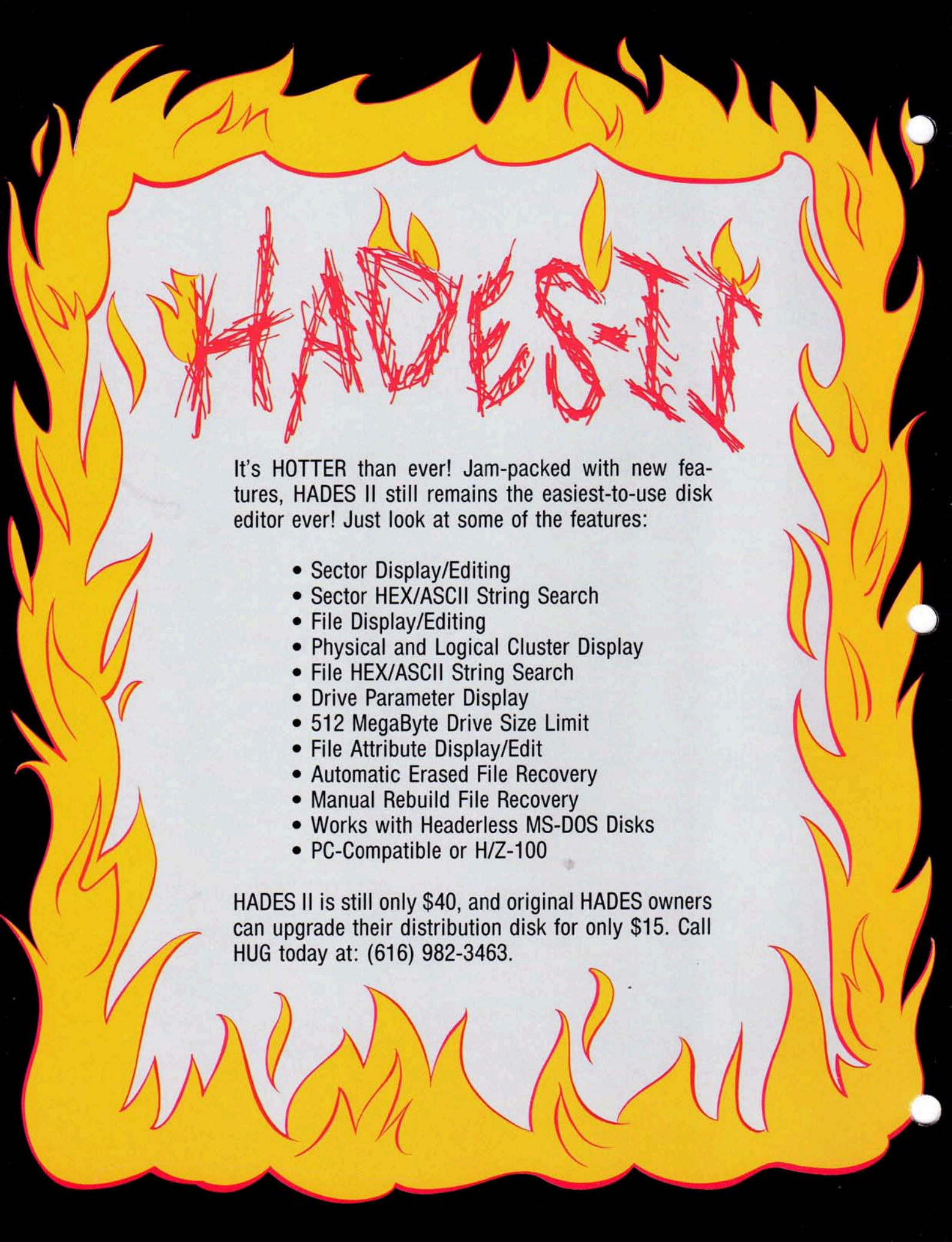
The Official Heath/Zenith Computer Users Magazine

REMark®

June 1990

NEW & IMPROVED!
HUG BBS
PAGES 5 & 15

TALK TO YOUR COMPUTER
PAGE 25



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The Official Heath Computer Users Magazine

REMark®

Volume 11, Issue 6 • June 1990

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HUG

PRODUCT NAME	PART NUMBER	OPERATING SYSTEM	DESCRIPTION	PRICE

H8 - H/Z-89/90

ACCOUNTING SYSTEM	885-8047-37	CPM	BUSINESS	20.00
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H8 - H/Z-89/90 - H/Z-100 (Not PC)

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CASSINO GAMES	885-1227-[37]	CPM	GAME	20.00
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CHECKOFF	885-8011-[37]	CPM	CHECKBOOK SOFTWARE	25.00
COPYDOS	885-1235-37	CPM	UTILITY	20.00
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FUN DISK II	885-1248-[37]	CPM	GAMES	35.00
GAMES DISK	885-1206-[37]	CPM	GAMES	20.00
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HUG SOFTWARE CATALOG UPDATE #1	885-4501	VARIOUS	PRODUCTS 1983 THRU 1985	9.75
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MBASIC PAYROLL	885-1218-[37]	CPM	BUSINESS	60.00
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REMARK VOL 7 ISSUES 72-83	885-4007	N/A	1986	25.00
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UTILITIES BY PS	885-1226-[37]	CPM	UTILITY	20.00
UTILITIES	885-1237-[37]	CPM	UTILITY	20.00

Price List

PRODUCT NAME	PART NUMBER	OPERATING SYSTEM	DESCRIPTION	PRICE
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CARDCAT	885-3021-37	MSDOS	BUSINESS	20.00
CHEAPCALC	885-3006-37	MSDOS	SPREADSHEET	20.00
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DBZ	885-8034-37	MSDOS	DBMS	25.00
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EZPLOT II	885-3049-37	MSODS	PRINTER PLOTTING UTILITY	25.00
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GAMES CONTEST PACKAGE	885-3017-37	MSDOS	GAMES	25.00
GAMES PACKAGE II	885-3044-37	MSDOS	GAMES	25.00
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KEYMAC	885-3046-37	MSDOS	UTILITY	20.00
KEYMAP	885-3010-37	MSDOS	UTILITY	20.00
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PS's PC & Z100 UTILITIES	885-3052	MSDOS	UTILITY	20.00
REMARK VOL 5 ISSUES 48-59	885-4005	N/A	1984	25.00
REMARK VOL 7 ISSUES 72-83	885-4007	N/A	1986	25.00
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UTILITIES II	885-3014	MSDOS	UTILITY	20.00
Z100 WORDSTAR CONNECTION	885-3047	MSDOS	UTILITY	20.00
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ACCOUNTING SYSTEM	885-8049	MSDOS	BUSINESS	20.00
CARDCAT	885-6006	MSDOS	CATALOGING SYSTEM	20.00
CHEAPCALC	885-6004	MSDOS	SPREADSHEET	20.00
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EZPLOT II	885-6013	MSDOS	PRINTER PLOTTING UTILITY	25.00
GRADE	885-8037	MSDOS	GRADE BOOK	20.00
HAM HELP	885-6010	MSDOS	AMATEUR RADIO	20.00
KEYMAP	885-6001	MSDOS	UTILITY	20.00
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SKYVIEWS	885-6005	MSDOS	ASTRONOMY UTILITY	20.00
TCSPELL	885-8044	MSDOS	SPELLING CHECKER	20.00
ULTRA RTTY	885-6012	MSDOS	AMATEUR RADIO	20.00

The following HUG Price List contains a list of all products in the HUG Software Catalog and Software Catalog Update #1. For a detailed abstract of these products, refer to the HUG Software Catalog, Software Catalog Update #1, or previous issues of REMark.

Now Available!

HUG software is now available on 2" disks. Just put a "-90" at the end of the part number (i.e., 885-6014-90). Also add $3.00 to the purchase price of the software (i.e., $20.00 + $3.00 = $23.00).

LAPTOP OWNERS . . . don't feel left out! All of HUG's MSDOS software is available on 3-1/2" micro-floppies too! When ordering, just add a "-80" to the 7-digit HUG part number. For the standard 5-1/4" floppy, just add a "-37".

Make the no-hassle connection with your modem today! ***HUGMCP*** doesn't give you long menus to sift through like some modem packages do. With *HUGMCP*, YOU'RE always in control, not the software. Order ***HUG P/N 885-3033-37*** today, and see if it isn't the easiest-to-use modem software available. They say it's so easy to use, they didn't even need to look at the manual. "It's the only modem software that I use, and I'm in charge of the HUG bulletin board!" says Jim Buszkiewicz. *HUGMCP* runs on ANY Heath/Zenith computer that's capable of running MS-DOS!

ORDERING INFORMATION

For VISA and MasterCard phone orders, telephone the Heath Users' Group directly at (616) 982-3463. Have the part number(s), descriptions, and quantity ready for quick processing. By mail, send your order, plus 10% postage and handling ($1.00 minimum charge, up to a maximum of $5.00) to: Heath Users' Group, P.O. Box 217, Benton Harbor, MI 49022-0217. VISA and MasterCard require minimum $10.00 order. No C.O.D.s accepted.

Questions regarding your subscription? Call Margaret Bacon at (616) 982-3463.

BUGGIN' HUG

Talk to Your Refrigerator

Dear Jim:

Thank you for publishing my article on the A-Bus interfacing system, "How to Get your Computer to Talk to Your Refrigerator", in the November issue of *REMark*. Unfortunately, the gremlins seem to have gotten to it with curious results. In order to program the A-Bus cards, it is necessary to send them a number which is some power of 2. This is represented in BASIC by the notation 2^X, where X is some single digit. Thus, we get two squared (2^2), two cubed (2^3), and so forth. this is represented in English by making X a superscript. In the article, as printed, the superscript did not come out as such. Instead, it was printed in several places as twenty-something (e.g., 23 + 24 = 24). No, this is not intended to be the numerical equivalent of non-eculidian geometry. That should read "two to the third (8) plus two to the fourth (16) equals twenty-four". In BASIC, $2^3 + 2^4$. I hope that the readers can figure out which numbers are which. Sigh!

Yours truly,
William G. Nabor
27172 Huerta Street
Mission Viejo, CA 92692

Robo Woman

Dear Mr. Fale:

Hopefully, you are the right one to write to, and if not, would you please forward this to the correct person. Thank you.

My subscription is almost two years old and ever since my first issue (Vol. 10, Issue 7, July 1988) I have been offended by the sexist implications of the front cover's back advertisement regarding HUG BBS. I realize that you may not have many females using BBS' yet, but believe me, more and more are becoming involved and I'm sure that I am not the only one to be offended. In fact, there are probably many male subscribers who are offended by the fact that this entire ad is too suggestive in nature. For instance:

1. Webster's Dictionary defines "take advantage of" as
   a. to profit by and,
   b. exploit
2. You picture HUG BBS as an obvious female and this only emphasizes an outmoded way of thinking that females are to be "profited from" and/or "exploited."
3. The suggestion is further compounded by:
   a. "I have everything you could possible want!"
   b. "I'm fast."
   c. "...will make you come back for more."
   d. "...how inexpensive I am!"

Perhaps this ad was done inadvertently, but it does appear that *REMark* is "pimping" for its HUG BBS, and the ad does point to blatent sexism in advertising. With the amount of sexual abuse in America today, I'm certain that *REMark* would not want to contribute to more.

Why not change the figure to an asexual robot like R2D2 in "Star Wars", or a picture of an actual computer BBS? Most anything would do a better job than the invitation "to profit by" and/or "exploit" females. Don't you agree?

I have learned a lot from subscribing to your magazine, but will have to stop my subscription if this ad continues. I have already let my subscription run on for too long as it is, but I kept thinking that with each issue, the ad would be changed. I realize that one subscription will make no different monetarily to your large organization, but I would hope that a change is made because it is the proper and decent thing to do.

I realize that you probably won't print this and probably won't even respond to my complaint. But I would like to hear from you, Jim Buszkiewicz, or any of the women on your staff. I do believe that most people and the corporations they work for are decent and do not want to offend their public/subscribers.

Thank you, and I look forward to an answer.

Sincerely,
Beverly T. Parker
3752 NW 20th Place
Gainesville, FL 32605

In Response to Robo Woman

Dear Beverly:

I am in receipt of your letter about the female robot ad in *REMark* magazines. First off, I am not certain why you wrote to me. I have absolutely nothing to do with *REMark* magazine. I subscribe to it, I advertise in it, and I even occasionally write for it. But I have no control over the contents of this fine magazine.

I really think the HUG Bulletin Board is great and I rather enjoy the picture of the female robot. After all, it is only a drawing of a robot and not something out of Playboy. I don't see what the problem is. As for the other points, I realize what you are saying about the suggestions. But don't you think you're creating something where it does not exist? The points mentioned are referring to their bulletin board and not to any woman — especially a robot? The HUG Bulletin Board costs nothing to access, so it is inexpensive. It does have a very fast response time. Since it has so much information and programs one **does** want to come back for more and it does have many features.

Look at the world around you. The entire world is on the verge of falling apart, pollution abounds, crime runs rampant, we cannot trust our own government, we are being taxed to death, people are starving, etc. In view of all this, I cannot understand why in the world you are so interested in creating problems that do not even exist like reading something into an advertisement which talks about a bulletin board.

I can see where you are coming from, but I do think you would channel your obvious talent and energy where it would serve some practical use. At your request, I am forwarding your letter to Jim Buszkiewicz, editor of *REMark* and bulletin board man.

Henry Fale
QuikData Computer Services, Inc.
2618 Penn Circle
Sheboygan, WI 53081

Parking All Your Hard Drives

Dear Richard:

I read with interest your article in the January 1990 *REMark* on installing hard disks. I have installed an HD on my Z-151 and installed 2 HDs on my Artech SP/286 at home. Plus, I have installed and swapped HDs on various machines at the office. It is usually quite a challenge. Nothing ever goes smoothly. I, too, have tangled with the drive select jumper vs. twisted cable challenge a couple of times. And what one brand of HD calls drive 1, the other brand calls drive 0! I must say that the literature and software free with drives sold by Hard Disks International has been a lot of help.

I usually try to use the utility supplied with each drive to format it. On the Zenith Data Systems, I had to use part of the ZDS utilities (PREP, PART, etc.) and part of Omtidisk. It had an Omti controller. Neither Z nor Omti was able to do all the job. For the SP computer, I used Speedstor on the Miniscribe drive and Ontrack Disk Manager on the Seagate drive. It was tricky to get the machine to accept two different brands of partitioning software.

Now for the good news. You *can* park all drives at once. PARK, from Gibson Research Corp., displays the message that 2 drives have been parked, if you have 2

Continued on Page 37

HUGPBBS Gets a Facelift

(Actually, The Whole Body!)

Jim Buszkiewicz
HUG Managing Editor

If you don't have a modem, GET ONE! You really don't know what you're missing!

For about the last 4 or 5 years, HUG has had in operation, an electronic bulletin board system called HUGPBBS (Heath User's Group Personal Bulletin Board System). It originally was written for the Z-100, under CP/M-86 (CP-wha???). Later, it was rewritten for MS-DOS, and made smart enough to know if it was running on a Z-100 or PC Compatible. It was capable of 1 phone line, a total of 128 messages, and an upload/download section for files. It ran somewhat leisurely this way for a couple of years without a hitch. At that point in time, I learned I could clone (network) the software on multiple machines (with some severe changes to the software), and add 1 additional phone line per machine. What prompted this cloning process was a feature that was added to the software. This feature was called the Bargain Centre. Its popularity demanded more throughput for its users!

Since its inception, the Bargain Centre had become almost legendary. During certain sales, the phone lines would light up for literally hours without rest, until the sale items were all sold out. I recall one user saying that he set his 'Demon-Dialer' to call every 20-seconds, but still couldn't get through in a one-and-a-half hour period. To further the problem, the newer version of the networking software I was using, seemed to have glitches during these periods of heavy disk activity.

To further the congestion, the message section started to see more activity than normal. Normal activity consisted of a single message rollover per month. That time had been reduced to less than a week!! It was obvious . . . HUGGIES like telecomputing!

The data base, which originally started out on a single 10 meg. Syquest cartridge drive, had grown past the 80 meg. mark. It was definitely time for a change. This bulletin board software was originally written for an individual, with small, individual needs, and not for a group as large as ours!

I could see the handwriting on the wall sometime prior to this time, and was slowly examining the alternatives. Most bulletin board packages were either too slow (written in BASIC), too small, or too expensive. NONE of them had the capability of handling the Bargain Centre in a manner that HUGPBBS did. Specifically, HUGPBBS could take the order, and monitor/adjust the inventory on the spot! My second requirement was, this new software, had to run on one computer, and not a bank of them. Furthermore, I wanted the software to run under MS-DOS. Now there weren't many choices left. One choice was a piece of free software requiring you to buy the serial interface board costing many thousands of dollars, and although the software came with source (in 'C'), there was very little support available. The other choice was the light at the end of the tunnel . . . TBBS!

Having logged into many different bulletin board systems over the years, I had known of the existence of TBBS (The Bread Board System) for quite some time. It's a type of system that can be configured to look and do just about anything (thus the term "Bread Board"). Strangely enough, at the time we were ready to upgrade here at HUG, Phil Becker (TBBS' author) was just getting ready to release TDBS, a dBase option module, that allows any user to run a dbase program while online! Here was the 'missing link'; the answer to running the Bargain Centre!

On April 4, 1990, HUG/TBBS became reality. Logging onto the system was made as simple as possible. You enter your FIRST NAME, your LAST NAME (exactly as shown on your ID card), and your HUG ID NUMBER (all the digits). Because the HUG membership data base, and TBBS registration data base formats were in no way compatible, a simple scanner program had to be written, which bumped the two data bases against each other. Once registered on TBBS, HUG members receive full authorization at 3:00 AM EST daily. Now, what does HUG/TBBS have to offer?

Currently, HUG/TBBS is handling over 500 calls per day without even a whimper! The information exchange in the message base is tremendous. Think about this for a moment. You recently purchased a piece of software, and find that it isn't working quite right, so you leave a quick message, in either the 'HARDWARE' or 'SOFTWARE' section, to anyone on the board who might be able to help. The next day and sometimes even sooner, your answer is there. HUG Software Engineer/Guru, Pat Swayne, and Heath Technical Consultant Larry Bollman, are always on hand for some of those real tough problems. Once in a while I even jump in with what little I know.

The 'CLASSIFIEDS' section of the message base appears to be the most active. Do you need a part, no longer available from ZDS? Looking for a used peripheral for your system? Maybe got an extra computer you'd like to sell? This section handles it all! You might call this area of the message base, a computer flea-market.

The message section of HUG/TBBS is not all computer related. I've even observed two users leaving chess moves, in private messages, to each other! Yes, there is a section where 'NON-COMPUT-

ER RELATED' messages can be exchanged.

One area of HUG/TBBS, not yet fully explored, is the real-time conferencing area. Here two or more users can 'chat' with each other either publicly or privately. In the future, I plan to have some prominent figures from within the ZDS organization, available some evening, for a question and answer period.

Now for the real attraction: The 'KEYBOARD SHOPPING CLUB'! If you're a HUG member, and registered on HUG/TBBS, you already belong to the club. This portion of the system currently includes the 'HUG SOFTWARE SALES', and the infamous 'BARGAIN CENTRE'.

In the HUG 'store', you can purchase a new membership, renew your current membership (at a discount), buy any piece of HUG software (at a discount) and shareware currently found in our download data base section. To promote usage of the system, these discounts can only be obtained when ordering items through the 'KEYBOARD SHOPPING CLUB'.

I can't say much about the BARGAIN CENTRE other than it's a place to buy used, and refurbished ZDS computer equipment. A list of items is placed up for sale at random intervals (to keep things fair, and the phone lines hopping). The list is usually emptied within a few days. You have to experience it!

In another article in this issue of *REMark*, Pat Swayne has more specific information on that subject. I would like to mention, however, that besides the standard shareware and freeware for registered users, there is a special free section of downloadable software available for any ZDS computer user (even if they don't belong to HUG). This section contains programs and information files which are specific to ZDS Computers. As an example, in that section you can find the latest version of PREP, or MOUSE DRIVER program, etc. You'll also find information files containing 'fixes' and 'how-to's'.

Although uploads are allowed, they're really not necessary, or required. I personally maintain the data base with software which I get from reputable sources. Uploads will only be accepted from registered HUG members, and their name is ALWAYS included in the program description.

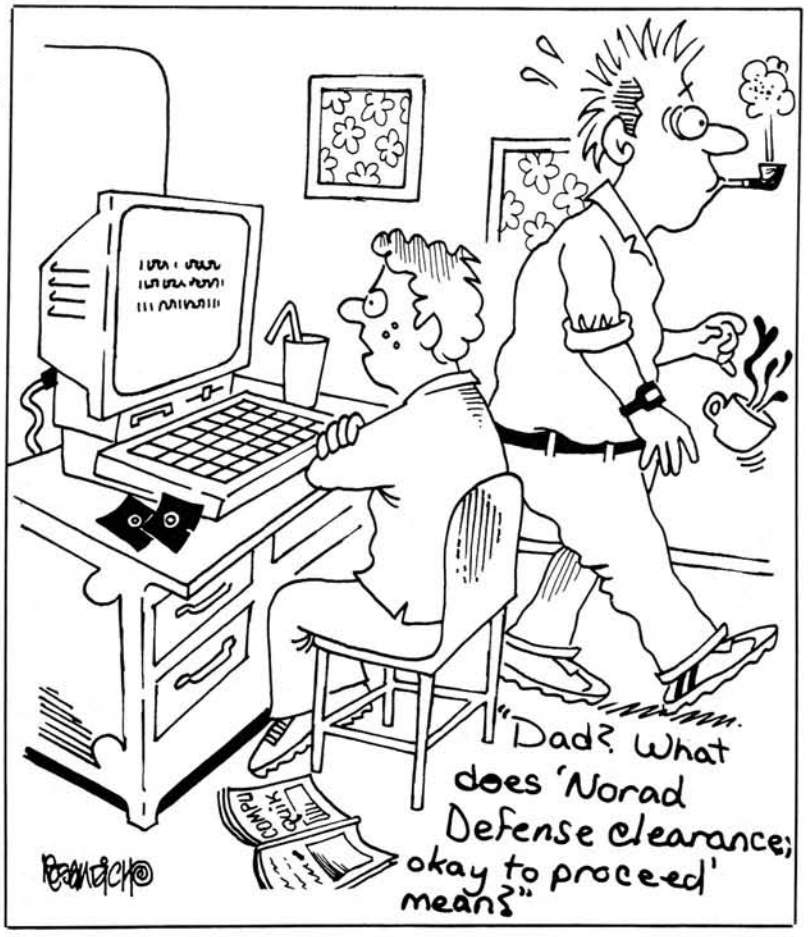
Finally, I'd like to say a word or two about costs. Although the call to HUG/TBBS may not be a 'local' call for you, all the services provided are free, with no strings attached. Consider the following data. There is almost NO speed degradation at any baud rate when connected to HUG/TBBS. When connected to CompuServe through Tymnet at 1200 baud, the average throughput is only 680 baud!! This value is almost one-half of what you'd expect, meaning that you're going to be connected TWICE as long for the same information. (Your supposedly $14/hour rate has now almost doubled!) Now, let's suppose you pay MA-BELL for a long distance call to HUG/TBBS instead. The MAXIMUM charge for weekday evenings is $10.80 per hour. This figure is for calls made from the furthest points in the continental US over the AT&T system (rate step 8). If you're calling from Hawaii (rate step 11), the charge is still only $13.80 per hour (weekday evenings). These figures are still LESS than the Tymnet/CompuServe charges, and, are reduced even further on Fridays and weekends!! Furthermore, your long distance carrier may even be cheaper than AT&T!! The above figures have been verified current as of 5/90.

In closing, I want to leave you with these tips for hassle-free logging on. In response to the FIRST NAME question, use any first name you'd like to be known by: Skip, Rob, Bo, etc. Your FIRST NAME does NOT have to match anything. Your LAST NAME, however, must match the LAST NAME on your HUG ID CARD or REMark MAILING LABEL. If you haven't been on the system previously, you WILL want to start a new account, so respond with <Y>es to that question. Normally, your computer will have 80 characters per line and 25 lines per page. Finally, enter your HUG ID NUMBER. It must contain all 6 (six) digits, 012345. From that point, you've been entered into the HUG/TBBS data base, but NOT yet fully authorized. Full authorization will occur at 3:00 AM EST, daily. When you do call back, you will need to use the same FIRST NAME, LAST NAME, and HUG ID that you used to initially log on with.

HUG/TBBS opens up a whole new world of telecommunications for HUG members. Why not check it out . . . at least once or twice. Just set your modem software for 8-data bits, 1-stop bit, and NO-parity (8N1), and have your computer call mine at (616) 982-3956. ✱

Z-100 Survival Kit #13

Paul F. Herman
3620 Amazon Drive
New Port Richey, FL 34655



I Just Bought a Z-100 . . . Now What?

This month's column is going to be a guide for all the folks who are buying used Z-100s for the first time. It will answer questions which are elementary for most of us, but which are of paramount importance to someone who has never seen, or heard of, a Z-100 computer before. The buyer of a used Z-100 is immediately at a disadvantage, because the machine may not come with the proper documentation or software. In fact, it may not even work. I've been fielding about two or three calls a week from people who just bought a Z-100 and don't know what they've got, or what to do with it.

Where Do They All Come From?

Many used Z-100s are purchased from folks who are upgrading (yes, I hear the hisses . . .) to bigger and better machines. Generally, in these cases, the purchaser is in pretty good shape because the machine will come with a pile of software and technical literature accumulated by the first owner. And if there are any difficulties, the new owner can usually ask the seller for help.

But MOST used Z-100s being purchased right now are bought at an auction or surplus outlet for a price ranging from $50 to $250. The buyers typically think they are getting an IBM-PC compatible computer (aren't all computers IBM compatible?) and don't know what to do when it won't boot their borrowed copy of PC-DOS. A large number of Z-100s are now beginning to show up at government auctions, and are being sold to the highest bidder — without any software — not even DOS.

Take an Interest in New Z-100 Owners

Many of you who have read up to this point are beginning to say that this doesn't have anything to do with you, because you already have a Z-100, and you are not a novice. That may be true, but you should realize that these new Z-100 owners need our help to figure out how to use their new computers. And we need their continued support to extend the useful life of the Z-100. If a new user can't get his Z-100 working and doing useful things, he will throw it away and buy a PC clone instead. On the other hand, if we help him discover the capabilities of the Z-100, he will continue to use it and may contribute to the Z-100 community in the future. When you consider that tens of thousands of Z-100s are owned by the government, and will be auctioned off in the next few years, the level of help and support the new buyers receive may have a drastic effect on the future of the Z-100.

The Typical Scenario

My company (Paul F. Herman Inc.) has become something of a clearing house for Z-100 information. The Heath Users' Group refers most of the questions they receive about the Z-100 to us, and Heath/Zenith is referring many of their Z-100 technical questions to us as well — especially those coming from the military.

The typical caller starts out by saying that he just bought a Z-100 (or several) for next to nothing, and needs some information. The questions these new buyers ask are not hard to answer, but they do take some time to explain properly. And I get asked the same questions over and over, several times a week — thus the reason for this edition of Z-100 Survival Kit.

I would like to address some of the more commonly asked questions in this column. And then I would like to finish by going through a step-by-step procedure to help you figure out if your Z-100 is operating properly, and to help you get your system on line — even if you don't have any documentation.

Is the Z-100 an IBM-PC Compatible Computer?

In a word, no. But before you get discouraged, some additional explanation is in order. When I say that the Z-100 is not IBM-PC compatible, this is to say that it will not run all of the software that you can buy for a PC clone. However, both the Z-100 and the IBM-PC use the MS-DOS operating system, and the same CPU chip, so many programs WILL run on both machines. These programs are generally referred to as "Generic DOS" programs. There are very few commercial software programs which fall into this class, but there are many public domain and shareware programs that are generic DOS, and

which will run on the Z-100.

Can the Z-100 Run IBM-PC Software?

There are several approaches to using IBM-PC software on the Z-100. First of all, many "PC programs" are really not IBM-PC specific, but are programs which will run on any MS-DOS computer, including the Z-100 (see previous question). In order to fall into this category, a program has to display only text (no graphics), use only ASCII keyboard input (text character keys or control codes), and access peripheral devices using MS-DOS function calls. It will be almost impossible to tell if a program is a generic DOS program without trying it.

For PC-specific programs, there is still hope for running them on the Z-100. The most economical approach, and the logical first alternative, is to try HUG's ZPC software emulator program. This program allows you to use a surprising number of IBM-PC programs on the Z-100. Many programs will run under ZPC without any problem. Others may require modifications, called patches, before they will perform correctly. For this reason, the ZPC software solution may not be a good choice for casual users unless the application programs you need will run without patching. ZPC may be ordered directly from the Heath Users' Group (see phone numbers in the front of this magazine). The ZPC program requires at least 768K of RAM memory (the full load) for the most successful emulation.

At least two companies have developed hardware solutions for the Z-100 PC compatibility problem. Gemini Technologies has a product called the Gemini Emulator Board, and UCI Corporation manufactures the UCI Easy-PC Emulator. These hardware modifications to the Z-100 allow just about any PC compatible program to be run on the Z-100, as long as it uses text or CGA graphics modes. Availability of these hardware emulator systems may be limited — check some of the suppliers who advertise in this magazine for current ordering information.

What Version of DOS Does the Z-100 Use?

The latest version of DOS available for the Z-100 is v3.1. But keep in mind that this must be a version which is designed to work on the Z-100. You can't take your brother-in-law's copy of MS-DOS 3.1 and expect it to work on the Z-100. As far as I know, the only place in the world that still sells DOS for the Z-100 is QuikData Inc. (a regular advertiser in REMark). Other Zenith Data Systems dealers may have some copies too. Supplies are limited, so don't delay if you need to get a copy of DOS for your Z-100.

I am currently involved in negotiations with Heath/Zenith and Microsoft to try to make MS-DOS for the Z-100 available on a continuing basis — only the future will tell if this project is successful.

What Do All of the Rear Panel Connectors Do?

Here is a listing of each connector on the back panel, and a description of its use:

J1 — This is a female DB-25 connector which serves as a DCE (Data Communications Equipment) port. It was originally intended to be used as a serial printer port, although many serial printers are more conveniently connected to J2.

J2 — This is a male DB-25 DTE (Data Terminal Equipment) serial port. It may be used for serial modems, printers, or other devices. This port is roughly equivalent to the COM1 port on PC compatibles. Both serial ports in the Z-100 (J1 and J2) are similar, and differ primarily in the gender of the connector and the pin-outs. Most devices can be used on either port if you have a null-modem gender changer.

J3 — A parallel printer port which uses a female DB-25 connector. This is a standard parallel output port similar to the LPT1 port on PC compatibles.

J4 — A modular phone jack which is used as a light pen connector. Use of a light pen with the Z-100 will require special software which knows how to interface directly with the light pen.

J9 — This is a female DB-9 connector used for RGB video output to a color monitor. Most CGA compatible color RGB monitors should work okay with the Z-100, and should come with this type connector.

J14 — An RCA phono jack used for monochrome video output to a monochrome monitor. This jack will be missing on All-In-One models, since the composite monochrome monitor is built in.

J16 — If installed, this should be a 50-pin connector for attaching a Shugart compatible 8-inch floppy disk drive. However, if the Z-100 has previously been attached to a Bernoulli Box, tape backup, or other special equipment, J16 may be used as a 50-pin SCSI bus connector.

There are knockouts for many more connectors on the back panel of the Z-100, but stock machines will only have those listed above. The existence of additional DB-25 or other types of connectors probably means that a multi-port I/O card (Z-204) or other accessory cards are installed.

If one of the rear panel knockouts has been replaced by a small slide switch, the switch is most likely used to change the Z-100 between 4 MHz and 7.5 MHz operation.

Can I Add a Hard Disk to the Z-100?

Sure, no problem. There are a variety of different ways of adding a hard disk, and there are a number of vendors who still provide this type of support. Check with one of the vendors who advertises in this magazine for more information.

Can I Read and Write PC Compatible Disks with the Z-100?

Yes, both the Z-100 and IBM-PCs use the standard 360K double-sided, double-density format. These disks are interchangeable between machines. If you find that you cannot read disks created in a PC compatible machine, there are several things to check:

1. Make sure the PC compatible disk is a standard 360K format disk. Many PC computers (especially the ATs) use a high density 1.2 Mb format which cannot be read by the Z-100.
2. Check your version of DOS. If you are using MS-DOS v1 (also known as Z-DOS on the Z-100), you will not be able to read disks created with version 2 or above of MS-DOS. This is because version 2 and higher of MS-DOS uses 9 sectors per track, instead of the 8 sector format used by Z-DOS.
3. In some cases, inability to read a known-good diskette may be caused by hardware problems, such as a drive which is not aligned properly, or a bad controller board. If the Z-100 seems to work just fine with its own disks, but refuses to read disks created on other machines, you may have an alignment problem.

If PC disk compatibility is a primary concern, and you need to read high density or 3.5 inch formats, software is available for the Z-100 which will allow the use of these special floppy drives.

Getting Your Z-100 Going Without Any Documentation

Many Z-100s are being sold these days without any documentation or user's manual. It is easy to understand why the new purchaser would have difficulty figuring everything out. The remainder of this column is a step-by-step guide for getting a Z-100 up and running, with or without documentation.

Power-Up Check

The only thing you'll need for this check is the Z-100 itself, and a video monitor. If you have the "All-In-One" model, your monitor is built into the computer. If you have the "Low-Profile" model, you'll need either a composite monochrome monitor, or a CGA compatible RGB color monitor. Plug composite video monitors into jack J14. Plug RGB monitors into connector J9. Sorry, the Z-100 won't work with a TV set (former Commodore 64 owners ask this question from time to time).

Oh, there is one other thing you'll need — a power cord for the Z-100. You should have received this with the computer, but the cord is removable, so it could be missing. The power connector

on the back of the Z-100 is a standard type used by many computers. If you need a cable, try a local electronics parts house.

Now plug the Z-100 in, and turn it on. (Can't find the switch? Just stop right here — you probably should not be playing with computers.)

You should hear one or two BEEPs (depending on ROM version). You should also hear a noisy fan coming up to speed. No Fan noise or BEEPs? This probably means the power supply is dead — a very expensive problem — find the guy who sold you this thing before he disappears. Yes, the Z-100 has a fuse, but it is considered to be a non-serviceable part (no this is not a joke, it is Heath/Zenith's way of selling power supplies). At any rate, if the fuse is blown, you've probably got other problems, so best to get your money back, if possible.

If you hear the fan, but no BEEPs, then there is something wrong with the internal electronics. Could still be the power supply, but before you give up completely, take the cover off (see below for instructions) and try wiggling all the sockets and connectors to see if that corrects the problem. Still no luck? I guess you're up the proverbial creek without a paddle.

If the Z-100 does BEEP at you, all is well so far . . . skip the next section.

How To Take Off The Cover

If you need to get inside the Z-100, the cover is easy to remove, but only if you know how. Look at the back of the computer, and on each side you should see metal rails sticking out. Grab these and pull them toward the back of the machine and lift the lid at the same time. You may need to use a screwdriver or a pair of pliers to get them moving if they're stuck. The lid should just lift off.

After the cover is off, you'll have access to quite a bit of the internal electronics of the machine. You still won't be able to get at some of the boards without further disassembly, but I don't want to get too involved here. If you have the guts and the desire, go for it! Z-100s are easy to take apart and put back together — just make sure you remember which connectors go where.

The Hand Prompt

(**Note:** Some Z-100s with a Winchester disk (hard disk) installed, may be set for automatic booting. If this is the case, but you would still like to follow along with our discussion, try hitting the DELETE key during the auto-boot sequence, and you should be returned to the hand prompt.)

After the BEEPs, you should be able to see a prompt on the video monitor that resembles a hand with a pointing finger. If you don't, check your video connections again, and make sure you are using the proper type of monitor. If you still don't get anything, it sounds like problems with the video board in the computer. This could be something simple like a connector which fell off in the machine, or it might be more serious. If you want to have a look inside, proceed at your own risk.

If you get a video display, but it is distorted or out of sync, check the adjustments on your monitor first. If the problem can't be corrected by adjusting the monitor, you may have to fiddle with the jumpers on the video board. Jumpers are provided to select the vertical and horizontal sync polarity, and the type of RGB synchronization. Most monitors are pretty standard these days, so this should not normally be a problem.

System Information

Now it's time to find out something about the configuration of this Z-100. When the hand prompt is displayed on the screen, press the 'S' key. The computer should display a few lines of information about how much memory is installed, what type of video memory is used, and if the system is color or monochrome. It may also tell you what size memory chips are used, and if you have an 8087 numeric coprocessor installed.

Now, press the 'V' key. This will tell you what version of the monitor ROM you have. If you have a Winchester installed, or plan to add one later, you MUST have version 2.5 or later of the monitor ROM.

Press the HELP key. You should see a list of all the valid ROM commands. You can play with some of these if you like — won't hurt anything. The exact details of how to use most of them will be left as an exercise for the user. One, which may be particularly useful, is the TEST command. If this option does not appear on your list of commands, then you must have a real old version of the ROM — don't worry about it for now.

If this option is available, try it. You should get a second menu showing the different tests which are available. Options should include a disk read test, keyboard test, memory test, and power up test. There's no need to run these tests right now, but make a mental note that they are available, if needed.

Booting Up

If you've gotten this far, you can take confidence that most of the computer is functioning as it should. The only major parts that could still cause problems are the disk drives and controllers.

If there is a hard disk (Winchester) installed in the Z-100, try just typing 'B' and RETURN to see if the Winchester is set up as the default boot device. If the DOS sign-on message appears, you're home free — the previous owner must have left the system software on the hard disk.

If your system does not have a Winchester, or if the Winchester boot attempt failed, we'll have to boot from a floppy disk. Find your MS-DOS (or Z-DOS . . . Ughhh!) distribution disk, and insert disk #1 in floppy drive A. Drive A is usually the one on the left (systems with full-height drives), or the one on top (All-in-One Z-100s, or systems with half-height drives). If you have a Winchester Z-100, you only have one to pick from, and it must be drive A.

Now try typing 'B', followed by RETURN. Or, if you have a Winchester system, you may have to type 'B', then 'F1', then RETURN. The drive A access light should come on, and the system should boot up and display the DOS banner.

If the computer waits for a long time and then displays "DEVICE ERROR", you may have hardware problems with the drive or controller board. If the computer just hangs forever, crashes back to the hand prompt, or does other crazy things, you're probably trying to boot with an improper version of DOS. Remember, you must be using Z-DOS or MS-DOS for the Z-100! If you get the message "NO SYSTEM", this means the disk you are trying to boot is not bootable. If you have an unlabeled two-disk set of DOS disks, try the other disk.

Configuration

If you have successfully booted DOS, you're just about home free. One other thing that will be necessary before you can use any printers or other peripheral devices is the DOS configuration. This is not normally necessary with PC compatible computers (or is done with the MODE command), but on the Z-100, you MUST configure DOS for the devices you will use.

Find the CONFIGUR program on one of your DOS disks. Run this program and follow the instructions. Typically, you would want to configure DOS to use a parallel printer as device PRN, and maybe a serial printer or modem as device AUX. Before exiting the CONFIGUR program, be sure to write the changes to DISK and MEMORY. This is an option on the main CONFIGUR menu. This configuration process must be done for each bootable DOS system disk you use, including each bootable hard disk partition.

To check out the configuration, try just copying some text to the printer using DOS. This can be done as follows:

1. At the DOS prompt, type: COPY CON PRN . . . followed by a RETURN.
2. When the cursor goes to the next line, type in some characters, like "Testing 1,2,3" and hit RETURN.
3. Enter a Control-Z character. This is done by holding down the Ctrl key and hitting 'Z' at the same time. Hit RE-

Continued on Page 24

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⇨Installs in ROM Socket on the CPU Board in Zenith computer series Z-100/ 138/148/150/160 and most all other XT computers. This clock/calendar contains a ten year battery and keeps your computer informed of both date and time at each boot-up. Instructions and software included. $35.00

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⇨These kits include high speed Seagate drives with autopark heads. Each kit includes all cables, hardware and instructions to mount the hard drive under your two floppy drives in your Z-150 series computer.

* ST-125/Z150 Kit	21 Meg, 40 MS,	$278.00
* ST-138/Z150 Kit	32 Meg, 40 MS,	$326.00
* ST-151/Z150 Kit	42 Meg, 24 MS,	$404.00

Z-148 HARD DISK DRIVE KIT

⇨Includes the hard disk drive and a Z-148 compatable controller together with the Z-148 Expansion Card described below. All required cables, hardware and instructions are included for you to replace one floppy with a Seagate Hard Drive in your Z-148. Add only $30.00 the the following price if your would like us to include a SmartWatch.

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⇨M-355 and ND356 run on AT compatible or special controller only.

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⇨We assemble 8088 XT, 80286 AT or 80386 IBM compatible computers to your specifications. Please write or call for a work-up sheet showing items available and prices. We can use many existing parts and take others as trade-in from your Z-100 to reduce your costs.

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⇨CM4531	SAMSUNG Color EGA 640x350	$ 389.00
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VIDEO CARDS

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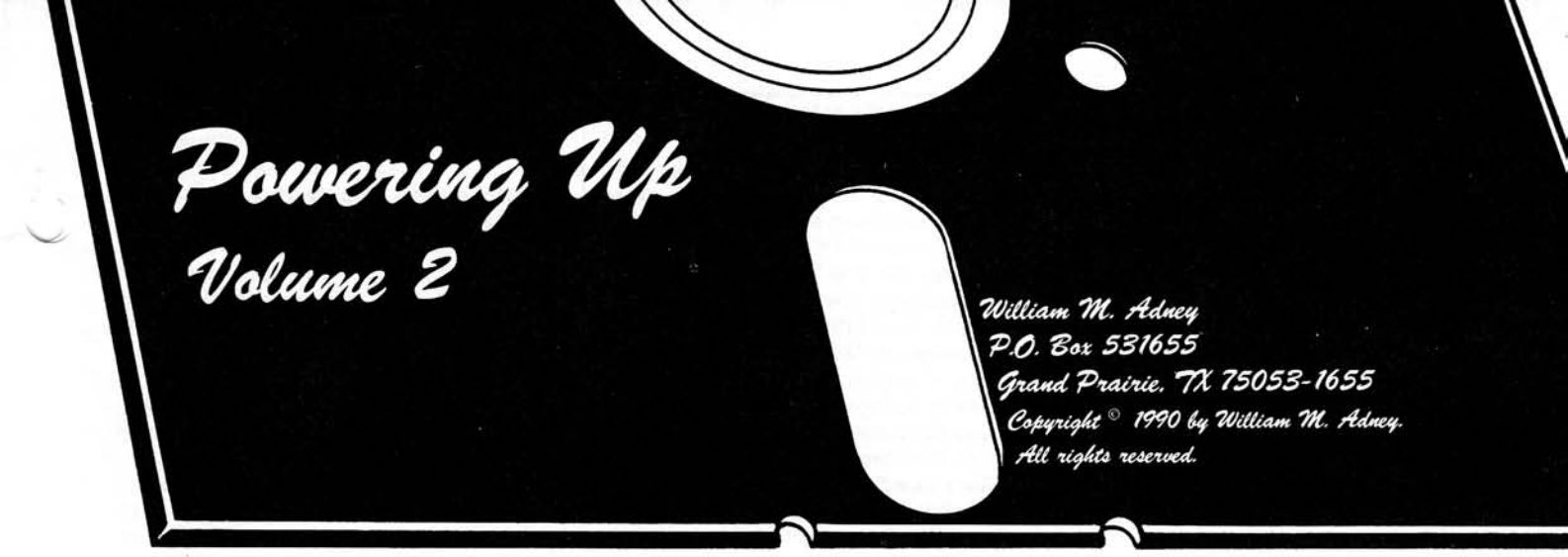

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Coping with Common DOS Error Messages

There are several general categories of error messages that can be generated by your computer system, and we have looked at a couple of them in this series. ROM error messages seem to cause a lot of problems for some reason, and a specific article was dedicated to explaining what they mean and what to do about them. The device error messages, commonly known as the "Abort, Retry, Ignore" group, are also quite common and were discussed in the previous article. The last major group of error messages, which I call DOS error messages, are generated because of an error condition detected during the execution of a DOS command, including such commands as COPY that are part of the Command Interpreter COMMAND.COM. This group of error messages is the specific focus of this article. Because there are literally hundreds of error messages that can be generated by various DOS commands, I have chosen some of the most common error messages that you will likely see at some time or other. Also, I have not included the common CHKDSK error messages in any detail in this article because they were thoroughly discussed in the article on "What a Disk Really Contains."

DOS Error Messages

If you use your computer very much, there are few things that you will run into as often as the DOS error messages. Like most error messages that are generated by operating systems, these messages tend to be rather cryptic, and many are not very helpful, to say the least. Some are downright obscure, and a few are actually misleading.

It is no wonder that many people believe that computers take on a life of their own when they try to use them. I can't help but recall the time I was teaching a group of students how to use a computer at UTA. One of my students told me that she thought that DOS was a good example of "user hateful" software. I can't totally disagree with that observation because a lot of DOS error messages are not particularly helpful, unless you have a clue as to what is going on. It's kind of like learning the "Rules of the Road" when you learn to drive a car. For example, what's the difference between a solid and a broken line which are used to mark the highways? In DOS however, most of the "lines" are solid, and if you cross them, you will probably see an error message.

But error messages are a way of life it seems, and even experts manage to find ways to cause them. Since many of the error messages tend to use terms that are unique to computer systems, I thought it might be worthwhile to try to explain some of the common, and obscure, error messages that you can get during the operation of MS-DOS or PC-DOS. Since it does not matter (for the most part anyway) which version of MS-DOS or PC-DOS you are using, I have used the general term "DOS" to indicate all versions of these operating systems.

In general, error messages in this article will be listed in alphabetical order. There are two exceptions. In all the years I have worked with DOS and computers, these two exceptions seem to cause more confusion than all others combined.

The Top Two

If I were to provide a nomination for the absolute worst error message in DOS, it would be a toss-up between "Bad command or file name" or "Invalid parameter". Both of them are obviously quite vague. Both lead to questions about what the terminology means. For example, what is a "parameter?" And the "Bad command or file name" message can take some time to figure out what caused it in the first place because it can have several different meanings, depending on what caused it.

The "Invalid parameter" error message is comparatively easy to discuss, so let's begin with that.

Invalid Parameter

The "Invalid parameter" error message is generated by LOTS of programs included with DOS. A lot of people seem to have difficulty with this error message, probably because they do not understand what a parameter is. So I will define it before I go on.

A *PARAMETER* is a variable item of information that controls the operation of software (i.e., a program) by defining program functions, selecting options, establishing limits or otherwise modifies program operation. Although this is a general definition that applies to computers, it specifically includes all information entered on the command line (excluding the command itself), such as drive identifiers, path names, file names, switches, and so on.

For example, consider the following command: DIR C:*.COM/W. Parameters in this command line include the C: (drive identifier), *.COM (file name), and the /W (optional switch for the wide directory display). Each of these items or elements of information (i.e., parameters) must be exactly correct for the command to function properly. If one or more of these items is incorrectly entered, the "Invalid parameter" error message may be displayed. As a matter of fact, one of the easiest ways to get the "Invalid parameter" message is to simply omit the colon following the drive letter so that the command becomes: DIR C *.COM/W. DOS sees that there is more information on the command line, but does not know how to process the command since the colon is missing. Is "C" a drive letter, file name or what?

Or, if you want to see a listing of the COM files in the DOS subdirectory, you could use the command: DIR C:\DOS *.COM\W. In this example, the path

name (\DOS) is also a parameter, but note that it MUST be enclosed in back slashes (\) for the command to work properly. If you inadvertently type a forward slash (/) in place of a back slash, all kinds of mysterious "interpretations" of the command are possible.

This error message can occur at unusual times when the command appears to be correct at first glance. Be sure that the character following the drive letter is a colon — it is very easy to enter a semicolon instead if you do not press the SHIFT key firmly when typing the character. Another common mistake is to type a back slash instead of a forward slash or vice-versa. Or, it could be a simple typographical error, such as typing a /S instead of a /W for the switch. In some cases, you may need to refer to a DOS manual for either the correct command syntax or valid switches that can be used with a specific command.

If you see this error message, there is also one other point to keep in mind. Be sure that the command you entered is valid for the *specific DOS version* you are using. For example, consider the FORMAT B:/N:9 command that is used in current DOS versions to format a 720 KB, 3.5-inch disk in a high density (1.44 MB) floppy drive. The /N switch is not valid in older DOS versions, such as 3.10, because they did not support the high density 3.5-inch floppy disk drives. If you have any doubt, check the DOS version you are using (by using the VER command), and then check the manual for that version. This kind of problem is becoming more frequent because people may use one DOS version at work and another at home.

Bad command or file name

This error message actually indicates that one of two possible problems was detected, depending on the context. The two problems are really separate and consist of: "Bad command" and "Bad file name." This error message is particularly clumsy because you must check for THREE possible errors, again depending on the context. Let's take a look at the "Bad command" part first, which may indicate one of two possible errors.

The first "Bad command" error is the obvious one — a typing error on the command line, such as typing FOMRAT instead of FORMAT. In this context, the error message really means "Command not found", because of the obvious spelling error. I chose this example because it is easy to remember to watch out for a FOM-type of RAT on the command line.

The second "Bad command" error is more subtle. As you know from Chapter 2 of the original *Powering Up* book, DOS looks for commands in a specific order which is: internal commands (e.g., COPY), COM files, EXE files, and BAT files. Also, the current directory on the current drive is always searched FIRST for any command entered on the command line. If none of those file types is found in the current directory on the current drive, then DOS begins looking at each one of the path names in the exact order specified with the PATH command that is usually added to the AUTOEXEC.BAT file. Then, if DOS still does not find the command, such as FORMAT, it will display the "Bad command or file name" error which still means "Command not found." In this context, the error message is quite subtle because it means that DOS performed its specified search and was unable to locate the command in the current path or any additional paths indicated by the PATH command. Many users seem to have a particular problem with this because there is a very subtle thing that you must do with the PATH command to help avoid this problem, and it most often occurs on a hard drive system with multiple partitions.

Consider a hard drive system with two partitions (C and D) and the PATH command shown in Figure 1 below.

```
PATH \;\DOS;\BATCH;\UTIL;\HUG
```

Figure 1
Incorrect PATH Command

The PATH shown in Figure 1 looks okay, and indeed it is, so long as your current drive is C, assuming that all directories listed exist on drive C. But if your current drive is D, and you attempt to use the FORMAT command from the DOS subdirectory on drive C, DOS will *NEVER* find the FORMAT command. Now, take a look at Figure 2 for the correct use of the PATH command.

```
PATH C:\;C:\DOS;C:\BATCH;C:\UTIL;C:\HUG
```

Figure 2
Correct PATH Command

Note that the only difference between Figure 1 and Figure 2 is that I have added the drive letter to each path to ensure that DOS looks at the correct drive letter for commands in the listed directories. The omission of the drive letter from the PATH command makes the "Bad command" error particularly subtle and difficult to find, especially because everything LOOKS like it should work.

So much for the two possibilities for the "Bad command" part of the error message. It is a user error due to a simple typing mistake or an incorrect PATH specification. Now let's take a look at the possible problems with a "Bad file name."

There are three possibilities for this part of the error message: a misspelled file name, the file name does not exist in the current or specified path, or the file name contains invalid characters.

First, check the spelling of any file name you have entered for a command. You can use the DIR command to check the spelling of all file names.

Second, check the path specification. If a complete path is *not* specified in the command line (e.g., COPY *.BAT B:), DOS will *ALWAYS* look at the current directory on the current drive. Otherwise, DOS will attempt to find the file as defined in the path specification preceding the file name (e.g., COPY C:\BATCH*.BAT B:). Regardless of how the command line is constructed, you can again use the DIR command to verify the existence of the specified file name in any directory and/or drive. And I always recommend DIR for this kind of checking because it will ALWAYS be found since it is an internal DOS command.

Last, but certainly not least, is the fact that you may have used invalid characters in a file name. Remember that all of the special characters used in a command line have particular meanings and cannot be used within a file name. Some of the characters that cannot be used in a file name are shown in Figure 3.

```
< > , ; : = [ ] + | \ / SPACE TAB
```

Figure 3
Invalid File Name Characters

Other special characters have unique meanings, such as the wildcard characters, * and ?. And of course, the period is used to separate the file name from the file type/extension. If you have carefully studied the various characters shown in Figure 3, you will recognize that they are generally reserved for some special purpose in a DOS command line, which is the reason they cannot be used within a file name.

When naming a file, you are nearly always safe in using letters and numbers in a file name. And if you need some kind of "separator" in a file name, I suggest using a hyphen (-) because nearly all applications (and DOS) will accept that as a valid file-name character. But be aware that some application programs, like word processors and spreadsheets, may have additional restrictions on file names.

I have picked on the "Bad command or file name" error message to show how ambiguous a message can be. Any error message that has at least five possible interpretations does not help a user identify and fix a problem very well, especially a new user. No wonder a lot of people do not like computers when programmers use this kind of rather obtuse logic to identify a problem. It's too bad that many people blame computers for this kind of problem when it is really caused by a programmer. Now let's move on to some other kinds of error messages that are listed in alphabetical order for the remain-

der of this article.

Access Denied

This error message most often occurs when using a command, such as COPY or RENAME, that attempts to "create" a new file when that new file name has already been designated as a Read-Only file, usually with the ATTRIB command. Or, the command may have attempted to write to a Write-protected disk. In the first instance, it is a simple matter to use the ATTRIB command to reset the attribute to Read/Write (the usual attribute for most DOS files). If the disk is Write-protected, the write-protect notch on a 5.25-inch floppy disk must be UNCOVERED (remove the tab) and the write-protect notch on a 3.5-inch floppy disk must be COVERED.

This error message is also quite common on a network when you attempt to access a file that is not defined as shareable, such as a file in another user's area. In that case, you should contact either that user or the Network Administrator if you believe you should have access to a file.

Duplicate File Name or File Not Found

This error message most often occurs during the execution of the RENAME command. It means that the new file name already exists and cannot be used for the old file or the old file name was not found as specified. Use the DIR command to check both the old file name and the new file name for a misspelling or name conflict, and reenter the command.

File Creation Error

This error message generally occurs when using the COPY command, but it always means that a file was not created as specified. Use the ATTRIB command to verify that the new file name is not an existing Read-Only file, and change that attribute if appropriate. Depending on the context (i.e., the last command issued), this error message may also mean that there is insufficient disk space or the target disk has reached the maximum amount of root directory entries. Run the DIR command on the target disk to determine the number of files in the root directory and the number of bytes of free space available. If the amount of free space on the target disk is less than that required for the file, you will have to use another disk for the new file name. If the number of root directory entries exceeds the maximum for the disk format shown in Figure 4 (below), you will also have to use another disk for the new file.

Figure 4 shows the maximum number of root directory entries allowed for most of the common disk formats, including a hard disk. As you might expect, the maximum number of files in the root directory also depends on whether the disk is single-sided (SS) or double-sided (DS). Also remember that the maximum number of files in the root directory INCLUDES all subdirectories, as well as the other usual kinds of files. After all, a subdirectory is nothing more than a very special kind of file used by DOS.

Drive Type	Drive Capacity	Max. Files in Root
3.5-inch	720 KB	112 (DS)
3.5-inch	1.4 MB	224 (DS)
5.25-inch	180 KB	64 (SS)
5.25-inch	360 KB	112 (DS)
5.25-inch	1.2 MB	224 (DS)
Hard Drive	Variable	512

Figure 4
Maximum Root Directory Entries

Invalid Directory

The "Invalid directory" error message is context-sensitive, and what it means depends on what command was last entered. If it occurred when you entered the CHDIR command for example, it means that the specified directory did not exist for one reason or another, such as a misspelling of the directory name. In general, you should use the DIR command to check the name of the directory if a spelling error is not obvious.

Invalid Filename or File Not Found

This error message is also context-sensitive. It may mean that you have used an invalid character in a file name (See Figure 3) or it means that whatever file name was specified in the last command was simply not found, possibly due to a spelling error, or an incomplete or misspelled path specification. If you are sure that the specified file name does not contain an invalid character, use the DIR command to check the spelling and path, if appropriate.

Invalid Media or Track 0 Bad — Disk Unusable

Nearly everyone has seen this message at one time or another because it is displayed by the FORMAT command when you attempt to FORMAT a floppy disk. While it is obvious that you cannot FORMAT the disk as specified, fixing the problem is not so obvious unless you know a few facts about how DOS works.

First, the default. DOS always attempts to FORMAT a disk at the maximum capability of a drive, unless you use a switch to specify otherwise. If you have a 5.25-inch high density drive (1.2 MB) or a 3.5-inch high density drive (1.4 MB), FORMAT will attempt to initialize the disk at 1.2 MB or 1.4 MB, respectively. Although it is true that you can sometimes successfully FORMAT a double-density (DD) 3.5-inch 720 KB or 5.25-inch 360 KB floppy disk, you will also find an extraordinary number of bytes in bad sectors simply because the disk is not designed or intended to be used for high density recording. In other words, do *NOT* even try to use a double-density disk with a high-density FORMAT because you can lose hours, days or weeks of work when DOS cannot even read the disk later. Unfortunately, the FORMAT command does not know about the difference in disk density ratings, so YOU must know that it attempts to format based on the DRIVE type, not the disk type. And the second fact you must know is the density rating (DS or HD) for a specific disk that you want to FORMAT. And from experience, I have also found that it is generally impossible to format a high density disk at a lower density, so do not expect to be generally able to successfully FORMAT a 1.4 MB disk at 720 KB or a 1.2 MB disk at 360 KB.

All in all, this error message really means that "Cannot FORMAT disk at the default or specified density" because it is extremely rare that Track 0 cannot be formatted at the rated density of the disk.

These commands will work with Zenith Data Systems MS-DOS versions prior to 3.3 Plus (or PC- DOS 4.0) with the exception of the /N parameter which is new to this version. The first general form of the FORMAT command is the one that is typically used to initialize any disk, including a hard disk, to the rated drive capacity.

To FORMAT a 360 KB (5.25-inch) disk in a 1.2 MB drive, it is easy to remember the /4 switch because you are formatting at about 1/4 of the drive's rated capacity. To FORMAT a 720 KB (3.5-inch) disk in a 1.2 MB drive, version 3.3 Plus has the /N:9 switch, which specifies the number of sectors per track (9) for a 720 KB floppy disk only. Because FORMAT looks at the drive type, it will attempt to FORMAT at 18 sectors per track (the default) on a high density drive when this switch is not specified. The /S (System) switch is valid (and optional) in all versions and is used to create a System (i.e., bootable) disk.

In summary, you must know three things: the drive capacity, the disk type, and what version of DOS you are using. Be sure to check your manuals for other switches that can be used with the FORMAT command. Also, remember that you probably will not be able to read (or FORMAT) a high density disk in any low density drive because the physical drive is not capable of doing it. As a final note, I always recommend specifying the drive letter *d* to help prevent formatting the default drive in all DOS versions.

Invalid Number of Parameters

This common error message is displayed by a large number of DOS commands. It is context-sensitive because its exact meaning depends on what the last command was. And it means precisely

```
FORMAT d:[/S] (Any disk to rated drive capacity)
FORMAT'd:/4[/S]'(360'K'disk'in'1.2'MB'drive'--'5.25")
FORMAT'd:/N:9[/S]'(720'K'disk'in'1.4'MB'drive'--'3.50")
```

Figure 5
FORMAT Command Examples

what it says. For example, you can cause this error message by entering the COPY command by itself, with no file specification. As you should know, the COPY command *requires* at least one complete and valid file specification (i.e., parameter), and it makes no sense to enter the COPY command with "zero" parameters. When you see this error, be sure to check the command for the proper syntax, and you may need to refer to your manual for that specific DOS version to make sure you have entered the command correctly.

Invalid Path, Not Directory, or Directory Not Empty

This error message is displayed when you try to remove a directory with the RMDIR (or RD) command and some problem was detected during command execution. For the "Invalid path" portion, it may mean that you misspelled the path specification or that the path does not exist as specified on the current drive. For the "not directory" portion, it means that the specified path is really not a path, but a file. In both cases, you should use the DIR command to verify the spelling of the path specified in the RMDIR command. If you believe that the path specification is correct, then you must make sure that the directory you want to "remove" (i.e., delete) is COMPLETELY empty by carefully using the dreaded DEL *.* command. If you still cannot delete the directory, then there may be one other problem.

At least one terribly primitive form of copy protection uses the DOS Hidden file attribute to "protect" software. Because that file is "Hidden" from the DIR command, a directory may appear to be empty when it really is not. Because of that, a number of people (including me) have written utility programs to display all files, and some even allow the user to change most of the DOS file attributes. If you do not have one of these programs, here is one way to find out whether a directory is really empty by using CHKDSK.

First, be sure you are in the root directory of the drive that has the "problem" directory, and run the *CHKDSK/V >FILENAME.DIR* command. This command causes CHKDSK to "display" EVERY file, including hidden files, on the disk, and the "greater than" sign (>) will create the FILENAME.DIR file by using I/O redirection. Because FILENAME.DIR is an ASCII file, you can now use the *MORE <FILENAME.DIR* command to look through the file until you find the name of the "problem" directory. If you see ANY file other than the directory name, you know that it is hidden from the DIR command. Unfortunately, the file is also hidden from the DEL command (and COPY), so there is no DOS command that allows you to get rid of the problem file. If you do not have a utility program that allows you to change the file attribute, it is probably best to just leave it alone, although you could backup all files on the disk, FORMAT it, and then restore all files back to the disk.

Out of Environment Space

Even if you have never seen this error message, I have found it is becoming more common because people are using longer PATH commands and complex setups for the PROMPT command. In addition, some new programs (and some old ones, like compilers) also require the use of the SET command to set one or more environment variables which are used by the program. There is a way to fix this problem, but it only works if you are using ZDS MS-DOS that is at least version 3.1, and it does not work with the Z-100 version of MS-DOS.

Without getting into the technical details, suffice it to say that DOS has a reserved area of memory — called the environment space — that is used to store essential information. You can see the entire contents of the environment space by simply entering the SET command. This error message is displayed when there is no additional environment space available to add something that was specified in the PATH, PROMPT or SET commands, whichever was the last command entered.

The solution is to expand the environment space using the COMMAND command, and I suggest adding it as the second line (after ECHO OFF) in the AUTOEXEC.BAT file. If you are using Zenith Data Systems' MS-DOS 3.10 (PC version only), add the following to your AUTOEXEC.BAT file: *COMMAND/E:20*. If you are using ZDS MS-DOS 3.20 or later, add the following to your AUTOEXEC.BAT file: *COMMAND/E:256*. Both commands effectively double the size of the environment space by adding an additional 160 bytes for version 3.10 and 128 bytes for version 3.20 and later. Be sure you check your MS-DOS version number (use the VER command) before using one of these commands because they are strictly version- dependent. If you use the wrong version of the command, you will usually get an error message like "Invalid environment size specified" or your system may freeze.

Unable to Create Directory

This error message is displayed when a problem is detected while attempting to create a new directory with the MKDIR (or MD) command. It usually means that the specified directory name (or a file with the same name) already exists, which is why MKDIR cannot create the directory. It may also mean that the specified path does not exist or that the root directory already contains the maximum number of directory entries as shown in Figure 4. Use the DIR command to verify that the specified directory name does not exist as either a file or directory. Check the root directory to be sure that you have not exceeded the maximum number of root directory entries (see Figure 4) for the disk format you are using.

Command-Specific Error Messages

In various parts of this article, I have mentioned that it is important to consider an error message in the context of what command you are using and what you are trying to do. Even some of the messages that have multiple meanings, such as "Bad command or file name", are easier to diagnose when they are considered in context. It is silly to look for an invalid file name when the command itself, like FOMRAT, is misspelled for example.

Each DOS command has a specific set of error messages associated with it, and you must always consider an error message in light of the last command you typed on the command line (i.e., in context). If you see an "Invalid parameter" type of error when the last command you entered was FORMAT, then you should check your manual for that specific DOS version under the FORMAT command to verify the command syntax and the use of any switches if required. Although this seems like an obvious thing to do, I find that many computer users, especially beginners, seem to panic when any error message appears and any semblance of rational thought disappears. Don't fall into that trap. If something unexpected happens, leave your computer on, and take a break to calm down before you try to fix it or figure it out. Get a cup of coffee, take a walk, play with the dogs or whatever.

The objective is to get completely away from the problem for a few minutes. Many people think the way to solve a computer problem is by using the brute force approach, which rarely works. It's much better to take a few minutes for a break and be able to approach the problem more calmly to solve it. Nearly all computer users have serious computer problems, usually of their own making, and it takes a while to realize that. For example, there is nothing quite so devastating as to enter what I call the "Dreaded

Continued on Page 42

A LOOK AT THE NEW HUG BBS

(OR, ROBOCHICK JUST KEEPS GETTING BETTER!)

PAT SWAYNE
HUG SOFTWARE ENGINEER

If you have a modem and you have not logged onto the HUG Bulletin Board System lately, you owe it to yourself to give it a try. The board is running all new software by TBBS (The Bulletin Board System), and it now has 8 lines. The hardware running the system is a 33 MHz Z-386 with a fast 320 megabyte drive. The baud rates (transfer speed rates) currently supported are 300, 1200 and 2400. Faster modems may be added in the future. At whatever baud rate you use, the board will run about as fast as is possible at that rate, because it has almost none of the delay problems that plague some other multi-user BBS systems. If your only experience with modem communication is one of the national services such as CompuServe™, be prepared to be "knocked off your socks" when you experience the speed and responsiveness of the HUG BBS for the first time.

A Tour of the HUG BBS

Let's take a tour of the HUG BBS, so that you know what to expect when you sign on. When you first make connection, you are greeted with:

```
                    WELCOME TO HUG/TBBS

          The Official Electronic Bulletin Board For The HEATH USERS  GROUP

   If you are NOT registered, or if you're here to order HUG or HEATH
   products, enter "NEW" as your FIRST NAME, and "USER" as your LAST NAME.

   For HUG MEMBERS who are NOT yet registered here, enter your FIRST NAME
   as you would like it to be, and your LAST NAME, exactly as shown on
   your HUG ID CARD, or REMark mailing label.

   First Name? Pat
   Last Name? Swayne
   Searching User File . . .
```

If you are a HUG member (and why wouldn't you be if you are reading this?) and you have not registered on the board yet, you will be asked to enter your HUG ID number and some other information. You will then be registered probably during the next business day (maybe sooner), and once you are registered, you will have full access to the board's facilities.

If you are a registered board user, you will be asked to enter your HUG ID number, and then the board will welcome you with a message like this.

```
HUG Welcomes PAT SWAYNE
Your last time on was 04-25-90 12:54
You have read through message 740
Current last message is 743
You are authorized 109 mins this call
Active combined Boards: GENERAL,
   HARDWARE, SOFTWARE, CLASSIFIEDS
Searching Message Base ...
```

The HUG/TBBS system searches its message data base at this point, and it finds messages for you that you have not read since you last logged on, it will display their headers (from, subject, etc.) at this point, and give you a chance to read them right away. If there are no messages, or if you elect not to read them right away, the system will prompt you to press any key and then it will display the main menu, which looks like this.

```
HUG/TBBS [ Top ]
----------------
<C>onference Area
<D>atabase, Upload/Download Files
<H>elp For This Menu
<I>nformation And Bulletins
<K>eyboard Shopping Club
<M>essage System
<S>ystem & Configuration Functions
<Z>DS Database Files (Free To All Callers)
<G>oodbye, Logoff System
```

The HUG system is so fast that if you have your modem program set up to supply your name and ID number from a script when it makes connection with the board, you will only have to wait a second or so (at 2400 baud) from the time connection is made until you are prompted to press a key or read your mail. During that brief time, the board will have searched for your name, HUG ID, and messages. Now, that's fast!

As you can see, the HUG Bulletin Board System has the usual features found on any good BBS — a conference area, a data base, a bulletin board, and a message system. It also includes some unique features, such as the Keyboard Shopping Club. The Club allows you to order renewals to your HUG membership and HUG software at a discount, and it also includes the world famous HUG Bargain Centre — the best Heath/Zenith computer bargain basement around. If you are looking for some good computer equipment real cheap, and you don't care if it doesn't have a warranty, then check out the Bargain Centre. But be sure to check it often, because new sale lists are put up as the equipment becomes available, which is quite sporadically, and the stuff goes fast! The few dollars you spend in long distance charges from checking the Centre will be recovered as savings with your first great bargain.

A future addition coming to the Keyboard Shopping Club will be the ability to order any Heathkit product. This feature may already be up by the time you read this.

The "usual" features of the HUG BBS are better than those usually found on other bulletin board systems. In the conference area, for example, you can not only talk with other people who are in a conference, but you can also send messages to people who are logged on, but not in a conference. And in the System section, you can find out who else is on the board.

The message system of the HUG BBS is categorized into non-computer related topics, hardware related topics, software related topics, classified ads, and there is

a section for private messages to the SYSOP (System Operator, Jim Buszkiewicz). You can read messages by topics, or you can read all of the non-private messages together. You can follow "message chains", where there are replies to messages, and replies to the replies, etc. You can leave messages to your friends across the country, and they will be able to read them the next time they log on. If you prepare your messages before hand and upload them, the cost can be less than a conventional long distance voice call.

One of the best parts of the HUG BBS is the file data base. In our data base you'll only find the "good stuff". I have downloaded programs from some BBS' that have turned out to be pure garbage, but Jim does his best to make sure that only good software gets on his system. Here is the current list of software categories on the HUG BBS.

File area # 1 ... Amateur Radio Applications
File area # 2 ... Business Applications
File area # 3 ... CAD And Drawing Programs
File area # 4 ... Copy-Protection Informaon
File area # 5 ... Database Software
File area # 6 ... Educational
File area # 7 ... Games And Entertainment (Part 1)
File area # 8 ... Games And Entertainment (Part 2)
File area # 9 ... Household And Personal Applications
File area # 10 ... Languages & Support
File area # 11 ... Miscellaneous
File area # 12 ... Printer Utilities
File area # 13 ... Picture Files And Viewers
File area # 14 ... Scientific/Engineering Applications
File area # 15 ... Spreadsheet Software
File area # 16 ... Utilities
File area # 17 ... Word Processing & DeskTop Publishing
File area # 18 ... Z-100 Specific Files

As you can see, there are a lot of different kinds of software to choose from, and the list will probably be longer by the time you read this. In the word processing section alone there are no less than 5 complete word processing packages, including the very latest version of the VDE editor that John Dvorak raved so much about in a recent issue of PC Magazine. You'll also find complete data base system packages, complete CAD packages, and more.

When you decide what you want to download, there are several ways you can do it. Here are the file transfer methods supported by the HUG/TBBS system.

1. TYPE file to your screen
2. ASCII with DC2/DC4 Capture
3. ASCII only, no Control Codes
4. XMODEM
5. YMODEM/YMODEM-g
6. YMODEM/YMODEM-g Batch
7. SEAlink
8. KERMIT
9. SuperKERMIT (Sliding Windows)

Those of you who do a lot of BBS-ing will notice that some of the newer transfer protocols, such as ZMODEM and BIMODEM are missing. They may be added in the future, as new versions of the TBBS software come out. This is going to be a dynamic board, constantly improving. Those of you interested in speed will find that SEAlink, although not as fast as ZMODEM, is pretty good.

If you haven't given the HUG BBS a try, do it soon, and perhaps you will agree with me that it is the best BBS around. As RoboChick (the official HUG BBS representative) says, "How can you take advantage of me . . . if you don't call?" *

Affordable Printers For Electronic Publishing At Home

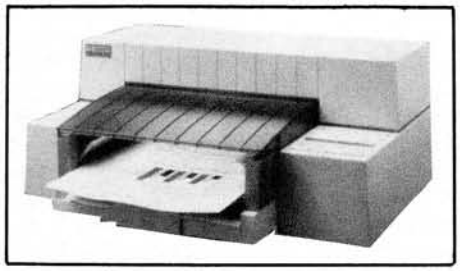
Ron Siebers
Woodbury, Minnesota

I work as a technical writer and have a wide range of Electronic Publishing resources available to me courtesy of the company I work for. Most are essential tools of today's technical writing profession, but purchasing each of them has to be justified. There is no question that the advent of the laser printer made EP (formerly called Desktop Publishing) possible. The 300 dpi laser printer resolution made a wide range of publishing possible without the additional step of typesetting. Photo printing plates can be made directly from the laser printer output. This eliminates typesetting, which is costly, adds days of extra time and tends to introduce typing errors. An additional EP evolutionary step is the current capability for Postscript file output from programs like Aldus Pagemaker® with drivers for phototypesetting equipment like the Linotronic 300. This allows direct typesetting from the computer output at either 1270 dpi or 2540 dpi.

Publishing at home is another matter. The frequent limiting factor is not the computer or software. The software is either purchased or sometimes "borrowed" from work. The limiting factor for home publishing is the high cost of high resolution (300 dpi) printers. Up until recently, these printers for desktop publishing were well over $2000 and were thus out of the question for most of us. If you could spend around $500, you might have settled for a 24-pin dot matrix printer and used the NLQ (Near Letter Quality) mode to get the highest quality text printing possible, at a much slower print speed. Two recent printer introductions from Hewlett-Packard have changed the situation in my opinion. The new printers are:

Printer Name	Model	List Price
Deskjet Plus	HP2277A	$ 995.00
Laserjet IIP	HP33471A	$1495.00

Both of these printers have 300 dots per inch resolution for text and graphics printing. They are both capable of printing a wide range of font styles and sizes using built-in fonts, optional font cartridges or softfonts. Both printers also feature dual computer interfaces built-in (serial and parallel). Both printers use the more convenient cut-sheet paper instead of fan-fold. The ability to use a range of font sizes and at least more than one font style is the minimum for true electronic publishing. But the real factor that changes the picture for small business and home use is lower prices. Those list prices, while all-time lows, actually translate into less than $700 and $1000 from mail order dealers, personal purchase through corporate buying plans or some hard-nosed negotiation with your local HP dealer. Let's look at the particulars of each printer.



Hewlett-Packard Deskjet Plus

This is a newer version of the Deskjet Printer which has been available for over a year. The printer uses multiple nozzle thermal inkjet technology to produce 300 dpi text and graphics output. The printer uses plain sheet-fed paper such as that used for photocopiers loaded in a convenient-to-use front-loading tray. You can also print on letterhead and make projection transparencies using special inkjet film available from HP, 3M and others.

The features and improvements over the Deskjet include:

- Multiple fonts using font cartridges (two cartridge slots built-in) or softfonts.
- Larger Fonts — The Deskjet Plus can print fonts up to 30 point in size versus 14 pt. max. for the Deskjet.
- Ten resident Courier fonts (6 Portrait and 4 Landscape) which now includes Italics. The Deskjet requires an add-on font cartridge for Italics or Landscape printing.
- An optional Epson FX-80 printer emulation cartridge is highly recommended for use with software not having a Deskjet or Deskjet Plus printer driver.
- Built-in Landscape Printing — The Deskjet requires an add-on cartridge for Landscape printing.
- Better Quality Printing — The Deskjet Plus produces higher quality printing for proportionally-spaced Times Roman and Helvetica fonts using new font cartridges which work only on the new model printer.
- Faster Printing — The Deskjet Plus prints text 2 times faster (4 ppm rating) and 300 dpi graphics up to 5 times faster than the Deskjet does.
- Larger Softfont RAM Capacity — The Deskjet Plus can access up to 512K of softfont RAM by supplementing the 128K built-in RAM with an optional 128K RAM cartridge, plus a new 256K RAM Cartridge. The Deskjet could only access up to 256K RAM.

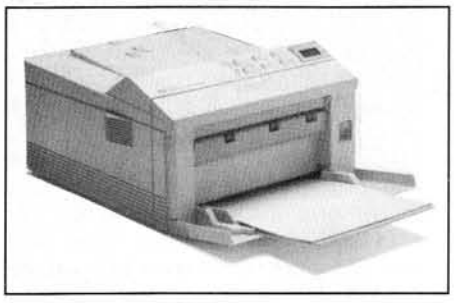
Printer Drivers — The software you use must have a Deskjet Plus printer driver to take full advantage of the new resident fonts and optional font cartridges. If your software only has the Deskjet driver, you can only use the fonts and features of this previous printer. If you do not have any Deskjet printer driver for your software, you may not work at all. The best thing to do is to contact the software company and see if a Deskjet Plus driver is available. Some will send it free and others charge a small fee. The second best method is to purchase the optional Epson FX-80 printer emulation cartridge (HP 22707F) at about $40. This will allow you to configure older software for the Epson FX-80 and print to the Deskjet Plus. The emulation only allows Epson FX-80 features, however, and can not use fonts from the cartridges.

Drawbacks — There are three draw-

backs to this otherwise bargain high-resolution printer.

1. *Water Soluble Ink* — Your printouts can be smeared by moist fingers or a drink spill for the life of the printout. This susceptibility can be overcome by care in handling and always sending only photocopies out to others.
2. *Ink Runs Out* — When the ink cartridge runs out of ink (without warning), you are out of business until you replace it. The cartridge is good for 1,000,000 draft characters or 500,000 letter-quality, but I strongly suggest you keep a spare black ink cartridge (HP 51608A) on hand at all times. The cost is $18.95.
3. *Price* — The $995 list price translates to a $700 street price that is $150 to $300 more than a 24-pin dot matrix printer.

Summary — The Deskjet Plus printer is fairly fast and very quiet while printing, especially when compared to a dot matrix printer. Despite the drawbacks, this printer is currently the lowest cost way to get 300 dpi resolution printing.



Hewlett-Packard Laserjet IIP

The new Laserjet IIP with the P standing for Personal Laserjet, is a stripped-down version of the popular Laserjet II. It has some of the features or options of the much higher-priced Laserjet IID which features two 200-sheet paper cassettes and duplex (2-sided) printing standard. This fourth Laserjet model is added to the Laserjet II, Laserjet IID and Laserjet 2000 models currently available from Hewlett-Packard. At less than $1000 street cost, the Laserjet IIP is an affordable option for a home printer. The Laserjet IIP has the following features:

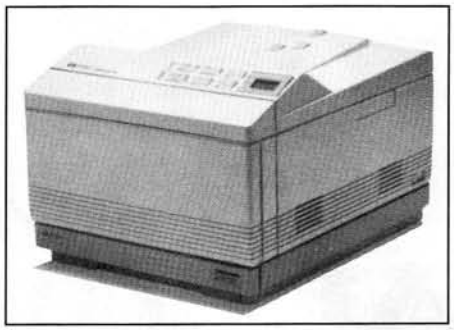
- 300 dpi resolution, same as all other Laserjets.
- 4 pages per minute printing speed (+ of the jet II).
- 512K standard memory with 2 slots for either 1MB or 2MB memory expansion boards (total of 4.5MB capacity), the same as the other Laserjet II's.
- Courier medium, bold and italic fonts in both 10 and 12 point sizes built-in with automatic Landscape rotation (not on jet II, only on higher cost jet IID)
- One font cartridge slot (versus 2 on others).
- Multipurpose input tray accepts up to 50 sheets of paper (letter or legal), film, labels or 5 envelopes. Other jets use removable 200-sheet cassettes.
- Optional Lower Cassette with a variety of tray options including a 250 sheet tray in either letter or legal size and a 20 envelope feed tray.

Speed — While the new Laserjet IIP is only half as fast as the 8-ppm Laserjet II, copy quality is the same. The 4-ppm speed would still be faster than a dot matrix printer or the Deskjet Plus. The new printer is somewhat smaller and at 25 lbs, exactly half the weight of the Laserjet II.

Built-in Fonts — If you just need letter or memo, report and graphics capability, the internal Courier fonts may be sufficient for your needs. Built-in Courier font provides Medium (normal text), bold and italic in 10 and 12 point sizes, as well as an 8.5 point line printer font that provides 16.66 characters per inch. All fonts are available in both portrait and landscape modes. Portrait is the normal 8-1/2" × 11" upright page printing while Landscape is the wide 11" × 8-1/2" orientation for those unfamiliar with the terms. There are also twenty-four symbol sets built in. These allow printing special math characters, Greek alphabet and special publishing symbols.

Optional Fonts — If you need more fonts or sizes, you can purchase either a font cartridge (my choice) or softfonts. Softfonts require several megabytes of hard drive space, must be down-loaded into the printer each time you turn it on and may require purchase of extra printer RAM if they require more than 512K to store them. The single font cartridge slot is not a problem if you order one of HP's or a 3rd party multiple font cartridge to meet your needs. HP originally wanted you to buy a font cartridge for every type size of every font you wanted to use. Due to competition and better judgement, they now have several multiple font size/style cartridges available. Several third party manufacturers such as IQ Engineering and Pacific Data Products have single cartridges with a wide range of fonts and sizes. My favorite is the IQ Engineering Supercartridge 2 which features 17 font types in sizes from 4 to 30 point. Be prepared to pay $599 list for this cartridge however. The Laserjet IIP makes the fonts from these cartridges also available in Landscape mode, even if the cartridge is Portrait only. This is a feature not available on the jet II, and is why one cartridge can fill all your printing needs on the jet IIP.

Second Paper Feeder — The optional Lower Cassette with 250-sheet letter size paper tray (HP 33472A) provides you a second paper feed capability for memo-head or envelopes while adding only 2 inches to the normal 8" printer height. Alternately, it can provide higher plain paper capacity (up to 300 sheets on line). There are also cassettes available for A4 (International) paper size, legal size and an envelope feeder that holds up to 20 commercial size (#10) envelopes. At $195, it is an inexpensive upgrade to more than jet II feed capability.



Memory — This is a very confusing part of laserprinters. Memory is needed for two purposes. One is to store down-loaded fonts and the second is to store bit-mapped graphics information until the whole page can be printed. The 512K standard memory allows printing 1/2 page of bit-mapped graphics at 300 dpi high resolution or a whole page at 150 dpi medium resolution. You will need a 1 Meg. memory board (HP 33474A) at $495 to print a full page of graphics from graphics programs such as Harvard Graphics or Lotus Freelance. You will need the 2 Meg. Memory board (HP 33475A) at $995 to print graphics and store softfonts at the same time.

Consumable Supplies — The supplies for the Laserjet IIP printer include cut sheet paper, such as that used for photocopiers and a replacement toner cartridge every 2000 to 3500 pages (depending on amount of toner used per page). That is a lot of printing, but you will pay $60 for a reconditioned cartridge (in exchange for your old one) or $100 for a new one. Replacement is quite easy after your first learning experience and is well under five minutes including replacement of a cleaning bar and your cleaning of the charger wire using a cotton swab included with the cartridge. Unlike the Deskjet Plus, you get some warning via light areas on your printouts when you are running out of toner.

Summary

You may buy one of these printers for the high quality printing you need for electronic publishing but you also get faster printing speed and much lower printing noise. The high-pitched whine of the dot matrix printer is a thing of the past when you purchase either of these HP printers. Once you get hooked on the quiet printing and high resolution output, you won't want to go back to a dot matrix printer. *

Disk Technician Advanced

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Prime Solution's Hard Disk Drive Crash Prevention Product

Prime Solution's $149.95 Disk Technician Advanced (DTA) hard disk maintenance and repair program comes in a bright multicolored 8-1/2" × 10" × 2" box (yellow with red, black, green, and white printing). The marketing hype on the back of the box describes Disk Technician Advanced as the U.S. Air Force's best discovery since Congressional pork-barrels. They even quote PC Magazine as being solidly behind this product. So I carefully opened the box and began.

Inside, I found two gray 3/4" foam pads (the bulk in the box), a 180-page 5-1/2" × 6" manual, two sizes of the program disk (5-1/4" and 3-1/2"), a special offer for a demo disk of another program, a referral offer, and a 12-month software upgrade plan.

Because I would be "messing" with my hard disk, I decided to first spend some time looking the manual over and reading important sections. The manual is well designed, easy to read, and understandable. Its author says that only a few pages need be read before one can safely begin. The rest of the manual is left as an exercise for the curious (or insomniac). Personally, I found that once I began, I read portions of every chapter.

Prime Solutions claims that only the Quickstall Installation Guide (3.5 pages) and the 10 Second Instruction Manual (2.5 pages) need be read before one can start using the program. This was not to be my experience.

After reading, it became clear that hard disk diagnostics are complex and unique. The DTA program extensively tests the condition of the electronics and each platter in your hard disk drive for hardware failure, track alignment error, and media-related problems.

In a typical system, the hard disk controller will repeatedly attempt a reread of a misread sector before finally applying an error correction technique based on mathematical algorithms. Each reread attempt involves a rotation of the disk. This appears as slow disk operation. If the error correction codes (ECC) don't work, the controller notifies the system's CPU that an error has occurred so it can notify you with the disliked "Abort, Retry, Ignore, Fail?" message. No attempt is made to develop and maintain a history of the occurrence and location of each failure.

However, Disk Technician Advanced will generate and update a complete history of the condition of the usable surface on all hard disk platters. By monitoring from below DOS and the controller's ECC circuitry, Disk Technician Advanced detects and counts every misread (soft error) that occurs. This sensitivity, and intelligent algorithms produce an error pattern data base that characterizes the soft error rate and predicts data failure before it occurs. If judged appropriate, DTA conducts a non-destructive low-level format (NDLLF) on a single affected track — without destroying the valuable data stored there. By automatically repairing bad disk areas and reallocating data as necessary, DTA can improve access time by up to 500 percent.

If a disk area cannot be repaired by an NDLLF, it is marked bad in the file allocation table (FAT) and avoided from then on. If data is stored in a bad area, DTA's sophisticated algorithms try and recover it. If recovery is impossible, each file containing corrupted data is displayed with the complete path and name so backup restoration can be performed manually.

Once a testing schedule has been initiated DTA automatically performs one of three tests:

1. *HyperSpeed* — Finds and repairs all marginal areas on the complete hard disk drive. Speeds up drive accesses. Provides advance warning of pending catastrophic failures on certain disk areas. Automatically shifts into Track Integrity test if a problem is detected that requires repair.
2. *Track Integrity* — Performs read and rewrite pattern tests that catch misread and miswrite operations. Every sector on every track is tested.
3. *Total Media* — Tests for marginal and confirmed bad spots on the boundary of, or adjacent to, all tracks of the hard disk.

Prime Solutions recommends that DTA be run after the system has been energized for two hours or more. The minimum recommended frequency of DTA testing is weekly. Each test takes from 1 minute to 4 hours to run. DTA can be run from either the hard disk or a floppy disk inserted into drive A.

The recommended test schedule is:

1. HyperSpeed Test (1-5 minutes) — Daily
2. Track Integrity Test (20-60 minutes) — Weekly
3. Total Media Test (1-4 hours) — Monthly

Note: If you use a portable or laptop, or operate in extreme environments such as a factory floor, or in sensitive applications such as health, defense, or electronic funds transfer, you should consider running DTA more often.

The first time you run DTA, it conducts a Total Media test to establish the initial history data base. Then it tracks the test history with the current date, and automatically performs the correct test to confirm optimum operation.

Given this, I backed up my hard disk (I'm very sensitive to viruses — a subject we'll cover in another article), and then made a backup copy of the program disk. Next, I ran the QUIKSTAL installation program from the DTA copy, answering the questions as they appeared on my screen.

I first tried to install DTA from a floppy disk. I was asked to replace the copy of DTA with a blank formatted disk and to

press ENTER. I did. The program created a DTA.RPT file and then queried me about my display. After my answer, the A:\> prompt appeared. This was not appropriate according to the manual. I expected to see:

```
INSTALLATION IS COMPLETE. REFER TO THE
10 SECOND INSTRUCTIONS MANUAL OR TO THE
MANUAL OPERATION SECTION OF THE REFERENCE
GUIDE TO BEGIN RUNNING DISK TECHNICIAN
                                ADVANCED.
```

As instructed in the User's Manual, I rebooted and was rewarded with a full main menu screen. The Date Today field was flashing with the correct date so I pressed ENTER to continue. The Drive Letter field flashed "B" so I typed in "C" to select the hard disk. <ENTER>.

After a QUICK CHECKING SECTOR TIMING message the display changed to

```
DISK TECHNICIAN HAS FOUND
A NON-STANDARD DOS PARTITION SIZE.
DISK TECHNICIAN IS UNABLE TO ACCESS THE DRIVE YOU HAVE
SELECTED. SEE YOUR DISK TECHNICIAN USER'S MANUAL OR YOUR
README.DOC FILE. PRESS ENTER/RETURN TO CONTINUE. <RETURN>
```

The system returned to the A> prompt. I did a directory of the program disk provided. The README.DOC file didn't help so I checked the error code descriptions in the User's Manual. My heart sank. Here I was, testing Disk Technician Advanced on my advanced Heath/Zenith 386, 40 Mb machine and this "advanced" software apparently only works on hard disks partitioned 32 Mb or less. Neither the Users Manual nor README.DOC file reported this limitation.

The Prime Solutions' technical support office confirmed my suspicions and suggested I backup all my files (individually), repartition, reformat, and then reload the files and rerun DTA. Rather than degrade a perfectly fine computer system just to test a hard disk diagnostics program written two or three years ago, I opted to rent a PC XT with a 20 Mb hard disk to complete the evaluation. Almost two hours of false starts later (discovered the XT had two different versions of DOS installed and a bad floppy disk cable that wouldn't read from head 1), DTA was finally installed on the hard drive. I ran DTA.

The screen cleared to become a Today's Test Menu. After updating the current date the program produced the main menu.

Since this was the first time DTA diagnostics were being conducted on this system, no history file existed so a complete Total Media test was initiated on all sectors and all cylinders to establish a reference baseline.

When the test began, the main menu display began flashing

```
*** WARNING *** DO NOT INTERRUPT *** WARNING ***
```

The lower right of the display identified each cylinder and head being tested. Then the menu cleared and a white double-lined screen saver rectangle appeared flashing a warning message and indicating that the main menu could be restored by pressing F3. The screen saver warning box shifted screen location approxately every 30 seconds.

When this part of the test was complete, the main menu returned and a message said:

```
LOW-LEVEL FORMAT IN PROGRESS. PLEASE
                                STAND BY
PRESS F3 FOR SCREEN SAVER MODE
PRESS CONTROL AND BREAK TO SAFELY ABORT
```

After a few moments, this cleared and the shifting screen saver warning returned.

The manual says that the Total Media test can take anywhere from one to four hours to run. After four hours of shifting blinking warning messages, I called Prime Solution's tech support to find out what was going on.

They were quite helpful, and also empathetic. After some system configuration questions, I was told that the XT drive interleave of 7 was optimized by DTA to 4 before running the extensive Total Media test. This "optimization" can take from 20 minutes to 1.5 hours. Therefore, after almost five hours of DTA operation, the menu (restored using F3) indicated the Total Media test had only been running three hours and 25 minutes. What a bummer! And since I was renting the computer (at $10 an hour), my burn rate of project funds was going fast. However, the menu did report that after testing out to cylinder 515, only one misread had been detected.

About forty minutes later and just at the end of the test, the disk access light went off and the screen display changed to:

```
CONTROL FILE DTA.CTL IS DAMAGED OR MISSING.
SEE YOUR USER'S MANUAL

PRESS ENTER/RETURN TO REBOOT SYSTEM FOR NORMAL USE.
```

I was furious. This, after almost six hours of testing? Pressing ENTER, I got the C:> back. Telephoning DTA tech support. I was told that something had caused the hard disk controller (HDC) to lock up. The Total Media test generates DTA.CTL and the very intensive disk operations sometimes cause the HDC to fail making files unreadable. DTA.CTL was still on the directory of the hard disk and was correctly 16,640 bytes long, so the disk was probably O.K. (especially given the low misread count for the time of testing). The hard disk card was bad.

A hard disk controller lock up can occur if the seek time is not within that set in the controller IC. At the end of testing, the outer tracks are checked. This causes the longest seek time. The HDC may not be able to handle the time. This can be especially troublesome when "plain vanilla" controllers are installed on adapter cards. The tech to whom I spoke said that Prime Solutions was working on an "expert system" that will perform more on-site evaluation of hard disk failures.

This failure can also occur at the end of the test when DTA attempts repair on any sectors that produced a misread by conducting an NDLLF. During this track reformatting, the controller card has complete control over the system. The track of data is copied into RAM and then the track is reformatted with new ID markings and other special information. Any failure of the controller or other component on the adapter card can cause the HDC to lock up. If this happens and the low-level format itself is suspected at fault, you can disable LLF calls and the program will then mark them out and bypass these sectors in all future tests.

I was asked to re-install the program and run it from a floppy disk. If the hard disk controller is at fault, I should get a CRITICAL SYSTEM SECTORS DAMAGED error message. I didn't have the time, nor the funds to continue this process (especially on someone else's computer system), so here are my conclusions.

While the package is supposed to detect faults in both the drive assembly and the adapter board, I do not feel a program halt without explanation is "user friendly." Nevertheless, the program seems quite capable — for older operating systems. There are many complications associated with the tests conducted by DTA. These are not well documented in the manual. This necessitated many calls to Prime Solution's tech support people — which brings me to tech support. There techs are super. Not only do they have in-depth knowledge of the program, but also of hard and floppy disk problems of every type.

I particularly like the automatic test selection feature (given that you test during an off-period). An upgrade to let DTA handle larger disk partitions and improved program response will make Disk Technician Advanced truly advanced.

Continued on Page 42

dBASE III

Part 4

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In my last article, I discussed some of the features of a simple menu-type program. This program suffered from a major deficiency in that it always returned the user to the dot prompt instead of back to the menu. The DO WHILE loop is the programming structure that can remedy this defect. A DO WHILE loop has the following structure:

```
DO WHILE condition
    commands
ENDDO
```

If the condition in the DO WHILE statement is true, the commands within the DO WHILE loop are executed. After the last command in the loop, dBASE III re-evaluates the condition. If the condition remains true, dBASE III again executes all of the commands within the loop. This process continues until the condition evaluates as false, at which time the program continues with the first statement following ENDDO.

At this point, we want to modify the PROJUPDT program to include the DO WHILE loop. At the dot prompt, type:

```
MODI COMM PROJUPDT
```

Between line 1 ("set talk off") and line 2 ("clear"), insert the command statement "do while .T.". Next, delete the three lines following 'case SELECT = "5" ' and insert the command "exit". Finally, following "endcase" add the following:

```
enddo
close databases
set talk on
clear
```

The program should now look like Listing 1.

The condition clause following the DO WHILE command — "while .T." — means "while true", meaning forever. It would appear there is no way out of the loop. However, another dBASE III command, EXIT, will cause dBASE to exit a DO WHILE loop regardless of the value of the condition clause. Whenever DBASE III encounters the EXIT command, control passes immediately to the first command following the ENDDO statement. In the revised PROJUPDT program, the EXIT command follows the statement case SELECT = "5" thereby causing dBASE III to exit the DO WHILE loop and execute the commands following ENDDO:

```
close databases
set talk on
clear
```

These commands close all data base, index and format files, set TALK to its default value and clear the screen.

With this revised program, whenever the user is finished editing or appending a data base, the program returns to the menu. Only when the user selects "5" will the program exit to the dot prompt. Without the DO WHILE structure, repetitive action within a program would be ex-

Listing 1

```
* PROJUPDT.PRG
* A SIMPLE PROGRAM TO UPDATE THE PROJECTS/CROSS REF DATA BASES
* WRITTEN BY:  D.COOL       11/18/89
* REVISED BY:  D.COOL       12/12/89

set talk off
do while .T.
   clear                && CLEAR THE SCREEN
   * PAINT MENU DISPLAY:
   @  5,26 say "PROJECTS MAIN MENU"
   @  7,21 say "1.  Edit projects data base."
   @  8,21 say "2.  Append projects data base."
   @  9,21 say "3.  Edit cross reference data base."
   @ 10,21 say "4.  Append cross reference data base."
   @ 11,21 say "5.  Exit program."

   * GET INPUT FROM USER:
   accept "Make selection: " to SELECT
   do case

      case SELECT = "1"
         use PROJECTS index PROJDWRV
         set format to PROJEDIT
         edit

      case SELECT = "2"
         use PROJECTS index PROJDWRV
         set format to PROJEDIT
         append

      case SELECT = "3"
         use PROJXREF index PROJXPJN
         set format to XREFEDIT
         edit

      case SELECT = "4"
         use PROJXREF index PROJXPJN
         set format to XREFEDIT
         append

      case SELECT = "5"
         exit

      otherwise
         ? chr(7)
         wait "Invalid selection -- Press any key to continue"

   endcase
enddo
close databases
set talk on
clear
```

tremely difficult, if not impossible.

Programming can also provide the means of checking the data in a data base for accuracy. Although an absolute verification of all data is obviously not possible, certain checks can be made to minimize error. For example, for the projects data base, we could specify that the project start date not exceed the estimated completion date, or that the edit-in date not exceed the edit-out date. We can also require that certain fields — namely STATUS, DWGNR, PROJNR, ENGINEER, STARTDATE and ESTDATE — not be blank. Once validation criteria have been established, a validation program can be written which will check each project record and provide a printed report of all errors.

The first task is to establish the validation criteria — that is, what fields are to be checked and for what. Assume that you want the program to check the following:

1. STATUS must equal "A", "C" or "D".
2. DWGNR should not be blank.
3. PROJNR should not be blank.
4. ENGINEER must not be blank and must equal only valid codes.
5. STARTDATE must not be blank and must not be greater than ESTDATE.
6. ESTDATE must not be blank.
7. EDITIN must not be greater than EDITOUT (assuming they are not blank.)
8. EDITOUT must not be greater than APPDATE (assuming they are not blank.)
9. APPDATE must not be greater than DOCDATE.

Before actually writing the code for a program, it is usually helpful to write a series of short statements or outline of what the program is to accomplish. For the validation program, such a series of statements (usually called pseudocode) might take the following form:

```
open PROJECTS data base
for each record
   check each field for valid input
   if any field is invalid
      print record number
      print what field is invalid and why
close data base
```

Note in this structure, a report is to be printed only if one or more fields are found invalid. There is no need to print a report if all fields are valid.

Basically, there are two ways to program the validation task. The first method would incorporate the following program flow:

```
check logic field 1
if invalid
   print message #1
check logic field 2
if invalid
   print message #2
...
etc.
```

In this method, statements are print-

Listing 2

```
* PROJVAL.PRG
* PROGRAM TO VALIDATE PROJECTS DATA BASE
* WRITTEN BY:  D.COOL       12/12/89

set talk off
use PROJECTS
clear
ROW = 0
@ 10,10 say "PROJECT VALIDATION"
@ 12,10 say "Prepare printer for printing"
wait
@ 12, 0 clear
@ 12,10 say "Validating PROJECTS ..."
set device to printer
do while .not. eof()
   store .T. to VALID
   store .F. to BAD_STATUS
   store .F. to BLANK_DN
   store .F. to BLANK_PN
   store .F. to BAD_ENGR
   store .F. to BLANK_SDATE
   store .F. to BAD_SDATE
   store .F. to BLANK_EDATE
   store .F. to BAD_EDITIN
   store .F. to BAD_EDITOUT
   if .not. STATUS $ "ACD"
      store .F. to VALID
      store .T. to BAD_STATUS
   endif
   if DWGNR = " "
      store .F. to VALID
      store .T. to BLANK_DN
   endif
   if PROJNR = " "
      store .F. to VALID
     store .T. to BLANK_PN
   endif
   if .not. ENGINEER $ "ABC/JAD/JZB/TTT"
      store .F. to VALID
      store .T. to BAD_ENGR
   endif
   if dtoc(STARTDATE) = '  /  /  '
      store .F. to VALID
      store .T. to BLANK_SDATE
   endif
   if dtoc(STARTDATE) <> '  /  /  ' .and. dtoc(ESTDATE) <> '  /  /  ';
                              .and. STARTDATE > ESTDATE
      store .F. to VALID
      store .T. to BAD_SDATE
   endif
   if dtoc(ESTDATE) = '  /  /  '
      store .F. to VALID
      store .T. to BLANK_EDATE
   endif
   if dtoc(EDITIN) <> '  /  /  ' .and. dtoc(EDITOUT) <> '  /  /  ';
                              .and. EDITIN > EDITOUT
      store .F. to VALID
      store .T. to BAD_EDITIN
   endif
   if dtoc(EDITOUT) <> '  /  /  ' .and. dtoc(APPDATE) <> '  /  /  ';
                              .and. EDITOUT > APPDATE
      store .F. to VALID
      store .T. to BAD_EDITOUT
   endif
   if .not. VALID
      if ROW > 50
         ROW = 0
      endif
      @ ROW, 0 say "Record number " + str(recno()) +;
                   " has invalid fields:"
      ROW = ROW + 1
      if BAD_STATUS
         @ ROW,10 say "Status must be A, C, or D"
         ROW = ROW + 1
      endif
      if BLANK_DN
```

```
69            @ ROW,10 say "Drawing number is blank"
70            ROW = ROW + 1
71         endif
72         if BLANK_PN
73            @ ROW,10 say "Project number is blank"
74            ROW = ROW + 1
75         endif
76         if BAD_ENGR
77            @ ROW,10 say "Engineer is not valid"
78            ROW = ROW + 1
79         endif
80         if BLANK_SDATE
81            @ ROW,10 say "Start date is blank"
82            ROW = ROW + 1
83         endif
84         if BAD_SDATE
85            @ ROW,10 say "Start date greater than est. compl. date"
86            ROW = ROW + 1
87         endif
88         if BLANK_EDATE
89            @ ROW,10 say "Est. compl. date is blank"
90            ROW = ROW + 1
91         endif
92         if BAD_EDITIN
93            @ ROW,10 say "Edit-in date greater than edit-out date"
94            ROW = ROW + 1
95         endif
96         if BAD_EDITOUT
97            @ ROW,10 say "Edit-out date greater than approval date"
98            ROW = ROW + 1
99         endif
100        ROW = ROW + 1
101     endif [.not. VALID]
102     skip
103  enddo
104  eject
105  set device to screen
106  @ 12, 0 clear
107  @ 12,10 say "Validation complete."
108  set talk on
109  close databases
```

ed immediately following each field validation.

The second method prints a report only after all fields have been checked and only if one or more fields have been found invalid. Neither method is more "correct" than the other; however, the first method requires additional coding to prevent the following type of output:

```
Record number 38 is invalid:
     Project number is missing.
Record number 38 is invalid:
     Engineer is not valid.
```

The statement "Record number x is invalid:" should be printed only once per record.

The second method also has a coding "problem" — how to store information on what fields are invalid until all fields have been checked. However, the coding for the second method is less complex and results in less lines of code. This method is shown as Listing 2.

The program starts by setting TALK OFF, opening the PROJECTS data base and clearing the screen. It then initializes a memory variable ROW to zero. The variable ROW will be used to control the line location of all @...SAY statements directed to the printer. Lines 5-7 comprise a program identification, a prompt to the user to make sure the printer is on-line and a WAIT command which temporarily halts the program until the user is ready for printing to begin. Line 10 changes the output device (normally the screen) to the printer. With the output device set to the printer, all subsequent @...SAY statements will go to the printer instead of the screen.

Lines 13-21 initialize a series of logic variables to ".F." (false). These variables are used to store the information as to what fields are valid and what fields are invalid. For each of these variables, a false value corresponds to valid data and true corresponds to invalid data. (The correspondence could, of course, be exactly the opposite. I chose this correspondence mainly because it allows the coding in the report section to be slightly shorter.) These variables are initialized to false prior to validating each record on the assumption that all fields are considered valid until proven invalid.

Line 22 begins the series of IF...ENDIF structures that test the validity of each field. The IF...ELSE...ENDIF statement is another of the dBASE III program structures. It is similar to the IF...ELSE command in BASIC. It is used whenever you have a choice of one of two actions to take. As with the DO WHILE loop, the condition clause following IF is evaluated. If the condition evaluates as true, all commands between IF and ELSE are executed; otherwise, the commands between ELSE and ENDIF are executed. The ELSE portion of the IF...ENDIF structure is optional. In the case in which you wish certain commands to be executed only if a certain condition is true and nothing to occur if the condition is not true, then the ELSE portion would not be required.

Let's examine a few of these IF statements. Line 22 uses one of the dBASE III relation operators "$". The "$" operator performs a substring comparison. For example, suppose A and B are character variables. If B = "MOP" and A = "M", then the comparison A$B returns a logical True because "M" is part of "MOP". However, if A = "D", the comparison A$B returns a logical False since "D" is not contained in "MOP". In line 22, the substring comparison:

```
STATUS $ "ACD"
```

is preceded by the logical operator ".not.". In effect, this statement says "if the contents of the STATUS field do not equal 'A', 'C' or 'D', then do the following". If this is the case, then line 23 sets the value of VALID to ".F." and line 24 set the value of BAD__STATUS to ".T.".

Line 26 compares the value of DWGNR to a blank space to determine whether the field is blank. This comparison will not only catch a blank DWGNR field, but also any DWGNR in which the first character is a space. This would also be considered to be an invalid entry, since all drawing numbers must start with a "5".

Line 34 is another example of string comparison. It determines whether the STARTDATE field is blank. Since it is not possible to directly compare a date field to a character variable, a conversion of one type to the other must be made. The DTOC function (date-to-character) converts the contents of STARTDATE to a character string which is then compared to the character string representing a blank date. It is also possible to compare a date field with a character string by converting the character string to a date field using the CTOD function (character-to-date); however, because of a quirk or bug in dBASE III, the comparison will return an erroneous result if the character string represents a blank date. Both dBASE III and dBASE III Plus have problems with blank date fields. For example, if STARTDATE and ESTDATE are both blank, the expressions:

```
STARTDATE < ESTDATE
```

and

```
ESTDATE < STARTDATE
```

will both return a logical False!

Line 42 (and likewise lines 50 and 54) involves a compound comparison. For the IF condition to evaluate as true, all three parts of the compound expression must be true — STARTDATE and EST-

DATE must not be blank and STARTDATE must be greater than ESTDATE. (The expression "<>" means "not equal".)

Line 58 starts the report process. During the validation routine, if any field was determined to be invalid, then the logic variable VALID was set to False. Since the logical operator .NOT. returns the opposite of the expression it is combined with, the expression ".not. VALID" returns a logical True if VALID is false.

Lines 59-61 are a method of insuring that a report does not start too far down the page such that it continues across the paper perforations. The value 50 is based on a paper length of 11 inches and the printer set at a standard 6 lines per inch. This will leave approximately a one inch margin at the bottom even if every field is invalid.

Line 62 starts the report with a statement identifying the record number. Record number is used instead of drawing number in the event that drawing number is blank. Since the RECNO() function is a numeric variable, it must be converted to a character string using the STR function in order to combine it with the other character strings "Record number" and "and has invalid fields:". Notice that this command statement (and several others) is broken into two lines with a semicolon at the end of the first line. The semicolon is recognized by dBASE III as an indicator that the next line should be considered to be part of the first line. This allows continuation of extra long lines in the event that word wrap forces a new line.

Line 63 increments the variable ROW so that the next statement will not overprint the previous statement. The remaining IF...ENDIF statements handle the printing of the various invalid-field statements.

Note the comment in brackets following the ENDIF of line 101. Certain words in dBASE III — namely ENDIF, ENDDO and ENDCASE — are not actually commands. Then simply mark the end point of the IF...ENDIF, DO WHILE and DO CASE structures. Therefore, when the dBASE III command interpreter encounters these words, it does not check any additional characters on that line, which means that comments can be appended to lines that start with these words without the "&&" characters normally required. The phrase ".not. VALID" was added to line 101 to indicate that this particular ENDIF belongs to the IF of line 58. This is simply another way of making a program more readable and easier to debug, particualarly if the IF...ENDIF structures span more than one page or if you have nested IF...ENDIF structures.

To finish the analysis, the command SKIP (line 102) causes dBASE III to advance the record pointer to the next logical record. Without this command, the validation process would continuously evaluate the first record. Once the last record is reached, the next occurrence of SKIP will cause an end-of-file condition and the program will exit out of the DO WHILE loop. The SKIP command can be followed by a numeric expression. For example, SKIP -2 would cause the record pointer to move backwards two records. SKIP by itself would be the same as "SKIP 1".

The EJECT command (line 104) sends a form feed code to the printer. This command works at all times, not just when SET DEVICE TO PRINTER is in effect. Line 105 redirects the output of @...SAY commands back to the screen, lines 106-7 tell the user the program is done, line 108 sets TALK back to its default state and line 109 closes the PROJECTS data base.

You can test this program by entering various types of invalid data in the PROJECTS data base. In the next article, I will show how the validation process can be integrated into data entry and also how to combine data entry for PROJECTS and PROJXREF data bases into a single, integrated update/inquiry screen. ✱

Continued from Page 9

TURN.

4. The text you entered should be printed on the PRN device. You can also do this for the AUX device.

Accessing an Already Bootable Winchester

At this point, you're basically in business. You should now be able to use any of the programs that you have for the Z-100. But if you have a Winchester system, and you were not able to boot onto the Winchester, there is still work to be done.

Try typing 'B', followed by 'F3', a colon (:), and then your name, followed by RETURN. What this does is tells the computer that you want to boot-up ('B') from the Winchester ('F3') onto the partition with your name. Needless to say, it will not find a partition with your name (unless you're name is something like Ms. Dos).

You should receive a message that says "Error — Partition Not Found. Hit RETURN to continue". Follow instructions, and hit RETURN. You should now see a list of the valid Winchester partition names. Try booting to each of the partitions that are listed by using the procedure above, but use the partition name, instead of your name. Hopefully, you will find one that is bootable.

If you don't get a list of partition names, this generally means that the Winchester needs to be prepared from scratch. This involves running the PREP program, and the PART program. These utilities are included with the Heath/Zenith Winchester utilities, and their use is a bit beyond the intended scope of this month's Z-100 Survival Kit column.

Accessing Winchester Partitions

If you have been unsuccessful at booting onto the Winchester, you will need to access it by booting from a floppy drive. Make sure you have gone through the procedure described above, and written down the names of the partitions.

To access the Winchester partitions, you will need a Heath/Zenith utility program that assigns drive letters to the partitions. The name of the assignment program will be ASSIGN if you are using Z-DOS or MS-DOS v2. The name will be ASGNPART if you are using DOS v3.

Boot up on your system floppy, and run the assignment program using the following syntax:

```
ASGNPART 0:pname d:
```

or...

```
ASSIGN 0: pname d:
```

where:

0 = the Winchester unit number
pname = name of partition to assign
d: = drive letter to assign

The drive letter you assign should be E, F, G, or H. After executing this command, you should be able to get a directory of the Winchester partition. If not, this generally means that the partition has not been formatted, so you will need to use the DOS FORMAT program to format the partition. Remember to use the '/S' FORMAT switch for any partitions you want to be bootable.

Wrapping It Up

I hope this information will help you get your 'new' used Z-100 on line. After getting it working, one of the next things you should do is start a search for any documentation you can find about the Z-100. This would include the Z-100 Users Manual, Z-100 Technical Manual Set, MS-DOS reference manual, Programmer's Utility Pack, and back issues of REMark and SEXTANT magazines. There are lots of other options, DIP switches, and jumpers in the Z-100 which I have not even mentioned in this column. Many of these will have an effect on the way the system operates, and how useful it is for you.

Till next time . . . keep in touch! ✱

HyperACCESS/5, Voice Master Key System

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Based on the responses I received when I asked for any comments you had about OS/2, it is quite clear that virtually all HUG members seem to be as skeptical as I am about this new operating system. Even though some of you told me that you used OS/2, most of those responses indicated that DOS was still your primary operating system, and only one user said that he used OS/2 as the only operating system for his computer. As I said last year, I do not intend to write about something that seems to be of little interest to most HUG members, but there is little doubt that most computer users are quite reluctant to forge ahead with OS/2 for a lot of reasons, even though there is some outstanding software that is now available, such as HyperACCESS/5 that we will look at in this column. For those who are interested in useful hardware accessories, we will also look at the rather incredible Voice Master that is available from Covox, who has been a regular advertiser as you may have noticed.

One of the great features of HyperACCESS/5 is that you do not have to worry about whether to buy the DOS version or the OS/2 version — they both come in the same package. And in case you have not decided whether to order 3.5-inch disks or 5.25-inch disks, you get both in the same package. But before I get too involved in HyperACCESS/5, let me make one point about OS/2.

OS/2 and Communications Programs

There are two major categories of programs that have been developed for DOS that will not run under OS/2, and one of them is the communications program category (the other is any TSR). Communications programs are special because of the way they talk to a serial port, and the way OS/2 does that is significantly different from DOS. Because of that difference, a communications program that runs under DOS will *not* run under OS/2 and vice-versa.

Fortunately, Hilgraeve has found a way around the problem by simply including both the DOS and OS/2 versions of HyperACCESS/5 in the same package. I think that is a great idea, but now let's take a look at the program.

HyperACCESS/5

Those of you who have read this column for a while know that I have always liked Hilgraeve's communication program, which was originally called Access and was changed to HyperACCESS when Microsoft decided to use the "Access" name. Hilgraeve has always had a state-of-the-art communications program, but this latest one is absolutely spectacular. And that isn't just my opinion. You can look at just about any comparison of communications programs, and you will find that HyperACCESS/5 is nearly always number one on the list. As is my usual custom, I will not do a comparison with other similar programs because you can find that anywhere. But I will tell you about some of the features of HyperACCESS/5 that I particularly like.

Perhaps the major difference between HyperACCESS/5 and earlier versions is that it uses ALT-key commands instead of the Function Keys. I think that is a major improvement. For example, you can get to the Menus by entering ALT-M or you can get to the Communications screen by entering ALT-C. Of course, the

```
Main ──────────────────────────────────────── HyperACCESS/5
  ■ Press first letter of option

 »Call a system          -- Initiate a connection with a remote system
  Define system settings -- Add or change systems and settings
  Answer                 -- Answer calls or be a direct-cabled host
  Use OS/2               -- Use OS/2 commands or programs
  Editor                 -- Run text editor or word processing program
  Keys                   -- Assign keys and manage automatic sequences
  Quit                   -- Exit from HyperACCESS/5

 System                  Telephone number     Basic settings      Logon
▶Initial settings--used when you start HA5   9600 F 8 N 1 TTY     <none>
 MCI Mail.....1-800-234-6245                 1200 F 8 N 1 TTY     MCILOGON
 Another PC via cable.....<none>             19200 F 8 N 1 TTY    <none>
 Another PC with HA5.....<none>              9600 F 8 N 1 TTY     <none>
 CompuServe (CS net).....<none>              9600 F 7 E 1 COMPUSRV <none>
 Dow Jones.....<none>                        9600 F 8 N 1 TTY     <none>
 Easylink.....1-800-325-4112                 9600 F 8 N 1 TTY     <none>
 GEnie.....<none>                            9600 F 8 N 1 TTY     <none>
                    PGDN, PGUP to page list
ALT-Comm ALT-Learn ALT-Run ALT-Files ALT-Help                      0:00
```

Photo 1
HyperACCESS/5 DOS Menu Sample

Help information is ALT-H, and the Abort function is ALT-A. That helps you jump quickly to one part of the program or another. Photo 1 shows a sample menu.

The appropriate ALT-key selections are displayed at the bottom of the screen, as you can see. Within a menu, you simply press the first letter of the option you want to use, such as a C to Call a system. HyperACCESS/5 also displays a description of each command on the menu, so it is quite easy to use, even if you have never used a communications program before.

While some programs may look, feel, and act differently under OS/2 and Presentation Manger, virtually all of the features of HyperACCESS/5 are identical, so you will not have to learn a whole new set of commands just to run this software. In fact, you really will not SEE much difference unless you really look for it, as shown in Photo 2.

I believe that the fact that HyperACCESS/5 has the same user interface in both the DOS and OS/2 versions is a significant advantage. And the OS/2 version runs just fine in the protected mode or under Presentation Manager (like Windows). You can run HyperACCESS/5 under DOS version 2.0 or later (PC compatible only), or OS/2 version 1.0 or later. Because of that operating system compatibility, there are few users anywhere who will not be able to use HyperACCESS/5.

Aside from the operating system, this program's basic system requirements are not too demanding either. It runs on anything from an 8088-based system (PC compatible) up to an 80386-based system, including the PS/2. HyperACCESS/5 has modest video requirements and can support CGA, EGA, VGA or 8514A. Although it will run on a floppy disk system, HyperACCESS/5 requires at least a 720 K disk capacity, and it runs just fine on a Z-150 with a 3.5-inch floppy disk. For speed, I recommend a hard drive, but that is not a HyperACCESS/5 requirement. Note that HyperACCESS/5 only runs on a PC compatible — it does not run on a Z-100.

HyperACCESS/5 supports just about any serial (i.e., COM) port you can imagine. In general, it supports COM1 through COM4, and it supports COM1 through COM8 on PS/2 systems with MCA (Micro Channel Architecture). For Heath/Zenith computers, it supports COM3 on the Z-304 or Z-404 boards. And you can configure the communications speed from 50 to 115,200 bps, which should be fast enough for just about anyone.

You want features? HyperACCESS/5 has them. It includes a wide variety of modem setups, so you should not have any problem with that. I still use my old Prometheus ProModem (1200 baud), and that was included in the installation procedure with about 50 modems that are specifically supported by brand name.

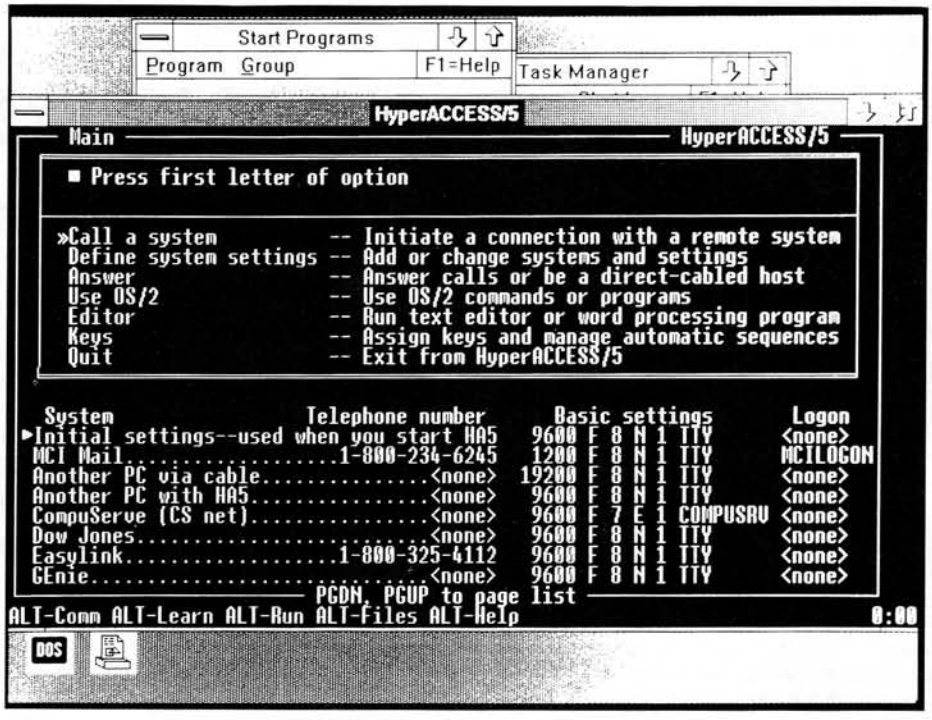

Photo 2
HyperACCESS/5 OS/2 Menu Sample

There is, of course, generic support for any Hayes-compatible modem, and you can also set up just about anything, so long as you know what the parameters are. I should also mention that HyperACCESS/5 supports modems up to 9600 bps, so it is difficult to imagine that you will need any more than that, at least for the next year or two. You can also transfer files between systems (e.g., from a laptop to a desktop computer) with a cable, and that can run like a rocket. For the fastest file transfer, Hilgraeve recommends that you use HyperACCESS/5 on both systems, but that is not a requirement. This is one thing I intend to try, but I have not had the time to see how well this works between one of my desktop computers and my SupersPort 286. The manual also includes all kinds of additional information (Appendix A) about setting up Modems, COM Ports, and Cables.

The dialing directory feature is a neat implementation, and it is also easy to use. You can even store setups while you are actually logging on a system (using the ALT-L Learn mode), so that is not really a chore. I like this feature so much that I might even be persuaded to give up my 3" × 5" card file with important phone numbers because HyperACCESS/5 can place voice calls too. One particularly nice feature is that you can automatically log (in a file) the time, date, and duration of the call.

Of course HyperACCESS/5 still has the HyperPilot script language that allows you to write a script for just about anything. And there are plenty of sample scripts in the package to give you an idea how to do it, if you are interested. You can create special user interfaces and display prompts, as well as checking keyboard entries. For speed, each script is "compiled", which can be a security feature if you need it. If you do not want to get into that kind of thing, there really is no need because you can use HyperACCESS/5 quite effectively without it. Still, HyperPilot is a very nice implementation, and it can be quite useful, especially if you like to experiment with these kinds of things like I do.

If you are not interested in working with HyperPilot, you can automate a variety of things without learning any kind of programming. You can write macros (using the Learn mode) by simply typing the keys or commands you want to execute. Once you have "written" the macro in the Learn mode, you can also edit it to add features or whatever. This particular feature rivals some of the keyboard enhancers that allow you to do the same thing.

For file transfers, HyperACCESS/5 has just about any protocol you will need including: XMODEM, YMODEM G, YMODEM Batch, KERMIT, 1K-XMODEM, XMODEM Auto, XMODEM CRC, XMODEM Checksum, and ASCII. And of course, there is also HyperProtocol that runs at warp speed (up to 115,200 bps) to help you complete space-age file transfers quickly. Of course, you can receive or transmit any disk file or print any received file directly to a printer.

If you want terminal emulation, HyperACCESS/5 has that too. All terminal emulations are full-featured and include:

VT-52, VT-100, VT-220, VT-320, TV- 925, TV-950, IBM 3101, IBM 3278, IRMA 3278, standard TTY, ASCII, and Wang. The on-screen help system is quite complete, and it is context-sensitive and indexed for ease of use — you may not even need the manual after the installation and initial setup. And HyperACCESS/5 has a built-in, easy-to-use editor PLUS a complete disk and file management system. Both the Editor and the Use DOS options are selected from the main menu (see Photo 2).

HyperACCESS/5 is not copy protected. As most of you know, it is my policy not to review copy-protected software because I do not believe it is in the best interest of users, or manufacturers for that matter.

All in all, HyperACCESS/5 is a dynamite communications program and is highly recommended for the beginner and expert alike. In fact, Hilgraeve is so confident that this software will perform as expected that there is a clear statement on the box (and the manual cover) that says: "If within 30 days of purchase this product proves unsuitable for your application, call our customer service department and we'll arrange a refund." Now THAT'S confidence! And I agree that Hilgraeve has every reason for that confidence because I think this is a perfect example of tomorrow's software today. HyperACCESS/5 is so well designed, implemented, and easy to use that it makes all other communications software positively obsolete. HyperACCESS/5 is an example of what software can and should be, but usually isn't.

For those of you not familiar with Hilgraeve, this company has been around a long time, and it has supported the Heath/Zenith users with a version of Access that was available on the Z-89 running CP/M. Hilgraeve has always used recommended Microsoft and IBM programming procedures, so their software has been extremely compatible with all kinds of hardware and other software. For example, the DOS version is "well-behaved" (in Microsoft and IBM terms) so that it can run under Windows or DesqView. The OS/2 version runs in the protected mode and can be run in a Presentation Manager window.

By the way, I should mention that I have discussed only a few of the features here, and HyperACCESS/5 has a LOT more. Although it is quite easy to use for a beginner, it has enough goodies to keep a super-power-user interested and busy for a long time, if you are so inclined.

If you are a registered HyperACCESS user for an older version, Matt Gray, President of Hilgraeve, tells me you can upgrade to HyperACCESS/5 for an extremely modest $49.00 plus $6.00 shipping. That is a real bargain and is well worth the cost. If you own HyperACCESS and have not registered the software yet, you can still take advantage of this upgrade offer by registering your program at the time you request the upgrade.

Voice Master Key System

Perhaps you have seen the advertisements for the Covox Voice Master Key System and wondered about it. When I first saw the advertisement, I have to admit that I thought it was an intriguing "gadget" that you would also find interesting. Since I've had an opportunity to work with it, I have found that it is much more than I expected, and it is far more useful than I ever imagined.

Although I have always mumbled (and sometimes grumbled) a little while working at my computer, there have been some times that my comments were not really something I have shared and many of them were certainly not printable. When one of my hard drives fails for example, my comments tend to get a little louder and less printable. Not to mention what happens when I use the dreaded DEL *.* command on the WRONG subdirectory. I did that last week when I was working with the \BATCH subdirectory, and I deleted all of the *.BAT files instead of the *.BAK files. Time for a coffee break and Mace Utilities . . .

My wife has always wondered why I talk to my computer, and I find myself talking to my system more and more these days. That's quite easy with the Voice Master Key System, and I have found a number of interesting and very useful tasks that make my work a lot easier. But before I get into that, let's take a look at what the Voice Master Key System includes.

The Voice Master Key System includes a headset with a microphone and a board that fits in an 8-bit slot inside your computer as shown in Photo 3.

You also receive a 5.25-inch floppy disk with the software for the Voice Master Key System, and of course, an instruction manual. Installation is easy and amounts to simply plugging in the board and connecting the headset. The board includes a jumper that is factory-set for port address 22FH, which should work fine in most computers. If it does not, you can change the jumper to use port address 24FH, 28FH or 2CFH. Even if you do not understand what all that means, all you have to do is move the jumper on the board if the system does not work at the factory setting. And for those of you who know something about computer hardware and problems with IRQs, Mark Stewart, Vice President of Covox, tells me that the Voice Master Key System does *NOT* use any IRQ, so you should have no conflicts there.

After that, you run a quick installation test using a program (OSCI for CGA or OSCIM for Hercules) that is included in the software. Then, I copied the software from the distribution disk into the VMKEY subdirectory as recommended in the manual. The manual quite specifically and correctly states that the VMKEY program *MUST* be loaded first, but first you will probably want to run the configuration program, VMCONFIG, to set up various features.

The basic configuration allows you to define the type of video display you are using (CGA, MDA, EGA, VGA or LCD) and the colors to be used for various parts of the VMKEY menu. In addition, you can also change the hot-key, change file names, and sort template names among others.

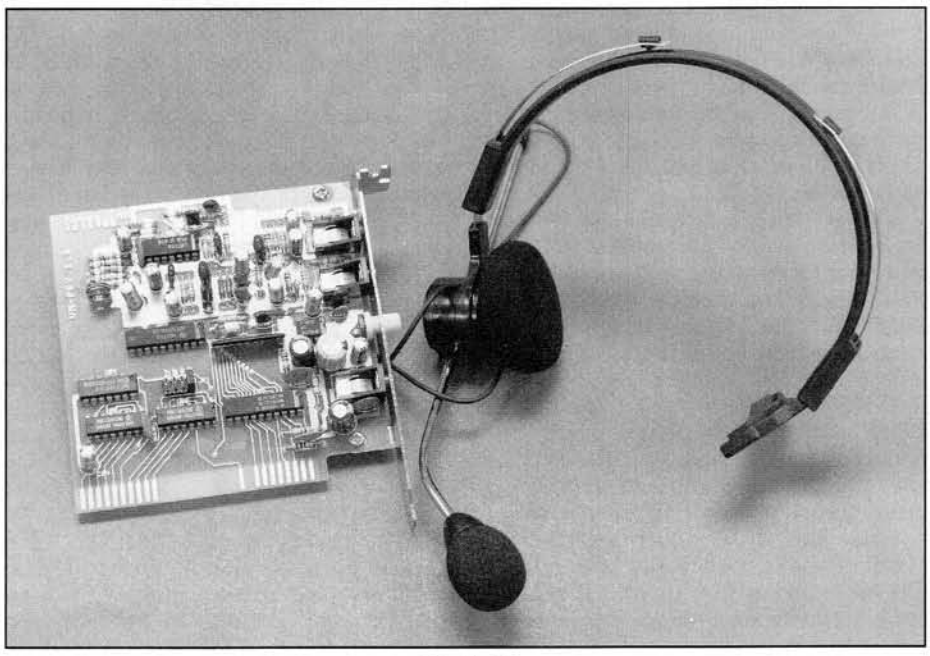

Photo 3
Voice Master Key System

VMKEY is a memory-resident (TSR) program that is used with the Voice Master Key System. Teaching the system how to interpret a word or words to be used with a macro is quite easy, and after you have done it a few times, it goes quite quickly. It basically amounts to defining a word and then defining the keyboard entries (i.e., macro) that are to be associated with that word.

First, you load VMKEY into memory and activate it by pressing both of the SHIFT keys to see the main menu. Next, enter the master menu selection A to Edit commands. Now you can define a voice template by pressing A for "Add a new template." First, you type in the word that is the name of the template, such as BOLD. When you see a happy face on the screen, you pronounce the word "BOLD" in your normal voice. Then, the happy face disappears, you press the SPACE BAR, and watch for the happy face to reappear. Repeat the word when you see the happy face. Covox recommends that you repeat each word three times.

Now that the voice template has been defined, you return to the main menu and press S to send the template to the macro menu. The program will record the keystrokes or you can enter macros directly. When you enter macros directly, you can enter command keys, like ENTER or ESCape, by pressing the SHIFT key in combination with the key, such as SHIFT-ENTER or SHIFT-ESC. When the macro is finished, you just press ENTER to store it. And of course, you want to remember to use the Save Macros option to store the completed macros to disk.

The basic process is quite easy, although I have not included all of the details because it is quite easy to follow the menus. I found it was easiest to define all of the voice templates first, such as BOLD, UNDERLINE, ITALICS, and then set up the appropriate macro for each command in one shot. That minimizes the movement between menus, and it is easy to do if you define your templates with appropriate names.

You can do the same kind of thing for a spreadsheet, like Quattro Pro. For cursor movement around the spreadsheet, I defined the obvious commands like HOME, UP, DOWN, RIGHT and LEFT, as well as more complex commands like END-HOME (for END-HOME), ENDLEFT (for END-LEFT), and ENDRIGHT (for END-RIGHT).

Aside from being useful, I had lots of fun setting up all of this and some other things too. With some minor changes, I was also able to set up the system with macros for Microsoft Word (the original was for WordStar 5.5), SuperCalc 5, Word Perfect, and Excel. One advantage in doing so is that the same voice command will do exactly (or close to it) the same thing in each program, regardless of the command differences. This makes it REALLY easy to move back and forth between programs, especially when they have different commands.

The Voice Master Key System has obvious applications for the handicapped or for anyone who does not have full use of their hands. For the non-handicapped, it can help you do a lot of chores much faster. And it can ease the transition between similar programs, like spreadsheets, when they have different command structures. If you can type it and say it, this hardware and software can translate it into keyboard entries. I mentioned last December that I found one very useful and interesting side effect as a result of using the Voice Master Key System.

I know most of my usual software pretty well, but I have found I now can use it MUCH faster, even without the Voice Master Key System. Part of the reason for that is undoubtedly that I had to teach the software how to interpret my words into keystrokes — a simple form of programming if you want to get right down to it. But I have found that I can do things faster without the Voice Master Key System too. When I travel with my SupersPort 286 and I use various kinds of software, I find that I can remember the appropriate keystrokes MUCH faster, almost without thinking. I think that must be a result of repeatedly saying the keystrokes when I use it, both for teaching it and for normal use. Perhaps you are familiar with the principle that if you say something repeatedly, you will remember it far longer. Besides, it is absolutely fascinating to see the software (or the computer, if you prefer) actually DO something you have TOLD it to do.

I was not able to find any real problems with this system, either in the software or the hardware. About the only difficulty I had was getting the system to occasionally recognize my words when I had a bad cold, which really made my voice a LOT deeper. Even then, I was amazed that the system was able to recognize most of the words, most of the time, even though I had trained it without having a cold.

The Voice Master Key System is an excellent product, and it is highly recommended. I enjoy working with it, and it makes much of my work go a LOT faster, especially editing. It's rare to find a useful accessory that improves productivity and is also fun to use, but the Voice Master Key System fills that need quite nicely.

Powering Down

As you have seen, I have selected a couple of really outstanding computer products that illustrate some of the ways that vendors can improve software and hardware. Both products are quite unique, and both are really excellent. If you are looking for a way to make a hobby or business more interesting and productive, you will not go wrong with either HyperACCESS/5 or the Voice Master Key System.

For help in solving specific computer problems, be sure to include the exact model number of your system (from the back of the unit or the model series from the Owner's Manual), the ROM version you are using (use CTRL-ALT-INS to find it), the DOS version you are using (including both version and BIOS numbers from the VER command), and a list of ALL hardware add-ons (including brand and model number) installed in your computer. The list of hardware add-ons should specifically include memory capacity (either added to an existing board or on any add-on boards), all other internal add-on boards (e.g., modems, bus mouse or video cards), the brand and model of the CRT monitor you have, and the brand and model of the printer with the type of interface (i.e., serial or parallel) you are using. Also be sure to include a listing of the contents of the AUTOEXEC.BAT and CONFIG.SYS files unless you have thoroughly checked them out for potential problems (e.g., TSR conflicts). If the problem involves any application software, be sure to include the name and version number of the program you are running when the problem appears.

If you have questions about anything in this column, or about Zenith Data Systems or Heath Company systems in general, be sure to include a self-addressed, stamped envelope (business size preferred) if you would like a personal reply to your question, suggestion, comment or request.

Products Discussed

HUG Software

Powering Up (885-4604) $12.00
Heath/Zenith Users' Group
P.O. Box 217
Benton Harbor, MI 49022-0217
(616) 982-3463 (HUG Software only)

Software

HyperACCESS/5
(DOS & OS/2 versions) $199.00
Upgrade (*Registered* HyperACCESS Users)(plus shipping) 49.00
Hilgraeve, Inc.
Genesis Centre
111 Conant Avenue, Suite A
Monroe, MI 48161
(800) 826-2760 (Orders only)

Hardware

Voice Master Key System $149.95
Covox, Inc.
675 Conger Street
Eugene, OR 97402
(503) 342-1271

Mace 5 Utilities $99.00
Mace Gold Utilities 149.00
Fifth Generation Systems, Inc.
11200 Industriplex Boulevard
Baton Rouge, LA 70809
(800) 873-4384 (Orders only)

Command Line Input for Compiled BASIC Programs

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The Professional Touch!

How often have you typed something like /O or /X following a program name to set an option in a program you're invoking? How often have you wondered how that information enters the program? How often have you wondered how you could write programs in BASIC that acquire the command text (entered following the program name) and use this information as input to your program? It is not only possible, but quite easy to acquire this string in your BASIC program. In this article, two methods are given to do just that (another one may be present among your BASIC functions).

Using the command text to supply information to your program will often result in a more streamlined, professional program than using other methods, such as displaying a menu and requesting the user's response. Furthermore, it can contain any type of information, numerical, logical or string. The program must, of course, contain the algorithm for interpreting the string of characters that are entered, to obtain from it the various components to use in appropriate ways. The method has become rather popular in commercial software packages. Most commercial software requires the entry of command text to determine operating modes, prompting levels and to choose various other options.

The Quick BASIC language contains the string function COMMAND$. It returns the command text with lowercase letters changed to uppercase. If you have a version of Quick BASIC that has this function and your application can accept the conversion of lowercase to uppercase, this is a very simple way to capture the command text. It will not be illustrated or discussed further in this article. Two other methods are given that return the command text exactly as entered. They utilize features of the DOS system to obtain the command text and can therefore be adapted to other BASIC implementations.

The first method given to capture the command text in a BASIC program uses the function INTERRUPT, supplied with Quick BASIC (4.5) as a library routine. The other method uses a simple Assembly Language subroutine that can be linked to compiled (Microsoft compilers) BASIC programs and called as a subroutine. Both methods rely on a DOS function that is part of DOS version 2 and above (don't try them with ZDOS). The method using the Assembly Language subroutine was successfully run on a Z-100 (not PC). The BASIC program was compiled without change using BASCOM with the /N op-

Program 1
CLINE1.BAS

```
'DEMONSTRATES HOW TO GET THE COMMAND LINE
'TO USE IN A BASIC PROGRAM.
'THIS PROGRAM CALLS QUICK BASIC (4.5) FUNCTION INTERRUPT
'Other BASIC compilers may have their own methods of calling DOS functions
'
'Once the command line is captured, it can be used for input,
'setting modes or...
'
TYPE regtype 'This typing is needed in QB 4.5 to call INTERRUPT
  AX AS INTEGER
  BX AS INTEGER
  CX AS INTEGER
  DX AS INTEGER
  BP AS INTEGER
  SI AS INTEGER
  DI AS INTEGER
  FLAGS AS INTEGER
END TYPE
'
DIM Ain AS regtype
DIM Aout AS regtype
nint% = &H21                'Interrupt 21 hex is a DOS function call.
Ain.AX = &H5100             'Set high byte of AX (i.e., AH) to 51 hex
                            'to call DOS function 51h to get the SEGMENT of
                            'the current Program Segment Prefix (PSP).
   'These two numbers are the required inputs.
'
CALL INTERRUPT(nint%, Ain, Aout) 'Make the DOS function call.
   'Output is in BX
   'It is the SEGMENT of the first element of the PSP.
   'Add 8 to obtain the SEGMENT of the number of bytes in the command line
SCL% = Aout.BX + &H8
PRINT "SEGMENT is: "; HEX$(SCL%)
'
DEF SEG = SCL%              'Define SEGMENT to BASIC
'
 'Print the number of bytes in the command line:
PRINT ''Number of bytes is  ; PEEK(0)
'
' Capture the command line in A$
A$ = ""
FOR i = 1 TO PEEK(0)
 A$ = A$ + CHR$(PEEK(i))
NEXT
'
' Print the command line.
PRINT A$
END
```

tion so that it would compile without line numbers. It was then linked to the Assembly routine. (BASCOM doesn't seem to support the equivalent of INTERRUPT; that method was not tried on the Z-100.) The programs were written on a Z-248/12 (a PC compatible).

If you don't have a version of BASIC that includes subroutine INTERRUPT, look for (the equivalent) subroutine INT-86 in other Microsoft BASICs. In True BASIC, you'll need a subroutine included in the IBM PC Developer's Toolkit to call DOS functions from BASIC (see documentation with this kit). True BASIC does support use of Assembly Language subroutines; however, the program given below as Program 3 will not work in True BASIC as it is. See the True BASIC IBM PC User's Guide, Appendix D for the requirements of Assembly routines for use with True BASIC. If you have a different BASIC, it is hoped that the explanations given here are sufficient so that you can adapt these methods to your BASIC's syntax and capabilities.

How Can the Command Text Be Saved?

When DOS loads a program, any string following the name of the program (up to a maximum of 127 characters) is stored. (Note, the redirection characters < and > are NOT stored as part of this string, but are trapped and redirected for their special purpose. Therefore, don't use < and > except for their redirection meaning.) The command text is stored whether it is used by the program or not. Therefore, a program written to use the command text need not contain any instructions to assure that the text is saved. The command text will be stored and waiting whether it's used or not if it was entered. (For programs that don't use such a command text, you may enter anything you please when invoking the program; it will be stored and ignored.) Note that the loader must know where the program name ends when invoking the program; the character following the program name must be a blank or / to indicate the end of the name of the file to be loaded. The command text that the loader stores starts with the character following the file name (blank or /).

What Happens When a Program is Loaded?

When a file name is entered and a program is loaded, several things are written into the "user memory" known as the Transient Program Area. These include the environment (strings usually entered in the autoexec.bat file using the SET or PATH command), the Program Segment Prefix and the program to be run. Our attention focuses on the Program Segment Prefix; it will be referred to simply as the PSP. The PSP is precisely 256 bytes long. The first half (128 bytes, or 80 hex bytes) is filled with bookkeeping information for use by DOS. The last half (80 hex bytes) is used for the command text. The first byte (of the last half) contains the number of bytes in the command text; the bytes following it contain the text itself (up to 127 bytes, or 7F hex bytes).

How Can a Program Find the PSP?

The PSP is written into memory just below (smaller address numbers) the program that is to run. This isn't much help, since it's not obvious where the program is located. The system must know where everything is, however, so it's not surprising that a routine exists as part of DOS that will tell your program exactly where DOS wrote the start of the PSP when it loaded the program. This routine is one of the many routines known as the DOS functions. They are called by using software interrupts. Software interrupts call routines that are loaded into memory before they are needed. They are called by number; the number indicates where in memory the address is stored that points to the routine itself. The number of the interrupt that is used for the DOS functions is 21 hex. There are many such DOS functions; the function number that returns the location of the PSP is function 51 hex. The method of calling these functions will not be explained in detail, but the accompanying codes should give some insight into the method. The number returned that identifies the location of the PSP is called the SEGMENT value of the first byte of the PSP. Suffice it to say that this SEGMENT number multiplied by 16 is the actual sequential memory location in RAM of the first byte of the PSP. The segment number will not be multiplied by 16 because the computer identifies a memory location by using a SEGMENT number or base and an OFFSET (in bytes) from that base. The SEGMENT base found using the DOS function and OFFSET zero is the location of the first byte of the PSP. To find the SEGMENT base of the location where the number of bytes in the command text is stored, 8 will be added to the SEGMENT base of the PSP first byte since it is 128 bytes beyond the PSP first byte (8 = 128/16).

Finding the PSP Using the Quick BASIC Subroutine INTERRUPT

The Quick BASIC subroutine INTERRUPT is designed specifically to call routines that are already loaded into memory and are designed to be called by the software interrupt (call-by-number) system. The input(s) and output(s) of these routines are performed through the registers of the computer's microprocessor unit (MPU). Calling INTERRUPT causes three basic actions:

1. The input values are moved from BASIC-variable storage locations (where they have been put by the program) to the registers of the MPU.
2. The routine is called that is identified by the interrupt number (21 hex in this case, for a DOS function call).
3. The output values are moved from the MPU registers to their BASIC-variable storage locations.

Program 1 (CLINE1.BAS) is a Quick BASIC program that uses subroutine INTERRUPT to perform the operations already discussed. Subroutine INTERRUPT requires the user definition of the TYPE regtype as shown in the listing. The elements of regtype refer to eight MPU registers identified by the names used in the TYPE declaration. Interrupts are normally

Program 2
CLINE2.BAS

```
'DEMONSTRATES HOW TO GET THE COMMAND LINE
 'TO USE IN A BASIC PROGRAM.
 'THIS PROGRAM CALLS AN ASSEMBLY PROGRAM SGCL
 '
 'Once the command line is captured, it can be used for input,
 'setting modes or...
 '
 CALL SGCL(SCL%)              'Get SEGMENT of the location of the number
                              'of bytes in command line.
 PRINT "SEGMENT is: "; HEX$(SCL%)
'
 DEF SEG = SCL%  Define SEGMENT to BASIC
 '
  'Print the number of bytes in the command line:
 PRINT "Number of bytes is"; PEEK(Ø)
'
' Capture the command line in A$
 A$ = ""
 FOR i = 1 TO PEEK(Ø)
  A$ = A$ + CHR$(PEEK(i))
 NEXT
'
' Print the command line.
 PRINT A$
END
```

Continued on Page 42

Programming LaserJet Printers

Part 1

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No matter how many oracles predict the paperless office of the future, business still depends on hardcopy. Just look at two of today's most popular software packages, word processing and desktop publishing, two types of software designed to produce printed output.

So with all the advances in communications and video displays, the quality of your printer plays a major role in determining the quality of your work, and the influence it has on those you want to impress.

From this viewpoint, the laser printer stands out as a major achievement. Here is a printer that produces high quality text and graphics, quickly and consistently.

In this series of articles, we'll look at the LaserJet family of printers marketed by Hewlett-Packard, and printers compatible with the LaserJet. This first of the series discusses how laser printers work and explains basic concepts needed if you plan to use your LaserJet to the fullest.

How Laser Printing Works

Laser printers work by using a photosensitive drum and electrostatic charges. Let's look at the process step-by-step.

1. The page you want to print is transferred from the computer to the printer's memory, then divided into individual scan lines 1/300 of an inch, or one dot, wide.
2. In a process called conditioning, the printer applies an electrostatic charge to the photosensitive drum that is built into the toner cartridge.
3. A beam of laser light scans across the surface of the drum. At each place where a dot will be printed on the paper, the beam pulses on, removing the electrostatic charge. This is called the writing process. The beam scans across the drum, line-by-line until the drum is full. (Since the drum is just over 3 inches around, it takes several rotations like this to print an entire page.)
4. A fine mist of toner is then sprayed over the drum's surface in the development process. Because of the electrical characteristics of the surface, toner only adheres to the spaces where the charges have been removed by the laser beam.
5. A sheet of paper is fed into the printer and also given an electrostatic charge like that originally applied to the drum.
6. The paper contacts the drum and attracts the toner particles.
7. A high intensity lamp (400 degrees) fuses, or melts, the toner onto the paper before it is ejected.
8. The drum is then scraped clean and cleared by an erase lamp in preparation for the next page.

This system is called black-writing, meaning that images will appear wherever the laser beam contacts the drum. Other types of laser printers are white-writing. In these systems, the charges are applied so toner adheres to unexposed areas of the drum.

The quality of the photosensitive drum and the toner has a lot to do with the quality of the printed page. But what gets printed is determined by the commands transferred to the printer in the first step of the process.

All LaserJet and LaserJet compatible printers understand commands in the Printer Control Language, or PCL. For example, say you use WordPerfect or Microsoft Word to create a document in the landscape orientation. Before transmitting to the printer the text of the page, your application will transmit the PCL command that switches the printer to landscape.

There are PCL commands for every function of the LaserJet — for selecting fonts, setting page margins, drawing lines and graphics, selecting symbol sets, and controlling every aspect of the printer's operation.

When you use an application program that has a LaserJet driver, it takes care of creating and transmitting the PCL commands for you. In fact, most LaserJet users never learn even one PCL command. But if you write your own programs, or just want to get the most from your printer, then you should learn about PCL.

PCL Command Structure

All commands to the LaserJet can be divided into three general classes: ASCII control codes, two-character escape sequences, and parameterized escape sequences.

Every PCL command except the ASCII control codes must start with the ASCII 27 escape character. But how you

transfer this command to the printer depends on the language you are using. When we show you the PCL commands later in this, and future articles, we'll refer to the escape code as <ESC>. For example, the command <ESC>E is an escape code followed by the capital letter E.

In program listings, the escape code is usually shown in its decimal (27) or hexadecimal (1B) equivalent. So before looking at the details of PCL, review how to transmit escape codes using your language.

Programming PCL Commands

You can program the LaserJet using any language that has a way of transmitting the <ESC> character to the printer. You can't use the ESC key, but must send the character using its decimal (27), hexadecimal (1B), octal (033), or binary (00011011) equivalent.

C

To print in C, you have to open a file accessing the DOS printer device. PCL commands are then treated as text strings starting with \x1B, the code for the hexadecimal equivalent of the <ESC> character.

For example, here is a sample C program designed for Turbo C:

```
#include <stdio.h>
main()
{
FILE *fptr;
char string[81];
if( (fptr=fopen("prn", "w")) == NULL)
{ printf("Sorry, can access printer");
exit (); }
fputs("\x1B&dDThis is underlined\x1B&d@
", fptr);
fclose(fptr);
}
```

The program includes the stdio.h header file, then creates and opens a file accessing the printer using the built-in "prn" file handle to link the file with the DOS printing device.

The fputs output line transmits the PCL command for underlining, the text to be underlined, then the code to turn underlining off. If you didn't turn underlining off, all other printing will be underlined until you reset the printer.

Pascal

This Turbo Pascal 5.0 program prints a line of text in italics:

```
program sample;
uses printer;
begin
write (lst, chr(27)+'(s1SThis is italic
'+chr(27)+'(s0S');
end.
```

The program uses the built-in printer unit which contains the pre-defined 1st printer file. The <ESC> code is transmitted by its decimal number 27. Chr is a built-in function that returns the character equivalent of the number of parentheses. So, the code chr(27) sends to the printer the ASCII character represented by decimal 27, the <ESC> code.

BASIC

All printer output in BASIC is transmitted by the LPRINT command. The <ESC> code is transmitted using the string function CHR$(27). This number-to-character conversion function changes the decimal 27 to its character equivalent, the escape code.

For example, this line prints text in boldface:

```
10 LPRINT chr$(27);"(s3BThis is Bold";
   chr$(27);"(s0B"
```

DBASE

Transmit PCL codes in Dbase using the command CHR(27) followed by one or more characters in quotation marks, such as CHR(27)+"&l10", the PCL command for landscape printing.

You have to direct output to the printer within your programs with the commands SET PRINT ON and SET PRINT OFF. So place your PCL instructions after the command SET PRINT ON.

As an example, the following program prints a report called ORDER using the STOCK data base on letter size paper with the Line Printer font. (The report form settings should be set with a page width of 129, 55 lines per page, 8 character left margin, and no right margin.)

```
use stock
set print on
? chr(27)+"E"+chr(27)+"(s16.66H"
report form order
? chr(27)+"E"
set print off
```

ASCII Control Codes

Every printer made to work with PC compatible computers recognizes a basic set of control codes in the ASCII range from 0 to 31.

Most of these codes perform the same function no matter what printer you have. For example, the ASCII code 12 always ejects the current page in the printer, while ASCII 10 is always a line feed.

The eight basic codes recognized by PCL are shown in Table 1. They are transmitted just like the <ESC> character itself. For example in BASIC, this line performs a form feed:

```
10 LPRINT chr$(12)
```

Use the decimal numbers for BASIC.

In C, this program line resets the printer then performs a line feed:

```
fputs("\x1BE\x0A", fptr);
```

In C, output the ASCII codes in their hexadecimal format.

Two-Character Escape Codes

There are five PCL commands that contain just two characters, the escape character and one other. These perform fixed functions and cannot be modified in any way.

<ESC>E resets the printer to its default environment.

<ESC>9 resets the right and left margins to the default values.

<ESC>= performs a half-line feed from the current cursor position.

<ESC>Y turns ON the display function. In this mode, most PCL commands are printed and not executed.

<ESC>Z cancels the display function. PCL commands will now be executed as normal.

Parameterized Commands

All other PCL sequences are parameterized which require a user-specified value and a parameter that signifies the function you want the printer to perform.

A simple parameterized command contains just one instruction for each <ESC> code. Complex commands combine any number of simple ones following a single <ESC> code. Certain rules must be followed for creating complex commands.

Simple Commands

Each simple parameterized command is in the format <ESC> A b # C [data].

<ESC> is the escape character that must be transmitted by your printer.

Table 1

Code	Hexadecimal	Decimal	Purpose
Backspace	08	8	Moves the cursor one character position to the left, but not past the left margin.
Line Feed	0A	10	Moves the cursor to the next line at the same column position.
Carriage Return	0D	13	Moves to the left margin of the current line.
Shift Out	0E	14	Selects following characters from the secondary font.
Shift In	0F	15	Selects following characters from the primary font.
Escape	1B	27	Beginning of control sequence.
Horizontal Tab	09	9	Moves the cursor to the next tab position.

"A" represents the Parameterized character that informs the printer that the command includes a parameter. Valid parameterized characters are in the ASCII range from 37 (the ! character) to 47 (/).

The "y" is the group character that signifies the general class of the instruction. Valid group characters are in the range from 95 (') to 126 (^t). For example, font selection commands are usually in group s, and format commands in group l.

Some commands do not contain a group character, but use the Parameterized character as the group indicator. For instance, many font selection commands have no group letter, but are identified by the "(" parameterized character.

The "#" represents a user-specified field value for the specific parameter that follows. Valid characters are from 0 to 9, "+", "-", and ".". Some commands do not require a value. If it does, and you do not include one, a 0 is assumed.

"Z" is the parameter character that indicates to which parameter the previous value applies. While the group letter identifies the general class of command, the parameter signifies the exact function. For example, a group letter "l" indicates a formatting command, but the parameter indicates which format is being set. In a simple PCL command, this also serves as the terminator character and, if a letter, must be capitalized. This lets the printer know it has reached the end of the command. Terminating characters are in the range 64 to 94.

Finally, [data] includes the bit-map binary information that must be transmitted in commands to download softfonts and raster graphics. Usually, the field value indicates the number of data bytes included in the command.

Here are some examples of parameterized commands.

The command <ESC>&l2D sets the printer to double spacing.

All sequences starting with "&l" are parameterized (&) formatting commands (group l) The "D" parameter signifies that the value preceding is the amount of line spacing. Valid values are 1, 2, 3, 4, 6, 8, 12, 16, 24, and 48. So the command for triple spacing would be <ESC>&l3D, assigning the "D" format parameter the value 3.

Another command in the same group would be <ESC>&l#E. In this case, the "E" indicates the value is the top margin in lines. To set the top margin to three inches, use the command <ESC>&l18E. Here, the "E" format parameter is assigned 18.

However, some commands do not have a group letter, such as <ESC>(8U which sets the primary font to the Roman-8 symbol set. The "(" parameterized character indicates it is a font command. Commands with the ")" parameterized letter, by the way, always refer to the secondary font.

There are also commands that have no field value, such as <ESC>&d@ which controls underlining. In this case, the "@" parameter character turns off automatic underlining, and no value is required.

An example of commands that include data is <ESC>*b4W 255 255 255 255 which transfers a line of 32 dots of raster graphics. The "*" parameterized character means the command is either for font management or graphics. The group and parameter characters, however, indicate it is a raster transfer of four characters.

You can include more than one command on the same program line. For example, to set the printer at landscape and select softfont one, you would use this code <ESC>&l1O<ESC>(2X.

In this example, an <ESC> code precedes each set of parameterized and group characters. The terminating parameter character in each command is uppercase.

Complex Commands

If the parameterized and group characters are the same, you can combine a series of commands into one complex command. This is a number command that shares a single <ESC>, parameterized and group character.

In order to combine commands, the parameterized and group characters must be the same for all commands and all alphabetic characters in the command must be lowercase except for the final parameter character which serves as the command terminator.

Parameter characters not terminating the code must be in the range 96 to 126; terminating parameter characters between 64 and 94.

For example, the command <ESC>-&l1s4h12E combines three escape sequences.

<ESC>&l1S turns on duplex printing with long-edge binding. In the complex command, the parameter character no longer terminates the sequence so it is lowercase.

<ESC>&l4H uses the lower tray as the paper source. In the complex command, <ESC>&l was dropped and the parameter letter made lowercase.

Finally, <ESC>&l12E sets a top margin of 12 lines. The <ESC>&l characters are again dropped, except the parameter character, which terminates the entire sequence, remains uppercase.

If you want to enter a complex command and one from a different group on one line, be sure to include all necessary characters. For example <ESC>-(4X<ESC>&l1s4h12E selects the softfont with "ID 4", then issues the complex command just discussed. Since the font command has different parameterized and group characters, it terminates with an uppercase letter, and the next command has its own <ESC>, parameterized and group characters.

Before learning the PCL commands, however, you need to know how PCL works with the page to be printed. We'll look at measuring systems used for cursor movement and the way PCL defines the page itself.

Measuring Systems

LaserJet printers measure the page and positions within it using decipoints, dots, inches, lines, and columns.

A Decipoint is 1/720 of an inch, or one tenth of a point. This small measurement can be used for precisely placing text on the page.

Dots are 1/300 of an inch. Working with measurements in dots is convenient because it relates directly to the actual dots that will print on the page.

Inches are most useful when dealing with large areas, such as margins and large graphics. But PCL commands that use inches use increments of either 1/120 or 1/48 of an inch.

The exact measures of lines and rows are dependent upon the current font or other PCL settings. For example, if you use the PCL command to move the cursor one line, the actual distance moved depends on the size of the font. Using a 12-point font with no leading, each line is 1/6 of an inch; a 24-point font makes each line 1/3 of an inch.

The column, or character, measurement is the most difficult to deal with. With fixed width fonts, each position is an even increment of the pitch, so 12 pitch means that each character is 1/12 of an inch. With variable width fonts, each character is a different width, so the width of the font's space character is used as the column width.

Three Pages

From the LaserJet's point of view there are three "pages" in every sheet of paper: the physical, logical, and printable pages.

The physical page is the actual sheet of paper you load into the printer, measured from side to side, top to bottom. When you select a page size, such as letter or legal, it is the physical page that you go by. This measurement establishes the size of the logical and printable pages.

The Logical Page is the area of the physical page in which dots can be placed, commonly referred to as the addressable area. It is the same length as the physical page, but narrower by about 50 dots (1/6 of an inch) on the left and right. While you can place the cursor anywhere in the logical page, you can't print outside of the printable page.

The Printable Page defines the region where text and graphics can actually be printed. It is the same width as the logical

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Upgrading an H/Z-151

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With a 1.2MB or 1.44MB Disk Drive

The H/Z-151 computer is out-dated by today's standards. When compared to the development of the AT compatible machines (Z-248) and the 80386-based computers, the Z-151 is slow. Upgrading the Z-151 to 8 megahertz with no wait states makes the Z-151 tolerable for most applications. There is still one weakness, the 360 kilobyte disk drives which came with the Z-151 computer are obsolete and not compatible with the latest technology (1.44 megabyte 3.5 inch disk drive). The 360 kilobyte drives are not even compatible with the AT class 1.2 megabyte 5.25 inch disk drive. For those of us who regularly use an 80386 computer or Z-248 (AT class) computer and need to transfer files to work on them on the old Z-151 at home, there are only two choices. We can replace the Z-151 with an AT class computer for about $1000, or we can find a way to make the Z-151 utilize 1.2 megabyte and 1.44 megabyte disk drives.

Both the 1.2 megabyte 5.25 inch disk drives and the 1.44 megabyte 3.5 inch disk drives are available at most computer stores and mail-order companies. Both of these disk drives are available with the standard 5.25 inch half-height mounting used by the IBM AT and the Z-151. The problem is that the Z-151 disk controller is not compatible with the high density disk formats used to obtain 1.2 megabytes on a 5.25 inch floppy disk or 1.44 megabytes on a 3.5 inch disk cartridge.

The 5.25 inch floppy disk is available in five formats. The Z-151 originally used the 360 kilobyte format. Other formats which are used are the 160 Kb, 180 Kb, 320 Kb, 360 Kb, and 1.2 Mb formats. The disk drives supplied with the Z-151 usually operate at 360 Kb. These disk drives also can operate at 160 Kb, 180 Kb, 320 Kb by properly selecting the slash options on the "FORMAT" command. Once the diskette is formatted to one of these other formats, the computer will automatically read and write the correct format data to the diskette. Neither the disk drives supplied with the Z-151, or the Z-151 controller is capable of operating at the 1.2 megabyte format. An AT class floppy disk controller utilizes a 16-bit data buss and is not compatible with the 8-bit data buss used in the Z-151. Also, the Zenith Data Systems BIOS (basic input/output system) (which is stored in read only memory (ROM) in the computer) does not have the capability of operating a 1.2 megabyte disk format or an AT class disk controller.

The 3.5 inch "floppy" disk cartridge is a hard shell plastic case about 3.5 inches square and 1/8 inch thick. This disk is capable of holding 1.44 megabytes of data (equivalent to four 360 Kb floppy disks). The other format for the 3.5 inch disk drives is 720 Kb. The Z-151 floppy disk controller is capable of operating at the 720 Kb format, but not the 1.44 megabyte format. Many of the mail order computer stores can supply 720 Kb floppy disk drives upon request. One of these disk drives can be installed in the Z-151 simply by replacing one of the original disk drives. Caution: If you attempt to install a 720 Kb disk drive in a Z-151, you will have troubles with the ZDS BIOS which was never designed to operate at 720 Kb format. Several companies sell programs to modify the BIOS to allow the use of 720 Kb disks in the XT compatible computers including the Z-151. The 720 Kb format is not very popular. Clearly, the future will be for the 1.44 megabyte format with 3.5 inch disks and 1.2 megabytes with 5.25 inch floppy disks.

Disk compatibility is a complicated issue. With the 3.5 inch disk drives, the 1.44 megabyte drives are fully compatible with 720 Kb format. These drives are capable of reading, writing and formatting diskettes to the 720 Kb format. The 3.5 inch 720 Kb disk drives are not capable of reading, writing or formatting disks to the 1.44 megabyte format. The 3.5 inch disks are 3.5 inches square and about 1/8 inch thick. The write protect is accomplished by a small hole on the lower-left corner of the disk. When the hole is covered, the disk is write enabled. When the hole is uncovered, the disk is write protected. This is opposite the way the 5.25 inch disk write protect works. The 3.5 inch diskettes are available in 720 Kb format or 1.44 megabyte types. The primary difference is the size of the magnetic particles on the disk. The disks are identified by a small hole in the lower-right corner of the disk (opposite the write protect hole). If the disk does not have a hole on the right side, it is a 720 Kb disk. If the disk has the hole on the right side, it is a 1.44 megabyte disk. The 1.44 megabyte disks are more expensive than the 720 Kb disks because of the better quality magnetic coating on the disk. Another difference between the disk types is the coercivity, which is a measure of the strength of the magnetic field required to write data to the disk. The higher coercivity of the 1.44 megabyte disks means they will not reliably operate at 720 Kb formats. Several companies sell a hole punch which is designed to create the additional hole, allowing the 720 Kb disks to operate as 1.44 megabyte disks. This technique has mixed results. Some people have had no problems utilizing 720 Kb diskettes at the 1.44 megabyte formats, but this is dangerous. One day they may get a surprise when some critical data stored on the disk is lost and not recoverable. If the disk is a 1.44 megabyte disk, format it to 1.44

megabytes and if the disk is a 720 Kb disk, format it as a 720 Kb disk. Do not attempt to use the wrong format or you may lose data.

The 5.25 inch disks are considerably more complicated. The 160 Kb, 180 Kb, 320 Kb, 360 Kb formats divide the surface of the disk into 40 tracks (which are concentric circles on the disk). The computer establishes these tracks magnetically during the format operation. The usable surface of the disk is slightly less than 1 inch so that 40 tracks is equivalent to 48 tracks per inch. Each track is 0.02 inches wide. The surface of the disk is also divided into pie shaped sections called sectors. The 360 Kb format utilizes nine sectors to obtain 180 Kb per side. Some other formats use eight sectors to obtain 160 Kb per side. The difference between the 160 Kb, 180 Kb, 320 Kb, 360 Kb formats is in the number of sectors and the number of sides used. The 360 Kb disk drives are fully compatible with each of these formats. Then came the 1.2 megabyte disks. These disks are physically the same size as the 360 Kb disks, but store over three times as much data. This is accomplished by making 80 tracks on the surface of the disk. This is equivalent to 96 tracks per inch. Each track is 0.01 inches wide (half the width of the earlier formats). The narrower track means the recording head on the disk drive must also be half the width. When you instruct a 1.2 megabyte disk drive to operate at 160 Kb, 180 Kb, 320 Kb, or 360 Kb formats, the drive simply skips every other track. This is fine for reading since the information recorded by a 360 Kb disk drive spans the full width of the track. When you write a 360 Kb format on a 1.2 megabyte disk drive, the drive again skips every other track. When you attempt to read this disk on a 360 Kb disk drive, the wider head on the 360 Kb disk drive reads the entire 0.02 inch wide track. Thus the proper information is averaged with the garbage which is recorded on the other 0.01 inch half track. Sometimes the 360 Kb disk drives successfully recover the data and sometimes the disk drive is unable to interpret the data written by a 1.2 megabyte disk drive operating in a 360 Kb format. This problem is made even worse when you consider the FORMAT operation. During FORMAT the tracks are defined magnetically on the surface of the disk and each of the sectors is also defined magnetically. A 360 Kb disk drive may become confused by reading the new format information and also seeing the previous format information which remained on the other 0.01 inch half track. If it is necessary to use a 1.2 megabyte disk drive to write to a 360 Kb disk, the chances of the write being accomplished successfully can be increased by using a bulk tape eraser (or a strong magnetic field) to erase the disk. Then reformat the disk as a 360 Kb disk and copy the desired files to the disk. When the disk is bulk erased, all the magnetic particles on the disk are arranged to a random pattern. When the disk is formatted on a 1.2 megabyte drive to a 360 Kb format, each track still occupies only 0.01 inches. When the disk is read on a 360 Kb disk drive, the full track (0.02 inches) is read, but the remaining 0.01 inches which was not written by the 1.2 megabyte disk drive is still in a random pattern. In many cases, the 360 Kb disk drive can filter this random noise and decipher the original data.

Simple mathematics shows that if the 1.2 megabyte disk drives use twice as many tracks as the 360 Kb disk drives, they should be only capable of storing 720 Kb of data (not related to the 720 Kb 3.5 inch disks). The additional data capacity is accomplished by placing more data in each revolution of the disk (higher density).

The 1.2 Mb diskettes have a finer particle and a different coercivity to achieve the higher density than the 360 Kb diskettes. The higher coercivity of the 1.2 Mb disks means they will not reliably operate at 360 Kb, 180 Kb, 320 Kb or 160 Kb formats when written by a 360 Kb disk drive. The larger particle size and the lower coercivity of the 360 Kb diskettes means they will not operate reliably at the 1.2 Mb format.

The 1.2 megabyte disk drives use several different methods of recording the higher density on the disk. The original 360 Kb disk drives rotated the disk at 300 RPM (revolutions per minute). To make the disk drives operate faster, most of the AT compatible computers rotate the 1.2 Mb disk drives at 360 RPM and transfer the data faster between the disk drive and the disk controller. Since both the 1.2 Mb formatted diskettes and the 360 Kb diskettes are rotated at 360 RPM, these disk drives are referred to as "FIXED SPEED" drives. Since on the 1.2 megabyte formatted disks, the data is packed more densely, some of the AT compatible computers slow the 1.2 megabyte disk drives down to 300 RPM to obtain a lower data transfer rate. These disk drives will rotate the 360 Kb diskettes at 360 RPM to obtain the same data transfer rate as the 1.2 Mb diskettes rotating at 300 RPM. These disk drives are referred to as "DUAL SPEED" drives. Most of the 1.2 megabyte disk drives available on the market can be jumper configured to operate as dual speed drives or fixed speed drives depending on the capabilities of your floppy disk controller. Before you invest in a 1.2 megabyte disk drive, be sure to check that it is compatible with the speed of your disk controller.

Enough about disk drives and disk formats. To upgrade a Z-151 to utilize a 1.2 megabyte drive or a 1.44 megabyte disk drive requires three things:

1. A disk drive compatible with the new format.
2. A disk controller capable of operating the disk drive.
3. A replacement BIOS to operate the new disk controller.

Computer systems require some basic intelligence to operate. The PC type machines (including the Z-151) called this program a Basic Input/Output System or BIOS (not related to the BASIC programming language). This program is stored in read only memory (ROM or EPROM) in the computer. The BIOS is the lowest level of the interface between the hardware and the software. In fact, MS-DOS (and PC-DOS) calls upon the BIOS to perform almost all functions. The BIOS is also responsible for boot loading the computer. Zenith Data Systems has upgraded the BIOS to allow upgrading the keyboard to a 101-key enhanced keyboard (BIOS version 3.0B). Caution: A standard AT type 101-key keyboard will not work, the keyboard must be XT compatible.

Zenith Data Systems has never upgraded the BIOS to allow the use of 1.2 megabyte, 1.44 megabyte or 720 Kb disk drives on the Z-151. Fortunately, the design of these machines allows a portion of the BIOS to be replaced with a BIOS supplied on an expansion card. A replacement BIOS or a supplemental BIOS can also be supplied from a floppy disk and loaded from the AUTOEXEC.BAT or the CONFIG.SYS programs upon boot-up of the computer system.

The AT class disk controllers utilize a 16-bit data path, whereas the Z-151 uses an 8-bit data path. Also, the AT computers have the BIOS in read only memory (ROM) already in the machine. For a disk controller to be compatible with an XT class machine (Z-151) must have an 8-bit data path and also must supply its own BIOS. Since the BIOS is responsible for boot loading the computer, if the computer is to be booted from floppy disk, the BIOS must be in the machine before the disk is accessed, i.e., in read only memory (ROM) in the computer. There are several disk controllers which are compatible with the 8-bit format and have the required on-board BIOS.

The Western Digital model WD-1002A-FOX) is available in four models, two of the models, FOX-3 and FOX-4, have the required BIOS on board. The FOX-1 and FOX-2 do not have the required BIOS on board and cannot be used in the Z-151. The FOX-3 can operate two disk drives and the FOX-4 is capable of operating four disk drives. The FOX cards can be jumper selected to operate either dual speed or fixed speed floppy disk drives. The FOX cards can also co-exist with another floppy disk controller in the same computer by selecting the proper jumpers on the card. This allows the Z-151 to operate six or eight floppy disk drives, providing you can find the mount-

ing space!

DTK produces two cards (models MM-2 and MM-4) which have the required on-board BIOS and are compatible with the Z-151. The MM-2 is capable of driving two floppy disk drives and the MM-4 is capable of driving four floppy disk drives. On both of these cards the BIOS can be disabled by jumper to allow their use in AT class computers which already have the BIOS installed. Both of these cards can be jumper selected to co-exist with another floppy disk controller. They also have the capability of operating either fixed speed or dual speed disk drives. The DTK cards are probably the lowest priced of all the cards mentioned here.

Microsolutions Computer Products manufactures two models (Compaticard and Compaticard II). The Compaticard is capable of operating up to four disk drives, while its less expensive brother, the Compaticard II can only operate two disk drives. Both Compaticards have the necessary on-board BIOS and can be configured to co-exist with another disk controller. Both Compaticards can also co-exist with each other allowing up to four disk controllers to exist in the computer at the same time. Why would anyone want 16 floppy disk drives installed in the same computer? The Compaticard (or Compaticard II) is only capable of operating dual speed floppy disk drives. I recommend caution in selecting the Compaticard because of a possible speed compatibility problem with some model floppy disk drives.

Sysgen has long been known for manufacturing tape back-up units. With these tape back-up units, Sysgen provides a controller card which also has the capability of operating up to four floppy disk drives of any type (360 Kb, 1.2 Mb, 720 Kb or 1.44 Mb). This card has the necessary BIOS on board, which can be disabled (by a switch on the card) for use in an AT class computer. This card is capable of operating either fixed speed or dual speed floppy disk drives and will support the full 500 kilobyte disk data transfer rate of the IBM AT. The Sysgen controller can co-exist with another floppy disk controller. Sysgen recently decided to market this card separately from the tape back-up units. The card is marketed under the name "OMNI-BRIDGE" and carries the part number 2678-01. If you decide on the Sysgen card, use caution since Sysgen has unfortunately decided to use the name BRIDGE in many of their products (BRIDGE-FILE, BRIDGE-TAPE) which are not the same as the OMNI-BRIDGE. Also Sysgen has decided to cut costs and eliminate the fixed speed drive capability from some of the cards. As a result, the OMNI-BRIDGE" part number 2678-01 is available in two versions, and the only way to identify the difference is to count the number of crystal oscillators on the card. This tends to confuse most mail order companies and so if you order the Sysgen card, you may get a fixed speed/dual speed compatible card or simply the dual speed card. Fortunately, Sysgen does offer to upgrade the dual speed cards to the fixed speed/dual speed compatible card at no charge by calling Sysgen to obtain authorization to return the card to the factory.

The MS-DOS (or PC-DOS) "FORMAT" program was upgraded in DOS version 3.3 to allow the formatting of 1.44 MB disks. MS-DOS (or PC-DOS) 3.0 or above is required to support the 1.2 Mb format. Older versions of DOS will read and write these disks, but formatting the disks require the correct version of DOS. To solve this problem, the controller manufacturers include a copy of their own "FORMAT" program which will format the 1.44 Mb, or 1.2 Mb disks when using older versions of DOS. Many of the "FORMAT" programs provided by the disk controller manufacturers do not support the "/S" option, and thus you cannot make a bootable 1.44 Mb disk, or a bootable 1.2 Mb disk. The simplest solution is to upgrade your DOS to version 3.3.

I chose the Sysgen OMNI-BRIDGE card due to their reputation, the USA-based company, and the fixed speed/dual speed compatibility. I wanted the fixed speed/dual speed capability because I wanted to achieve the slightly faster floppy disk operations available from the fixed speed 360 RPM disk drive. As luck would have it, my card had only one crystal oscillator. I returned the card to Sysgen and they were very courteous and replaced the card with one of the fixed speed/dual speed versions (with two crystal oscillators) by Federal Express. The Sysgen card can operate two internal disk drives in any combination of 360 Kb, 1.2 Mb, 720 Kb or 1.44 Mb. And two external disk drives or a QIC-40 format tape drive. Unfortunately, two disk drives are mounted internally, and the remaining two disk drives interface through a 37-pin connector on the back of the Sysgen card. Sysgen provides a pin out description for the connector, as well as a pin out description for a standard floppy disk interface. The task of making the required cable is left up to you. The external connector is the same as the external connector used on the original IBM XT. Sysgen also sells external disk drive kits for use with this circuit card. If you wish to add your own disk drive as the third or fourth disk drive, you will have to make your own cable.

The XT compatible computers (including the Z-151) do not have the battery back-up RAM and will not run the "SETUP" program used in the AT class computers to inform the BIOS of the number and type of disk drives installed. The Sysgen card has two banks of dip switches which you select for the type of disk drives attached to the system as drives A: and B:. Another switch will disable the on-board BIOS if you choose to utilize the card in an AT class computer. Another switch will allow the card to co-exist with another floppy disk controller.

Installing external disk drives or installing floppy disk drives C: or D: requires loading an additional BIOS which was provided on the software disk. The additional BIOS is in the form of a program which is run from the CONFIG.SYS file during boot-up.

I had few difficulties installing the Sysgen card. I found the manual and software disk very clear and easy to understand. Sysgen even provided a program on the software disk which asks a series of questions about your computer and then shows the correct switch configuration. Of course, the program (which is on floppy disk) explains how to configure the floppy disk controller to work in your computer. If your ZDS floppy disk controller is not usable, you must read the instruction manual for the switch settings.

I now had the controller card and the BIOS needed for installing a high density disk drive in my Z-151. I now needed a floppy disk drive. I opted for the 1.2 megabyte 5.25 inch format. I chose the TEAC FD55GFR disk drive since my Z-151 came with TEAC FD55BV drives originally, and the FD55GFR looked similar, except for the color of the faceplate (beige vs. black). Installing the disk drive was easy. I simply removed one of my 5.25 inch 360 Kb disk drives and replaced it with the new TEAC disk drive.

On most 5.25 inch disk drives there is a termination resistor which must be removed if the drive is used in a two drive system. The concept was that only one termination resistor was used, at the end of the cable farthest away from the controller. In a two drive system, only one disk drive would have the termination resistor installed. I found no termination resistor in the TEAC FD55GFR disk drive. Since my disk drive also came without documentation, I placed a phone call to TEAC. I was informed the TEAC FD55GFR used a different concept and the termination resistor was a different value, and should not be removed when the drive was used in either a one drive system or a two drive system. In fact, the termination resistor was soldered onto the disk drive motherboard and was not removable. I was also informed that the FD55GFR disk drive came factory configured to operate as a single-speed disk drive (which suited me fine). To operate the disk drive as a dual speed drive, install two jumpers onto terminals "I" and "IF" on the disk drive motherboard.

The Z-151 floppy disk controller card also contains one or two serial ports. If

you remove the Z-151 floppy disk controller card and replace it with the Sysgen card, you will be without serial ports. You can purchase a serial port card from most computer stores which will solve the problem. A much cheaper solution is to disable the floppy disk controller portion of the Z-151 controller card and utilize the Z-151 card as a serial port card only. To disable the Z-151 floppy disk controller, remove the following integrated circuits; U519, U521, U529, U530, and U533. Be sure to label the chips for easy re-installation, should you wish to use the ZDS floppy disk controller again. As always, when handling the circuit boards, you should be sure to touch the ground plane of the circuit board to dissipate any static electricity, prior to touching any of the chips. Carefully remove the chips using a small screwdriver under the edge of the chip. After removal, the chips should be placed in anti-static foam for storage. If anti-static foam is not available, a piece of styrofoam covered with aluminum foil will suffice. The aluminum foil will electrically connect all the leads of the chip together, preventing any static electricity damage. After removal of chips U519, U521, U529, U530, and U533, the Z-151 disk controller will be disabled, allowing the Sysgen controller to act as the primary disk controller. The Z-151 controller's serial ports will operate normally.

After I installed the Sysgen controller card, I attempted to use the Zenith Data Systems floppy disk cable which came with my Z-151 computer. I discovered the ZDS cable used pin 2 as a key. Where-as the Sysgen card used pin 3 as a key, thus the cable would not fit. Since pins 2 and 3 are both grounds, which one is used is not important. I used a small pick to remove the plastic insert from pin 2 and re-installed it into pin 3. The cable now plugged into the Sysgen card. I then tried the computer, and discovered a strange problem. The floppy disk drives would address as drives A: and B: as they should, but only the disk drive B: motor would run. The B: motor ran when drive A: was addressed, or when B: was addressed. Needless to say, drive A: was un-usable. The Z-151 addressed the drives using the drive selector jumper on the disk drive to select drives 0 or 1 for A: or B:, respectively. The IBM design utilized a special cable which had the address lines for the disk drives reversed between the two connectors. When disk drives are installed in an IBM PC or AT, both drives should be set to drive 1 position, and the cable will determine that drive A: is on the end of the cable farthest from the controller and drive B: is closest to the controller. This cable was called a "twist cable" since lines 10 through 16 were twisted between the two disk drive connectors. I assumed the problem with the disk drives was associated with the use of a twist cable. I grabbed a twist cable I had in my junk box and it worked fine. I selected both drives as drive 1 and both A: and B: drives worked properly. If you do not have a twist cable, you can modify the ZDS Z-151 cable as follows:

1. Pry the back off the disk drive connector on the end of the cable (not the controller connector).
2. Wire 1 is the wire with the red (or blue) stripe. Count ten wires up and separate wire 9 from wire 10. Pull the wires apart allowing about 1.5 inches. Also separate wire 16 from wire 17 for about 1.5 inches up the cable.
3. Fold the wires over such that:
   wire 10 connects to pin 16,
   wire 11 connects to pin 15
   wire 12 connects to pin 14,
   wire 13 connects to pin 13,
   wire 14 connects to pin 12,
   wire 15 connects to pin 11,
   wire 16 connects to pin 10.
   all other wires connect to their appropriate pins.
4. Place the wires back into the connector, and re-install the back cover on the connector. Be sure to install pin 1 to wire 1. On the connector, the pins are separated into two groups separated by a piece of plastic. The plastic is between pins 3 and 5. This will aid in identifying which end of the connector is pin 1.

My Z-151 computer came with TEAC FD55BV disk drives which had the black faceplate. My new TEAC FD55GFR disk drive looked similar, but had a beige faceplate. I obtained spare beige faceplates from JDR Microdevices for about $4 each. When I attempted to install the faceplates on my FD55BV disk drives, I discovered there were several differences in the way they mounted. On the FD55BV disk drives, the bat handles were secured with allen set screws, the new style bat handles were designed for a shaft with one side flat. Installation of the new bat handles required disassembly of the disk drive, to remove the shaft, filing one side of the shaft flat, and re-assembly of the disk drive. The new style plastic faceplate had a plastic lip which inserted into the frame of the disk drive all the way around the faceplate. The FD55BV did not have provisions for the lip along the top. Since this was out of sight, I cut the lip off the new faceplate using a very small saw. This is alot of work to change the color of the faceplate, but it can be done.

The Z-151 is an old computer and slow by today's standards. When operating at 8 MHz, the speed is acceptable for most applications. The use of 1.2 Mb disks and 1.44 Mb disks is necessary to be compatible with files saved on the more modern computer systems. With a relatively minor investment (less than $200), the Z-151 can be upgraded to be compatible with the modern disk formats. This same modification should work in the Z-158 and many of the other XT clone machines.

The Sysgen OMNI-BRIDGE controller is available from:
Microcomputer Concepts
(800) 772-3914

The DTK disk controller is available from:
Advance Computer
(800) 543-3691
or
LOLIR Computer Corp.
(800) 245-6547

The TEAC FD55GFR disk drive is available from:
Computer Direct
(800) 289-9473

TEAC beige faceplates are available from:
JDR Microdevices
(800) 538-5000 ✱

Continued from Page 4

hard disks. PARK comes as an accessory to Spinrite and Spinrite II, which I highly recommend.

More good news. When you select Park from the Disk menu in PC Tools 5.5, both drives are parked, even though the manual does not say that it will park 2 drives. Even if I ask it to park drive A: (heh heh), both C: and D: (and E: and F:) get parked. I can tell, because each drive makes a different sound and the lights on both drives come on.

Yours truly,
Cal Lamoreaux
Computer Systems Engineer
Golden Grain
11220 Keller Road
Shelbyville, MI 49344-9612 ✱

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Note: All memory upgrades come without memory chips. Call for current chip pricing. Memory chip prices are down. Example: 256K 150ns DRAM is $2.39 as of this printing.

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CCARD2 - $89
CCARD - $109
CCARD4 - $139

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MF504 - $89 96 TPI 1.2 meg AT/Z100 drive
MF353 - $85 720K 3.5" drive in 5" frame
MF355 - $95 1.4 meg 3.5" AT drive in 5" frame
SIEM-R - $39 40 track SS refurb (H8/H89 type)
TM100-4R - $75 90 trk DS refurb (H8/H89 type)

8-BIT/Z100

We carry a full line of replacement boards, parts and power supplies for the H/Z89/90 and Z100. We also have some H8 boards available. We continue to fully support and carry a full line of hardware and software products for the H8/H89/90 and Z100 computers. This includes diskettes, printers, modems, hard drives, etc. Here's a sample.

H37 SOFT SECTOR CONTROLLER	$169
H8 SOFT SECTOR/WINNIE CONTROLLER PACKAGE	$195
DISKPACK for Z100 (allows reading and writing of PC formats including 1.2 and 1.4 meg on Z100.	$39
MSDOS 3.1 FOR Z100	$89

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H-SCOOP

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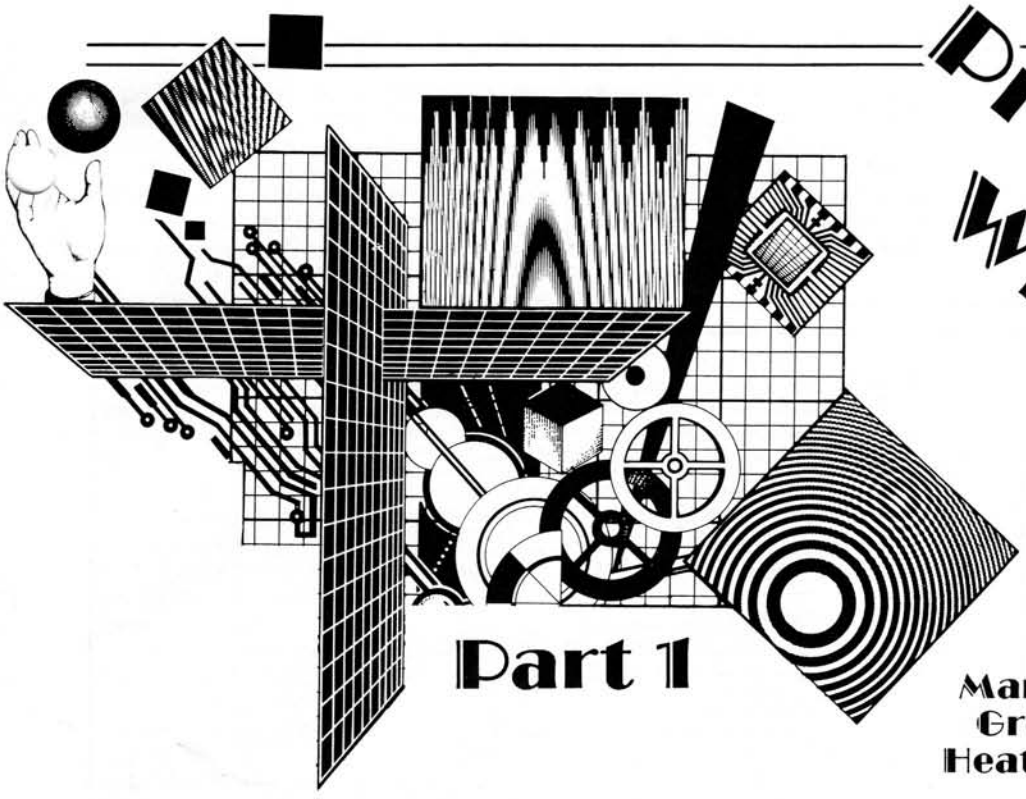
Reader Service #193



Programming with VGA

Part 1

Mark Mangerson
Greg McDonald
Heath Technicians

Mark Mangerson
Heath Technician

As graphics enthusiasts, we were both glad to hear about the arrival of the IBM Video Graphics Array, which for the remainder of this article we will refer to as VGA. VGA is the first video board that holds the promise of professional image quality on the PC at an affordable price. With superior resolution and wealth of colors, VGA was quickly made the new industry standard in video display technology. Now all that remained was to put all that power to work.

Looking around on a number of computer bulletin boards, we found a large assortment of digitized pictures and viewing programs which had been uploaded by other groups interested in computer graphics. Most of the pictures we found were in the 320 × 200 × 256 color mode. In this mode with a carefully selected palette, a VGA card can be made to display a picture as realistic as any produced on TV. These pictures were all stored in the GIF file format which stands for Graphics Interchange Format. This format was created by CompuServe and is supported on a large number of computer systems including IBM, Apple, and Commodore. The GIF file format also helps to decrease file size since picture data is stored in a compressed format. The GIF file format does not, however, lend itself to being easily understood. In future articles, we will show simple ways to capture, display, store and otherwise manipulate images on both the VGA and EGA, but for now we'll stick to what makes them tick.

The heart of the VGA's ability to do color is the palette chip. This chip enables the card to map any of 262,144 available colors to the 256 displayed colors. Each pixel on the VGA in the 320 × 200 × 256 color mode (video mode 13) contains one byte of information. This byte is presented to the palette chip and serves as an address to the color lookup table. Each of the 256 locations in the table contains information on how much red, green and blue will be used to make up that color. Table 1 contains a list of the palette ports on the VGA.

The mask register tells the palette chip which of the 8 bits representing each pixel it should pay attention to. The pixel data is ANDed with the contents of the mask register and the result is presented to the color lookup table. As an example, if a value of 0F hex is written to this register, the palette chips would only look at the 4 least significant bits of the pixel byte.

The color value register consists of 256, 24 bit words with each word representing a color. The first 8 bits of the word contain the red value, the second 8 bits contain the green value and the third 8 bits contain the blue value. Each of these words can be read from or written to by outputting its address to the read or write address registers and doing three consecutive reads or writes to or from the color value register. The palette chip also has an auto incrementing feature that lets you read or write a group of colors. If you wanted to write the whole palette table, you could output a 0 to the write address register and do 768 writes to the color value register. You don't have to change the address every time because the palette chip will advance the count for you. The same holds true for the read function. Table 2 contains the layout of the color value register.

Listing 1 contains a small BASIC program to write the first 64 palette locations to 64 levels of gray. Any version of BASIC will enable you to program the palette chip, but you will need Quick BASIC 4 or later or Microsoft's GW-BASIC 6 to switch

Table 1

ports		
3C6	MASK REGISTER	
3C7	READ ADDRESS REGISTER	All addresses are in hex
3C8	WRITE ADDRESS REGISTER	
3C9	COLOR VALUE REGISTER	

Table 2

color #	0	1	2	.....	255
RGB values	R G B /	R G B /	R G B /	.....	R G B

into a VGA card's enhanced modes. Video mode 12h gives you 16 colors at 640 × 480 resolution while mode 13h gives you 256 colors at 320 × 200 resolution.

The next area to deal with is the memory map of the video. Since each pixel contains one whole byte and the resolution is 320 × 200, the amount of memory needed to display a full screen is 64000 bytes. This means the entire screen can be displayed using only one 64k segment of memory which starts at A000 hex. Address 0 is the upper-left most pixel of the screen and each 320 bytes of video memory represent one horizontal line. The address for a pixel at coordinates X,Y can be calculated with the formula A = Y * 320 + X where A is the address. Refer to Figure 1 to see the layout of the video map.

Listing 1

```
10 out &h3c8,0      : rem  set write address reigster to 0
20 for clr=0 to 63  : rem  start loop to write 64 colors
30 out &h3c9,clr    : rem  output red value to the palette
40 out &h3c9,clr    ' rem  output green value to the palette
50 out &h3c9,clr    : rem  output blue value to the palette
60 next clr         : rem  address will automatically advance
```

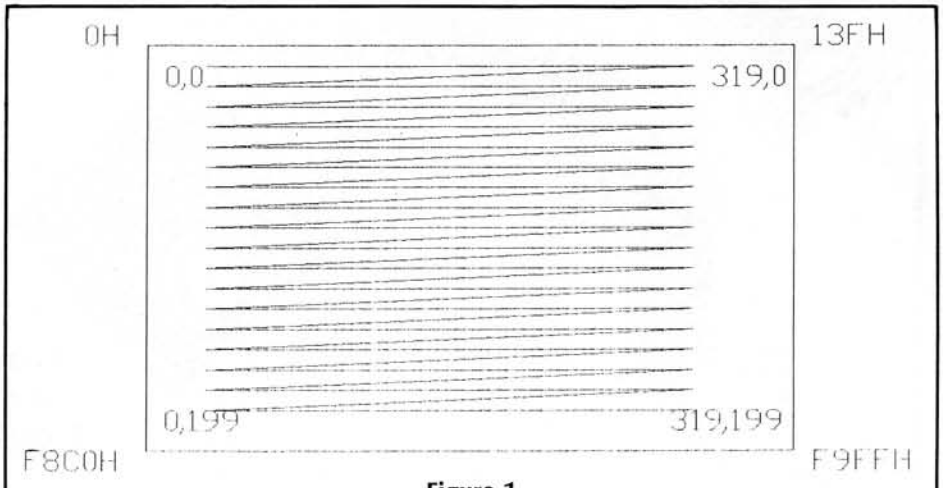


Figure 1
VGA Bit Map

Greg McDonald
Heath Technician

I will be describing the basic use of all 16 color EGA and VGA graphics modes. Fortunately, the programming interface for all of these modes is similar; differing only in the size of the video buffer and number of colors available in the palette.

The native EGA video buffer is split into four bit planes numbered 0 to 3, and start at address A000:0000$_{HEX}$. By default, bit plane 0 is blue, 1 is green, 2 is red, and 3 is intensity, reproducing the 16 colors available in the CGA text mode (see Table 3). Referring to Figure 2, notice each byte represents eight pixels and the four bit planes combine to form the desired color. The size of the bit planes is directly proportional to the resolution (see Table 4 and Figure 3). Any picture may be displayed by writing the appropriate bits into the four bit planes.

EGA and VGA video boards are very flexible when it comes to reading and writing the four bit planes. Unfortunately, this flexibility makes it more difficult for the novice graphics programmer. Therefore, I will cover only one method for reading and writing the bit planes.

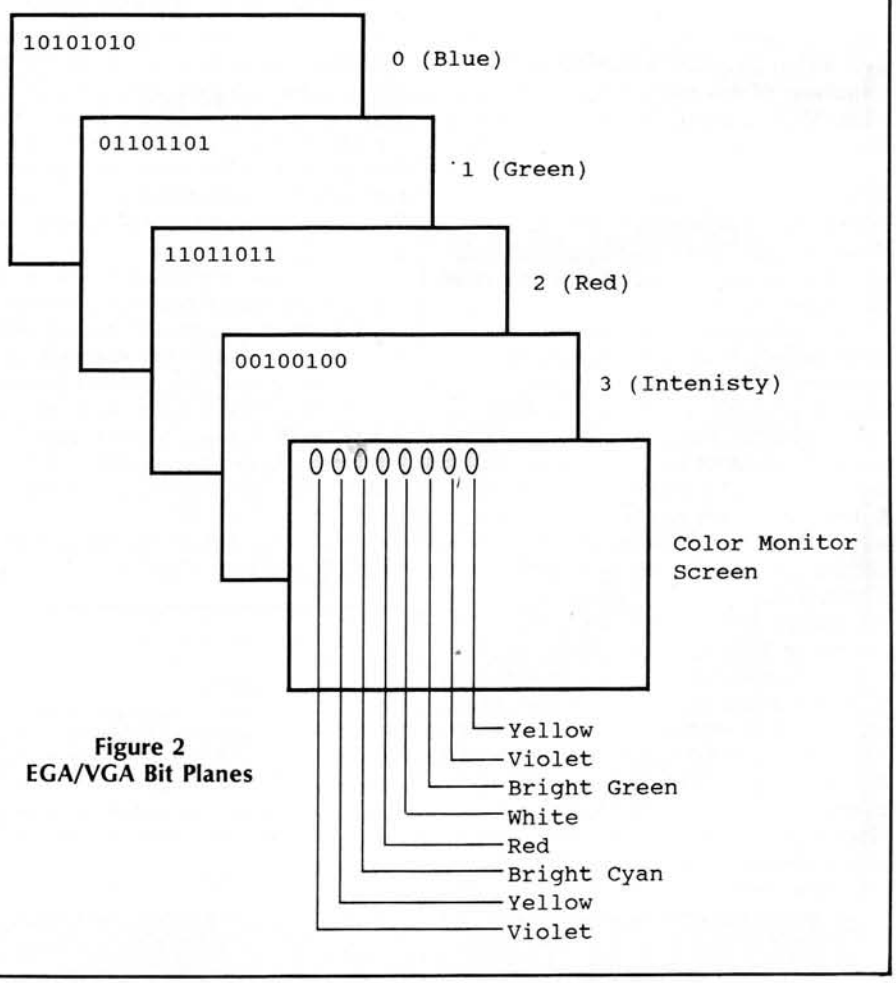


Figure 2
EGA/VGA Bit Planes

Writing Bit Planes

When a byte is written to the video buffer, it is really written to a set of bit plane latches. From the bit plane latches the byte is written to the bit planes. By default, the bytes are written to all of the bit

Palette Location	Intenisty	Red	Green	Blue	Color
0	0	0	0	0	Black
1	0	0	0	1	Blue
2	0	0	1	0	Green
3	0	0	1	1	Cyan
4	0	1	0	0	Red
5	0	1	0	1	Violet
6	0	1	1	0	Yellow or Brown
7	0	1	1	1	White
8	1	0	0	0	Bright Black
9	1	0	0	1	Bright Blue
A	1	0	1	0	Brignt Green
B	1	0	1	1	Bright Cyan
C	1	1	0	0	Bright Red
D	1	1	0	1	Bright Violet
E	1	1	1	0	Bright Yellow
F	1	1	1	1	Bright White

Table 3
EGA/VGA Default Palette

Mode Number (HEX)	Resolution	Bit Plane size in Bytes	Screen Width in Bytes
D	320x200	8000	40
E	640x200	16000	80
10	640x350	28000	80
12*	640x480	38400	80

Table 4
EGA/VGA 16 Color Modes

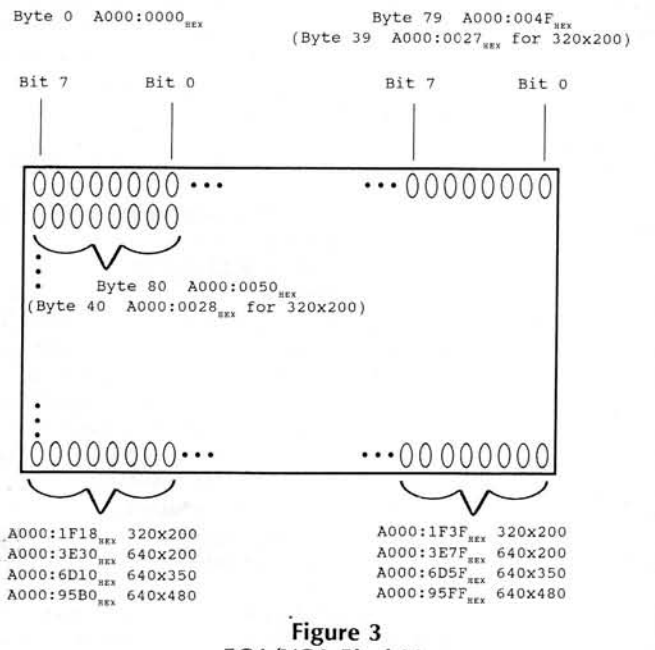


Figure 3
EGA/VGA Pixel Map

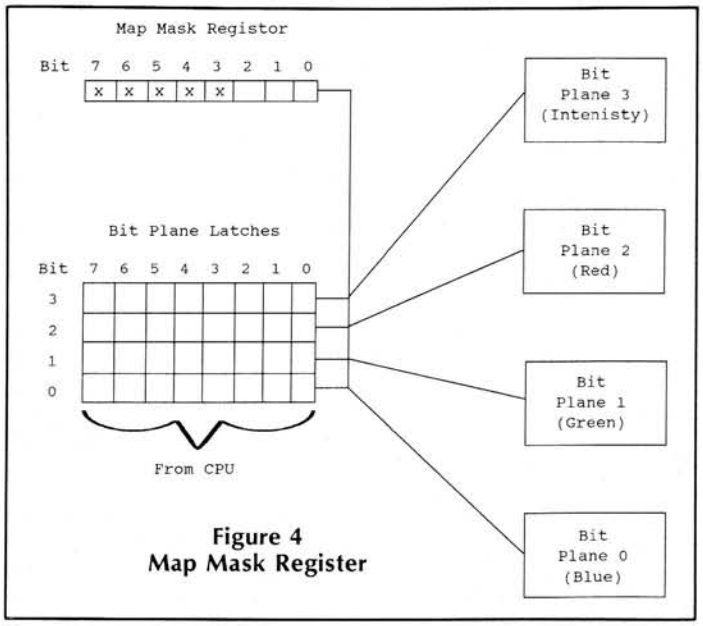
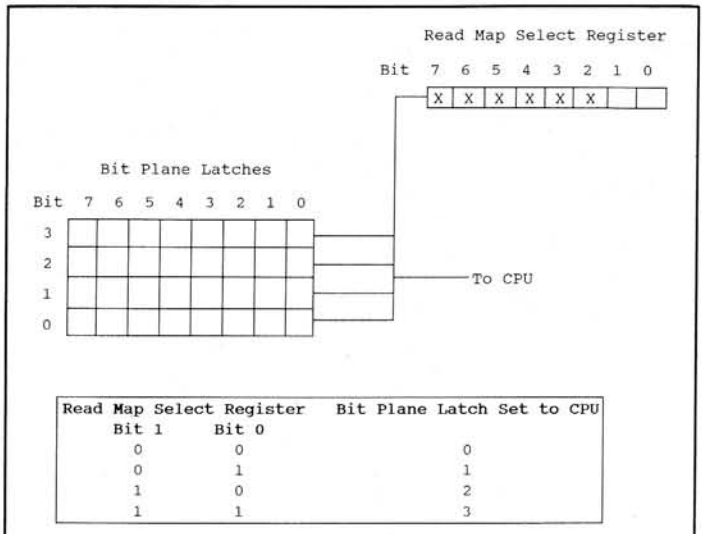


Figure 4
Map Mask Register



Read Map Select Register Bit 1	Bit 0	Bit Plane Latch Set to CPU
0	0	0
0	1	1
1	0	2
1	1	3

Figure 5
Read Map Select Register

```
CPU
Register
   AH = 10HEX
   AL = 0HEX
   BH = Palette location to update (0HEX to FHEX).
   BL = Palette value in rgbRGB form.

Invoke interrupt 10HEX.
```

Figure 6
Writing the EGA Palette

planes. Any combination of bit planes may be written to by using the Map Mask register (see Figure 4). The first four bits of the Map Mask register directly corresponds to the bit plane latches, i.e., Map Mask register bit 0 controls bit plane latch 0. Only bit planes with their Map Mask register bit set to one will be written. The Map Mask register is accessed by writing a 2 to port $2C4_{HEX}$. Then write the byte you want to port $3C5_{HEX}$.

Reading Bit Planes

Reading byte from the video buffer causes all four bit plane latches to be updated. The byte presented to the CPU is determined by bits 0 and 1 of the Read Map Select register (see Figure 5). The Read Map Select register is written by outputting a 4 to port address $3CE_{HEX}$ followed by outputting the data to port address $3CF_{HEX}$.

Writing the Palette

The palette is made up of 16 palette locations. Each palette location is of the form rgbRGB. Where the capital letters represent a 2/3 intensity, and the lowercase letters a 1/3 intensity. Individual locations may be written by using BIOS in-

terrupt 10_{HEX} function 10_{HEX} subfunction 0_{HEX} (see Figure 6). Also refer to Table 3 for the default palette mapping.

Next month, we will present programming examples, covering modes 13_{HEX} and 10_{HEX} in BASIC and C. More information on video programming may be found in the book: "Programmer's Guide to PC and PS/2 Video Systems" by Richard Wilton. ✱

Continued from Page 14

DEL *.*" command, only to realize that you have very cleverly deleted ALL of the files in the *WRONG* directory. I have done that too (more than once!), and I have learned that the only way to "recover" from that kind of mistake is to take a short break before I try to restore the files using the Mace Utilities.

Powering Down

As I hope you have seen, coping with common DOS error messages need not be as difficult as you might have thought. When you see one of the error messages included here, or one that isn't, be sure to take some time to figure out exactly what you did wrong. In many cases, you will find a simple spelling error on the command line, but it is always a good idea to review the DOS manual for the last command you entered, just in case you made a mistake on the command syntax.

The next article will discuss some of the details on "Connecting a Serial Device to Your Computer." You will see why the "standard" serial interface is not quite as standard as you might have thought. This article includes a discussion of both the 9-pin and 25-pin connectors, and you will see at least one solution to the null-modem "mystery."

If you have any questions about anything in this column, be sure to include a self-addressed, stamped envelope (business size preferred) if you would like a personal reply to your question, suggestion or comment.

Products Discussed

HUG Software
Powering Up (885-4604) $12.00
Heath/Zenith Users' Group
P.O. Box 217
Benton Harbor, MI 49022-0217
(616) 982-3463 (HUG Software only) ✱

Continued from Page 20

Disk Technician Advanced $149.95
Prime Solutions Inc.
1940 Garnet Avenue
San Diego, CA 92109
(619) 274-5000 ✱

Continued from Page 30

identified by their hex number; hence, nint% = &H21 is the interrupt for the DOS functions. The function number is input in the high byte of AX (all of the registers in the regtype are two-byte registers). Hence, Ain.AX = &H5100, for function 51 hex (the low byte is ignored in this case; the 00 doesn't do anything). INTERRUPT is then called. The output is in both bytes of register BX. The value in BX is increased by 8 (as discussed above) so that the new SEGMENT points to the location of the number of bytes in the command text (the 81st hex byte in the PSP).

The first output of the program is this SEGMENT value. Setting DEF SEG to this SEGMENT value tells BASIC what SEGMENT to use with the PEEK function. The argument of PEEK is the OFFSET in bytes to be applied to the SEGMENT base defined by DEF SEG. The SEGMENT has been defined so that at OFFSET zero, the number of bytes in the command text is found. Hence, the number of bytes in the command text is given by PEEK(0) and printed as the second output of the program. The text itself is in the memory locations following the number-of-bytes location (OFFSET = 1, 2, 3,...). It is moved from memory using PEEK(I) and summed into the string A$ in a FOR-NEXT loop.

Program 3
SGCL.ASM

```
;  GETS SEGMENT OF COMMAND LINE (THAT IS STORED IN THE PSP)
;
;  TO BE CALLED FROM (COMPILED) BASIC (Microsoft compilers).
;
;  Calling sequence: CALL SGCL(SCL%)
;   On exit SCL% = the SEGMENT pointing to the no. of bytes
;   in the command line.
;
        .model medium
        .code
                public sgcl
sgcl    proc    far
        push    bp                      ;entry sequence, save bp
        mov     bp, sp                  ;set stack framepointer
        ;
        ;  Want to call DOS function 51h
        mov     ah, 51h                 ;set ah to function no.
        int     21h                     ;call DOS function 51h
        ;
        ;  SEGMENT of Program Segment Prefix (PSP) now in BX
        ;  register
        ;  Add 8h to point to SEGMENT of the command line
        ;  number of bytes (in the PSP)
        add     bx, 08h
        mov     ax, bx                  ;move it to ax
        ;
        ;  Set the output variable SCL%
        mov     bx, [bp + 6]            ;get offset of SCL%
        mov     [bx], ax                ;store AX there
        ;
        ;  All done, exit sequence:
        pop     bp                      ;restore bp
        ret     2                     ;return & restore 2 bytes
;
sgcl    endp
        end
```

Finding the PSP Using an Assembly Language Routine

Program 2 (CLINE2.BAS) is a Quick BASIC program that calls the Assembly Language routine SGCL that returns the required SEGMENT. The rest of the program is identical to Program 1. The Assembly Language program SGCL.ASM is shown as Program 3. In the Assembly Program 3, 51 hex is moved to register AH (the high byte of AX). Interrupt 21 hex is then called; eight is added to BX, and the result is stored at the location of the argument (SCL%) of the (Microsoft) BASIC subroutine.

It should be noted that if these programs are called from within the BASIC environment, the command text is returned (if any) that was used to invoke BASIC. The programs only have a usefulness when run as part of a stand-alone compiled (.EXE) code. To use subroutine INTERRUPT in the Quick BASIC environment, the switch /L must be used when Quick BASIC is invoked. This switch causes Quick BASIC to link the library QB.QBL that contains subroutine INTERRUPT. The library is supplied with Quick BASIC. ✱

Cheap Tricks: Inexpensive Utilities for Desktop Publishing

Harold C. Ogg
357 W. Diversey Avenue
Addison, IL 60101-3508

You just cleaned out your bank account for the laser printer you'd been eying for months. You also spent another $700-$800 on printer memory. Then there's the scanner you just had to have to complete the ensemble. And of course there's Ventura or Pagemaker desktop publishing software or...? which were essential to making the whole thing work.

In other words, you spent a small fortune. It's time to act virtuous and at least attempt the pretense that you've saved some money. Fear not – there are a number of quality programs that can unlock the potential of your desktop publishing equipment. A few of these are quite novel, and one or two do some things that you couldn't get for more money – even if you tried.

The programs and utilities mentioned below work with all Heath/Zenith computers, and were tried and proven on the Hewlett-Packard LaserJet series II printer and HP ScanJet desktop scanner. They are known to work on the Z159 and Z248 PC's, although for some graphics-based programs it is essential to have an EGA monitor attached. It will be left to the reader to determine how well the software functions with other peripherals. But at (most of) these prices, a mistake in compatibility won't be costly.

Harold C. Ogg is Automation Librarian for Chicago State University.

For clarity, the various programs and utilities are mentioned by name only in the body of the article, with full citation/order information given as footnotes at the end. The reader is advised also to keep a sharp eye at computer shows and flea markets – many of these programs appear regularly on public domain software vendors' tables, and demonstration versions of many of the utilities exist for as little as $1.00 to $5.00 per disk. Bear in mind that "cheap" may mean "relatively inexpensive" in the context of this essay. Some things are included below that are excellent values as compared to their more pricey counterparts, and these instances are noted.

FONT MANAGERS AND GENERATORS

What your laser printer dealer is hoping you won't notice is the stack of font cartridges and softfont boxes elsewhere in the store. This is something that (from the salesperson's viewpoint) is best left for discussion after the sale. Regardless of your intended publishing application, you're going to need additional fonts. Cartridges – even the so-called "super cartridges" – are priced in the $150-$400 range. Pre-made soft fonts (disk based) aren't much cheaper, and they eat hard disk space with a ravenous appetite.

As it is with many other things in life, the more economical way to get the fonts you need is to make your own. Xerox Ventura in its release 2.0 includes a starter kit of two styles of Bitstream fonts, with the appropriate generator for making different sizes and orientations. The results are excellent, but you need additional kits for different typefaces. You get what you pay for, and they're expensive.

A cheaper solution is to purchase a font generator. A comprehensive review of ten different packages appeared recently in *PC Magazine*.[1] What these programs do is allow the user to create soft fonts as needed, erasing infrequently used ones after use and thereby saving valuable hard disk space. The tradeoff is that many of the generated fonts reveal their bit patterns, especially in the larger point sizes. One brand that combines well-tuned features of typeface clarity, ease of use, speed, and affordability, is **Glyphix**.[2] This is a commercially-available utility, but it is cited here because it is such a good value for the money. There are two dozen typefaces available, sold in sets of four. Glyphix will allow boldfacing, shading, italicization, and sizing all in the same operation.

Be certain that your font generator will output fonts in both portrait (8½" x 11") and landscape (11" x 8½") mode. If it creates fonts in portrait mode only, you need one of the portrait-to-landscape (portolan) utilities widely available. Glyphix does provide that feature. Also, when shopping for a font generator, don't forget

to obtain at least one file version that outputs monospaced type. This is an often overlooked necessity, since it is so easy to be wooed by the laser printer's ability to perform proportional spacing (PS) so impressively. You'll need a fixed font typeface, for example, if your spreadsheet program misaligns the columns with a PS type font.

For the more artistic person, the really creative way to get fonts is to design your own, from scratch. A good example of a commercially available program is VS Software's Fontgen V for $249. It is typical of its class, allowing the user to design an ASCII character set bit-by-bit (yes, pixel by pixel). The advantage of such programs is that special characters (such as trademarks) can be designed and given ASCII values.

Font design programs actually have a double use: they can also function as font editors. Ostensibly, this is so that the user can fine tune a typeface (trim serifs, etc.). However, in many cases, a user can take an existing font sample and use a design utility/editor's "save" conventions to create whole new fonts, in different sizes. Although the issue of "Who owns the rights to the fonts?" is debated, it is generally accepted that fonts created with font generators are not technically copyrighted. So, if you can get font samples from the public domain, you can alter/scale/modify them to your heart's content. Note, however, that many of the programs handle only the abbreviated (127 character) ASCII set, but this shouldn't be a problem unless you have a strong need for such things as foreign language diacritical marks.

There are two sources of inexpensive, acceptable font editors. **AlterFnt**[3] can take an existing font and allow the user to modify it to taste. Although the program cannot create a font file from scratch, it allows you to change the bitmapping patterns as needed. **ChEdr**[4] functions similarly, and includes a download utility to make the LaserJet think a font is cartridge-based. The registration fee for the latter gets you the Turbo Pascal (V. 4.0) source code and an additional font download utility.

A caveat: homemade fonts are just that—homemade. My experience has been that the results are acceptable if you're using a laser printer with a resolution of no more than 300 dots per inch. It has also been my observation that modified fonts, i.e., those whose origins were font files created elsewhere, start exhibiting their bit patterns noticeably in sizes above eighteen points. If you need a number of fonts in large type sizes, it is suggested that you obtain one of the commercial font generators to maintain a quality appearance.

Although your desktop publishing software probably takes care of the chore of downloading fonts to your printer's memory, there are times when you want printer-resident fonts for other tasks such as word processing or label making. **AddFnts**[4], a part of the ChEdr package, will handle this job, as will the **DownLd**[5] utility. If you need only to maintain a hard copy library of font samples, use **ListFont**[6] and keep the printouts in your reference portfolio.

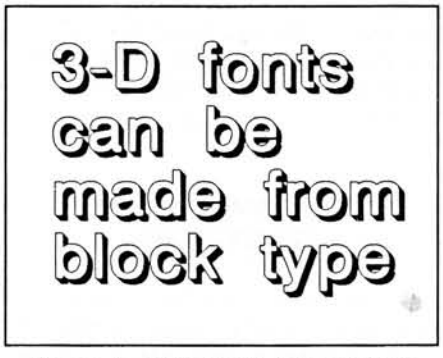


Figure 1. FFilters Makeshad Font

As mentioned, complete, single font files are available from a variety of shareware sources. If you need a more novel typeface, there are some more options. The **FFilters**[7] program takes an existing font (it works best with a plain, heavy typeface) and converts it either to a hollow or three-dimensional font. An example of its output is given in Figure 1. **FntTools**[8] can also make a hollow font, and can save it as a subset of the original so that disk space is not wasted on very large characters. **FontFlt2**[7] also creates hollow fonts and also makes shadow and "Halloween" (where characters "drip") typefaces. If you're really in the mood for something unusual, try **Candyland**,[9] a candy-striped specialty font.

PRINTER CONTROL UTILITIES

Anybody who has perused the HP LaserJet II user's manual knows that the list of print controls is extensive. But causing a document to output the proper commands to a laser printer is no more a trick than sending control codes to an Epson dot matrix printer. You simply need a utility to take away some of the drudgery of handling all those reference tables.

There exists a handy terminate-and-stay-resident (TSR) program that allows you to embed LaserJet control codes directly in your document. Called **Asprn**,[10] this command file lets you define up to twenty-six control strings that are invoked by two-character macros in the text file. The advantage is that even Edlin.Com (from MS-DOS) can be used for text input, if you don't own a word processor. The source listing is in assembly language, and results in a very tight piece of code.

Printer control is also accomplished with the **Laserjet**[11] utility. This small program can be invoked either as a DOS command or left in memory as a TSR, to be called when needed. Figure 2 shows the utility superimposed over a passage of text from which a laser printout is desired.

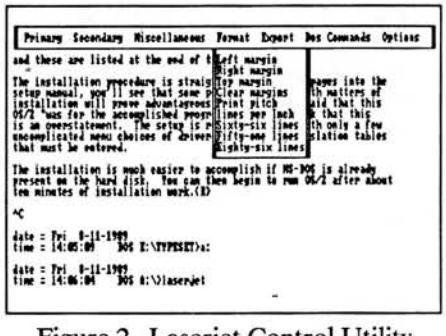


Figure 2. Laserjet Control Utility (Pop-Up Menu)

The menus also provide control over font selection and page sizing, and there is even a built-in feature for generating labels. Copies of this program have been seen in several shareware vendors' price lists for $1.00 or $2.00. A similar program, for font control only, is **Zep**[12], administering the loading and selecting of fonts, as well as the control of paper trays.

There are similar programs for non-Hewlett-Packard printers. **Can-LBP**,[13] also a TSR, performs as a pop-up printer setup menu for the Canon LBP-8A1. **SetLips**[14] allows a similar convention for LIPS-10 and OASYS printers.

ENVELOPE PROGRAMS AND FORMS GENERATORS

Despite its impressive output, the laser printer can thwart efforts to line up text exactly where you want it. Very few persons have brought home the new printer and immediately discarded the old, faithful typewriter. Single envelopes occasionally must be addressed, and the invocation of a word processor to do the job just isn't worth the effort.

This wasn't a difficult problem to solve, but you wonder why it wasn't anticipated by the hardware manufacturers. If you're looking for a memory-resident (TSR) utility, there is a good **Envelope** assembly/BASIC language program listing available for the copying.[15] While intended for casual use, it allows a good latitude for production runs as well.

EnvLJ[16] is a ready-made utility for addressing envelopes on the laser printer. You can vary the envelope size and embed text in the loader file so that your return address is preprinted on the output (work) screen, and from there, automatically to your envelope. Some control of printer fonts is also available.

Another reason the typewriter was retained was because its platen could be manipulated to align precisely on boxes in forms. The forms maker software has matured, and some programs will even create the forms for you. Two exhaustive reviews have recently appeared for forms generation packages, and there is something for everybody therein.[17,18]

Because of the number of lines required for even a one-page form, forms creation wasn't completely practical when the output printer was of the dot matrix variety. Channelmark Corporation, in its line of Power Up! programs filled this void with such titles as Grid Designer and Forms File. After generating the form(s) on a 9-pin printer, the result was best photocopied in order that it not be necessary to purchase printer ribbons by the gross.

GridMakr[19] does approximately the same job for the laser printer. The user has control over line thickness, spacing, and frequency. This allows an infinite number of design possibilities, and is quite handy where graphs such as odd-spaced accounting sheets are needed.

PAGE CONDENSERS

Most owners of laser printers are so fascinated with the quality of output that they use paper at an ecologically alarming rate. Several inexpensive utilities allow multiple pages to be output on one 8½ " x 11" sheet.

LJ2UP[20] and **4Print**[21] invoke the landscape (11" x 8½") mode on your printer to output two portrait-aligned, side-by-side, reduced print documents on the same page. The latter additionally allows front/back output, four pages at a time. **P4Up**[22] does a further compression by outputting four pages to a side (in 1-3-2-4 order), using a 3.8 point font. **Pamphlet**[23] takes all these features and provides a way to output a properly arranged, eight-page IBM-sized user manual from your text file. Figure 3 illustrates the resulting orientation.

SCREEN CAPTURE UTILITIES

One of the more useful buttons on the keyboard is the PrtSc switch. It and its program counterpart, Graphics.Com, are handy for quick screen dumps and impromptu printouts. Unfortunately, these images can't always be used directly by desktop publishing software.

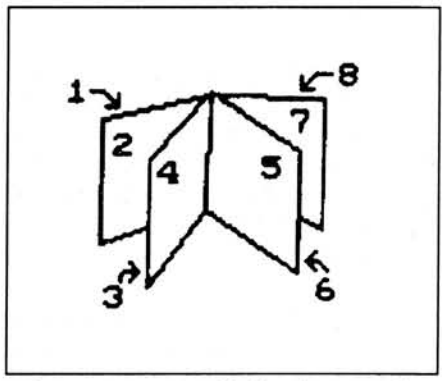


Figure 3. Page Collation in Pamphlet Utility

Ashton-Tate's Byline and Lattice's Highstyle packages each contain utilities, Camera.Exe and Snapshot.Exe respectively, which allow the user to make screen prints that are importable into the published document. Unfortunately, Byline's .CAM files are useful only in that program, and Highstyle's .PIC files must be converted to another format before other programs can make use of them.

Xerox's Ventura Publisher can use graphics images in several formats, but it prefers the GEM .IMG files. **GemCap**[24] is installed in memory as a TSR and waits until the user presses the hot keys (Shift-Alt). After three beeps, an .IMG file is created in a predetermined subdirectory, ready for use in Ventura. As many as twenty-six image files (all 16K bytes each) can be created at one loading (up to the extent of available disk space). You have the same capabilities as with Graphics.Com, i.e., the utility will handle graphics bit mapping but won't capture EGA or VGA screens. However, the time saved foregoing tedious conversion processes makes the little utility most valuable. Figure 2 was, in fact, made using the GemCap utility.

If all you need is a laser printer version of Graphics.Com, however, **LG**[25] will do the job nicely. It works on

CGA monitors and takes up very little disk space.

GRAPHICS AND PICTURE CONVERTERS

Certainly, the area of desktop publishing that wins the award for poorest planning is that of graphics compatibility. The fight to become the standard file format is shared by Microsoft/Aldus (TIFF or .TIF, tagged image file), GEM Draw (.IMG files), PC Paintbrush (.PCX graphics), and several others.

The computer flea markets are offering a number of packaged graphics for only a few dollars per disk. There are enough of these images that you don't actually have to buy a scanner to import thematic images, unless you want to customize. PrintMaster (.SHP) files have been seen in four disk sets for $12.00 for the entire collection. One of the better bargains is Public Brand Software's **Pictures 3** collection of 297 PC Paintbrush (.PCC) for only $5.00.[26] Figure 4 is a sample of what's on the disk.

Figure 4. PBS Graphics File

Unfortunately, all desktop publishing programs don't recognize all graphics formats. One solution to the dilemma is to buy Inset Systems' Hijaak for $149 which allows conversion back and forth between some twenty-three types of graphics files. Or you could use the **IConvert**[27] utility to switch between MacPaint (.MAC), PC Paintbrush (.PCX), PrintMaster (.SHP), PrintShop (.DAT), Windows Paint (.MSP), and several others. If that utility doesn't cover enough, **ArtCon**[28] will pick up the slack with PrintShop (.DAT), PrintMaster (.SHP), PFS:First Publisher (.ART), and a few others.

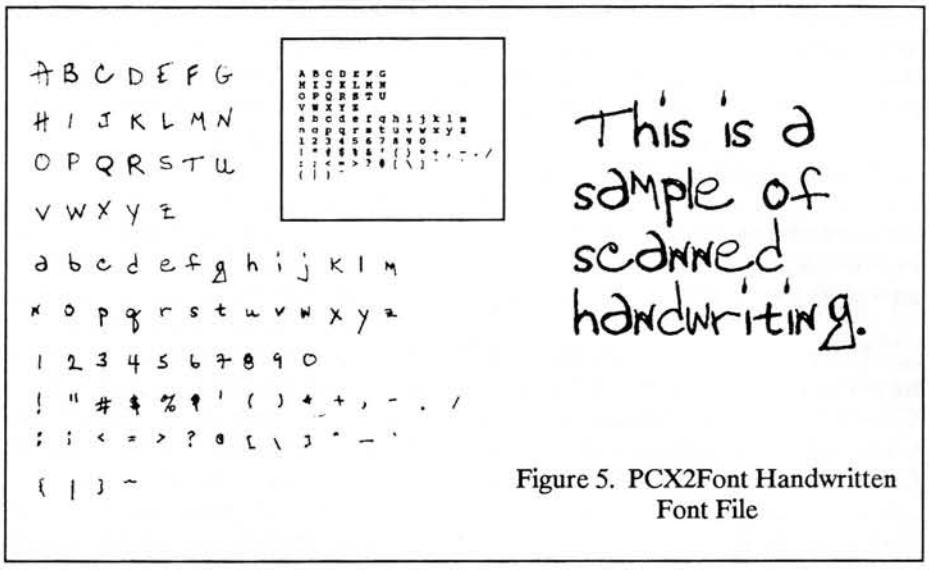


Figure 5. PCX2Font Handwritten Font File

Two font-oriented utilities are listed in this section since they fall more into the category of graphics converters. **T2F**[29] takes a text file and a LaserJet compatible soft font, and outputs a .PCX file usable, e.g., with Optiks, to produce banners and flyers. The result is similar to the product created by PrintShop on a dot matrix printer.

There is also **PCX2Font**,[30] which is a real conversation starter. A sample of a person's (block) handwriting is taken, as shown in figure 5. PCX2Font then takes the scanned image (processed as a .PCX file) and, with the assistance of an ASCII descriptor file (figure 5 inset), creates a LaserJet portrait soft font (.SFP). After being processed in the manner of any disk-based font, the file is used in the desktop publishing software to output text in the person's handwriting. A result is in the right side of figure 5. A companion file, FONT2PCX, reverses the process and allows you to edit soft fonts using PC Paintbrush itself.

SOURCES NOT ON DISKS

Let's assume you <u>really</u> went first class and bought a scanner. Also assuming you purchased the proper scanning software, virtually any pictorial image on paper became available to you. You also quickly learned that, unless your scanner is the deluxe (read super expensive) model, you can't reproduce photographs or low-quality artwork such as that found in newspapers.

What you also learned (hopefully, not the hard way) is that artists lend a jaundiced eye toward persons using their copyrighted work without permission or payment of royalties. Also, items scanned from magazines or other trade media tend to "bleed" into your captured image, since there is printing on both sides of the paper.

There are a couple of very inexpensive sources available at the shopping center that alleviate the aforementioned problems. Dover Publications[31] prints several dozen books of clip art at $3.95-$4.95, each of which contains more than a hundred clear, scannable images. Most of their books are printed one side of the paper only, and the images can be used in your publications free of permission and royalty payments. There are numerous subjects available in cutouts, borders, cartoons, and mortised frames. There are even alphabets, if you care to experiment with PCX2Font (above). The figure at the head of this article is from the *Ready-to-Use Silhouette Spot Illustrations* of Dover Publications.

These booklets are available at bookstores (naturally) and most art supply stores. And if you want to carry the spirit of cheap desktop publishing to its extreme, look for the books at the public library. Scan and retain all the images you want, but return those books you borrow to share with others who read this article.

SOURCES AND PROGRAMS MENTIONED

(n.b. – some prices are for licensing or royalty payment(s) to the program's author. This is noted by the symbol (A) and is usually for a shareware or bannerware type program. Payments should be negotiated directly with the person(s) mentioned.

Location information is provided where the author of the program is known. Since authorship is usually by individuals, for the sake of professional courtesy it is suggested that initial contact be through the mail, with a SASE enclosed with your inquiry. In the case of "free" programs, expect at the very least to reimburse the author for the cost of the disk and mailing.

Where shown as .EXE or .COM files, the entries are sometimes the feature files of a larger set.

One excellent source of demonstration copies of many of the programs is Public Brand Software, P.O. Box 51315, Indianapolis, IN 46251/(800) 426-DISK, (800) 727-3476 in Indiana. Where noted as 'PBS', that vendor's catalog number for the disk which includes the footnoted program is given. Individual disks are $5.00, even if the program itself is marked "free."

[1]Mendelson, Edward. "Font Generators: Starting from Scratch." *PC Magazine*, June 13, 1989, pp. 253-270.

[2]Glyphix $99.95 per set
SWFTE International, Ltd.
P.O. Box 5773
Wilmington, DE 19808
(302) 733-0956

[3]ALTERFNT.COM ver. 1.1 free (PBS UQ 18.0)
R.J. Holmgren
no address given
(516) 536-8723 (BBS)

[4]CHEDR.EXE ver. 1.4 (package includes ADDFNTS.EXE) $15 (A) (PBS UQ24.0)
Daniel T. Ingersoll
EWE-WARE Programs
120 Claremont Road
Oak Ridge, TN 37830

[5]DOWNLD ver. 1.7 $15 (A); obtain demo disk from Public Brand Software (see above) (PBS UQ25.0)

[6]LISTFONT.EXE free (PBS UQ18.0)
Daniel J. Hickey
7481 Dallas Drive
La Palma, CA 90623
(608) 271-3684 (BBS)

[7]FFILTERS.EXE, FONTFLT2.EXE free (PBS UQ8.1, UQ18.0)
[19]GRIDMAKER.EXE free (PBS UQ18.0)
[30]PCX2FONT.EXE ver. 1.05 free, but contact author if commercial licensing agreement is needed (PBS UQ18.0)
James Bumgardner
no address given
(818) 846-7781
(608) 271-3685 (Cooperworks BBS)

[8]FNTTOOLS.EXE free (PBS UQ18.0)
Thomas E. Doyle
5222 Big Bow Road
Madison, WI 53711

[9]CANDYLAND $10.00 each for 12, 18, or 23 point files (portrait and landscape included); add $1.00 for width (.WID) table and $1.00 for 3 1/2" disk format (A) (PBS UQ24.0)
Sol Guber
717 Elkington Lane
St. Louis, MO 63132

[10]Hummel, Robert L. "ASPRN Cures Laser Printer Headaches." *PC Magazine*, March 15, 1988, pp. 247-284.

[11]LASERJET.COM ver. 4.4 free (PBS UQ5.1)
Guy Gallo
P.O. Box 344
Piermont, NY 10968

[12]ZEPR.COM ver. 1.0 free; fee for future revisions (A)(PBS UQ24.0)
[25]LG.COM free (PBS UQ 5.1)
[29]T2F.EXE ver. 1.0 free (PBS GR34.0)
Keith P. Graham
238 Germonds Road
West Nyack, NY 10094
(914) 353-2176 (PC Rockland BBS)

[13]CAN-LBP.COM free (PBS UQ5.1)
Nelson Ford
P.O. Box 35705
Houston, TX 77235-5705

[14]SETLIPS.COM free (PBS UQ5.1)
Toshifumi Morisaki
no address given
CompuServe ID 76525,2360/
Source ID BDJ234

[15]Saidikowski, Ron. "Envelopes on Lasers are Easy." *PC Magazine*, December 27, 1988, pp. 233-250.

[16]ENVLJ.EXE ver. 5.10 free (PBS UQ8.1)
Steven D. Stern
JMB Realty Corporation
875 N. Michigan Avenue
Chicago, IL 60611
CompuServe ID 70327,135

[17]Fersko-Weiss, Henry. "Forms Software Fills in the Blanks." *PC Magazine*, June 13, 1989, pp. 203.

[18]Yacco, Wayne A. "Forms Production Enters New Realm of Desktop Publishing." *PC Publishing*, August, 1989, pp. 14-22.

[20]LJ2UP.EXE ver. 2.0 free (PBS UQ5.1)
Joe Barnhart
no address given

[21]4PRINT.EXE $10 (program only), $35 (program, manual and registration) (A) (PBS UQ18.0)
Korenthal Associates, Inc.
230 West 13th Street
New York, New York 10011

[22]P4UP $30 (A); obtain demo disk from Public Brand Software (see above) (PBS UQ20.0)

[23]PAMPHLET.COM $15 (A) (PBS UQ8.1)
Martin Beattie
9190 Rolling Tree Lane
Fair Oaks, CA 95628
CompuServe ID 76555,454

[24]GEMCAP.COM ver. 3.0 $20 (A)
Natural Software
19 South 5th Street
St. Charles, IL 60174
(312) 377-7320

[26]PICTURES 3 free; order from Public Brand Software (see above) (PBS GP3.0)

[27]ICONVERT.COM ver. 1.00D $35 for ver. 1.x and user manual, $45 for same plus ver. 2.0 when available (A) (PBS GR33.0)
John Paul Michalski
Infinity Engineering Services
322 W. Palomino Drive
Chandler, AZ 85224

[28]ARTCON.EXE $15 for more conversions and 100 graphics images (A) (PBS 33.0)
Robert Onda
Box 611
Lanham, MD 20706

[31]Dover Publications, Inc.
31 East 2nd Street
Mineola, NY 11501

*

Continued from Page 33

page, but 50 dots shorter on the top and bottom, leaving a printable length of 10.66 inches on letter size paper.

However, the default environment of the LaserJet includes 1/2 inch top and bottom margins, 150 dots each. So unless you manually change the margins with PCL commands, your printable area is just 10 inches long by the logical page width of 8.17 inches.

The Coordinate System

When you layout a page, you have to tell the LaserJet where to place characters or dots. This is done through cursor movement commands that point to locations on the page using an X-Y coordinate system. The X-axis runs along the width of the page, the Y-axis down the side.

Like the coordinate system of your monitor, there is a "home" position at the upper-left corner of the page. But in this case, the X-axis 0 position is at the left edge of the logical page, the Y-axis 0 position at the current top margin. Using default settings, the top margin is 1/2 inch. So, the home position is 50 dots from the left and 150 dots from the top of the page.

If you change the top margin setting using PCL commands, the Y-axis home position moves also. Setting the top margin to 2 inches, for example, places the home position 50 dots from the left and 600 dots from the top of the page.

If you manually set the top margin to 0, the home coordinate (0,0) moves to the very top of the page at the left border of the logical page. While this position is within the addressable area, it is outside of the printable page. So, even though you can use PCL commands to place the cursor in that region, nothing will print.

With this background, you can now look at the specific PCL commands that control your laser printer. We'll do this in my next article.

*

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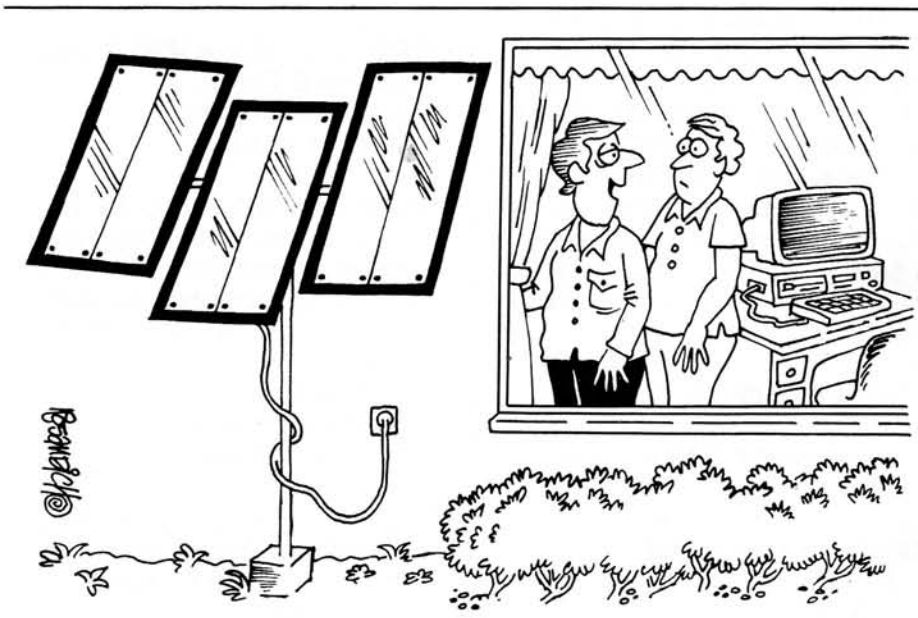

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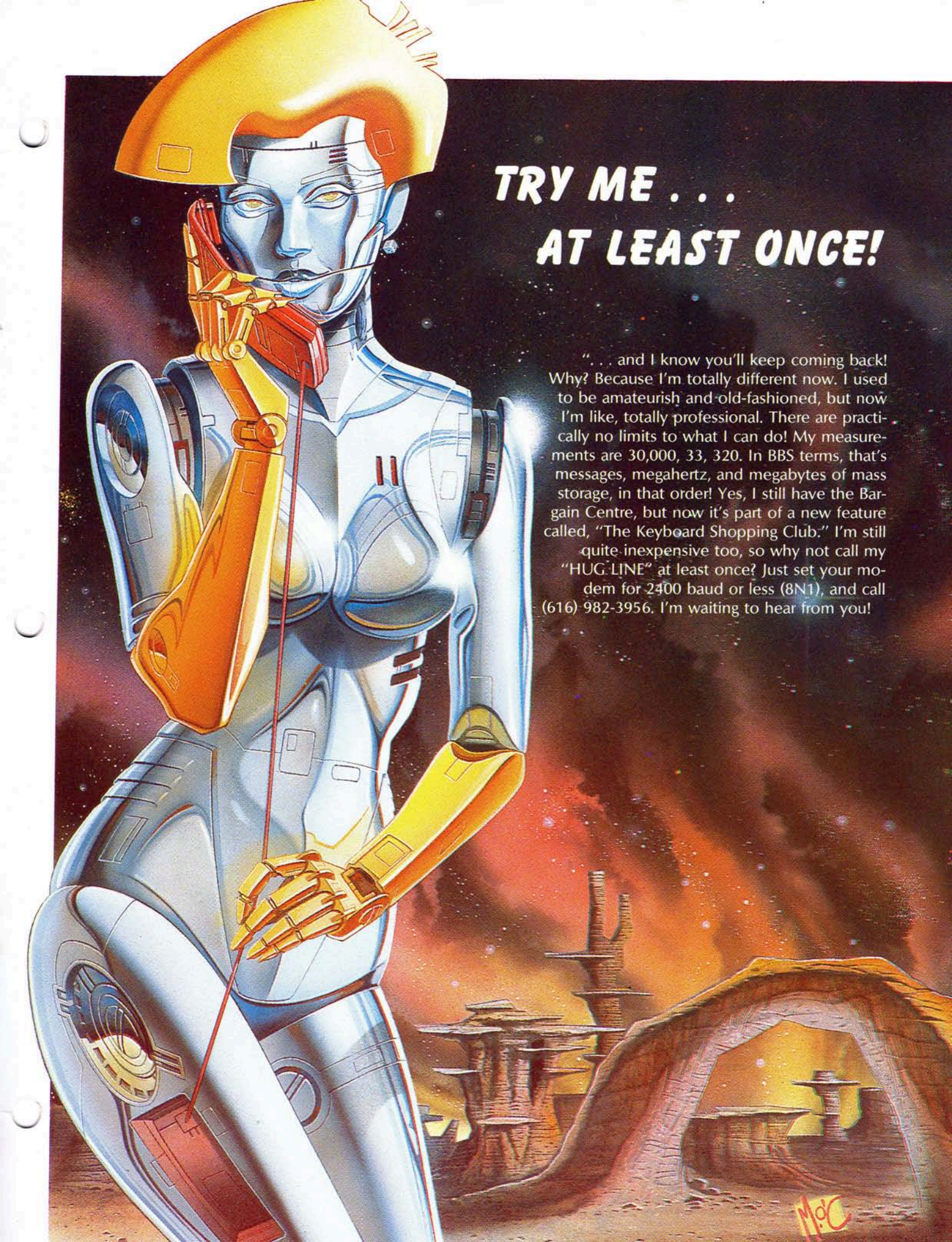
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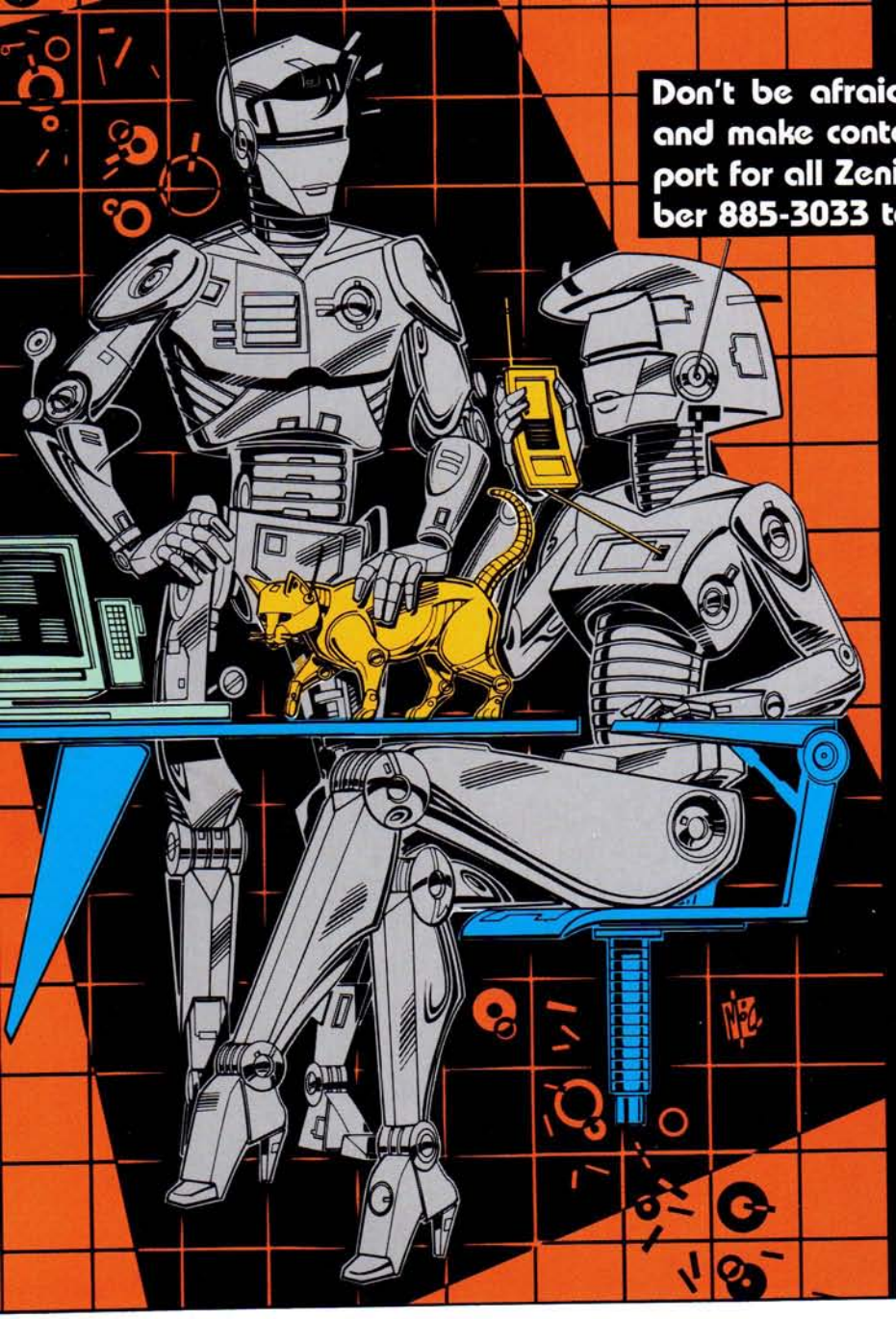

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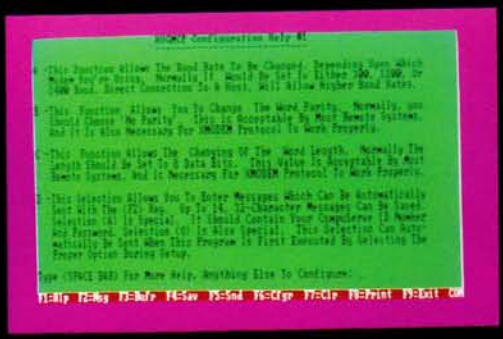

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