Users' Group
Club no longer in existence

FL, Fort Myers
SWFHUG (Southwest Florida HUG)
PO Box 05-0037
Tice, FL 33905
(813) 334-6190 Group Size: 30
Contact Person: Robert Sloat
Meet 2nd Wed 8:00 pm
Meet at J. Hamilton Welch Academy

FL, Fort Walton
NWFHUG (NorthWest Florida HUG)
PO Box 3275
Ft. Walton Beach, FL 32548
(904) 682-6013 Group Size: 45
Contact Person: Allan White, President
Meetings 2nd Wed at DATATEC Inc. 7 PM

FL, Jacksonville
Jacksonville Users Group Inc.
PO Box 17547
Jacksonville, FL 32245-7457
(904) 264-9763 Group Size: 150
Contact Person: Harry Walker
Meet 1st Wed at 7:30 pm at Englewood HS Library
BB (904) 725-4995 24 hrs

FL, Miami
Miami Amateur Computer Club
c/o Heathkit Electronics Center
4705 W 16th Ave Hialeah, FL 33012
(305) 823-2280 Group Size: 85
Contact Person: Charlie Robertson, Secretary
Meet 2nd Thurs each month 7:00 pm at HEC
BB (305) 823-2281

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HyperACCESS gives you tremendous power—power that lets you communicate without getting technical—power that lets you glide through applications other programs can't touch.

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Z-100 Version fully supports Gemini and EasyPC Boards

† Hilgraeve and its dealers will continue to sell ACCESS, as well.

HyperACCESS and ACCESS are trademarks of Hilgraeve Inc.

* Certain programs cannot be operated remotely.

FL, Orlando
HUG of Central FL Computer Sc.
121 Talmeda Trail
Maitland, FL 32751
(305) 644-6847 Group Size: 20
Contact Person: Joseph Walker, President
Meet 4th Wed at Kane Furniture (address below)
Intersection of 436 and Red Bug Road

FL, Pensacola
PENSAHUG
221 E. Government
Pensacola, FL 32501
(904) 438-7805 Group Size: 15
Contact Person: Gerry Harris
Meet 2nd Sun each month 2:00 pm at above address
Meet at Professional Business Sys.

FL, Plantation
PHUG (Plantation HUG)
7173 W Broward Blvd
Plantation, FL 33317
(305) 791-7300 Group Size: 60
Contact Person: Warren Reeves
Meet 2nd Tues from 7-9 pm at H/Z C&E Ctr
BB (305) 791-7302 24 hrs on Z150

FL, Tallahassee
Tally HUG
c/o LPLC PO Box 4276
Tallahassee, FL 32315-4276
(904) 562-1412 Group Size: 10
Contact Person: Bill Hill
Meet 3rd Tues at Leon Co. Resource Center
In the lower level Northwood Mall

FL, Tampa
Al Lynch HUG
PO Box 151762
Tampa, FL 33684-1762
(813) 885-1923 Group Size: 80
Contact Person: Jim Cottingham, Secretary
Meet 1st and 3rd Wed 7:30 pm at Tampa HEC
Dues $10.00 year

Georgia

GA, Atlanta
HUG-GA (Georgia HUG)
c/o HEC 5285 Roswell Road
Atlanta, GA 30342
(404) 449-3328 Group Size: 30
Contact Person: Tom Campbell
Meet 2nd Mon at 7:00 pm at HEC
BB (404) 252-4345 24 hrs.

GA, Warner Robins
MGHUG Middle Georgia H/ZUG
PO Box 1989
Warner Robins, GA 31099-1989
(912) 923-1353 Group Size: 30
Contact Person: Gary H. Arnett, President
Meet 3rd Tues at Nola Brantley Public Library

GA, Augusta
CSRA Computer Club
PO Box 284
Augusta, GA 30903
(803) 648-3603 Group Size: 10
Contact Person: Dave Howard
Meet 4th Wed-location rotates
BB (803) 279-5392

Hawaii

HI, Hilo
BIHUG (Big Island HUG)
P.O. Box 4271
Hilo, HI 96720
(808) 959-8985 Group Size: 20
Contact Person: R.A. Curtis
Meet 1st Thurs 7:00 pm at HELCO Conference Room
BB (808) 961-4818

HI, Honolulu
HUGH (HUG Hawaii)
1255 Nuuanu Avenue # 1405
Hononlulu, HI 96817
(808) 531-8843 Group Size: 107
Contact Person: Jim Branchaud, President
Meet 3rd Wed 7:00 pm at Pearl City HEC
BB (808) 487-8755

Illinois

IL, Champaign
CCCC Champaign County Cmp Club
1004 Kinch
Urbana, IL 61801
217 344-2178 Group Size 150
Contact Person: Jim Mullen
Meet 1st Wed 7:30 pm at Urbana Civic Center
24hr Public Service BB 217 359-9090

IL, Chicago
CHI-HUG (Chicago HUG)
c/o Heathkit Electronics Center
3466 W Devon Chicago, IL 60645
(312) 674-2491 Group Size: 20
Contact Person: Hank LaBarbara, President
Meet 2nd Thurs 7:30pm at Chicago HEC
BB (312) 679-8980 after store hours

IL, Davis
NI-HUG Northern IL HUG
427 Lockwood Rt 1
Davis, IL 61019
(815) 248-2241
Contact Person: Jim Isenhart
Just starting

IL, Downers Grove
I-HUG (Illinois HUG)
6116 Lane
Downers Grove, IL 60516
(312) 971-1660 Group Size: 15
Contact Person: Len Bateman
3rd Wednesday at various locations

IL, Downers Grove
HUG Metro (Local Chicago)
124 Arlington Road
Barrington, IL 60010

(312) 358-6293 Group Size: 40
Contact Person: Marvin Gino, Secretary
Meet 2nd Monday of each Month 7:30pm at HEC

IL, Peoria
CIHUG (Central Illinois HUG)
2422 Willow
Pekin, IL 61554
(309) 347-3366 Group Size: 18
Contact Person: John Cole, Jr.
3rd Sunday at 3 PM (Jan, Mar, May, Jul, etc.)

IL, Springfield
Springfield HUG
2621 S. College
Springfield, IL 62704
(217) 525-1878 Group Size: 12
Contact Person: Jim or Bobbie Suttie
Club just forming

Indiana

IN, Indianapolis
Indiana HUG (IHUG)
11425 Lakeshore Dr West
Carmel, IN 46032
(317) 852-3530 Group Size: 75+
Contact Person: Charles C. Hillman Jr.
Meet 2nd Wed 7:30pm at HEC

IN, South Bend
MIHUG (Michiana HUG)
51061 US 31 North
South Bend, IN 46637
(219) 255-3923 Group Size: 10
Contact Person: Mark L. Meidel
Meet 3rd Monday 7:30 pm

Iowa

IA, Ames
Ames HUG
5006 Todd Dr c/o George Covert
Ames, IA 50010
(515) 292-1231 Group Size: 40+
Contact Person: George F. Covert
Meet 1st Wed 7:00pm Will exchange Newsletters
Meet in room 204 Eng Anx Bldg at ISU

IA, Des Moines
DMA HUG (Des Moines Area HUG)
10275 NE 23rd Avenue
Mitchellville, IA 50169
(515) 967-6042 Group Size: 21
Contact Person: Harold Dykens
Meet third Mon each month 7:00 pm

Kansas

KS, Mission
MUG (Mission Users' Group)
5960 Lamar Avenue
Mission, KS 66202
(913) 381-5470 Group Size: 80+
Contact Person: Jerry Royse, Sec/Treas
Meet last Sun of the month 2:00pm at Mission HEC
BB (913) 362-9583 and Newsletter

KS, Wichita
Wichita HUG
c/o Joe Cross 1029 Burrus
Wichita, KS 67207
(316) 794-2698 Group Size: 30
Contact Person: Don Robinson
Meet 2nd Thurs at 7:00 pm at Wichita St Univ
Meet in Clinton Hall Room 326

Kentucky

KY, Louisville
LHUG (Louisville HUG)
6802 Crossmoor Lane
Louisville, KY 40222
(502) 426-9433
Contact Person: Ray Donner
Meet last Sun at 8:00pm at Louisville HEC

Louisiana

LA, Baton Rouge
LSU H/Z Users' Group
Dept of Chem Eng LA State Univ
Baton Rouge, LA 70803
(504) 388-1426 Group Size: 40
Contact Person: Danny Reible, President
Meet 2nd Wed at 4:00pm Ctr for Eng & Bus Admin
$5.00 dues/yr

LA, Lafayette
ZUG (Zenith Users' Group)
318 W. St. Mary Blvd
Lafayette, LA 70506
(318) 948-7804 Group Size: 40
Contact Person: Tommy Billiodeaux
Meet every other Tues 6:00 pm
Meet at Zenith Computer Depot

LA, New Orleans
NOHUG
1900 Veterans Blvd.
Kenner, LA 70062
(504) 467-6321 Group Size: 80
Contact Person: John Ligda
Meet 3rd Wed at 7:30 pm at HEC

LA, Shreveport
SHRUG Shreveport Heath Regional Users' Group
c/o Colvin L Sammons POB 752
Barksdale AFB, LA 71110
(318) 742-8552 Group Size: 31
Contact Person: Colvin L. Sammons
Meet 3rd Wed 7:00 pm at Shreveport-Bossier Votech

Maryland

MD, Baltimore
Baltimore HUG
c/o Heathkit Electronics Center
1713 E Joppa Rd Baltimore, MD 21234

Group Size: 50
Contact Person: James Kratzer
2nd Mon 7:00 pm at Park School - Old Court Road
May also meet at the Heathkit Center

MD, Rockville
MD Z100 Special Interest Group
c/o HEC 5542 Nicholson Lane
Rockville, MD 20852
(301) 384-1040
Contact Person: Jerry Horwitz
Meet 1st Mon at 7:30pm at Rockville HEC
This club is a sub-unit of CHUG

Massachusetts

MA, Northampton
Hampshire Computer Club
37 Drewson Drive
Northampton, MA 01060
(617) 584-6227 Group Size: 80
Contact Person: George Scheurer
2nd Tuesday 7 PM at McConnel Hall Smith College
Beginners Group 1st Tuesday

MA, Peabody
HUG North Shore
12 Stanley Road
Lynnfield, MA 02940
(617) 334-5128 Group Size: 60
Contact Person: Ernest Bay, President
Meet 2nd Wed at Peabody Heathkit Center
BB (617) 531-9332 24hrs

MA, Pittsfield
BerCHUG (Berkshire County HUG)
Box 1985
Pittsfield, MA 01202
(413) 499-2903 Group Size: 12
Contact Person: Paul E. Ouellette, President
Meeting place and time vary
Evening phone number (413) 443-1862

MA, Wellesley
HUG'EM
165 Worcester Ave
Wellesley, MA 02181
(617) 237-1510 Group Size: 200
Contact Person: Malcolm Partridge, Director
3rd Wed 7:00 p.m. at HEC
BB (617) 237-1511 24hrs

Michigan

MI, Ann Arbor
A-SQR-HUG
895 Starwick Drive
Ann Arbor, MI 48105
(313) 769-6052 Group Size: 15+
Contact Person: Leonard E Geisler
Meet last Mon 7-9:30 pm Jun-Aug Ann Arbor Pub Lbr
Meet Sep-May at Northside School

MI, Detroit
Metro Detroit Area HUG
35681 Hees
Livonia, MI 48150
(313) 427-3905 Group Size: 65+
Contact Person: Neil Coffin-Sec, Tres, Librn
Meet 2nd Sat of alternate months at the 2 HECs
Club meets in the evening

MI, Kalamazoo
SMHUG (Southwest Michigan HUG)
1054 Blanchard SW
Wyoming, MI 49509
(616) 532-3875 Group Size: 20
Contact Person: Bob Hamel
Meet 2nd Sat 10:00am Kalamazoo Val Comm College
Main building Room 4010D

MI, Okemos
H/Z SIG a part of M3G
2283 Knob Hill Drive #12
Okemos, MI 48864
(517) 349-9657 Group Size: 10+
Contact Person: Bill Goodwin
Meet 2nd Wed at 7:30pm
Meet at All Saints Episcopal Church

MI, Saint Joseph
BLHUG (Blossomland HUG)
P.O. Box 414
Saint Joseph, MI 49085
(616) 983-0161 Group Size: 50
Contact Person: Vance A. Fisher, President
1st Tues 7:00 pm at St Joe High Sch Cmptr Classrm
$15.00 dues/yr Monthly Newsletter

Minnesota

MN, St. Paul-Minneapolis
SMUGH
H/Z Computers & Electronics
101 Shady Oak Rd Hopkins, MN 55434
(612) 488-2028 Group Size: 180
Contact Person: Roy Tally, President
Meet last Sun 2:00 pm at Falcon Hgts Comm Ctr
BB (612) 778-1213 24 hrs

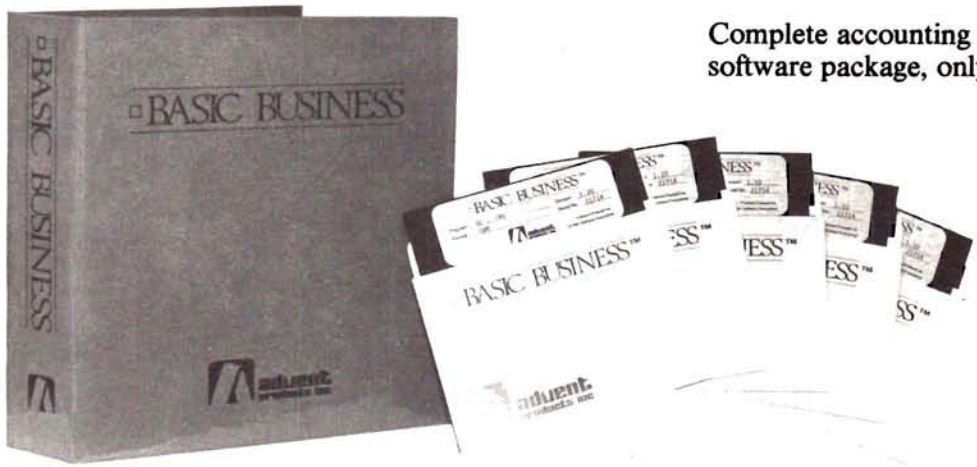
Mississippi

MS, Starkville
Mississippi St University HUG
PO Box 6269
Mississippi State, MS 39762
(601) 325-3050 Group Size: 30
Contact Person: Dr. Harry Cole
Do not meet on a regular basis

Missouri

MO, St. Louis
SLHUG (St. Louis HUG)
3794 McKelvey Road
Bridgeton, MO 63044
(618) 259-8113 Group Size: 140
Contact Person: Brad Pulaski, Treasurer
Meet 2nd Wed 7:30 pm at HEC

TIMELY REPORTS, ACCURATE RECORDS, RELIABLE INFORMATION.....



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Price is nice - and so is a long list of features - but when you choose a software package to automate your accounting, don't lose sight of the basics of good business record keeping. Basic Business is an all-in-one accounting software package consisting of General Ledger, Accounts Receivable, Accounts Payable, Payroll, Inventory Control, Sales Order Processing and Purchase Order Processing. It offers an excellent price and extensive feature list without sacrificing these basic business principles:

Full Audit Trails - to give you complete confidence in the accuracy of your data and provide crucial backup information when you need it. And double entry accounting keeps your books in balance.

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Flexibility - Basic Business can be adapted to your way of doing business, including balance forward or open item accounts receivable, departmental or consolidated general ledger, variable aging periods and easy entry of manually written checks and voids.

Extensive Reporting - each accounting module provides complete reports, including master lists, transactions, journals, statements and forms. In addition, all data files are compatible with Ashton-Tate's dBase II and dBase III, for the ultimate in custom reporting capability.

With some accounting software, even packages costing hundreds of dollars more, you must make detailed estimates and complex calculations for the maximum number of customers, transactions, inventory items, etc., before using the system. Then, when your business grows to exceed these original estimates, you must repeat this process.

Not with Basic Business! All data files are automatically initialized when you install the system on your computer. Files can grow dynamically as your business increases and are usually limited only by the amount of disk storage space available. No need for cumbersome reformatting once you exceed your original estimates.

FORMS ARE NO PROBLEM! Basic Business uses standard forms for invoices, statements, checks, purchase orders, etc., which may be ordered with your company name, address and logo imprinted.

Basic Business is one of a family of accounting and business software packages, and has sold previously for several hundred dollars per module. It has been improved, updated and re-packaged to sell at a market-busting $89.95 for all seven modules. A Point-of-Purchase module, which controls an electronic cash drawer and allows direct entry of transactions from your sales counter is available. Also a dBase file format program is availble for importing Basic Business data files into dBase II/III for custom report generation or other special uses.

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Do you have a distinct accounting problem that off-the-shelf software won't handle? Special forms or statements? Don't write your own accounting system from the ground up - start with Basic Business. Call (714) 630-0446 for all the details on source code licensing.

Basic Business can go to work for you today and is available for most popular MS-DOS (IBM and compatibles) and CP/M-80 personal computers. Compare our price, features and attention to detail. There is only one choice . . . it's Basic Business.

Basic Business	**$89.95**
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dBase II/III file formats	**$19.95**

All items are warranteed for 90 days. 30 day money back guarantee if not completely satisfied and diskette package is not opened. MasterCard and VISA are welcome. Please add $2.50 for shipping. California residents please add 6% sales tax. Prices, availability and specifications subject to change without notice.

Minimum hardware required for MS-DOS: 128K memory, two 360K floppy disk drives (hard disk recommended for Sales and Purchase Order Processing), 132 column printer, MS-DOS (or PC-DOS) version 2.0.

Minimum Hardware Required for CP/M-80 computers: 80 x 24 character display terminal, 64K memory, two 360K disk drives (hard disk recommended for Sales and Purchase Order Processing), 132 column printer.

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3154-F E. La Palma Ave.
Anaheim, CA 92806

Nebraska

NE, Omaha
OMAHUG (Omaha HUG)
PO Box 777
Bellevue, NE 68005
(402) 291-4676 Group Size: 100
Contact Person: Robert Wasilewski, President
3rd Sun odd mos. 6:30 Bellevue W HS or Offutt AFB
Meet even mos Amer Red Cross 6:30 pm

New Hampshire

NH, Amherst
HUG of New Hampshire
61 Stearns Road
Amherst, NH 03031
(603) 673-6040 Group Size: 23
Contact Person: Dean Hayden-Macy
Meet 2nd Mon 7:30 pm at Systematic Solutions Inc.
BB (603) 673-7366 also (603) 465-2280

New Jersey

NJ, Fairlawn
HUGNJ (HUG of New Jersey)
C/O AMBI-TECH 319 Knickerbocker
Hillsdale, NJ 07642
(201) 666-0504 Group Size: 155
Contact Person: Matt Baum
BB (201) 791-6936 evenings
3rd Monday 8:00pm at HEC

NJ, Ocean
SHUG (Shore HUG)
1013 State Hwy 35
Ocean, NJ 07712
(201) 775-1231 Group Size: 71
Contact Person: James J Jones Jr. (Sec)
Meet 1st Wed 7:30 p.m. at Ocean HEC
BB (201) 775-8705 24hrs.

New Mexico

NM, Albuquerque
Albuquerque HUG
1200 Madeira Drive, S.E. #126
Albuquerque, NM 87108
(505) 266-0677 Group Size: 25+
Contact Person: Jim Pattee, President
Meet 3rd Sun., 7:00 PM at Que Pasa Rec. Center,
Kirtland AFB. Newsletter, 24hr. BB (505) 292-6770

New York

NY, APO New York
BWHUG (Bentwaters HUG)
PSC Box 3703 RAF Bentwaters
APO New York, NY 09755
Group Size: 6
Contact Person: TSGT Rodney Jones
Phone Autouon 225-2161 or Saxmundham 3519

NY, APO New York
BAHUG (Bad Aibling HUG)
UNIT AA Box 561
APO New York, NY 09098
Group Size: 10
Contact Person: Louis J. DeMichele
Phone 08061-4519/6340 West Germany

NY, Buffalo
BUG (Buffalo Users Group)
223 Clark Road
Kenmore, NY 14223
Group Size: 75
Contact Person: Bob Allen
Meet 3rd Tues 7:00 pm at Amherst HEC
Club doesn't meet July, Aug or Dec

NY, Long Island
Jeri-HUG (Jericho HUG)
5 Helen Place
Glen Cove, NY 11542
(516) 676-5616 Group Size: 75
Contact Person: Alan Scott Dodge, Sec./Tres.
Meet 2nd Thurs at 8:00 pm at the Jericho HEC
Newsletter, Software library, BB

NY, North White Plains
North White Plains HUG
c/o HEC 7 Reservoir Road
North White Plains, NY 10603
(914) 761-7690 Group Size: 50
Contact Person: Ed Koch
Meet 2nd Tues. ea mo 7:30 pm at HEC

NY, Potsdam
CUHUG (Clarkson University)
Attention: Educational Computing
Clarkson University
Potsdam, NY 13676
(315) 268-6455 Group Size: 60
Contact Person: William Kaster
Meet monthly-call for date, time and place
Alternate Contact Person: Donna Lee

NY, Rochester
RH/ZUG (Rochester H/ZUG)
937 Jefferson Road
Rochester, NY 14623
(716) 424-2560 Group Size: 55
Contact Person: RHUG Editor, Blanche Nail
Meet last Tuesday each month 7:30 pm at HEC
BB (716) 424-2576

NY, Schenectady
Schenectady HUG
c/o T. Budge 715 Sanders Ave.
Scotia, NY 12302
(518) 377-4273 Group Size: 20
Contact Person: Walter Whipple
Meet 3rd Wed 7:30 pm at above address

NY, Syracuse
SYRHUG (Syracuse HUG)
c/o Garrett Voss Box 6
Oran, NY 13125
(315) 682-5113 Group Size: 18
Contact Person: Garrett Voss
Meet 1st Wed at 7:00 pm
24 hr BB (315) 682-6912

North Carolina

NC, Charlotte
HUG Charlotte
4415 Emory Lane
Charlotte, NC 28211
(704) 364-9667 Group Size: 25
Contact Person: Mike Lafleur
Meet 1st Tues at 7:30 pm

NC, Fayetteville
Club no longer in existence

NC, Glen Alpine
Western Piedmont HUG
Rt 2, Box 371
Morganton, NC 28655
(704) 584-3684 Group Size: 10
Contact Person: Bill Poteat
Meeting time and place varies
Will have BB

NC, Greensboro
Carolina HUG
2711 Azalea Drive
Greensboro, NC 27407
(919) 855-5188 Group Size: 40
Contact Person: Graham Andrews
Meet 3rd Thurs at 7:30 pm at Greensboro HEC
BB (919) 292-5392 after hours

NC, Hillsborough
HUG-RTP
Rt 3, Box 39A
Hillsborough, NC 27278
Contact Person: Joe Williams
Meeting place and time unknown

Ohio

OH, Cincinnati
Cincinnati HUG
10133 Springfield Pike
Woodlawn, OH 45215
(513) 771-8850 Group Size: 90
Contact Person: President
2nd Tuesday 7:00 pm at HEC, $10.00 dues/year
Newsletter, 24hr BB (513) 772-6190

OH, Cleveland
NOHUG (Northeastern Ohio HUG)
7838 Valley Villas Dr.
Parma, OH 44130
(216) 845-6752 Group Size: 54
Contact Person: Don Danko, Sec.
Meet 2nd & 4th Thurs 7pm at St. Gregorys Church

OH, Cleveland
Cleveland HUG
28100 Chagrin Blvd
Cleveland, OH 44122
(216) 291-0698 Group Size: 30
Contact Person: Kent Currie
First Thurs 7:00 p.m. at HEC
BB (216) 292-7554 Non-store hrs only

OH, Columbus
Columbus HUG
2095 Milden Road
Columbus, OH 43221
(614) 457-0419 Group Size: 40
Contact Person: Jay Eikes
Meet 2nd Tues at HEC
BB (614) 475-7201 after store hours

OH, Dayton
Dayton HUG
1670 N Laddie Ct
Beaver Creek, OH 45432
(513) 426-5014 Group Size: 160
Contact Person: George Elwood
Meet 1st Thurs 4:00 pm for H8/89 users
Meet 3rd Thurs for H/Z100 users 4:15

OH, Toledo
THUG (Toledo HUG)
48 S. Byrne Road
Toledo, OH 43615
(419) 729-4621 Group Size: 300
Contact Person: Ryck Zarich
Meet last Sunday of the month at 7:00 p.m at HEC
BB (419) 537-1888 24hrs also 729-4221

OH, Youngstown
YOU-HUG
1502 S. Raccoon Road
Youngstown, OH 44515
(216) 799-5028 Group Size: 12
Contact Person: Mario DeSantis
Club just getting started

Oklahoma

OK, Oklahoma City
OKC TUGS
c/o Bill Cadwallader PO Box 1171
Lawton, OK 73502
(405) 848-7593 Group Size: 40
Contact Person: Bill Cadwallader
Meet 3rd Thurs 7:30 pm at HEC
BBS (405) 848-9329 24 hours

OK, Tulsa
Tulsa HUG
23 Glenwood Estates
Claremore, OK 74017
Group Size: 5
Contact Person: Christian Kessler
Meet 2nd Tues at members homes
Club just starting - No dues

Oregon

OR, Salem
SHUG Salem Heath Users' Group
PO Box 13434
Salem, OR 97309
(503) 393-0786 Group Size: 21
Contact Person: Ken Hiigel
Meet 2nd Tues each month
Contact Ken Hiigel for location

Pennsylvania

PA, Allentown
Lehigh Valley HUG
c/o Bob Kendi Cpt Ctr Lehigh Un
Mart Library 8-B Bethlehem, PA 18015
(215) 770-5993 Group Size: 30
Contact Person: James Batug
2nd contact Bob Kendi (215) 861-3992
Meet 2nd Sat at Lehigh University

PA, Frazer
FUG (Frazer Users Group)
4631 Pine St G-101
Philadelphia, PA 19143
(215) 748-1439 Group Size: 80
Contact Person: Colin McGowan, President
Meet 1st Wed 7:00 pm at Frazer H/Z C&E Ctr
BB (215) 644-7661

PA, Harrisburg
CPaHUG (Cent Pennsylvania HUG)
7540 Mourningstar Dr. c/o Ernest Asper
Harrisburg, PA 17112
(717) 545-2764 Group Size: 7
Contact Person: Ernest E. Asper
Meeting time & place varies
Club just getting started

PA, Philadelphia
Philadelphia Heath Users'Group
6318 Roosevelt Blvd
Philadelphia, PA 19149
(215) 748-1439 Group Size: 75
Contact Person: Colin C. McGowan
Meet 2nd Wed. each month 7:30 p.m. at HEC
RBBS (phone # to be announced)

PA, Pittsburgh
Pittsburgh HUG
3482 William Penn Highway
Pittsburgh, PA 15235
(412) 882-5932 Group Size: 35
Contact Person: Bill Pridemore, President
Meet 3rd Tues at 7:00 pm at HEC
Newsletter

Rhode Island

RI, Warwick
HUG-'RI' (HUG of Rhode Island)
558 Greenwich Avenue
Warwick, RI 02886
(401) 738-5150 Group Size: 150
Contact Person: Dave Haskell or Bill Rothman
2nd Wed 8:00 pm at HEC

South Carolina

SC, Anderson
Anderson HUG
401 Tiffany Drive Regency Park
Anderson, SC 29621
(803) 225-0084 Group Size: 8
Contact Person: John R. Miller
Meet 2nd Thurs 7:30 pm, place varies
Club just starting

South Dakota

SD, Sioux Falls
Sioux Falls Area HUG
2001 S Spring Avenue
Sioux Falls, SD 57105-2820
(605) 336-8629 Group Size: 20
Contact Person: Lorin Dobson
Meet once a month on Sat-time and place varies
BB (605) 336-3935 24 hrs

Tennessee

TN, Knoxville
ETCHUG East Tenn Central HUG
7608 Luscombe Dr
Knoxville, TN 37919
(615) 690-3864 Group Size: 20
Contact Person: Walter M. Scott III
Meet 3rd Thurs 7:30 pm
Meet at John XXIII Center

TN, Memphis
Memphis HUG
6874 Kirby Brooks Drive
Memphis, TN 38115
(901) 362-8860 Group Size: 16
Contact Person: Morris Proctor
Meet 2nd Tues 7:00 pm at The Computer Center

TN, Nashville
Mi Te HUG (Middle Tenn HUG)
c/o Radio Ser Ctr 116 17th Ave S
Nashville, TN 37203
(615) 242-0556
Contact Person: Charlie Wolf
Meet 2nd Monday 6:30 pm at Radio Service Center

Texas

TX, Austin
AHUG Austin Heath Users Group
4206 Tamarack Trail
Austin, TX 78727
(512) 255-0376 Group Size: 60
Contact Person: George Koehler
Meet 1st Thurs 8:00pm Univ. of TX $10.00/yr dues
Meet at Robert Lee Moore Hall

TX, Dallas
DFW HUG (Dallas-Fort Worth)
2715 Ross Avenue
Dallas, TX 75201
(214) 826-4053 Group Size: 70
Contact Person: Henry Gardiner, President
1st Thursday and 15 days later (Wed.) at 7:30 PM
At HEC BB (214) 742-1380

TX, El Paso
EPHUG
5436 Van Horn
El Paso, TX 79904
(915) 821-3488 Group Size: 30+
Contact Person: Rick Peterson
Meet 3rd Wed. 7:00 pm 444 Executive Ctr Blvd
Suite 100 24hr BB (915) 821-3638

TX, Ft. Worth
FWHUG
6825A Greenoakes Road
Ft. Worth, TX 76116
(817) 737-8822 Group Size: 60
Contact Person: Kent Young
Meet 4th Thurs 7:30 pm at HEC

TX, Houston
HUG-H
7798 Braniff
Houston, TX 77061
(713) 644-5689 Group Size: 75
Contact Person: Tom McCormick, President

TX, Houston
NHHUG (North Houston HUG)
20207 Cotton Glade
Humble, TX 77338
Group Size: 50+
Contact Person: Barbara Gabner, Secretary
Meet 3rd Tues 7:30 at HEC
24 hour BB (713) 583-1287

TX, San Antonio
San Antonio (SAHUG)
7111 Blanco Road
San Antonio, TX 78216
(512) 341-8876 Group Size: 65
Contact Person: Tom Schneider
First Tuesday at HEC, 7:30 PM

TX, Wichita Falls
NORTEX HUG (N. Texas S. Okla)
4510 Allendale Road
Wichita Falls, TX 76310-2102
(817) 691-0814 Group Size: 42
Contact Person: Alan D. Martin
Meet 3rd Sat 9am at MicroEducation Institute
Meet at 4550 Seymour Hwy

Utah

UT, Castle Dale
Castle Mesa Computer Group
670 N 90 E Box 587
Castle Dale, UT 84513
(801) 381-5173 Group Size: 10
Contact Person: Doug Sorensen
Meet 2nd Mon 5:30 pm at above address

UT, Midvale
UHUG (Utah HUG)
58 E. 7200 South
Midvale, UT 84047
(801) 262-8810 Group Size: 130
Contact Person: Wayne Newland
2nd Wednesday 7:00 PM at HEC
BB (801) 566-4551

Virginia

VA, Christiansburg
New River Valley HUG
c/o CCS Data Sta. 8 Roanoke St
Christiansburg, VA 24073
(703) 382-4234 Group Size: 42
Contact Person: Ted Fleshman
Meet 1st Thurs 7:30 pm Christiansburg High School

VA, Fairfax
CHUG (Capital HUG)
PO Box 16406
Alexandria, VA 22215
(703) 780-4516 Group Size: 1000
Contact Person: Larry Sites
Meet 3rd Mon 7:00 pm at Fairfax High School
Large Software Library (150+ disks)

VA, Richmond
RHUG (Richmond HUG)
4302 Smithdeal Avenue
Richmond, VA 23225
(804) 231-6759 Group Size: 20+
Contact Person: Carlos Chafin
Meet 3rd Mon 7:30 pm
Meet at Alpha Audio 2049 W Broad

VA, Virginia Beach
THUG (Tidewater HUG)
1055 Independence Blvd.
Virginia Beach, VA 23455
(804) 467-4783 Group Size: 90
Contact Person: Hank Rogerson
Meet 1st & 3rd Tues 7:30 pm at H/Z C&E

Washington

WA, Bellevue
PNHUG (Pacific Northwest HUG)
14213 SE 52nd Place
Bellevue, WA 98006
(206) 643-6651 Group Size: 250
Contact Person: Barry Dupler
Meet 2nd Thurs odd months Tukwila HEC (both 7:00)
Meet 2nd Mon even months Seattle HEC

WA, Kennewick
Tri-Cities HUG/ZUG
2714 W. John Day
Kennewick, WA 99336
(509) 735-7008 Group Size: 20+
Contact Person: Pete Roberson
Meet 4th Tues 8:00 pm - location varies
2nd Contact John Nelson (509) 375-0300

WA, Spokane
SPOHUG (Spokane HUG)
S. 3810 Havana
Spokane, WA 99204
(509) 448-9727 Group Size: 25
Contact Person: Charles Ballinger/Ron Hodges
Meet last Thurs 7-9pm at Acme Business Computers
Alternate phone # (509) 448-5009

WA, Vancouver
Portland-Vancouver HUG
516 SE Chkalov Drive
Vancouver, WA 98663
(206) 254-4441 Group Size: 46+
Contact Person: Dan Heims
1st Thursday at 7:30 PM at HEC
Portland OR and Vancouver Area
BBS (503) 648-5591 (special section for ZPC users)

WA, Walla Walla
HUG/ZUG of Walla Walla
112 N. Division
Walla Walla, WA 99362
(509) 525-8404 Group Size: 8+
Contact Person: Pat Hanna
Meet 2nd & 4th Tues 8pm at 112 N Division
2nd cont Pete Parcells (509) 527-5267

Wisconsin

WI, Madison
Madison Area HUG
3519 Tally Ho Lane
Shorewood Hills, WI 53705
(608) 233-4588 Group Size: 25
Contact Person: Thomas Gans
Meet 1st Wed 7:30pm at Wisconsin Union South

WI, Madison
UWHUG (Univ of Wisconsin HUG)
109 N Few
Madison, WI 53703
(608) 257-0373 Group Size: 30
Contact Person: Walter Burt
Meet 1st Wed 7:30pm at Univ WI Union South
Club newly formed 12/83

WI, Milwaukee
MHUG Milwaukee Heath Users' Gp
9040 N. Lake Drive
Milwaukee, WI 53217
(414) 352-3346 Group Size: 80
Contact Person: Marvin Olson, Tres.
Meet 3rd Sat 2:00pm at Milw Sch of Eng Rm L-100

WI, Mosinee
CWHUG-Central Wisconsin HUG
PO Box 66
Rothschild, WI 54474
(715) 359-4156 Group Size: 10
Contact Person: Edward Ignace Porwit
Meet 2nd Tues

Foreign Countries

BELGIUM
27, Avenue des Marguerites
B-1970 Wezembeek-OPPEM BELGIUM
Group Size: 4+
Contact Person: Will Degeest
Meet 1st Tues 8:00 pm at Cafe "Alice's"
Cafe is in Brussells, BELGIUM

CANADA, Calgary, ALBERTA
Heath Users of Calgary
#101-5809 Macleod Trail South
Calgary, Alberta T2H 0J9 CANADA
(403) 252-2688 Group Size: 20
Contact Person: Bill Jones
Meet 1st Tues at 7:00pm at Calgary HEC
Club reorganized March 1985

CANADA, Edmonton, ALBERTA
HUGOE (H/Z Users' of Edmonton)
17314 106 Avenue
Edmonton, Alberta CANADA T5S 1H9
(403) 483-4656 Group Size: 12
Contact Person: Edward Hrdlicka
Meet 1st Wed at 7:30pm Meeting place varies.
BB (403) 454-6093

CANADA, Ottawa, ONTARIO
HUG `O' (HUG Ottawa)
866 Merivale Road
Ottawa, ONTARIO K1Z 5Z6 CANADA
(613) 728-3731 Group Size: 30
Contact Person: Brian Fultz, President
2nd Wednesday 8:00 PM at HEC

CANADA, Toronto, ONTARIO
THUG (Toronto and area HUG)
54 Camrose Crescent
Scarborough, Ont. CANADA M1L 2B7
(416) 755-0853 Group Size: 20
Contact Person: Stephen Dugas, President
Meet 2nd Thurs 7:30pm - meeting place varies
BB (416) 755-8823

CANADA, Vancouver, BC
VANHUG (Vancouver HUG)
3058 Kingsway Attn Robert Hudak
Vancouver BC, CANADA V5R 5I7
(604) 437-7626 Group Size: 50+
Contact Person: Robert J Hudak
Meet last Tues 7:30 pm at HEC

CANADA, Vancouver, BC
Vancouver Island HUG
Suite 304 560 Johnson St
Victoria, BC CANADA V8W 3C6
(604) 384-3134 Group Size: 9
Contact Person: Greg Greene, President
Meet 2nd Wed 7:30 pm at Dogwood Software

ENGLAND, Gloucester
United Kingdom Users' Group
ZDS Limited Bristol Road
Gloucester,GL2 6EE, ENGLAND
0452-29451 Group Size: 80
Contact Person: Philip Meek
Group does not hold regular meetings

FRANCE, Paris
GUFI (French HUG)
37 Boulevard Saint-Jacques
75014 Paris, FRANCE
1 565 10 11 Group Size: 350
Contact Person: Dr. Bernard Pidoux
Meet every WED at 7:00 pm at club address
CBBS +33 (1) 45 65 10 09

HOLLAND, Apeldorn
See NETHERLANDS club listing

HONG KONG
Compudragon
273 Prince Edward Road
11/C Kowloon, HONG KONG
3-711-8904
Contact Person: K.T. Lee
Club just organizing

KOREA, Yongsan, Seoul
K-HUG
HHC 1st SIG BDE c/o LTC Dismukes
APO San Fran, CA 96301

293-4132 Group Size: 6
Contact Person: LTC William Dismukes
Just started-monthly meetings not established.

NETHERLANDS
Dutch Heath Users' Group
NIEUWE KERKHOF 16
9712 PV Groningen, NETHERLANDS
050-180203 Group Size: 120
Contact Person: Evert Jan Stokking
Meet quarterly at Amersfoort

NEW ZEALAND
HUG New Zealand
94 Dowse Dr
Maungaraki, Lower Hutt, NEW ZEALAND
695-924 Group Size: 1
Contact Person: Mr. R. Siebers
Would appreciate New Zlnd REMark readers contact
Eager to expand group

OKINAWA
OKIHUG (Okinawa Users Group)
Kenneth K Bailey, Jr Box 38 USAFSO
APO San Francisco, CA 96331
Group Size: 22
Contact Person: Kenneth K Bailey Jr, President
Meet 2nd Fri at 7:00 pm at American Video Office
Alternate phone # 631-4244

PANAMA CANAL
Club no longer in existence

PUERTO RICO, Rosario
PRHUG (Puerto Rico HUG)
Calle La Paz #706, Miramar
Santurce, PR 00907
(809) 722-1612 Group Size: 30
Contact Person: Joseph Gonzalez
Meet 2nd Sunday of odd numbered months

SCOTLAND, EDZELL
EDZELL HUG
Box 517 NSGA EDZELL
FPO New York, NY 09518
EDZELL-7254 Group Size: 3
Contact Person: Lt. Dave Smith
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W. GERMANY, Frankfurt
Club no longer in existence

*

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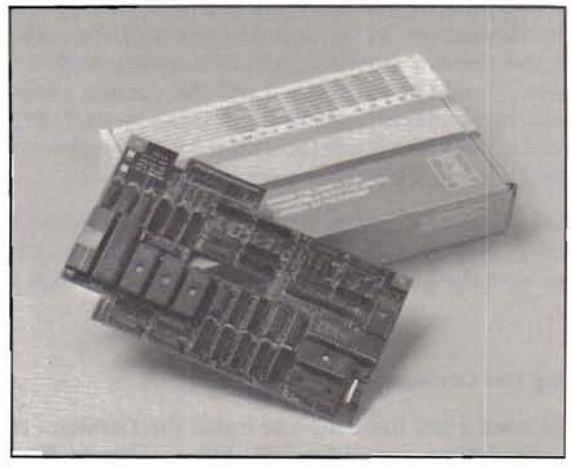
The Gemini Emulator Board: A Review



William M. Adney
P.O. Box 531655
Grand Prairie, TX 75053

Interrupt 10 — standby, execute. Interrupt 16 — standby, execute. Those are the "sounds" of the long awaited D.E.L. Gemini Emulator Board running H/Z-150 programs on the H/Z-100 computer. As Bob Ellerton would say, the IBM Personal Computer is FINALLY compatible with the entire family of Heath and Zenith computers.

This article begins the first of three on PC emulation on the H/Z-100 computers. It deals with the Gemini installation and PC compatibility issues that have bothered some H-100 owners. The second article in this group will review UCI's Easy PC Emulator in the same way. In both articles, I intend to provide a basic review of each board, and tell you what it will and will not do. The third article will be my comparison of both boards in terms of compatibility and performance. In addition, I will include a review of HUG's excellent ZPC emulator by Pat Swayne. After you have read all three articles, you should have a fairly good idea of what will be the best emulator for you.

What Is Emulation?

Webster's New Collegiate Dictionary says that an EMULATOR is a "hardware device or a combination of hardware and software that permits programs written for one computer to be run on another". Similarly, EMULATE is defined as "to strive to equal or excel".

Emulators have been used in the mainframe computers for a long time, so I have more than a passing familiarity with them. And I have found that they usually bring some good news and some bad news. Most emulators are able to provide a satisfactory level of emulation for the system. But there are some hazards associated with emulation. The biggest hazard is that it is nearly impossible to achieve the same performance with an emulator that the original system provides. Performance degradation (or slower system response) is the usual price you pay for emulation.

But enough of the introduction . . . let's take a look at the Gemini.

Buying The Gemini

When you plunk down your $700, you will walk away with two boxes. Ah yes, I can hear it now . . . some sharp individual will point out that the Gemini is only $599. True, but you must also buy an operating system, since the Gemini will NOT run PC compatible programs with the standard Z-100 MS-DOS. You must have the Z-150 MS-DOS or IBM PC-DOS to run PC programs. As I write this, I note that the Heathkit Christmas 1985 catalog (200R) has a special deal on the Z-150 MS-DOS (version 3.1) when you purchase it with a Gemini or Easy PC emulator — $90.00. Even though you can find PC-DOS for less money, the Zenith MS-DOS is much better for several reasons that I will talk about later.

Unpacking the Gemini will reveal a single board with some instructions and other information. One specific item that you should send in immediately is the registration form for your board. Additional information includes specific information about the keyboard and other functions which is also displayed on the Gemini help screens.

The Testing Configuration

In order to establish the parameters that I used for testing the Gemini Emulator, it seems appropriate to tell you exactly how my system is configured. My H-100 has the old motherboard. It has been modified as specified in the Heath Winchester Upgrade manual and supports a 26 megabyte Tulin hard disk. The motherboard is fully populated with 64K RAM chips for a total of 192K. Video memory is a single bank of 64K memory (monochrome only). In addition, I have a Piiceon 256K memory board for a total of 448K of system memory. One half height drive is also located in my H-100.

I also have another separate 5-1/4" drive in a separate cabinet with its own power supply. Printer support is provided by an H-25 dot matrix printer, plus a DTC Style Writer (similar to the Brother HR-15) for letter quality.

As a matter of information, I will use this same configuration for the testing of the UCI Easy PC even though I have plans to upgrade my H-100 to support the 256K RAM and 8 mhz.

The Gemini board tested runs at 5 megahertz only and was one of the first boards available. ROM version 1.0 on the Gemini was used to test all software as shown in Listing 4. During the testing process, Heath Company provided me with ROM version 1.42, but due to writing deadlines, I was not able to fully test that version with all software. By the time you read this, the newer version of the Gemini Emulator, which supports both 5 and 8 megahertz, should be available. It will also contain an updated ROM which provides support for both clock speeds. The Gemini was tested in the 5 mhz mode (actually it is 4.77 megahertz) using the CDR speed up kit at the slower speed.

I have used all available ports on my H-100. J1 is connected to my trusty H-25 printer. J2 is connected to my Prometheus Pro-Modem. And the parallel port is used for my DTC Style Writer printer.

Installing The Gemini

You will need a few basic tools to install the Gemini. I recommend a #2 phillips screwdriver, #3 phillips screwdriver, a 1/4" nutdriver preferably with a deep socket (low profile only), and an IC remover or a small flat blade screwdriver. I also found that a good light is extremely helpful, if not essential.

The first task is to remove enough of the Z-100 hardware so that you can get full access to the motherboard. D.E.L. has included excellent installation instructions for both the low profile and the All-in-One computer, so you will not have to look for your other manuals. The video board also must be removed in order to get to the motherboard. Remove the 8088 CPU IC and one of the cables that runs from the motherboard to the video board. Plug the 8088 into the indicated socket on the Gemini. If you have an 8087, there is also a socket for that on the Gemini. The underside of the Gemini contains a plug which mates with the 8088 socket and a socket which mates with the P106 plug on the motherboard. Now for the tricky part — align the plug and socket on the Gemini with the corresponding plug and socket on the motherboard and press down. It is difficult to see P106 which is why I suggest that you have a light available. One of the video cables runs through a slot in the Gemini, and the other plugs in directly to the Gemini. Reassemble your computer and you are ready to go.

I found the installation to be easy, and it took me about 35 minutes from start to finish on my low profile H-100. I took plenty of time to check things as I went, so that should be about the maximum time if you are somewhat familiar with the internals of your computer.

The six step instructions provided with the Gemini are clear, and I had no problem with the installation. Some people are reporting that they can add the Gemini to the H-100 in about 11 minutes, but I recommend that you take time to check that all plugs are carefully mated as you reassemble the system.

Now that the installation is complete , I guess it is time for the smoke test.

Power On!

My H-100 beeped (actually it was a keyclick) satisfactorily when the power was turned on, and the Gemini sign-on screen appeared. There are three options: Press I for the IBM mode, Z for the regular Z-100 mode, or the Help key for some information.

I quickly went through the help screens. The first shows how the Z-100 keyboard has been changed to reflect keys needed to run PC software. There was obviously some thought placed into that key configuration, since it is about as close as possible to the standard IBM keyboard layout without the disadvantages. I think that D.E.L. did an excellent job of defining the keys.

The keyboard has been slightly changed to reflect the IBM requirements as shown in Listing 1. In addition, you still must use the standard CTRL-RESET keys to reboot the system instead of IBM's CTRL-ALT-DELETE sequence. By the way, Listing 1 only shows the keys that were changed in function on the Z-100.

The second help screen provides some information on the use of the Gemini with a hard disk. More on that later.

The third help screen provides information about the serial ports. It is significant to note that the Z-100's J2 in now COM1 and J1 is COM2. More on that later.

Listing 1
Gemini Z-100 Keyboard Configuration

Z-100 Key	Gemini (IBM) Key
F0	ALT
F11	Hi-Res
F12	* and PrtSc
ICHR/DCHR	Scroll Lock
INS/DEL LINE	Num Lock
HELP	Not used
BREAK	Not used
LINE FEED	Not used
DELETE	DEL
HOME	Home
Cursor Arrows	Porform same function as 2, 4, 6, 8
2, 4, 6, 8	Cursor for IBM
9	PgUp
3	PgDn
1	End
ENTER	+
0	Ins
Period (.)	Del

The Serial Ports

One of the more interesting things about the Gemini Emulator is the way the serial ports for the IBM PC are implemented. What can be confusing is that the Z-100's serial J2 (DCE) port is COM1 and J1 is COM2. I specifically asked D.E.L. about that and was told that J2 is identical to the IBM's COM1, except for pin 22 which has Ring Detect. Most serial hardware connected to the IBM PC is intended to be connected to COM1. Since all IBM serial ports are set up in the DCE configuration, you may have to make up a special cable (or use a cable matcher) to get IBM compatible peripherals (like printers) to work on the Z-100's J1.

Since all of this can be very confusing, I have shown a wiring translation table as Listing 5, which should allow you to change

the J1 configuration to the IBM standard. This information was obtained from D.E.L. since it was not included in the Gemini that I received. Since I do not have any specific IBM compatible peripherals/cables, I did not test the configuration.

The Operating System

The addition of the Gemini basically gives you a new computer. As such, you must have an operating system that is Z-150 compatible, such as the Z-150 MS-DOS or IBM PC-DOS. I highly recommend that you buy the Z-150 MS-DOS since you can get the latest version 3.1 at a modest price. Although you can find PC-DOS for less money, all major releases of PC-DOS (e.g. 1.0, 2.0, and 3.0) have contained well documented and rather significant bugs. My experience with Heath/Zenith software is that it is uniformly high quality and has caused me no problems. In addition, D.E.L. has done most of their testing with the Z-150 MS-DOS which appears to be fully supported in the Gemini board.

Although PC-DOS, for the most part (excepting the hard disk commands) runs satisfactorily on the Gemini, there is at least one other good reason for using the Z-150 MS-DOS. Aside from the fact that the documentation is much better than a comparable version of PC-DOS, Heath and Zenith provide technical support for both the Gemini and MS-DOS. High quality software, good documentation, and hardware/software technical support justify some additional expense.

The use of the Z-150 MS-DOS can also make your life much easier because it includes the CONFIGUR command. CONFIGUR allows you to easily set up the various ports on your system. PC-DOS does not have a similar command, so it is a little more difficult to get things up and running properly.

In summary, I recommend that you buy the Z-150 MS-DOS with the Gemini. For those of you who do not have a chance to read a lot of magazines, there are a number of published patches to PC-DOS that correct a number of significant errors. Apparently, there is a DOS redirection bug in at least one of the lastest versions of PC-DOS. My experience with all Heath and Zenith operating systems is that they tend to be relatively bug free. While no software is perfect, they appear to take greater care before the software is released. Although they may release updated versions later than other manufacturers, they do not have any catastrophic bugs that I have ever seen. In a well documented and published problem with PC-DOS version 2.0, certain error conditions encountered in BASIC could cause the system to completely trash the disk directory. I have never heard of or found a similar problem with the Heath/Zenith operating systems.

Running PC Software

In the Heath supplied information with the Gemini, they have provided a list of tested software as shown in Listing 3. I tested a variety of software as shown in Listing 4. Similar to Heath, I did not test every command and every function of the software, but I did take the test far enough to determine that the software would run on the Gemini. As with any hardware change, Heath recommends (and so do I) that you carefully check out the performance of the software before you entrust any valuable data to the system.

Aside from that caveat, the bottom line is that the Gemini does run PC software on the Z-100 as advertised. In most cases, I tested the software running PC-DOS. Due to time restrictions, I was not able to test all programs under the Z-150 MS-DOS, but I would expect that slightly better performance might be achieved.

The only problem that I encountered is that Gemini seemed to have a problem with Sidekick running under PC-DOS. Although Sidekick seemed to run normally, I could not open more than one function (except for the help screen). I do not consider that a significant problem, but I did report it to D.E.L. My suspicion is that it is a problem with PC-DOS, and D.E.L. told me that Sidekick was tested under Z-150 MS-DOS. It works fine under those conditions.

Listing 2
Serial Port Information For Gemini Emulator

Z-100 J2 (DCE port) is basically the same as the IBM serial port (COM1) except that the Ring Detect (pin 22) is not implemented due to hardware in the Z-100. Microsoft Mouse (serial version) can be plugged in directly to J2, and D.E.L. tells me that it will function correctly with appropriate software.

Z-100 J1 (DTE port) can also be used for serial interface with IBM compatible peripherals as COM2 when the cable is set up as shown below. This information was obtained from D.E.L., but was not tested as part of this review.

Pin Conversion For Z-100 Serial Port J1

Z-100 J1 (DTE Port)	IBM PC Serial Port 2 (COM2 - DCE Port)
1	1
2	3
3	2
4	5
5	4
6	20
7	7
8	8
11	11
20	6

Note: Two jumpers (J109 and J111) on the Z-100 motherboard must be in their normal positions as specified in the Z-100 manual. These jumpers are factory set in their correct positions and should not be modified.

A Look At Performance

In order to provide a qualitative measure of performance, we tested Flight Simulator on a Z-150 and a Z-100 at the Dallas store. Flight Simulator was set up in the demonstration mode for an RGB color monitor, and we hit the space key at the same time to begin the demo. When the Z-150 clock indicated 12 seconds into the flight, the Z-100 clock was at 6 seconds. Admittedly, Flight Simulator is a complex test because of all the graphics and video processing, but it does demonstrate that the Gemini's video display is somewhat slower than a PC. You can expect that video intensive PC programs will run slightly slower on the Z-100, but you should be aware that this test was done with 5 megahertz system. I expect that the addition of the 8 megahertz clock to the Z-100 would provide a corresponding performance improvement of about 30 percent.

The use of a hard disk also improves performance as expected. While I did not do any similar performance testing with a Z-150 hard disk, the Z-100 performs quite well with my hard disk. If you expect to use a large number of PC programs, you will probably want to run the system at 8 megahertz with a hard disk. Perfor-

mance on my system, even with a 5 megahertz clock, is quite easy to live with if the programs are on the hard disk.

Gemini And The Hard Disk

Instructions are included for using the Gemini with a hard disk. The basic process is to use the Z-100's PART utility to identify a "Gemini" partition. At the time of this writing, you also must use the Z-150 PREP utility for the Gemini partition. For those of you who have hard disks, this may sound like you might destroy all of the other data on the hard disk. Not true. PREP only accesses the identified Gemini partition and does not PREP the entire hard disk. However, I recommend that you completely back up your hard disk just on general principles. That is always a good practice whenever you make a major hardware change in your system. Be sure to take periodic backups on the hard disk, too.

As mentioned previously, I have a 26 MB Tulin hard disk. I defined a 3.3 MB Gemini partition with PART. I then ran the Z-150 PREP utility which took 65 minutes for a 6 pass check. The Z-150 FORMAT program (with the /S option) tells me that I have a total of 3,362,816 bytes on the hard disk with no bad sectors.

After the hard disk was formatted, it was a simple matter to copy programs from a floppy using the standard MS-DOS COPY command. Since I have very few PC programs, I only tested those programs on the hard disk which belong to me personally, so that I would not violate any of the copyright restrictions. In addition, the Dallas and Fort Worth Heathkit stores allowed me to test some of their "inventory" of Z-150/PC programs in the store on a Gemini equipped Z-100.

As previously mentioned, those of you who expect to use the Gemini with a hard disk must use the Z-150 MS-DOS PREP utility on the hard disk. In fact, all hard disks shipped for the IBM PC/XT/AT have already been prepared at the factory or the dealer with a utility similar to PREP. That utility is not available to users in all current versions of PC-DOS. Information contained in the hard disk's Superblock is factory installed for the IBM computers.

The unique Superblock format for the IBM PC's is probably the reason that the PC-DOS FDISK command does not work with the Gemini on the Z-100. Since the PREP utility provides the capability to use just about any hard disk with the Z-100 or the Z-150, that is a significant advantage in my opinion.

The bottom line is that, if you want to use a hard disk with the Gemini, you must use the Z-150 MS-DOS PREP utility. Although I found that D.E.L. is aware of and working on the problem, I suggest that it is a waste of time to pursue it. I would rather see enhancements and improvements to the Gemini.

Does The Gemini Work As Expected?

Basically, the answer is yes. I have tested the DTC printer on the parallel port with the Z-150 WordStar. My ProModem works fine with Hilgraeve's HyperAccess telecommunications program on serial port J2 (COM1). I was not able to get the H-25 printer to work on serial port J1, which I finally determined was the result of a different cable configuration required by the ANGEL Print Buffer (See May 1984 REMark for a review of the ANGEL). One of the technical support experts at D.E.L. tells me that the H-25 works just fine with a standard cable connected to J1, but I did not have the time to set up a new cable for testing.

My H-100 contains an old motherboard which does not support the 256K RAM chips. There are some initial reports that the Gemini does not work with old motherboards which have been modified in accordance with Pat Swayne's article in the July 1985 issue of REMark. While that is probably due to some kind of a timing problem related to the modification, the Gemini is only certified to work with unmodified motherboards, either old or new. If you have an old motherboard (part number 85-2653-x), I would recommend that you not plan to do the 256K/8 mhz modification until more information is available. If the part number is different from the one above, you have a new motherboard, and the Gemini should work with no problems. As you might expect, however, the Gemini is only certified to work properly with the HA-108 upgrade kit since a significant number of ICs are changed during the upgrade process to support the 8 mhz processing.

Listing 3
Heath/Zenith Tested PC Software On Gemini

MS-DOS for Z-150; Versions 1.25, 2.11, and 3.1
CCPM-86
GW-BASIC for Z-150; Versions 1.10 and 2.02
Microsoft FORTRAN
Microsoft PASCAL
C-86 Compiler
WordStar Professional
Multimate
dBase II and dBase III
Condor
RBase 4000, 5000
Microstat
Lotus 1-2-3
Symphony 1.0
SuperCalc 3
Microsoft Chart
Graphtalk
Digital Research GEM
4-point
MASM Macro Assembler
Microsoft Flight Simulator
Robotron
Donkey Kong
Microsoft Mouse

Note: Heath has not tested every command or configuration for each of the above programs.

The only real limitation of the Gemini is that it does not support the sound capability of the PC in the basic kit. I have just received a Gemini Sound Board from D.E.L. which adds the sound capability. It includes a small board, about 2" by 3", which plugs into the Gemini, and a small speaker. Due to writing deadlines, I have not had a chance to test the Gemini Sound Board, however, I will include that in the third article on emulators. With the addition of the sound board, the Gemini system will provide all essential elements of the IBM PC emulation. According to D.E.L., the Gemini Sound Board will sell for under $50, and you can check with them at the phone number listed at the end of this article for additional information.

In order for you to get a full picture of the Gemini, I have also listed Heath Company comments which are included with the Gemini board. Listing 5 is the summary of what the Gemini will do. Listing 6 is a summary of what the Gemini will not do.

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Other limitations on the Gemini are basically those imposed by the IBM PC. The most significant is perhaps the lack of support for 8 inch disk drives. Although not all IBM PC video modes are supported by the Gemini, it does support color, but does not support intensity differences. That is the specific reason why the Gemini only supports half the colors available on the IBM PC. The IBM PC really supports eight basic colors. Eight colors are displayed in high intensity, and the same eight colors can be displayed at low intensity. During the testing process at the Heathkit stores, I did not see any noticeable difference between the color displays on the Z-150 and a Gemini equipped Z-100.

My Opinion Of The Gemini

All in all, I think the Gemini is a rather spectacular technological achievement. The capability to provide PC emulation on the Z-100, with some very modest limitations, is available with the Gemini. It performs as advertised, although there is no question that it "downgrades" the Z-100 to perform like an IBM PC. That is not a bad reflection on D.E.L. or the Gemini board since the IBM PC simply does not have some of the advanced features available on the Z-100.

Since I received the Gemini Sound Board too late to be included in this article, I have not tested any of the software with it. My current indication is that it is expected to sell for under $50, but you should check with D.E.L. for the exact price.

Since the Gemini obviously involves a hardware change to the Z-100, I also tested the various other H/Z operating systems and associated software to verify that there was no effect on the normal performance of the computer. I could not find any performance differences, and all software worked normally under all operating systems.

Special Software Testing On The Gemini

Hilgraeve, Inc., and Redwood Development provided very quick response to my request for some software to run on the Gemini. Since both programs worked satisfactorily with the Gemini, they will also be used to check out UCI's Easy PC. More surprising is the results of that testing with some very sophisticated programs.

HyperAccess (Hilgraeve, Inc.)

In the September issue of REMark, I noted that Hilgraeve's ACCESS telecommunications program was highly recommended for all users ranging from novice to expert. Since telecommunications programs can be tricky to interface on a normal machine, I thought that a good compatibility test of the Gemini would be to try the latest Z-150/IBM PC version of HyperAccess on the Z-100. With a slight configuration change that is easily made on the IBM PC version, I was able to use HyperAccess with absolutely no problem. HyperAccess provides the unique capability to modify the configuration with absolutely no changes to the program code which is the particular feature that allows the PC version to run on the Z-100. Hilgraeve's foresight in developing HyperAccess is commendable.

Although I thought ACCESS was excellent, HyperAccess is absolute dynamite! If you need a telecommunications program, HyperAccess is probably the ultimate for any application that I can imagine. And I can imagine quite a few unusual applications! As if that weren't enough, Hilgraeve has thoughtfully provided an outstanding tutorial disk which displays just about all of the HyperAccess features in about two hours. That will be of particular interest to telecommunications novices and busy executives who do not have a lot of time to spend in learning new software. The basic features of HyperAccess will probably provide all that is required by most people. The advanced features should satisfy even the most discriminating expert.

If you have already purchased ACCESS and would like to upgrade to HyperAccess, Hilgraeve has a reasonable update policy. Matt Gray, President of Hilgraeve, Inc., tells me that registered ACCESS owners can obtain HyperAccess by sending in the difference between the purchase price of ACCESS and HyperAccess. Registered owners do not have to return the original ACCESS distribution disk. The upgrade policy only applies to registered owners, and you must obtain the upgrade directly through Hilgraeve regardless of where you originally purchased ACCESS. Be aware that Hilgraeve's ACCESS program is altogether different from Microsoft's copy protected Access telecommunications program. I will not comment on the similarity of the names.

If you need a telecommunications program, HyperAccess has everything you will need whether you are a novice or an expert. If you order the Z-100 MS-DOS version, you will also receive a modem adapter for the serial port plus a special version which runs on the Gemini in addition to the normal Z-100 MS-DOS version. The bottom line is HyperAccess is highly recommended.

Listing 4
List Of Z-150/IBM PC Tested Software For This Review

MS-DOS 2.11, 3.1 for Z-150
IBM PC-DOS; versions 1.10, 2.10, 3.0
Microsoft Flight Simulator
Microsoft Word version 2
Microsoft Project
Microsoft Chart
Microsoft Multiplan
WordStar Professional Package (Z-150 version)
CI C86 C Compiler
MS-DOS Version 2 Programmer's Utility Package
Multimate
Framework
AutoCad
Micro/SPF
COPY II PC
HyperACCESS
WINCAD
jr-CAD
Sidekick *

* Tested under PC-DOS 2.10. See text for more information.

WINCAD And jr-CAD (Redwood Development)

Although I will review WINCAD for the Z-100 in more detail later this year, I thought that another good compatibility test for the Gemini would be to test the graphics capability typically provided by a Computer Aided Design (CAD) program. Redwood Development provided me with standard PC versions of WINCAD and jr-CAD which both ran satisfactorily on my Z-100 with the Gemini.

My initial impressions of both programs are very favorable. Both are easy to use, and I ran the demo programs which worked fine.

Although I have not used a CAD program on a microcomputer before, it only took about 10 minutes to become familiar enough with the command structure to use the programs. WINCAD is the advanced version of the program which obviously has more features. I became so engrossed in the capability to draw pictures that I had to force myself to stop.

Some Input From D.E.L.

Almost everyone interested in the subject of PC emulation on the Z-100 has probably wondered why the Gemini was announced about a year ago, but was not available until recently. I specifically asked Ed Dolejsi, President of D.E.L., about that. Here is the answer to that question.

When the Gemini was in development, D.E.L. was told that the Microsoft Flight Simulator was the ultimate and final test for a computer in terms of IBM PC compatibility. The announcement of the Gemini was based on the fact that D.E.L. was able to successfully run Flight Simulator on a Gemini equipped Z-100. Unfortunately, Flight Simulator is not really the ultimate compatibility test even though it really exercises the video and hardware interrupt capability of the PC hardware configuration. Since the objective of the Gemini was to provide a nearly total PC emulation, that also required the capability to run virtually all of the copy protected software available for the PC.

Copy protected software, which normally can cause all kinds of user problems, also was responsible for the delay in the final production of the Gemini. Strange forms of copy protection ranging from specially programmed access to normally unused floppy disk tracks to weirdly formatted tracks in the middle of a disk or file caused some significant development problems. One form of copy protection also includes a physical alteration of the disk which involves using a laser to "punch" a tiny hole in the floppy. Copy protection involving the so-called worm code is another consideration. In any event, Ed tells me that the implementation of the required hardware/software to cope with the various copy protection schemes conspired to introduce associated delays in the final production of the Gemini.

The Latest (And Worst) In Copy Protection

Those of you who have read this column before know of my particular aversion to copy protected software. As a matter of fact, you will not see a review of any copy protected software in my column because I do not believe that it serves the best interests of the user community. I have to admit that I am more than a little puzzled at the popularity of Lotus 1-2-3 because of the copy protection that it has. That appears to be primarily the result of a corporate fad which incidentally popularized the use of the 16-bit computer. I should also note in passing that Lotus has reportedly won at least one lawsuit in the million dollar range because of illegal copying of software by a rather large company. That proves at least one of my points in that copy protection does not really protect the software manufacturer.

I have already done some research on the techniques of copy protection with the intention of doing some detailed writing about it. Some recent news has prompted me to make another comment about the copy protection situation, however.

One of the most insidious forms of copy protection is known as WORMS. Software which contains worm code supposedly detects the fact that an illegal copy of the software has been made. When an illegal copy is "found", the worm code proceeds to systematically destroy the data on the disk. How that happens is not important . . . the fact is that it does happen.

The best publicized case right now happened to Sheldon Richman who is a columnist for the Washington Times. He was apparently using his personal and legal version of Microsoft Access (not to be confused with Hilgraeve's ACCESS) when the worm got loose and trashed the disk. Reports also indicate that this was preceded by a nasty message. This basic story is related in John C. Dvorak's column in the November 11, 1985 issue of InfoWorld. Microsoft apparently claims that this message was an idle threat that was not condoned by the company (also reported by Dvorak). I will continue to recommend caution on buying and using copy protected software because of this kind of problem.

Listing 5
Heath Notes On What The Gemini Will Do

The Gemini Emulator will:

- Run many IBM PC software programs.
- Run IBM PC programs that use ROM BIOS for I/O (input/output) functions, although some programs will require less than maximum baud rate settings for serial devices. Specifically, hardware handshaking is not supported in the current release, although software handshaking (XON-XOFF) is supported. (**Note:** I found that this specifically refers to ROM version 1.0 on the Gemini.)
- Allow full Z-100 operation.
- Run in Z-100s with the 5 MHz system clock. (**Note:** D.E.L. tells me that, as I write this in October, new boards which run at 5 and 8 mhz will be shipped in several weeks. See the text for more information.)
- Support both Z-100 and IBM PC Winchester drive operations.
- Access the 8087 Numeric Co-Processor in both the Z-100 and IBM PC modes.
- Allow you to use the less expensive 8087 Numeric Co-Processor (model Z-316) upgrade.)
- Support eight colors.
- Give you the capability to run future releases of current PC software.

Credits And Thanks To . . .

Special thanks to Heath Company, and particularly Bob Ellerton, for providing a Gemini board for this review. I also found that the people at D.E.L. were particularly helpful in providing the technical information.

The Dallas and the Fort Worth Heathkit Stores both allowed me to use one of their machines to test various software on the Gemini. Since I do not own a lot of PC software, they also provided store software which was tested in each store in order to preserve the copyright and license restrictions. Special thanks to the store managers, Don Murray (Dallas) and Dave Koslowsky (Fort Worth) for providing that support. In addition, the Dallas store also provided technical assistance by allowing Chris (the store technician) to modify a store Z-100 so that we could test the Gemini under various hardware configurations.

Hilgraeve, Inc. provided me with an evaluation copy of HyperAccess on very short notice, so that I could test the telecommunications compatibility of the Gemini. Special thanks to Matt Gray, President of Hilgraeve, for that support.

Redwood Development also furnished evaluation copies of WINCAD and jr-CAD on very short notice for Gemini Testing. Special thanks to Phil Winninghoff, President of Redwood Development, for his assistance.

Listing 6
Heath Notes On What The Gemini Will Not Do

The Gemini Emulator will not:

- Support IBM PC hardware add-on products.
- Run software that requires the addition of special hardware (network I/O cards and analog joysticks, for example) unless custom drivers are supplied by Gemini Technology, Inc.
- Support more than 640 Kbytes of RAM (random access memory) in the IBM PC mode.
- Support 16 colors.
- Support data input through its parallel port in the IBM PC mode.
- Allow you to use the Z-100's type-ahead buffer.
- Allow you to use the CAPS LOCK key. It may generate non-printable characters. (Note: I did not have any problem with this. The Z-100 CAPS LOCK performs as a toggle just like the IBM PC.)
- Allow you to use CTRL/ALT/DEL keys to reset your system. You must use CTRL/RESET.
- Support sound or keyboard "beeps".
- Co-exist on the Z-100 main board with ZCLK (model PC-240).
- Recognize and clear characters scrolled up from the 25th line display.
- Boot-up if you have only 32K of video RAM (you must have 64K). **Note:** To determine the amount of video RAM you have, type S at the System Prompt. Your display will indicate how many bytes of contiguous RAM and Video memory you have installed in your system, and the type of video display you are using. If you have only 32 Kb of Video memory, you must install the Z-219-1 option and configure the video board for 64 Kb.
- Support MFM-150 ROM tests.

Notes:

1. Operation in the IBM PC mode requires the OS-63-50 MS-DOS Operating System (or equivalent) which must be purchased separately. Please note that there are syntax differences between many Z-150 MS-DOS commands and their Z-100 counterparts. Refer to their respective manuals for specific information on these commands.
2. J1 is equivalent to COM2; J2 is equivalent to COM1.

Next Month And In The Future

Based on the latest information, it appears that I will not receive UCI's Easy PC in time to review it in the February issue. Regardless the actual shipment, I will also be continuing the general information series with various topics of general interest. My thanks to all of you who have written to me on how that information has helped you. I have even received some letters from advanced users who learned something about operating systems and system setup. I have received more letters about these subjects than from all previous columns combined. Interestingly enough, few of the letters requested technical information or clarification. Most were simply notes containing complements and requesting that I continue that series.

If you have any particular subject of general interest that you would like to see in these pages, please let me know. Databases, FAT's, files, directories, directory trees, I/O redirection, and command pathing are a few of the topics planned for future articles.

Questions relating to the Gemini as discussed in this article will usually require a personal answer, so I will request that you include (as usual) a self addressed stamped envelope for a personal reply. If you have any general questions about the Gemini, your best bet is probably to start with your local Heath/Zenith Computer Center. It is obvious that things will change due to the lead time required to publish this information in REMark.

Products Discussed

ACCESS	
H-8, H/Z-89 (CP/M-80)	$ 49.95
Z-100 (MS-DOS, CP/M-85, CP/M-86)	59.95
Z-150/IBM PC (MS-DOS, CP/M-86)	69.95
HyperAccess (all Operating Systems)	149.95
Heath/Zenith Computer Centers	
Hilgraeve, Inc.	
P.O. Box 941	
Monroe, MI 48161	
(313) 243-0576	
Gemini Emulator Board (PC-251)	$599.00
Z-150 MS-DOS (OS-63-31)	90.00
(when purchased with PC-251 only)	
MS-DOS Version 2	
Z-100 only (OS-61-8)	150.00
Z-150 only (OS-63-50)	150.00
MS-DOS Version 3.1	
Z-100 only (OS-63-30)	150.00
Z-150 only (OS-63-31)	150.00
Z-100 CP/M-85 (OS-53-2)	150.00
Z-100 Concurrent CP/M (OS-61-12)	150.00
Z-100 CP/M-86 (OS-63-2)	99.00
Concurrent CP/M-86 (OS-61-12)	
Z-100 only	299.00
HA-108 Upgrade Kit (Z-100 only)	249.95
Heath/Zenith Computer Centers	
Heath Company Parts Department	
Hilltop Road	
St. Joseph, MI 49085	
(616) 982-3571 (HUG Software only)	
(800) 253-7057 (Heath Catalog orders only)	
Gemini Sound Board (See text for price information)	
D.E.L. Professional Systems Ltd.	
12-11151 Horseshoe Way	
Richmond, B.C. V7A 4S5	
Canada	
(604) 274-1283	
WINCAD (Z-100, Z-150/IBM PC)	$149.95
jr-CAD (Z-150/IBM PC/PC jr.)	49.95
Heath/Zenith Computer Centers	
Redwood Development	

7 Redwood Drive
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Important Notice To ZPC Users

Pat Swayne
HUG Software Engineer

The first 80 or so copies of the new ZPC support disk (885-3034-37) that were made (including those distributed at the West Coast HUG Conference) contain an error in the file FIXZPC5.DAT. This file contains the line

```
F184E,1951,90
```

which should be changed to

```
F184E,1851,90
```

If the file ZPC3.COM on your ZPC distribution disk is dated 10-4-85, you should use an editor to correct the file FIXZPC5.DAT before you run PREFIX on the support disk.

*

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Continued from Page 49			
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NOTE: The [-37] means the product is available in hard sector or soft sector Remember, when ordering the soft sectored format, you must include the "-37" after the part number; e.g. 885-1223-37.

Continued from Page 51

patches are self-installing, and a special batch file called PREFIX-.BAT selects the proper patches for your release of ZPC. The patches are only for level 3 of ZPC, but the assembly language code for the patches is provided in the file FIXASM.DOC so that you can fix your source code and assemble updated lower levels.

The second section of the ZPC Support Disk contains an emulator for the ANSI.SYS device driver that is supplied with MS-DOS for the Z-100 PC series computers. Some PC programs require ANSI.SYS, but it will not work on a Z-100, and the ANSICON .DVD driver supplied with Z-100 MS-DOS will not work while ZPC is in the PC mode. The file ANSISYS.COM on this disk, when loaded after ZPC, provides an exact emulation of the ANSI.SYS driver, so that programs requiring it will run properly. Once ANSISYS.COM has been loaded, ANSI emulation can be turned on or off using a companion program, ANSI.COM. You just give the command ANSI ON to turn emulation on, and ANSI OFF to turn it off.

The third section of the ZPC Support Disk contains patches that enable the following programs to run under ZPC: LOTUS 1-2-3 (PC version, release 1A), DBASE III (version 1.1), FRAMEWORK (version 1.1), ENABLE (version 1.1), MULTIMATE (Z-150 version 3.3), VOLKSWRITER DELUXE (version 2.0), EDIX (version 2.05), and PC PALETTE (version 1.0). Also included is a corrected patch for the Heath/Zenith release of SuperCalc3, a patch for the IBM PC release of SuperCalc3 (release 2.0), and alternate patches for Microsoft Word.

TABLE C Rating: (10)

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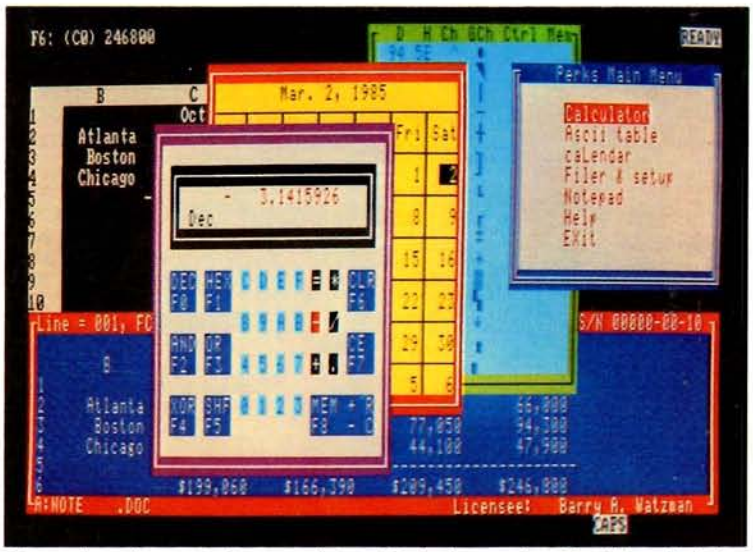
Perks is the background desktop utility program for Z-100's featuring full-color windows, a calculator, a notepad, an ASCII table, a Filer, a screen saver, alarm timers, context sensitive help screens and a calendar with an appointment schedule. Perks works with all Z-100's having 192K or more of memory and using the Z-DOS/MS-DOS 1.X or 2.X operating systems.



Shown above is an actual screen photo of Perks in operation. The Notepad window contains data "imported" from the Lotus 1-2-3 worksheet being prepared when Perks was activated.

Here are some actual unsolicited comments from customers:

"My heartiest congratulations and thanks for a fine product. I expect that Perks will be the best software dollar I have yet spent, and I have spent lots. Anyone with a Z-100 should run to buy Perks"

"I know I said this over the phone, however, once again I would like to thank you for a GREAT product."

"You're the best friend a Z-100 ever had! Mine loves Perks, and I want to thank you for the prompt filling of my order. Perks is everything and more than I thought it was going to be. The Notepad function alone is worth the price. And to think, I'd thought about buying a Programmer's Calculator from Hewlett Packard! Yours does everything I'd have used HP's for. Your Program is simply beautiful and elegant."

Perks is available at Heath/Zenith Computers & Electronics Centers, many independent Zenith Data Systems dealers or directly from:

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