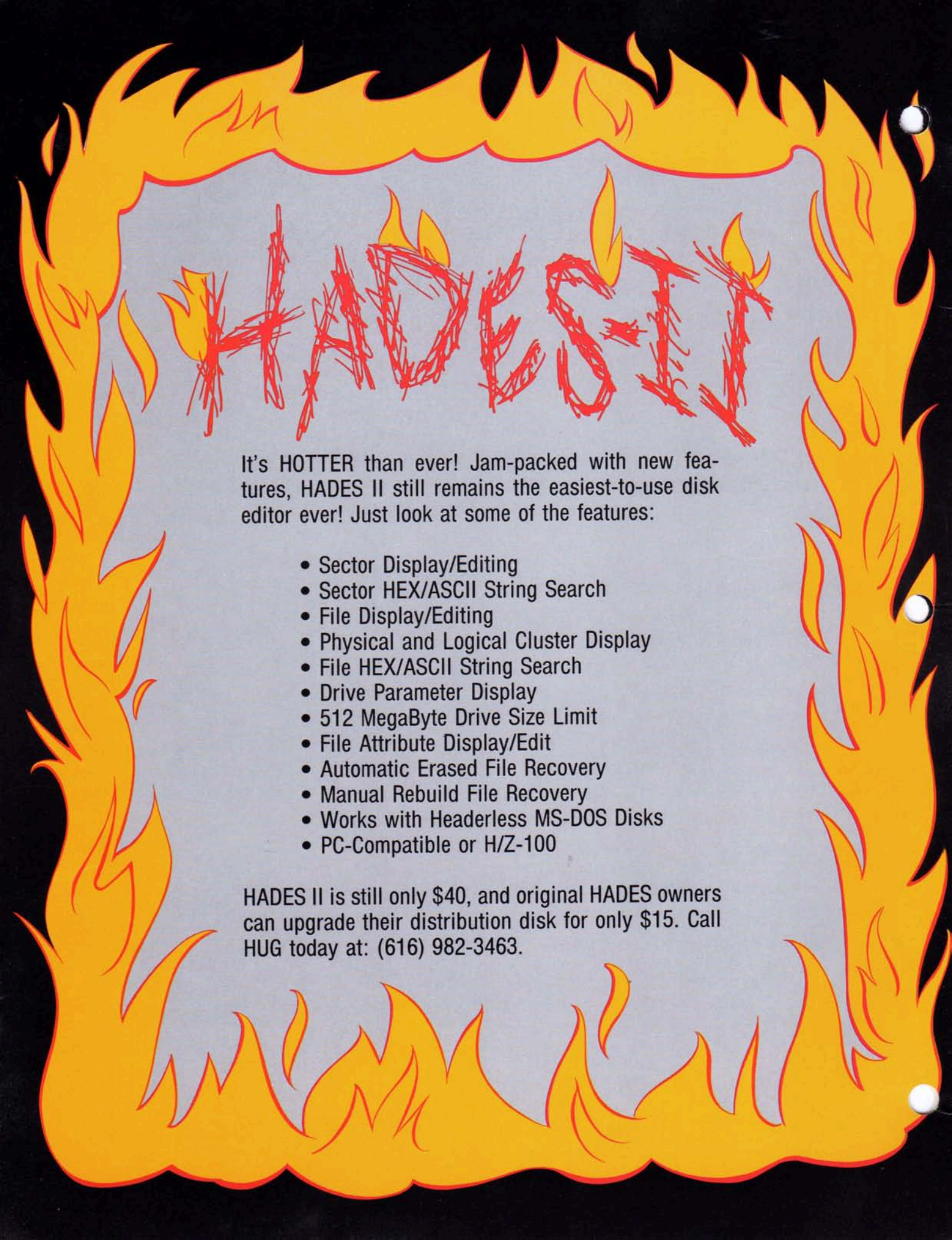
REMark®

December 1990

The Official Heath/Zenith Computer Users Magazine



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ACCOUNTING & TAX

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PC Compatibles

All models include the following series of computers: H/Z-130, 140, 150, 160, 170, 180, H/Z-200 and 300.

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Send Payment to: Heath/Zenith Users' Group
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HUG

H8 - H/Z-89/90

PRODUCT NAME	PART NUMBER	OPERATING SYSTEM	DESCRIPTION	PRICE
ACCOUNTING SYSTEM	885-8047-37	CPM	BUSINESS	20.00
ACTION GAMES	885-1220-[37]	CPM	GAME	20.00
ADVENTURE	885-1010	HDOS	GAME	10.00
ASCIRITY	885-1238-[37]	CPM	AMATEUR RADIO	20.00
AUTOFILE (Z80 ONLY)	885-1110	HDOS	DBMS	30.00
BHBASIC SUPPORT PACKAGE	885-1119-[37]	HDOS	UTILITY	20.00
CASTLE	885-8032-[37]	HDOS	ENTERTAINMENT	20.00
CHEAPCALC	885-1131-[37]	HDOS	SPREADSHEET	20.00
CHECKOFF	885-8010	HDOS	CHECKBOOK SOFTWARE	25.00
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FLOATING POINT PACKAGE	885-1063	HDOS	UTILITY	18.00
GALACTIC WARRIORS	885-8009-[37]	HDOS	GAME	20.00
GALACTIC WARRIORS	885-8009-[37]	CPM	GAME	20.00
GAMES 1	885-1029-[37]	HDOS	GAMES	18.00
HARD SECTOR SUPPORT PACKAGE	885-1121	HDOS	UTILITY	30.00
HDOS PROGRAMMERS HELPER	885-8017	HDOS	UTILITY	16.00
HOME FINANCE	885-1070	HDOS	BUSINESS	18.00
HUG DISK DUPLICATION UTILITIES	885-1217-[37]	CPM	UTILITY	20.00
HUG SOFTWARE CATALOG	885-4500	VARIOUS	PRODUCTS THRU 1982	9.75
HUGMAN & MOVIE ANIMATION	885-1124	HDOS	ENTERTAINMENT	20.00
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MAGBASE	885-1249-[37]	CPM	MAGAZINE DATABASE	25.00
MAPLE	885-8005	HDOS	COMMUNICATION	35.00
MAPLE	885-8012-[37]	CPM	COMMUNICATION	35.00
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REMARK VOL 1 ISSUES 1-13	885-4001	N/A	1978 TO DECEMBER 1980	20.00
RUNOFF	885-1025	HDOS	TEXT PROCESSOR	35.00
SCICALC	885-8027	HDOS	UTILITY	20.00
SMALL BUSINESS PACKAGE	885-1071-[37]	HDOS	BUSINESS	75.00
SMALL-C COMPILER	885-1134	HDOS	LANGUAGE	30.00
SOFT SECTOR SUPPORT PACKAGE	885-1127-[37]	HDOS	UTILITY	20.00
STUDENT'S STATISTICS PACKAGE	885-8021	HDOS	EDUCATION	20.00
SUBMIT (Z80 ONLY)	885-8006	HDOS	UTILITY	20.00
TERM & HTOC	885-1207-[37]	CPM	COMMUNICATION & UTILITY	20.00
TINY BASIC COMPILER	885-1132-[37]	HDOS	LANGUAGE	25.00
TINY PASCAL	885-1086-[37]	HDOS	LANGUAGE	20.00
UDUMP	885-8004	HDOS	UTILITY	35.00
UTILITIES	885-1212-[37]	CPM	UTILITY	20.00
UTILITIES BY PS	885-1126	HDOS	UTILITY	20.00
VARIETY PACKAGE	885-1135-[37]	HDOS	UTILITY & GAMES	20.00
WHEW UTILITIES	885-1120-[37]	HDOS	UTILITY	20.00
Z80 ASSEMBLER	885-1078-[37]	HDOS	UTILITY	25.00
Z80 DEBUGGING TOOL (ALDT)	885-1116	HDOS	UTILITY	20.00

H8 - H/Z-89/90 - H/Z-100 (Not PC)

ADVENTURE	885-1222-[37]	CPM	GAME	10.00
BASIC-E	885-1215-[37]	CPM	LANGUAGE	20.00
CASSINO GAMES	885-1227-[37]	CPM	GAME	20.00
CHEAPCALC	885-1233-[37]	CPM	SPREADSHEET	20.00
CHECKOFF	885-8011-[37]	CPM	CHECKBOOK SOFTWARE	25.00
COPYDOS	885-1235-37	CPM	UTILITY	20.00
DISK DUMP & EDIT UTILITY	885-1225-[37]	CPM	UTILITY	30.00
DUNGEONS & DRAGONS	885-1209-[37]	CPM	GAMES	20.00
FAST ACTION GAMES	885-1228-[37]	CPM	GAME	20.00
FUN DISK I	885-1236-[37]	CPM	GAMES	20.00
FUN DISK II	885-1248-[37]	CPM	GAMES	35.00
GAMES DISK	885-1206-[37]	CPM	GAMES	20.00
GRADE	885-8036-[37]	CPM	GRADE BOOK	20.00
HRUN	885-1223-[37]	CPM	HDOS EMULATOR	40.00
HUG FILE MANAGER & UTILITIES	885-1246-[37]	CPM	UTILITY	20.00
HUG SOFTWARE CATALOG UPDATE #1	885-4501	VARIOUS	PRODUCTS 1983 THRU 1985	9.75
KEYMAP CPM-80	885-1230-[37]	CPM	UTILITY	20.00
NAVPROGSEVEN	885-1219-[37]	CPM	FLIGHT UTILITY	20.00
SEA BATTLE	885-1211-[37]	CPM	GAME	20.00
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
X-REFERENCE UTILITIES FOR MBASIC	885-1231-[37]	CPM	UTILITY	20.00
ZTERM	885-3003-[37]	CPM	COMMUNICATION	20.00
H/Z-100 (Not PC) Only				
ACCOUNTING SYSTEM	885-8048-37	MSDOS	BUSINESS	20.00
CALC	885-8043-37	MSDOS	UTILITY	20.00
CARDCAT	885-3021-37	MSDOS	BUSINESS	20.00
CHEAPCALC	885-3006-37	MSDOS	SPREADSHEET	20.00
CHECKBOOK MANAGER	885-3013-37	MSDOS	BUSINESS	20.00
CP/EMULATOR	885-3007-37	MSDOS	CPM EMULATOR	20.00
DBZ	885-8034-37	MSDOS	DBMS	25.00
DUNGEONS & DRAGONS (ZBASIC)	885-3009-37	MSDOS	GAME	20.00
ETCHDUMP	885-3005-37	MSDOS	UTILITY	20.00
EZPLOT II	885-3049-37	MSDOS	PRINTER PLOTTING UTILITY	25.00
GAMES (ZBASIC)	885-3011-37	MSDOS	GAMES	20.00
GAMES CONTEST PACKAGE	885-3017-37	MSDOS	GAMES	25.00
GAMES PACKAGE II	885-3044-37	MSDOS	GAMES	25.00
GRAPHIC GAMES (ZBASIC)	885-3004-37	MSDOS	GAMES	20.00
GRAPHICS	885-3031-37	MSDOS	ENTERTAINMENT	20.00
HELPSCREEN	885-3039-37	MSDOS	UTILITY	20.00
HUG BACKGROUND PRINT SPOOLER	885-1247-37	CPM	UTILITY	20.00
KEYMAC	885-3046-37	MSDOS	UTILITY	20.00
KEYMAP	885-3010-37	MSDOS	UTILITY	20.00
KEYMAP CPM-85	885-1245-37	CPM	UTILITY	20.00
MAPLE	885-8023-37	CPM	COMMUNICATION	35.00
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SPELL5	885-3035-37	MSDOS	SPELLING CHECKER	20.00
SPREADSHEET CONTEST PACKAGE	885-3018-37	MSDOS	VARIOUS SPREADSHEETS	25.00
TREE-ID	885-3036-37	MSDOS	TREE IDENTIFIER	20.00
USEFUL PROGRAMS I	885-3022-37	MSDOS	UTILITIES	30.00
UTILITIES	885-3008-37	MSDOS	UTILITY	20.00
ZPC II	885-3037-37	MSDOS	PC EMULATOR	60.00
ZPC UPGRADE DISK	885-3042-37	MSDOS	UTILITY	20.00
H/Z-100 and PC Compatibles				
ADVENTURE	885-3016	MSDOS	GAME	10.00
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BOTH SIDES PRINTER UTILITY	885-3048	MSDOS	UTILITY	20.00
CXREF	885-3051	MSDOS	UTILITY	17.00
DEBUG SUPPORT UTILITIES	885-3038	MSDOS	UTILITY	20.00
DPATH	885-8039	MSDOS	UTILITY	20.00
HADES II	885-3040	MSDOS	UTILITY	40.00
HELP	885-8040	MSDOS	CAI	25.00
HEPCAT	885-3045	MSDOS	UTILITY	35.00
HUG EDITOR	885-3012	MSDOS	TEXT PROCESSOR	20.00
HUG MENU SYSTEM	885-3020	MSDOS	UTILITY	20.00
HUG SOFTWARE CATALOG UPDATE #1	885-4501	VARIOUS	PROD 1983 THRU 1985	9.75
HUGMCP	885-3033	MSDOS	COMMUNICATION	40.00
ICT 8080 TO 8088 TRANSLATOR	885-3024	MSDOS	UTILITY	20.00
MAGBASE	885-3050	VARIOUS	MAGAZINE DATABASE	25.00
MATT	885-8045	MSDOS	MATRIX UTILITY	20.00
MISCELLANEOUS UTILITIES	885-3025	MSDOS	UTILITIES	20.00
PS's PC & Z100 UTILITIES	885-3052	MSDOS	UTILITY	20.00
REMARK VOL 8 ISSUES 84-95	885-4008	N/A	1987	25.00
REMARK VOL 9 ISSUES 96-107	885-4009	N/A	1988	25.00
REMARK VOL 10 ISSUES 108-119	885-4010	N/A	1989	25.00
SCREEN DUMP	885-3043	MSDOS	UTILITY	30.00
UTILITIES II	885-3014	MSDOS	UTILITY	20.00
Z100 WORDSTAR CONNECTION	885-3047	MSDOS	UTILITY	20.00
PC Compatibles				
ACCOUNTING SYSTEM	885-8049	MSDOS	BUSINESS	20.00
CARDCAT	885-6006	MSDOS	CATALOGING SYSTEM	20.00
CHEAPCALC	885-6004	MSDOS	SPREADSHEET	20.00
CP/EMULATOR II & ZEMULATOR	885-6002	MSDOS	CPM & Z100 EMULATORS	20.00
DUNGEONS & DRAGONS	885-6007	MSDOS	GAME	20.00
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
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PS's PC UTILITIES	885-6011	MSDOS	UTILITIES	20.00
POWERING UP	885-4604	N/A	GUIDE TO USING PCS	12.00
SCREEN SAVER PLUS	885-6009	MSDOS	UTILITIES	20.00
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
YAUD (YET ANOTHER UTILITIES DISK)	885-6015	MSDOS	UTILITIES	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

No IMAGER Support

Dear HUG:

I am writing about a support problem that I have for the IMAGER backup as mentioned in March 1988 and December 1988 issues of REMark.

I am using the board in a Zenith Data Systems 248 without any problems as long as I do not install any other boards that conflict with D000 segment address.

But now I need to change the hardware base I/O address. The documentation says to contact AUTOFAX Corp. in California. I can not reach them by phone or written letters. (408) 336-5171 has been disconnected and The Light Pen Co., where I ordered the board, has not been able to contact them either.

I would appreciate any help you can give me. Possibly another reader knows how to change the I/O address on the board. If so, please have them contact me with the information, as I can no longer use the board with my present system configuration.

Thank you for your time.

Sincerely yours,
Dan Carlson
18476 Natchez Avenue
Prior Lake, MN 55372

P.S. Just a word to tell you that REMark has been excellent in giving me *useable* information. You have my full support!

Life With a Laptop

Dear HUG:

In the fall of 1986, I decided to buy a small, light laptop computer for my wife for Christmas, to keep recipes and other personal information on instant tap. At that time, Radio Shack had their famous Model 100 computer on sale. Its price was about $400. I bought one and began entering my wife's recipe files. Well, eight lines of forty characters just isn't enough density for displaying lengthy recipes, as far as I am concerned. Nor is 8k-bytes anywhere near an adequate amount of memory for an extensive recipe file system. Nor is a 2 MHz 80C85 a very fast searcher through long files.

At this time, I noticed a sale item in the Heath catalog; yes, a laptop computer. I have been a Heathkit enthusiast since 1957, and an H/Z computer advocate since 1977, when I built an ET-3400 computer trainer, an H8 computer in 1978, and then a low-profile H/Z-100 in 1984.

The ZP-150 seemed to be ideal for my needs: 32K of standard memory, a 16 line by 80 character display, and a fast (these things are relative) 4.77 MHz 80C88 microprocessor. And it was on sale, plus $600 worth of Zip-150 accessories, for about $700. Not much more than that puny Model 100. I'll take it!

I hurried home with my new-found treasure, returned the Model 100 for a full refund with no hassle (thanks, Radio Shack!), and began entering recipes, as I wanted this ready for Christmas.

I entered the recipes into the Microsoft WORD processor provided on the ZP-150, so that the 'Search' function could be used to find recipes by name, content, or any other relationship. As a matter of fact, WORD is a part of WORKS in ROM, and with familiarity, is quite capable in a BASIC way (which is also included in firmware). I like the ZP-150 and find it a friendly machine to use.

Well, Christmas 1986 arrived, and the 'Recipe Filer' was presented to my lovely spouse. She was immediately suspicious of this machine that wasn't labeled 'Recipe Filer', but rather "Zenith Data Systems" embellished its open face. That, I'm sure she thought, is a COMPUTER! Not a favorite subject with a woman who has never accepted the 'computer widow' title gracefully.

Functionally, the 'Recipe Filer' was great. Screen layout, speed of retrieval, and capacity were great! But, unfortunately, in our kitchen, the screen was illegible without a flashlight or being in just the right position (I know that you Zip-150 users out there know what I'm saying). The two shiny and almost-parallel surfaces that the display presents to the user (the LCD and the protective cover) create a 'swimmingly' confusing picture in most of the lighting situations I have encountered. Very frustrating and annoying.

I am proud to this day of the valiant try given to computer operation in the kitchen, but in the end my efforts were for naught. It was back to the 3 by 5 file card system.

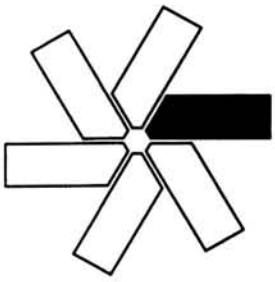
Licking my pride (and rubbing my ears), I retreated downstairs to the Computer Room in defeat. I then decided to attempt modifications to make the ZP-150 more tolerable in the real world.

First, I tried lightly sanding the glossy protective surface with 400 grit sandpaper to eliminate the secondary reflection that produces the greatest annoyance. Alas, the LCD can't get through anything that's not crystal-clear. Then it dawned on me: don't try to modify the bothersome thing . . REMOVE IT! Since I've cut it out, it's been like a different machine to use, tolerable in most light situations.

Secondly, to reduce the rate of battery consumption (10 AA alkalines - no wimpy rechargables here), I wanted to leave the AC adapter connected most of the time while using the computer. But the cord between the brick and the machine was so short, I was always at least aware of the anchor, but usually dragging it off the couch, bed or chair. Solution: LENGTHEN IT! With five feet of coaxial cable (microphone cable from Radio Shack - tough and flexible).

The final, seemingly-insurmountable frustration was the printer port. An odd cable was supplied with the ZP-150 to connect to an even-odder 26-pin connector on the back of the machine. At the other end of the cable was a normal DB-25 female outlet (as found at the printer port of most IBM XT/AT machines). The bothersome detail was this adapter cable, which was about a foot long and made of a 25-conductor flat cable, wrapped in a copper-screen sheath (which was not connected electrically to anything. Purpose?) and a very stiff black plastic cover. Using a Diconix 150 printer (a real sweetheart) with a normal three-foot PC printer cable made

Continued on Page 37



Index to REMark: 1988-1989

Jan Axelson
2209 Winnebago Street
Madison, WI 53704

The following pages contain an index to REMark for 1988-89. I made the index with PC-File Version 5.0, then converted it to a text file for publication in REMark.

If you prefer an electronic index, you can download REM8889.EXE from the COM1 BBS. REM8889.EXE is a self-extracting file that contains the REMark index in the form of a PC-File-compatible database. Or, send $6 to Jan Axelson, 2209 Winnebago Street, Madison, WI 53704. I'll send you the files on a 5-1/4" 360K MS-DOS floppy.

Using REM8889 and PC-File, you can quickly search for occurrences of any topic or combination of topics you wish.

Note: To use the disk-based index, you must have PC-File Version 5.0 or a compatible database. (PC-File says its files are dBase-compatible, but I haven't confirmed this.)

Evaluation copies of PC-File V5.0 are available on many BBS's and from many mail-order sources, including The Public (Software) Library. A registration fee is requested. Or you can buy the software and printed manual directly. I got mine from PC Connection for $75, which is much less than the normal registration fee of $130.

Sources

PC Connection
6 Mill Street
Marlow, NH 03456
1-800-243-8088

Public (Software) Library
P.O. Box 35705
Houston, TX 77235-5705
1-800-2424-PSL

REGULAR COLUMNS & FEATURES

Bug Zapping

- ZKB-2 keyboard, Z-319 with MFM V3.0, H-140 or Z-159 and monitor ROM memory test, H-150 keyboard, 84-key keyboard on Z-200 series, Z-386 with coprocessor, ZVM-1220, -1230, -1240 monitors, ZCM-1490 monitor, Feb 89, p.63
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MEGARAM - $43 **Upgrades your H/Z150160 series** with up to 704K of main memory, and about 512K for RAMDRIVE memory. Includes documentation, software RAMDRIVE disk, PAL and jumper wire. For the full **1.2 megs total memory**, 45 256K DRAM chips are required.

EAZYRAM - $95 Upgrades EaZy PC from 512 to 640K

ZMF100 - $53 Will allow you to **upgrade your H/Z110/120** (old motherboards; with p/n less than 181-4918) **to 768K system RAM.** Requires 27 256K DRAM chips.

Z100MP - $76 Similar to ZMF100 above, but for new motherboards with p/n 181-4918 or greater.

Z159 EMS LOGIC UPGRADE includes the PAL chip, logic chips and one bank of 256K (9) chips. Up to two banks (18) can be installed for a total system RAM of 1.2 meg on the Z159 main board.
Z315-1 - $79!!

Z248/12, Z286LP RAM UPGRADE Z605-1 consists of 2MB SIMM 80ns RAM kits to upgrade your H/Z systems.
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PCW20 - $249 Complete MFM winchester setup for a H/Z150, 148, 158, 159, 160, PC etc. Includes **21 meg** formatted half-height Segate ST-125 37ms drive, WD (DTC for Z148) controller, cable set, doc.

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PCW40 - $319 42 meg with 28ms Segate ST-251-1.
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We also have the DTC controllers ($59) and daughter board expansions ($65) to place a hard drive in the **H/Z148** computers.

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ST-125 - $219 21 meg 37ms autopark 3.5" drive in 5" frame
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ST-2182 - $995 **160MB ESDI** half-height drive
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IDE hard drives and controllers for AT computers:
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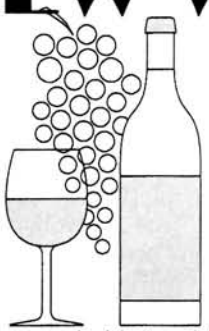

Upgrading Old Computers and Other Challenges

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LA JOLLA, CA 92037

Computer hobbyists fall into two groups. One group will always have the latest, most up to date equipment. The members of this group are never obsolete. The members of the second group are just the opposite. They will hold on to a piece of equipment as long as absolutely possible. Tweaking the maximum performance from a piece of equipment at the lowest possible cost is the main challenge. I belong to the second group. My Zenith Data Systems 151 computer has had so many "organ transplants" that it barely resembles its original self. A bottle of wine may improve with age and outlast the cork and the label, but more often the wine deteriorates first leaving behind a solid cork and a shiny label.

The older the computer, the greater the dilemma of whether investing more money makes sense. Certainly if you have a cheap clone with a clunky keyboard, spending the money on a replacement is the way to go. But I love my computer. I service it myself, the keyboard is great and, being a "hobbyist" I need an excuse to keep tinkering. I feel like a kid who takes pride in his old car, and who likes to put in new parts and keep it running like a top. In this article, I will describe low cost options for improving the colors on your RGB monitor, improving the capacity of your hard drive controller, speeding up your microprocessor and doing some simple networking.

EGA and RGB

I read a magazine article that described how you can get 16 color EGA graphics on your old RGB monitor just by replacing the CGA video card with an EGA video card. This I had to try. I have two Z-151 computers. I use one primarily for writing and it has already had its CGA video card replaced with a Hercules compatible video card. That computer connects to a high-res monochrome monitor. The original RGB monitor now connects to the other Z-151, which my kids use primarily for playing games. It seems that the kids only want to play computer games when I am doing my writing. The second computer allows for a more or less peaceful coexistence.

If all these acronyms, CGA, RGB and EGA sound like agencies of the federal bureaucracy, I will give some definitions. The original IBM PC had two choices of video display. You could have high resolution, black and white text (Monochrome Display Adapter or MDA) or you could have lower resolution color and graphics (Color Graphics Adapter or CGA). The CGA video card supported the RGB (Red, Green, Blue) video monitor. Hercules created a third standard that allowed for both high resolution text and graphics in monochrome (black and white).

Today's state of the art is tomorrow's obsolescence. IBM replaced the CGA with the Enhanced Graphics Adapter (EGA), which allowed for high resolution text and graphics in color, as well as black and white. The EGA video card required a *special* (translation: more expensive) "Enhanced RGB" monitor. One could easily spend $500 for a new EGA card and monitor. Of course, when everybody jumped on the EGA bandwagon, IBM came out with VGA and then super VGA. Each new development is followed by dramatic price decreases for the earlier products. EGA video cards are now a glut on the market and used ones are especially prevalent. I got my EGA card used for $45.00.

The developments in color monitors mean a lot if you are doing desktop publishing and Computer Aided Design and manufacturing. I don't need fancy colors for the work I do (mostly word-processing and database management), but I wanted better colors for my kids. My kids love to play "King's Quest," an adventure type of game. I like puzzles, but I don't like adventure games. For me, an adventure game means wandering around from screen to screen, trying to stay out of trouble and trying to figure out what some perverted programmer is thinking in the dark recesses of his twisted mind.

The kids like playing King's Quest and they like me to help them with it. Doing things together, especially using the computer, is special. When we played King's Quest using the CGA-RGB combination, we enjoyed pleasant but anemic colors. CGA only supports four colors, two of which are black and white. Resolution was poor and details were hard to make out. Replacing the CGA card with the EGA card was like a miracle. The dip switches on the EGA card were set to the CGA mode with gorgeous results. With the EGA card, the same monitor now showed 16 colors. Though the resolution was the same, the use of shading now provided much more detail in the pictures. The kids wanted to go back and start playing King's Quest all over just to see all the colors.

Other games from Sierra (the makers of King's Quest) showed similar improvement. The only other program that showed improvement in colors was Paintshow Plus, a drawing program that came bundled with my Logitech mouse. When I reinstalled the Paintshow Plus program using the EGA drivers provided, this program also burst into life. None of my other programs has shown any difference.

Was it worth it? Definitely. I now look forward to getting other programs with EGA drivers. Also, the kids will eventually be doing more writing and will appreciate better resolution. The dip switches on the EGA card can be set to emulate the Hercules standard and I can then connect a high-res monochrome monitor without having to buy another video card. Monochrome monitors are relatively inexpensive.

Disabling Video RAM. Replacing the video card in the Z-151 computer requires a special procedure and there are two options. The one I used in my first computer was to disable the video ram and leave the video card in place in

the computer. Zenith provides a kit, the ZCA-6, which is a replacement PROM that disables the video RAM on the video card while leaving the extra RAM enabled that the system needs for scratchpad memory. The new Hercules or EGA video card is installed in any vacant slot. I bought my ZCA-6 kit from a local electronics store for $25.00.

The other option is to install a video eliminator kit and remove the video card entirely. For my second computer, I used the VMM150 kit made by Dante Bencivengo in Poway, California. This kit provides a small PC board, which mounts to the CPU board in a piggy-back style, and a new address decoder. The installation took just a few minutes, and Dante provided a new back panel for the memory card so that it could be moved to the slot vacated by the video card. This freed up one (very precious) standard size slot. The list price for this kit was $55.00.

Another video eliminator kit is available from FBE Research Company in Seattle, Washington. I haven't tried this kit personally, but I have found other equipment from this company to be very reliable. FBE Research is a solid company with a good reputation.

Hard Drive Controllers

My 20 meg. hard drive came bundled with the popular Western Digital disk controller, WD1002S-WX2. When I upgraded to a 40 meg. hard drive I expected to pay another $70.00 for a new controller. I discovered, however, that Western Digital provides a ROM BIOS upgrade, the Super BIOS, for only $15.00. This chip supports the higher capacity drive and replaces the original ROM BIOS on the S-WX2 controller, as well as on the S-WX2A, the A-WX1, the -27X and the A-27X controller cards. The chip came with excellent documentation, and the installation was simple. Installation of the 40 meg. drive was equally easy.

Speed-Up Modification

Almost every issue of REMark Magazine has some type of article on performance improvement. Two issues that relate specifically to the Z-151 computer are June 1986 (H-150 Speed-up Modification, D. Bencivengo), and November 1989 (Installing the Intel Inboard 386/PC Into the Heath/Zenith-150, D. M. Caranci). No other topic generates as much heated discussion. Should you upgrade or replace? If you upgrade, what do you get for your money? How much is reasonable to spend? Personally, I've opted for upgrading as opposed to replacing, partly because I enjoy the process, partly because I think I save money this way, and partly because I think you can achieve quite satisfying results for most requirements.

The Bencivengo modification is currently available as TurboPlus V2.0 for $125.00. The Intel Inboard 386/PC can be found for under $575.00. Other types of upgrades are available and prices for new '386 computers continue to fall. I have the Intel Inboard 386/PC in one Z-151 computer and the TurboPlus in the other Z-151 computer. The Intel uses the 80386 CPU at 16 MHz. and the TurboPlus uses the NEC V-20 CPU at 7.4 MHz. (Crystals are also supplied for operation at 8 MHz. and at 6.8 MHz.) Each computer serves a different purpose and meets different needs. For my needs, I find each computer is perfect.

The computer with the TurboPlus is used primarily for games and for some writing. It also serves as a backup computer for troubleshooting problems. I save enormous amounts of time by being able to swap boards back and forth between the two computers. One unexpected benefit of the TurboPlus was that the optimum interleave for my hard drive changed from 1:5 to 1:4 at the higher speed. This plus a disk cache (using expanded memory from an Intel Above Board) gives an efficient, pleasant to use computer. Norton SI is 2.8 and PC Tools relative speed is 175%.

The other computer is used for more extensive writing and data base operations. With the Inboard, I can go back and forth instantly from the beginning to the end of long documents, and spelling checks are equally fast. The Inboard comes with one meg. of high speed 32-bit memory. 640K of that memory is used for system memory and 128K is used for internal operations. The remaining 256K is available as extended memory that I use for a high speed disk cache. The improvement in hard disk performance is amazing. The Norton SI is 16.9 and the PC Tools relative speed is 790%. As David Caranci pointed out in his REMark article, the Inboard does not support OS/2. If you expect to use OS/2, you must change computers. If you don't need OS/2, then the Inboard may be the answer for you, too.

Networking the '151

In the September 1989 issue of REMark, a letter from Professor Smetana described how he networked several of his computers together. I had picked up a second Z-151 computer from the National HUG Bargain Centre, and the idea of connecting them intrigued me. I never really understood networking. I knew it had something to do with "host" or "slave" or "server." I assumed that I was the slave using floppy disks to transfer files back and forth between the two computers. Tom Hart, the president of the San Diego HUG is a network specialist. He said that networking allowed for the direct transfer of files between computers without having to run back and forth with floppies. He also said that just being able to transfer files was not true networking. True networking allows more than one person to use the same computer simultaneously.

I felt challenged. Looking in the Zenith MS-DOS manual, I found a program called "ZCOM." ZCOM allows for the direct transfer of files between two computers using direct serial communications or modems. I bought a 10 foot "nul modem" cable that connects the serial port of one computer to the serial port of the other. Nul modem means that the pins from one serial port are not directly connected to the pins in the other computer in a straight through fashion. Some of the wires at one end of the cable are reversed. This is because some of the pins in a serial port are for "sending" signals and some of the pins are for "receiving" signals. Reversing certain wires insures that "send" signals from one computer will end up as "receive" signals by the other computer. (Figure 1).

I learned two new terms: "User Mode" and "Server Mode." The user mode computer is the one I am using. The server mode computer runs completely unattended. I can now transmit files back and forth between the two computers, but only from the one designated "user." The process is not interactive.

COMPUTER PIN #	MODEM PIN #
2	3
3	2
4	5
5	4
6	20
7	7
8	8
20	6

Figure 1

Using ZCOM. First, the ZCOM program must be loaded into each computer. Typing "ZCOM SERVER" on the unattended computer and "ZCOM" on the user computer (the parameter [/2] must be added if using the second serial port) gets things started. Next,

you must set the baud rate (the rate at which data will be transmitted). The command "SCAN" will check baud rates from 300 to 57600 on both computers, and on my system the baud rate was set to 2400. (Figure 2).

```
A>zcom

ZCOM Version 3.30.00
Copyright(C) 1986, Zenith
Data Systems Corporation

* scan
Baud rate set to   9600.
Baud rate set to   19200.
Baud rate set to   38400.
Baud rate set to   57600.
Baud rate set to   1200.
Baud rate set to   300.
Baud rate set to   2400.
Baud rate set to   4800.
Baud rate set to   600.
Baud rate set to   150.
Baud rate set to   110.
Scan unsuccessful. Baud rate
set to   2400.

*
```

Figure 2

Typing the command "BAUD" followed by a number will also set the baud rate. I did a little experimenting and found that baud rates of 57600 and 38400 do not work but a baud rate of 19200 works perfectly.

ZCOM is limited to five functions: changing the logged drive in the remote computer, changing the directory in the designated drive, listing the files in a directory, transmitting files and receiving files. Two other commands are "QUIT," which exits the program while leaving the server still active, and "ABORT" which exits the program on both computers. (Figure 3). I transferred some files back and forth between the two computers quite easily.

Communications Software. The communications software program that I use is Mirror III. The program's manual has a chapter on using Mirror to transfer files in a hard wire (direct connect) situation. I like using a communications program because it is interactive. Everything typed on one computer also appears on the screen of the other computer. I can easily send files back and forth between the two computers at 19200 baud using the XMODEM protocol. Also, the calling computer can control the answering computer remotely. A limited number of commands can be entered on the remote computer by preceding the command with a "Control-C." I prefer using Mirror to ZCOM because of the added power and flexibility.

Parallel Transfer. After reading Professor Smetana's letter I decided to try the program: "The Brooklyn Bridge, Parallel Version." I wanted to try this program particularly because I heard it allowed for the operation of a remote printer, as well as a remote computer. The program came with a six foot cable that connects a parallel port on one computer with a parallel port on the other. The six foot cable is much less convenient than the ten foot serial cable I was using. I like Brooklyn Bridge a lot, but I was disappointed in the remote printer feature, the very reason I bought the program in the first place.

The remote printer is designated as an "RPRN" device. Any program that can send output to a "PRN" device can access the remote printer. For instance, typing "COPY FILENAME RPRN" will redirect output to the remote printer. Unfortunately, most of my programs will only output to an "LPT" device, which renders this feature virtually useless.

The remaining Brooklyn Bridge features are wonderful. One computer has to be set up in advance as "remote." (It is easy to reset the computers in the other direction.) The remote computer then becomes an extension of the user's computer. My first computer has drives A through E. The remote computer automatically sets up as drives F, G, and H. I can log on to any of the eight drives, call up and run any program, and easily copy files back and forth using Copy or XCopy.

The manual states that communications take place at between 100,000 and 500,000 baud (depending on the CPU speed of the sending and receiving computers). My favorite trick is to use Fastback Plus to backup the hard drive on one computer onto the Kodak 6 meg. floppy drive I have on the other computer. It goes really fast. I love it. (I would say more about this wonderful floppy drive, but Kodak has unfortunately stopped selling it.)

I believe that this can legitimately be considered networking in a limited sense. It still does not allow for multi-users and the speed cannot compare to a true network. For file transfers I have come to prefer The Brooklyn Bridge. I guess I will just have to break down and get a second printer for the other computer.

I no longer feel bypassed with each new computer development. Zenith Data Systems is a quality machine with great flexibility and versatility. I am continually impressed by its ability to keep up with the times. Spending more money on the Z-151 has been a good investment for me.

```
ZCOM provides serial communications between two computers

Useage: ZCOM ?
        ZCOM [/2]
        ZCOM SERVER [/2][/m][/p]

One and only one computer must be running ZCOM SERVER.
The other computer is then used to perform any of the following
commands:

Receive <filespec>      =Receive files from server
Transmit <filespec>     =Send files to server
Files[<filespec>]       =Get list of files on server
Baud [<nnnn>]           =Set local and server baud rates
Scan                    =Scan common baud rates for server
Password                =Send password to server
Connect <string>        =Connect to modem, dial string
Disconnect              =Disconnect from modem
Quit                    =Terminate local (server stays active)
Abort                   =Terminate both local and server
LDrv [<pathname>]       =Print/Change server default drive
CDir [<drive>]          =Print/Change server default directory

*
```

Figure 3

Products Mentioned

King's Quest
Sierra On-Line Inc.
P.O. Box 485
Coarsegold, CA 93614

Dante Bencivengo
14772 Carlson St.
Poway, CA 92064
(619) 748-7041

FBE Research Company, Inc.
P.O. Box 68234
Seattle, WA 98168
(206) 246-9815

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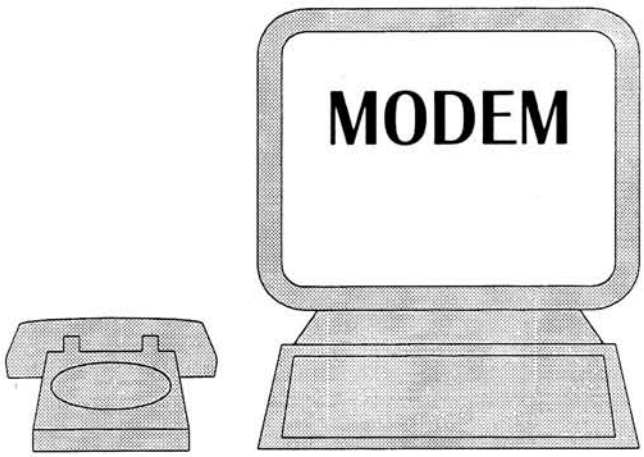

A Data Transfer Solution

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San Diego, CA. 92129

With the right modem, you can reach the world, but what's "the right modem." And, for that matter, just what is a modem? The world of modems is ripe with incompatibility, inconsistencies, and inaccuracies. This is the first in a series of articles that will educate you to the lure and limitations of the "modern" modem.

Modem ads shout "2400 baud, 9600 bps, V.32, MNP Class 5, Bell 212A, internal, Hayes compatible, asynchronous, half-duplex," and a myriad of other strange terms and expressions. In the following articles, you'll step through this subject, learn the language, and also learn how to make intelligent modem selection and purchasing choices.

A modem is a solution to a data transfer problem. The RS-232C serial and Centronics parallel data transfers between our computer and printers, scanners, display and graphics adapters, and so on have a finite data path length. To quickly send and receive information between cities, across the country, or around the world, we need another communication path. Ham radio works, but only a few users can participate simultaneously. Dedicated satellite and microwave comms work, but are too expensive for most users. The best existing long-distance communications media is the standard dial-up telephone system. There is a telephone near every desktop computer, and telephones reach almost every corner of our globe.

The telephone line can be two-wire (public dial-up, voice-grade), four-wire leased (dedicated 24-hours a day and conditioned), or a private twisted-pair wire (user-installed and limited to a mile in length). This is the media we use. But, how can we get the ASCII-based characters that we read on our screen and see printed out by our printer into a form that we can push through the telephone line?

The language of the computer is a language of digital ASCII. But the world of low-cost, long distance communications is a world of analog tones. The sending and receiving computers are digital, but the transmission media itself is analog. The telephone converts our voice into frequencies that are passed to another person through the telephone network.

As shown in Figure 1-1, although we can speak and hear sounds between 20 and 20,000 Hz, a telephone is limited to sounds in the 300 to 3400 Hz range (less if signal and line conditions deteriorate). This gives us a bandwidth of 3100 Hz within which we must represent and transfer digital data.

While we could send data as a form of Morse code — consisting of a series of long and short signal bursts, there are primarily just three variables that we can modify to send and receive binary computer information in analog form — amplitude, frequency, and phase.

We could turn on and off the amplitude of a single continuous frequency, and represent a logic 1 by the presence of a tone, and a logic 0 by the absence of a tone. However, to be recognized as a true off or on condition, this transmission rate must be restricted to half the maximum frequency, or about 1550 cycles per second (Hertz). Since we can push information out our computer at megahertz speed, 1.55 KHz is pretty slow. We could also vary the signal strength (amplitude) of a carrier frequency with certain amplitudes representing binary digits. Both of these techniques (on/off and varying signal strength) are forms of pulse amplitude modulation.

We could represent digital information using different frequencies. One frequency could represent a logic 1 and a different frequency could represent a logic 0. This technique is called frequency shift keying or just FSK. FSK is fine for slow-speed modems. Within the 3100 Hz bandwidth is a center point of 1850 Hz. We could define a frequency below 1850 Hz (1170 Hz) as one logic level and another above (2225 Hz) as the other logic level. This provides a wide guard band of unused frequencies to keep the logic levels separate and distinct. This also minimizes errors during transmission. We could also use one carrier frequency for originating a message and a separate carrier for receiving a message back. Our system could vary around each carrier to distinguish between 1s and 0s.

Finally, we could represent binary information by changing the phase of a carrier frequency in a method called phase shift keying (PSK). The binary 1s and 0s can

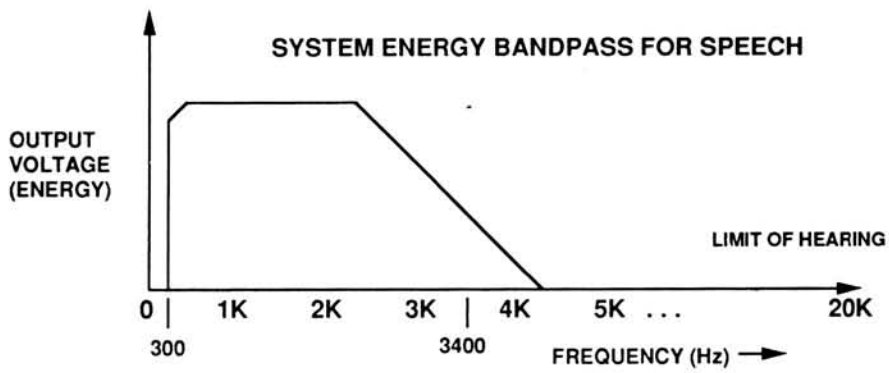


Figure 1-1 The energy range (bandpass) of intelligible speech.

be represented by sending data in phase-varying format. If two phases are used, the binary digits are represented by phases that are 180 degrees opposite. If four phases are used (90 degrees apart), we can represent four binary characters on the same carrier frequency.

The device that modulates data for transmission and then de-modulates it for computer receipt is called a modem (MOdulator-DEModulator). The interface between the computer and the modem is digital and relatively simple, but, between a sending modem and a receiving modem, the data format changes drastically.

AT&T designed the first modem. It transferred data using FSK modulation. To handle two-way communication, one end was designated the "originator" and the other the "answerer." The originator modem keyed discrete binary information about a 1170 Hz carrier, using 1070 Hz as a binary 0 and 1270 Hz as a binary 1. The answer modem responded around a carrier frequency of 2125 Hz using 2025 Hz to represent a binary 0 and 2225 Hz to represent a binary 1. AT&T called this the Bell 103 standard. The 1070 Hz and 2225 Hz upper and lower bounds provided plenty of unused frequency guard band between the upper and lower limits of the 300 – 3400 Hz passband. A guard band also isolates the originator and receiver channels. Guard bands improve frequency response when data is transferred over older telephone systems or during poor electrical conditions.

Data can be transferred a character at a time, or in blocks. In asynchronous communication, each seven- or eight-bit character is preceded by a start bit, and followed by one or two stop bits (one can be an error detection parity check bit). Thus each character is formatted into 10 or 11 bits before transfer. At the other end, the start, stop, and parity bits are stripped off leaving the seven or eight bits of the ASCII character. The two or three stop bits impose a 20-27 percent overhead on data transfer speed.

In synchronous communications, no start and stop bits are required. Instead, a series of synch bits are first sent to lock step (synch) the receiver to the sender. Then data is transferred continuously until an end of block character is sent marking the end of the data packet. This allows large blocks of data to pass without the overhead of individual character start and stop bits.

The movement of data over a line can be in one direction only, bi-directional with one end sending while the other listens, then the other sending while the first listens, or bi-directional with both ends sending and receiving simultaneously.

Simplex communications occurs if one end of the link only sends while the other end only receives. An analogy to one-direction-only simplex transfer is the way a computer sends data to a display or to a printer.

A duplex data transfer scheme lets both ends send and receive. Alternating two-way data transfer over a single telephone channel, like two people talking over CB radios, is called half duplex. Data can go in both directions, but in only one direction at a time.

Sending and receiving simultaneously, like talking with someone on the telephone, is called full duplex. Full duplex requires two frequency channels (within the same 3100 Hz bandwidth constraint).

If we need to know during transmission that what we sent, actually got to the destination, we can have the receiving device echo back. This echoplex technique lets you monitor on your computer screen what was actually received at the other end. You can visually see if a character was garbled or lost, or when the transfer rates are not matched.

The speed of information transfer through a telephone line (and across a cable) is measured in baud (for Emile Baudot, a pioneer in data communications). The term baud represents the number of times the signal changes each second. If the line condition (signal) is changed to indicate a logic 1 or 0, the baud rate is the same as bit rate (bits per second). However, if the signal rate remains constant, but the phase of the signal is varied to represent a binary value, the phase changes are now expressed in bits per second (bps), but the signal rate is measured in baud. Using PSK, you can transmit at 600 baud and achieve 2400 bps transfer rate. Clever variations of phase and amplitude modulation enable 4800 and 9600 bps data transfer rates at the same 600 baud carrier signal rate.

Slow speed modems are typically FSK machines. The guard bands they use limit the speed at which FSK data can be duplexed. A 300 bps rate requires a bandwidth of 600 Hz. For duplex operation, two 600 Hz channels are "shoehorned" into the available 3100 Hz telephone system bandwidth. This works fine, but the practical limit is approached as we double the transmission rate to 600 bps. Here we need 2400 Hz of active frequency plus guard bands. To send and receive faster, we need a different transmission scheme. Enter PSK.

The 1200 and 2400 bps modems combine both frequency and phase modulation. Phase modulation encodes the data as different states (phases) of a carrier signal. By using four 90 degree phase states (0, 90, 180, 270 degrees) the system achieves quadrature modulation (QM), in which four bit pairs (two bits to a state – 00, 01, 10, 11) can be represented in the same carrier. These bit pairs are called dibits. In telephone jargon we call these four conditions symbols. QM transfers two times the information at a 600 baud rate yielding an actual data rate of 1200 bps.

The modem could also produce 45 degree phase shifts for eight possible conditions. This three-bit representation (000, 001, 010, 011, 100, 101, 110, 111) effectively triples the data transfer rate. If the modem is designed to handle 16 discrete states (four bits to a state), we can send data at 2400 bps while operating at 600 baud full duplex, all within the bandwidth limitations of our telephone line. Because the line can handle 2400 baud, the eight-phase approach with three bits per symbol can easily achieve 4800 to 7200 bps transmission rates.

This requires close synchronization between sending and receiving modems to confirm binary state. Rather than assign a logic 1 or 0 to a phase, most PSK systems use a phase transition to indicate the opposite logic level (no change in phase repeats the same logic level). This is called differential phase shift keying (DPSK). DPSK systems usually scramble data to prevent a long string of 1s or 0s from hanging up the modem. The scrambler applies a mathematical polynomial to data to generate a relatively even distribution of 1s and 0s. At the receiving end, the same polynomial is applied to descramble the encoded data to recover the original information.

A technology step from DPSK uses two independent data streams X and Y to modulate two carriers of the same frequency separated in phase by 90 degrees. In this quadrature amplitude modulation (QAM) mode, both amplitude and phase are varied providing greater distance between states and hence more information to the demodulator for decoding the correct bit pattern. This 16-state (16-symbol) QAM system is used in most current high speed modems. In this modulation scheme, 600 four-bit symbols are transmitted every second. Each four-bit symbol is called a "quadbit."

At one time, 2400 bps was accepted as the maximum transfer speed for dial-up telephone lines. Today this limit has been extended to 20,000 bps. Above 20 Kbps, transfers must be digital. Actually, once transfer rates exceed 9600 bps, it's easy to jump to digital at 56 Kbps using a leased telephone line. For the majority of users, the development of the Integrated Services Digital Network (ISDN) for all-digital telephone circuits is expected to dominate high speed transfers on dial-up phone lines. Today, a digital leased line can provide 56 Kbps capability for less than $100 per month.

Table 1-1 describes the features of the common modem standards. Standards will be covered in the next article.

A number of design and noise interference factors affect the quality of modem transmission, and complex innovations have been developed to improve and

maintain data quality while increasing data transfer speed. In the next article, I'll describe line interference and how equalization and data compression work to keep data transmissions clean and error free. I'll also explain MNP, LAP-M, HST, and Trellis coding. And you'll read about the U.S. and international modem standards, how the modem hardware works, and how to decipher a modem data sheet. Stay connected.

NOTE: If you'd like a copy of the source reference for these articles, The Quick Guide to Modems can be purchased for $6 (plus sales tax) from Brenner Information Group, 13223 Black Mountain Rd., #430, San Diego, CA 92129.

SPEED (bps)	300	1200	2400	4800	9600
BELL STD.	103/113	202/212	201B,C	208A,B	209
CCITT STD.	V.21	V.22,V.23	V.26	V.27	V.29,V.32
MODULATION	FSK	FSK	PSK	PSK	QAM
DUPLEX	Full	Half,Full	Full	Half,Full	Half,Full
SYNCHRON.	Async	Async,Sync	Async	Sync	Sync

Table 1-1. Characteristics of the common modem standards used with PCs.

Continued from Page 13

REMark Magazine
Heath Users' Group
P. O. Box 217
Benton Harbor, MI 49022-0217
(616) 982-3463
(616) 982-3956 (BBS)

Western Digital Corporation
2445 McCabe Way
Irvine, CA 92714
(800) 847-6171
(800) 777 4787 (Tech. Support)

Intel Corporation
5200 NE Elam Parkway
Hillsboro, OR 97124
(800) 538-3373

Zenith Data Systems
St. Joseph, MI 49085
(800) 842-9000 (ZDS Service Center)

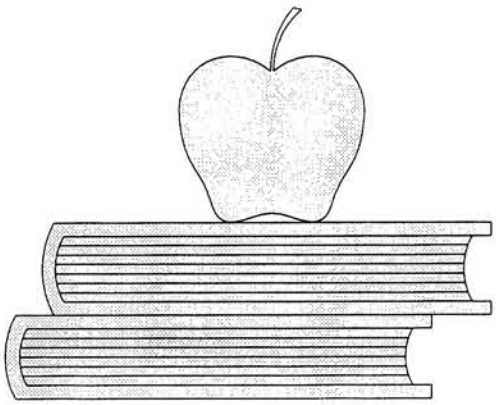
The Brooklyn Bridge
Fifth Generation Systems
11200 Industrial Blvd.
Baton Rouge, LA 70809
(504) 291-7283 (Tech. Support)
(504) 291-7221 (Customer Service)

Mirror III
Softklone Distribution Corp.
327 Office Plaza Drive
Tallahassee, FL 32301
(904) 878-8564

Introduction To C++

First Installment

Lynwood H. Wilson
2160 James Canyon
Boulder, CO 80302



Introduction

This is the first of a series of articles on C++. In these articles I will present a tutorial on the language and some ideas on how it may best be used. I will assume that you have experience with some block structured language such as C or Pascal, but I will not assume you are familiar with C. I will teach a bit of old C along with the C++.

I am currently using the Zortech V2.0 compiler which corresponds to Release 2 of C++, but if you have another compiler you should not have any difficulty with my code. Please let me know if I am wrong about this. Later I will discuss some of the features of Release 2 of C++ which a Release 1 compiler will not know.

You may find this tutorial a bit different than others you have read. I am documenting my own study of C++ here. I am learning the language as I teach it to you and I am at most one class ahead of you. I expect this will have several results.

- One is that I may make mistakes. Of course I might anyway, and this way I will be less reluctant to admit and correct them.
- Another likely result is that I will be able to better guide you through the difficulties of the learning process since I will be experiencing them along with you. Object Oriented Programming requires a major change in our thinking which I think can be better communicated as a process than as a finished product.
- Still another is that this approach should prevent me from slipping into a boring scholarly tone. After all, you know I don't know much more than you do at any particular time so I can't act too superior.

Please let me know how this is working for you, and what I can do to improve. I will answer all letters that include a stamped self addressed envelope, and your questions and comments will help guide my future articles.

The first article will introduce the language and Object Oriented Programming, give a bit of the history of each, and place them in the context of programming languages and paradigms. Then I will present a few simple programs.

Why C++?

C++ seems likely to be the most important computer language of the next decade.

The computer magazines and books have been full of the advantages of Object Oriented Programing (OOP) for some time now. It looks like it will be as big a step forward as the Structured Programming was a few years ago. And in a similar way. Structured Programming taught us a new way of relating the problem and the solution, a new way of getting from the problem to the program. OOP offers yet another way of translating a problem into a program. It won't replace Structured Programming, but it will give us another kind of structure to use.

They tell us that OOP will help us to manage the increasing complexity of our programs, will simplify program design, and will make it easier for us to reuse old code in new programs. And the Object Oriented Language which is most often mentioned in the articles is C++.

C is the most popular applications language for microcomputers today. C++ is a superset of C with the capability for Object Oriented Programming added, along with other enhancements. The large population of C programmers will find it an easier transition than learning a completely new language.

Why Now?

Up until now there have been plenty of reasons (or excuses) not to learn C++.

- There is no standard.
- The language is changing too fast.
- There aren't any good books.
- None of the major players has a C++ compiler.
- There is no market for C++ programmers.
- Even if you already know C, the Object Oriented part, the paradigm, will take some learning. This is a different approach to programming, after all.

Most of these reasons are no longer valid. The rate of change seems to be slowing. AT&T has recently collected the changes to date into Release 2 of C++. (There is an even more recent Release 2.1, but the differences are minor.) There are some good new books. Zortech has an excellent compiler complete with good manuals, a debugger and other tools. Borland, surely a major player, just (June 1990) released Turbo C++, which conforms to AT&T's 2.0 standard. And I have recently seen three advertisements for C++ programmers in the local paper (Boulder, Colorado). Admittedly learning a new paradigm takes some effort, but this one seems worth it.

I decided that C++ would be my next language some time ago, but I'd been putting it off for most of the above reasons. I had "The C++ Programming Language" by Bjarne Stroustrup, the author of the language, but I found it difficult reading. And I didn't have a compiler. I told myself I would buy a C++ compiler as soon as Microsoft or Borland released one. After all, hardly anyone is going to commit a major project to a language which is not supported by the big guys. Then Microsoft released V6.0 of their C compiler.

I was surprised and disappointed that it wasn't C++. (I suspect Microsoft was too.) So instead of ordering the 6.0 upgrade to my Microsoft V5.1 C compiler, I ordered C++ from Zortech. I figured that Microsoft wasn't going to have C++ for a while, and I don't like Turbo C quite as well, so I took a chance on Zortech. It had been very well reviewed and most of the authors of C++ articles in the magazines used it. And Computer Language Magazine picked it as the best C compiler in their annual C issue. Their position was that it compiled C as well as the rest, and did C++ too.

It was the right decision.

Resources

If you are thinking of buying a C++ compiler, Byte Magazine for July 1990 had a review of the Zortech compiler and a peek at the Borland Turbo C++ compiler, and Computer Language Magazine for May 1990 reviewed the major C compilers including Zortech C++. I haven't seen Turbo C++ yet, but I am sure it is as good as there other products. I have been using the Zortech compiler and I like it very well.

I think it's worth the money to buy the complete system with the debugger and the tools, rather than just the compiler. The debugger is very useful in the learning process and the tools contain a lot of example code. The library source code also has useful examples. But if you have more time than money, you can certainly learn it all with just the compiler.

Here are my favorite C++ books. I recommend that you get them all. They each present the information in a different way with a different emphasis, and they all are very useful.

The C++ Programming Language by Bjarne Stroustrup, Addison-Wesley, 1986. This book has some good information, and after all he developed the language, but I find it difficult to read. I would wait for the next edition, which will probably cover Version 2.

C++ Primer by Stanley B. Lippman, Addison-Wesley, 1989. An excellent textbook, although a bit dry, and it includes Version 2. If you like the academic style, this is a good one.

Using C++ by Bruce Eckel, Osborne McGraw Hill, 1989. Some of you may know Mr. Eckel from the late & lamented Micro Cornucopia magazine. He is good, and so is this book. It is the most accessible book I know on C++. It is mostly based on Version 1, but has a good appendix on V2. Highly recommended. My favorite.

Object Oriented Program Design by Mark Mullen, Addison-Wesley, 1989. You will not get the full benefit from OOP until you use it in the design of your systems as well as the programing. This book is oriented toward business programming, but will be useful to all. It follows the design of a major program from the beginning, in detail. Highly recommended. Probably best left until you have some command of the language.

I would like to hear your opinions of these and other books, so I can pass them along.

Before I start into the language itself, I'd like to talk a bit about history and background.

Introduction to C

C was written by Dennis Ritchie at Bell Labs in the mid 1970s. It is a systems language, which means it is intended to be used to write systems software such as compilers and operating systems. Mr. Ritchie did the early work on slow computers with little memory (by our standards), using a teletype machine for a terminal. This explains a lot about the way the language turned out.

- C is terse, using odd characters where other languages use words.
- C is small, giving the programmer relatively few basic constructs from which he may build whatever he needs. For example, C has no input or output capability in the core language. All I/O is done with library functions.
- C is expressive and responsive. It is like riding a motorcycle with all the freedom and wind in the face and the attendant risk. Other languages seem more like driving a Buick. It may get you there, and safely, but the act of driving is not much fun.
- C has a unity, an internal consistency which seems to come from being written by one man rather than a committee.
- C is easy to write a compiler for and easy to port to a new processor.
- C allows the programmer to work close to the hardware, to control the computer at a very low level in ways that most high level languages do not. You can do things in C which would otherwise require assembly language.

But C is not your friend. It does not offer the help with errors that some other languages such as Pascal do. It does exactly as it is told, no matter how foolish. And I think this accounts in part for its popularity. It is perceived as a difficult language, a language for professionals only. A real hacker's language, if you will. But even pros occasionally make mistakes and need help. The modern debuggers help a great deal, but with the memory and processor speed available today it makes sense for a language to be a bit more friendly.

Introduction to OOP

The first object oriented language was Simula. It descended from ALGOL as did C and Pascal. Simula was designed for writing simulations, and that's all anyone seems to know about it anymore. But when Alan Kay at the Xerox Palo Alto Research Center (Xerox PARC) set out to design a graphics based language for non-programmers, he drew ideas from Simula and LOGO (a language similar to LISP).

The language which grew out of this work at Xerox PARC was Smalltalk which is the best example of a pure object oriented language today. You don't hear much anymore about Smalltalk being for non-programmers, but it has been used to write interesting and useful programs. I have never used Smalltalk, but according to those who have it can be a bit difficult to break your old habits and switch into this new mode. It seems to require a major mental shift. It has also been said that this is the best way to get into OOP, since you are forced to embrace it completely before you can do anything. Unfortunately there seems to be little chance that Smalltalk will ever become a mainstream language, so I would not recommend it unless you just like learning languages. If you do like learning languages (as I do) I understand that Digitalk's Smalltalk products for the PC are very good and reasonably priced.

And then from Bjarne Stroustrup at Bell Labs, the home of C, comes an Object Oriented version of C called C++. At a stroke most of the barriers are down. C++ is a superset of C, so for most of us its not really like learning a new language. C++ was written by an applications programmer to help solve a real programming problem, not by academics to prove a point. And the boys at AT&T are writing real programs in it. C++ is the first object oriented language in overalls with a hammer in its hand. Ready to go to work.

What is OOP?

There are as many definitions of Object Oriented Programing as there are of Structured Programming. I will try to give you an idea here and discuss the ideas further as we learn to use the language.

OOP is based on packaging code with the data it operates on in a construct called an object. An object may be defined from scratch, or it may be a modification of an existing object in which case it inherits characteristics from its parent which may in turn inherit characteristics from its parent. This allows the details of the data structure to be hidden from the rest of the program in a very neat way. Thus the data structure may be changed (along with its encapsulated code) without affecting the rest of the program.

OOP has a considerable effect on the way you think of the programming process. Programs seem to be easier to design and write and debug.

The use of OOP should affect the design process and the analysis as well. Begin thinking of objects from the very beginning.

The first decision in the design process should be the selection of objects. The selection of artifacts from the real world of the problem to be represented as objects in the program. The way the object data is represented in the program may readily be changed later, but the objects themselves, the things represented by objects, cannot.

More on this later.

C++ (At Last)

C++ is a descendent of traditional C.

C++ is a superset of ANSII standard C. There are a few very minor exceptions which we will ignore for the time being.

C++ is one of the ancestors of ANSII C. Several features such as function prototyping first appeared in C++ and were later incorporated into the ANSII C stan-

dard.

C++ is C with extensions for Object Oriented Programming. It also has other extensions of various kinds. Many of the advantages of C++ have nothing to do with OOP.

I plan to ignore all that and treat C++ like the new language it is.

Even though C++ is a different language, you should eventually get and study "The C Programming Language" by Kernighan and Ritchie. This is one of the best computer books I have ever read, and it can teach you a lot about the C part of C++ and programming in general. Make sure you get the second edition, which covers ANSII standard C.

HELLO

Now we will write a simple program to make sure the system works, and to begin our exploration of C++. In order to do that, create a plain ASCII file named HELLO.CPP which consists of the following:

```
//HELLO.CPP  a simple program
#include <stream.hp>p// stream
                        declarations
main()
{
   cout << "Hi yourself.";
}
```

and do whatever your system requires to compile it. The Zortech compiler would be invoked with the command ZTC HELLO to compile a file named HELLO.CPP. It will then compile the file named HELLO.CPP and write an object file named HELLO.OBJ. Then it will link the object file with the necessary code from the libraries and create an executable file called HELLO.EXE. Your system may vary.

In C, source files (the text of the program which you compile into the executable program) are expected to have the extension C, such as HELLO.C. In C++, source files are expected to be of type CPP or CXX, such as HELLO.CPP. I use CPP, since that is what my Zortech compiler uses.

In any case, after compiling and linking your program, run it by entering the command HELLO in the directory where the HELLO.EXE file is and it should write to the screen "Hi yourself.". (Without the quotes.) Congratulations. You have written a C++ program. Take a break, have a smoke/cup of coffee/can of Jolt. It's coffee for me. Back in a minute...

Now let's look at that program and see what's what.

Comments

The first line is a comment. It's just for us, the compiler ignores it completely. Anything from two slashes (//) to the end of the line is a comment. Note that you can combine comments and program code, as in this line:

```
#include <stream.hpp>// stream
                        declarations
```

In this case the first part of the line is program code and the text following the "//" is a comment and is ignored by the compiler.

There is another way to indicate that something is a comment. That is by enclosing it in a combination of slashes and asterisks like this:

```
main()/* HELLO.CPP a simple program */
```

This method of indicating a comment does not end at the end of the line but can extend over many lines and must be terminated by "*/". This is the original C method of indicating comments. Comments of this kind may not be nested.

This is illegal:

```
/* /* HELLO.CPP */ a simple program */
```

This is legal, although potentially confusing:

```
// HELLO.CPP // foolish
```

Headers and the Preprocessor

The second line of the program:

```
#include <stream.hpp>// stream
                        declarations
```

is a message to the preprocessor. The preprocessor is part of the compiler and does its work before the code is actually compiled. It responds to any line which begins with a "#", and can do many other things which we will see later. When invoked with "#include" it finds the file named inside the angle brackets and inserts that file into the program in place of the line which called it. The file can be anything which you want to put into your code, and is often called a header. Headers can be #INCLUDEd in several files if needed. In this case the file STREAM.HPP will be inserted in place of the line

```
#include <stream.hpp>// stream
                        declarations
```

Because the file name is in angle brackets, the preprocessor will look first in the directory where the header files that came with your compiler are kept. This directory is usually called INCLUDE. If you should want to use the preprocessor to include a file of yours which is in the same directory as your code, enclose the filename in quotes.

```
#include "myheader.hpp"
```

The filenames must follow MS-DOS conventions, of course. And there are some other conventions for header names too. C header files usually have an extension (file type) of H, such as STDIO.H. C++ header files conventionally have an extension of HPP or HXX (since MS-DOS will not accept H++). I will use HPP here, since that is the Zortech convention.

STREAM.HPP is a header file from Zortech which contains the declarations for the stream input and output routines. It is stored in the INCLUDE directory. I will go further into streams in a later article.

`main()`

C++ and C programs are made up of functions. A word with parentheses after it, such as MAIN() above, is the name of a function. Every program must have a function called main. When the program is run, execution begins at the beginning of the main function. When the last line of the main function is executed, the program ends.

C and C++ are case sensitive. main is not the same as MAIN which is not the same as Main. It is a convention to reserve upper case in programs for constants and a few other cases which we will see as we get to them. Most of the program is in lower case. In my text I will use upper case to identify something from the program, even though it is actually in lower case in the program.

{}

The curly braces, { and }, indicate the beginning and end of a block of code. They are similar to BEGIN and END in Pascal. In this case they indicate the beginning and end of the body of the MAIN() function, which is also the beginning and end of the program.

```
cout << "Hi yourself.";
```

This line is the body of the program.

COUT, a sort of a variable, is an object of the class STREAM. Both COUT and STREAM are defined in the header file STREAM.HPP. COUT will accept data and send it on to the standard output, normally the screen.

I will explain how to define classes and create objects soon. For the moment, we are just learning how to use objects which are defined as part of the standard library for the language.

The operator <<, when used with streams, means "Send the stuff on the right to the thing on the left."

"Hi yourself." is a literal character string. The quotes around it tell the compiler that it is a literal character string, rather than a variable to be interpreted.

So the character string is sent unchanged to the stream COUT which sends it to the screen.

The semicolon (;) is the statement terminator. Each statement in C or C++ must end with a semicolon. Our program only contains one statement.

Format

The compiler does not notice white space, tabs, spaces, carriage returns and such, so you can use white space in your program to make it easier to read. There are conventions and customs in C and C++ which I will explain as we get to them. I will not try to tell all about readability and the format of programs, since I expect you already have a style of your own. I will try to write clear readable code, but I will use fewer comments than I normally would since much of the article is explanations of the code.

I indent the program code in this article to make it stand out from the text. Normally you would start your program in the first column, without indenting.

Old C

This is the same program written in ANSII C. It should compile and run under the C++ compiler as well.

```
/* HELLO.C     a simple program
*/
#include <stdio.h>/* I/O function
declarations */
main()
{
   printf("Hi yourself.");
}
```

Note the differences in comments.

PRINTF() is a function which sends whatever is in the parentheses to standard output which is normally connected to the screen. It is less efficient than using a stream and can be quite cumbersome. I include it here because you will likely want to read or write some C code someday, and printf() is the most common output function in C.

The End

That's all for this month. If you get bored waiting for the next installment, you might try changing our simple program in various ways and re-compiling it. You will learn more about the language, and you will become more familiar with the error messages. One of the important parts of learning a new language or a new compiler is learning what the error messages really mean. For example if you omit the final curly brace you will get an error message which says "Premature end of source file." If you think of it from the point of view of the compiler, you will see that it got to the end of the file before it got to the end of the program so it seems reasonable. Some of the error messages make a lot less sense than that.

Sources

Zortech C++ compiler$199.95
Zortech Developer's Edition$450.00
Zortech Inc.
4-C Gill St.
Woburn, MA 01801
1-800-848-8408

Turbo C++ compiler$199.95
Turbo C++ Professional$299.95
Borland International Inc.
1800 Green Hills Rd.
P.O. Box 660001
Scotts Valley, CA 95066-0001
1-800-331-0877

The C++ Programming Language
by Bjarne Stroustrup
Addison-Wesley, 1986

C++ Primer
by Stanley B. Lippman
Addison-Wesley, 1989

Using C++
by Bruce Eckel
Osborne McGraw Hill, 1989

Object Oriented Program Design
by Mark Mullen
Addison-Wesley, 1989

Smalltalk/V $99.95
Smalltalk/V 286$199.95
Smalltalk/V MAC$199.95
Smalltalk/V PM$499.95
Digitalk Inc.
9841 Airport Blvd.
Los Angeles, CA 90045
1-800-922-8255

*

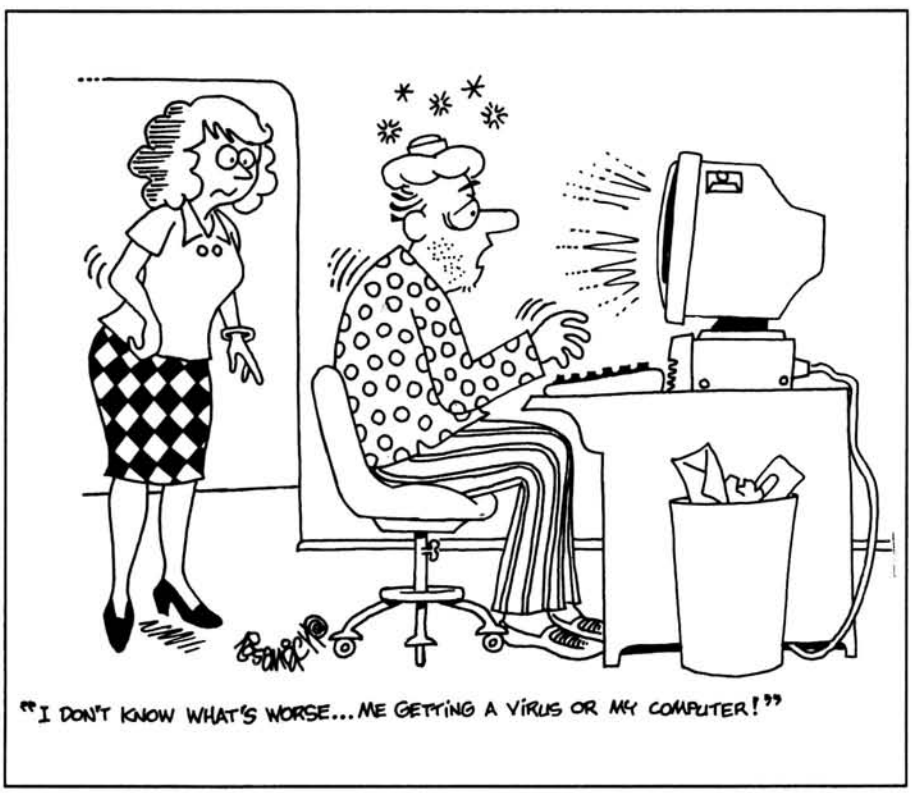
Lynwood H. Wilson

I am a free-lance programmer, teacher and technical writer with a hardware background. My favorite languages are C and LISP, though I like C++more and more as I learn it.

I read heavily, computer magazines and books, since I feel that the breadth of my knowledge and experience is one of the main things I have to

sell. I try to be a generalist, and keep up with as much of the field as I can.

My current research interest is genetic algorithms and artificial life. I am working on a computer simulation of the evolution of behavior in simple organisms. This is written in C++, of course.



Getting Started With...

DOS Shells

Alan Neibauer
11138 Hendrix Str.
Philadelphia, PA. 19116

One of the most frustrating sights is the message *bad command* or *file name* on the screen when you are sure you typed the program name correctly. You check the file name, then start searching through your directories to locate the program you want to execute.There are numerous techniques to help navigate the DOS directory structure. One way is to use the Path command in your AUTOEXEC batch file, such as **PATH=C:\DOS;C:\WORD;.**

This way you can access executable programs in subdirectories without having to log onto them first with the CD or CHDIR command.

You can also substitute drive letters for complex paths, such as **SUBST E: C:\WP51.** With this command, you can log on to your WordPerfect directory by entering **E:** instead of **CD\WP51.**

While both techniques can help overcome the inconveniences of DOS, they have their drawbacks. The path command, for example, lets you access program files but not necessarily data files.

For example, suppose you have Microsoft WORD and your document files in a directory called WORD. The path command PATH=C:\WORD will allow you to execute the word processor from any directory on your disk. If you are in the root directory, just enter WORD. But when you try to recall a document file, the program will look for DOC files in the root directory, or whatever directory you executed the program from. You would have to enter the full path when recalling a document from within Word itself, not a real time saver.

You won't have this same problem using the SUBST command, but you have to include the command in your AUTOEXEC file, remember which substitutions you've made, and still have to log into it to access your files.

Of course, you could also write custom batch files to change directories and run applications. For example, you can create a batch file called LOTUS that contains these commands

```
cd\lotus
LOTUS
```

to change to the correct directory and execute the program. With a similar batch file for all of your applications, you wouldn't have to worry about changing directories or using a path command. But just think of the overhead. Even if you created one gigantic batch file that lets you select options, you'd still have to copy the file to each of your directories. This way, you'd have access to it no matter where you are on the disk.

These and other inconveniences of working with DOS are created by DOS's limited user interface where all you see on the screen is the A or C prompt.

To overcome these problems, DOS Shells are programs that provide a new interface between you and the operating system. Think of the DOS Shell is an intermediary, a guide that leads you through all of the DOS functions, and some that DOS left out, using as few keystrokes as possible.

Most shells are TSR (terminal and stay resident) programs. TSR programs remain in your computer's memory and stay active while you work on another application. When you need the services of the shell, you press a **hot key** — a special combinations of keys — that *pops* the shell into view and into action. When you're ready to return to an application, you *collapse* the TSR, hiding it in your system's memory until you call it up again.

There are a number of DOS shell programs. While each provides its own array of features, and methods, there are some standard features for which DOS shells have become known. In this article, we'll look at DOS Shell features using Norton Commander as an example. Norton Com-

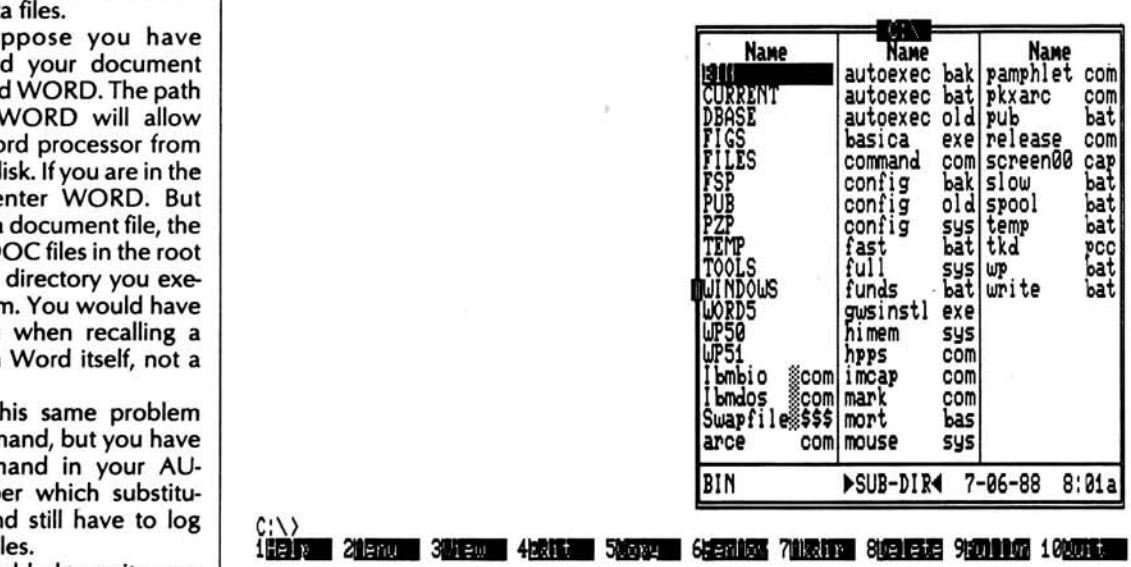


Figure 1

mander is from the same folks that brought us the ubiquitous Norton Utilities. While the Utilities are a general purpose set of programs for improving and protecting your system, Norton Commander is dedicated to your everyday work with DOS and your computer.

Starting Norton Commander

Norton Commander's installation routine creates the NC directory, copies all of the files from the floppy disk, and adds the directory to the PATH command in AUTOEXEC.BAT. After the installation, just enter NC from any directory to display a screen similar to Figure 1. The file listing of the currently logged directory is on the right, the tasks assigned to the function keys shown along the bottom.

You can change the contents of the window on the right, and display an additional window on the left by using Window's-like pull-down menus. Press the F9 function to display the options Left, Files, Commands Options, and Right along the top of the screen. These options let you customize Norton Commander for your own preferences.

Even with Norton Commander running, the DOS prompt near the bottom of the screen is still active. If you want, you can use it to bypass the shell and enter DOS commands manually. Since the shell improves so much on the standard DOS interface, you'll be likely to ignore the DOS prompt in favor of Norton Commander functions. But the prompt is handy for entering commands that require parameters or other options not available through the shell. In a sense, this gives you the best of both worlds — the DOS shell plus complete access to DOS through the normal interface.

Directory Management

One outstanding feature of DOS shells is their ability to graphically display the directory structure of a floppy or hard disk. Figure 2, for example, shows Norton Commander with a directory tree diagram in the left window. The diagram lists all directories and subdirectories on your disk as well as the relationships between them. Using the tree diagram, you can quickly determine the paths to subdirectories and locate the most likely directory holding the file you want to access.

The right window shows the files contained in the directory highlighted in the tree. When you move the highlight in the tree from directory to directory, the file listing automatically changes to that of the highlighted directory. So you can look through your disk without using the CD command or trying to enter long and complex paths. When you move the highlight to a file, the shell performs the CD/ and DIR commands for you.

The process of performing commands by simply moving a highlight is called point-and-shoot. You perform some commands by pointing to a directory or file name by moving the highlight with the arrow keys. Other commands are performed by first highlighting the file, then pressing a single key, such as Enter or a function key.

Point-and-shoot methods save you from remembering DOS commands and their syntax. For instance, suppose you wanted to log onto a subdirectory and display its directory using regular DOS commands. The sequence of keystrokes might appear like this

```
CD/WP51/REPORTS/BUDGET/1991
DIR
```

Using point-and-shoot with the tree diagram, you'd have to only move the highlight to the 1991 subdirectory on the screen. Of course, the power of point-and-shoot goes beyond listing directories.

Not only can you change and delete directories easily, but you can rename them. Renaming a directory with DOS can be a time-consuming. For example, here are the DOS steps to rename the directory \BIN to \DOS

```
md\DOS Enter
cd\BIN Enter
COPY *.* c:\DOS Enter
DEL *.* Enter
Y Enter
cd\ Enter
rd\BIN Enter
```

Since DOS does not have a directory rename command, you have to create the new directory, copy all of the files to it, then delete the original files and the directory. Of course, you need enough room on your disk to temporarily store two complete sets of the same files.

Using a DOS shell, like Norton Commander, you simply give the existing directory a new name, in the same way you rename a file. The files themselves are never moved, just their associated directory name is changed. Not only in this faster than using DOS, but it cuts down sharply on your drive's overhead. You don't need any additional disk space to store the duplicate files and there won't be any further file fragmentation.

DOS Shells also typically provide the graft function. This allows you to move a subdirectory and all of its files from one branch of the tree to another.

File Management

Once you've identified the correct directory, you can use point-and-shoot methods to manipulate individual or groups of files. You can, for example, copy, delete, rename, or move a file to another disk or directory by just pointing to its name on the screen and pressing a function key.

To erase a file with Norton Commander, for instance, display the directory containing the file, press the up or down arrow key to highlight its name in the directory listing, then press the F8 function key to select ERASE from the bottom command line.

DOS shells often provide new functions that aren't available in DOS. The move command copies a file to another location and deletes the original in one step. Moving a file with DOS is a two-step process — you have to first copy the file to a new disk or directory, then delete it from its original location. Norton Commander, like other shells, will copy and delete the file for you.

While using the directory tree to locate

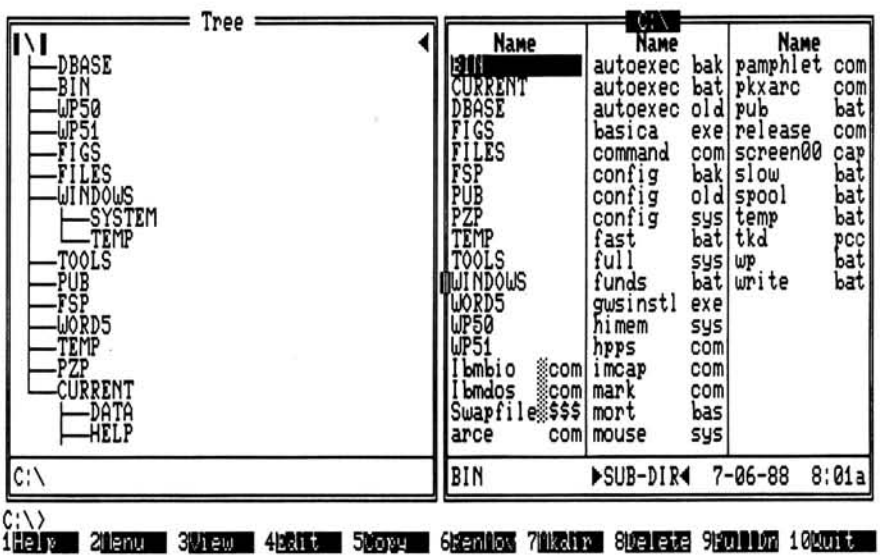


Figure 2

files is as easy as point-and-shoot, you can locate a file even faster using the *find* command. When you enter the name of the file you are searching for (you can use wildcards to locate groups of files), the shell searches all of your directories, lists the file on the screen, then lets you change to the directory in a single keystroke.

In addition to using wildcards, shells let you tag files in the point-and-shoot display – designating groups of files that you want to copy, erase, rename, or move at one time. This is more useful than wildcards, for instance, when you want to manipulate files that do not have a name or extension in common. With Norton Commander, you tag a file by highlighting its name then pressing the INS key. The next file command you select acts on all of the tagged files.

The *edit* command will display the highlighted file in a built-in mini-word processor, making it easy to modify files such as AUTOEXEC.BAT or CONFIG.SYS. You can even use your own word processing program, automatically running WordPerfect or WORD, for example, using the highlighted file.

By the way, you can customize the directory listing itself using the pull-down menus. These allow you to sort the listing, display them in their short or long form (complete with file size and date), or filter the listing to include specific files using wildcards.

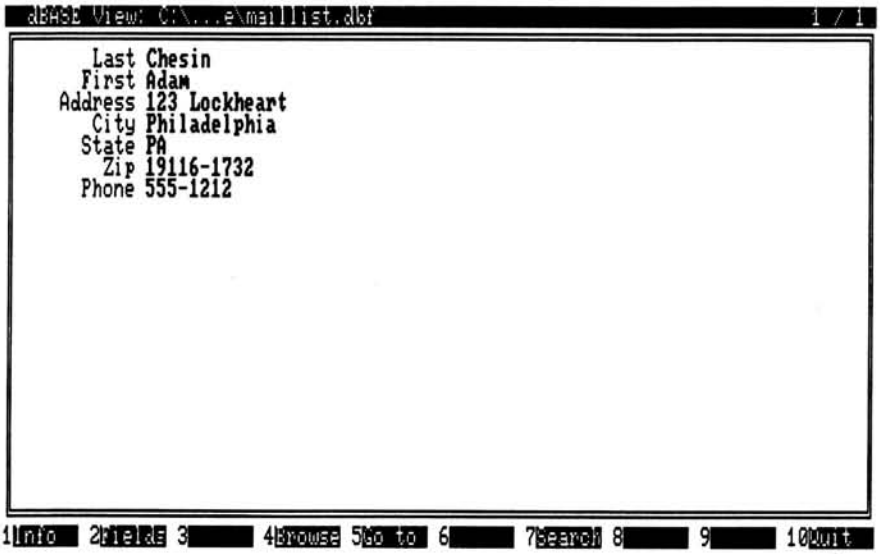


Figure 3

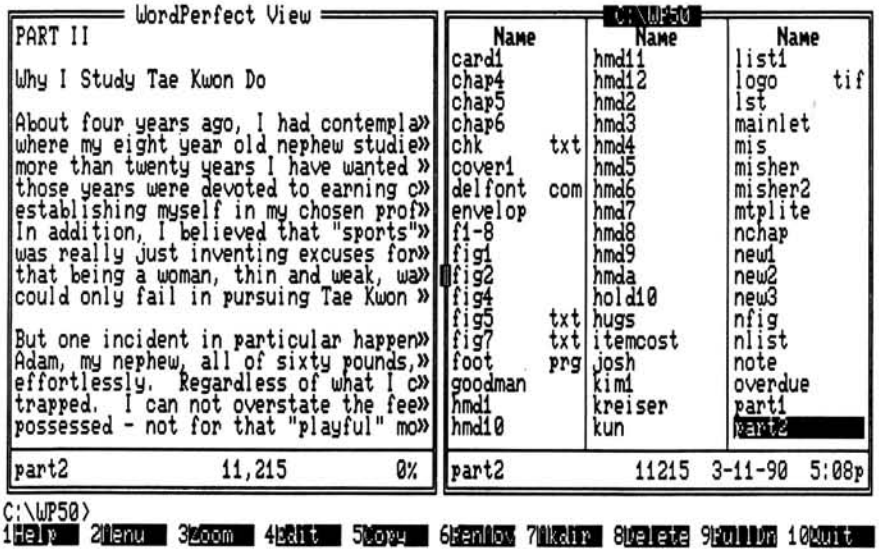


Figure 4

File Viewing

The DOS TYPE command lets you view the contents of a file as long as it is in ASCII format. You get nonsense characters and symbols when you try to display a file with control codes.

Using a file viewer, the DOS shell displays application files as ASCII text, ignoring formatting and other codes that would garble the display. Viewing lets you quickly review the contents of a file from the directory listing so you make sure you have the proper file highlighted before taking any action on it.

Norton Commander, for example, has a powerful view command that can display files from a wide range of programs, including 8 databases, 9 spreadsheets, 9 word processing programs, and graphic files in the PCX format.

Figure 3 shows the view screen for a Dbase data file. The viewer even displays the file names along the left of the window and allows you to scroll from record to record in the database, allowing you to read the data file without having to run Dbase itself.

You can also split the screen into two windows, the directory list on one side and a view window on the other. As you point to a file in the directory list, its contents automatically appear in the view window, as shown in Figure 4.

Several shells, unfortunately, are limited in the number of viewers they have available; some only display ASCII files, for example. If you use many application programs, look for a DOS shell with more file viewers.

Running Applications

Having the shell loaded does not mean you can't run another program. When you execute, or launch, one of your applications, the shell temporarily hides itself in memory until you call it up again.

Some shells use a point-and-shoot method from the directory listing, others display the DOS prompt line. With Norton Commander, highlight the name of the file you want to run then press Enter. When you exit the application, Norton Command will come back into view.

Making Your Own Menus

When you primarily use your computer for running just a few applications you might not want to be bothered with the full directory listing. Many DOS Shells let you create custom point-and-shoot menus that list just selected applications.

Some shell programs, such as Bourbaki's 1dir+, let you customize their own command line to run your favorite

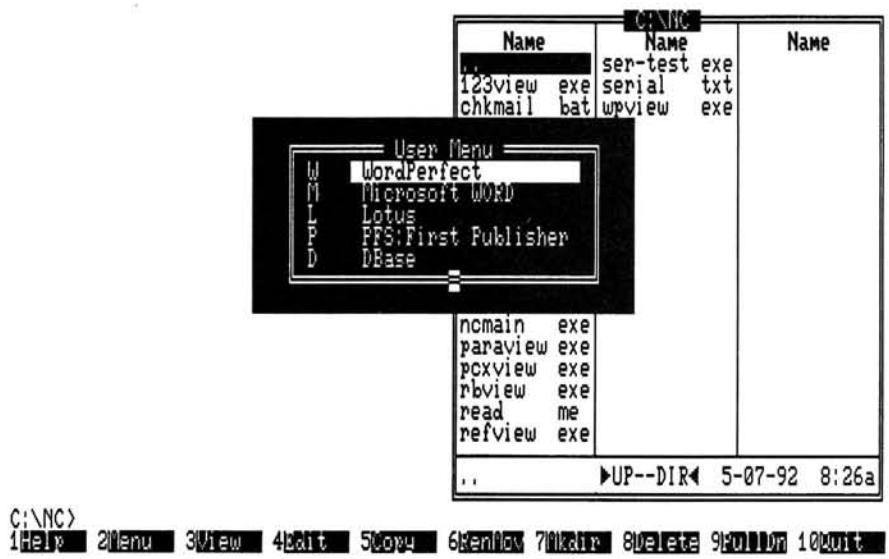


Figure 5

applications with the press of a function key. Press one of the function keys to run an application or DOS command without having to locate the directory listing and point-and-shoot.

Other DOS shells let you create custom menus that are not associated with the function keys. User menus in Norton Commander, for instance, use a single letter to activate an application (Figure 5).

User menus reduce required keystrokes to a minimum, and are perfect when you're setting up a computer system for a novice.

As I mentioned earlier, each DOS shell provides its own range of features and functions. PC Tools, for example, provides desktop tools such as a calculator and calendar. Norton Commander includes Commander Link, a file transfer utility for use between two computers, such as a desktop and laptop computer. As with similar dedicated file transfer utilities, Commander Link allows you to quickly send and receive files between computers via a serial cable. Norton also includes Commander Mail, a communications program designed specifically to link with MCI Mail.

There are many powerful DOS shells available. Norton Commander is only just one example of this powerful class of software that can be used by both novice and experienced computer users.

Dos Shells

1dir+
Bourbaki, Inc.
615 West Hays Street
Boise, Idaho 83701

PC Tools
Central Point Software, Inc.
15220 NW Greenbriar Parkway
Suite 200
Beaverton, Oregon 97006

Take Charge!
Departmental Technologies, Inc.
P. O. Box 645
Andover, NJ 07821

DOS Partner
EasySoft, Inc.
1215 Hightower Trail
Suite B100
Atlanta, Georgia 30350

Q-DOS II
Gazelle Systems
42 N. University Avenue
Suite 10
Provo, Utah 84601

Norton Commander
Peter Norton Computing
2210 Wilshire Blvd. #186
Santa Monica, CA 90403

XTreePro
XTree Company
4330 Santa Fe Road
San Louis Obispo, CA 93401
XTreePro

*

On the Leading Edge

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Christmas Gifts, Disk Compatibility and DASDDRVR.SYS, Index Tabs for Manuals, General Goodies, PC Tools, Mace Utilities, HUG Software, Educational Software, Imager, Voice Master Key System

As many of you know, it has been my custom for the last several years to offer a few suggestions for gifts that you might want to consider for your favorite computer user or even for yourself. And even though it may be a little early, let me be one of the first to wish you and yours a Merry Christmas or Happy Holidays. As usual, I have tried to keep most of these suggestions limited to items under $100, but some exceed that because of increasing prices. If you need to drop a subtle hint to Santa Claus, you can do so by circling the appropriate item on the list at the end of the article.

One of the key objectives of this column is to discuss various technical issues that you need to know about, so before we get into the holiday gifts, I will share some interesting things that I have learned in the last month.

Disk Compatibility

I spend a lot of time traveling, and I nearly always carry my SupersPort 386SX with me when I do. Over the last 18 months, I have had three separate situations occur where I could not read a 3.5-inch floppy disk in my laptop. In fact, I could not even read the directory with the DIR command because I would always get an "Abort, Retry, ..." error. Sometimes it would be a "General Failure" error and sometimes it would be a "Data read" error. Until recently, I had always assumed that it was a disk problem of some kind. When it happened again a couple of weeks ago while I was traveling, I had a few extra minutes to consider the problem. Fortunately, I had the assistance and cooperation of the local computer expert, and we did some testing to verify the problem.

Since many people seem to have difficulty troubleshooting a problem, I think it is worthwhile to describe the process that we used to figure this problem out. The first difficulty is to determine what common factors are always present when the problem occurs. And there seemed to be an anomaly in the first factor.

I have been using ZDS MS-DOS 3.3 Plus on my laptops, and I have never had a problem with having disks formatted on this system being read by any other computer, assuming that there is a relatively current version of DOS available on that computer of course. The point is that version 2 DOS releases did not support 3.5-inch floppy disk drives, so of course I knew that there was no chance that an old DOS version would read my disks. That has never been a problem because all companies I work with keep their DOS versions quite current. The first factor was that, although no one ever had any problem reading disks that I had formatted on my laptop using ZDS MS-DOS 3.3 Plus, three separate situations occurred when I could not read floppy disks formatted on other systems. The fact that any computer could read my disks and that only three exceptions occurred when I was trying to read other disks was the reason I thought it was a disk problem. That turned out to be wrong when I considered the other common factors.

After some thought, I realized that the problem only occurred when I was trying to read a disk that was formatted on an IBM PS/2 computer. The most recent occurrence was a disk formatted on an IBM PS/2 Model 80 (80386 system) in Detroit. As I recall, the other two situations both involved a PS/2 Model 50 (80286 system): one in Chicago and one in St. Louis. In addition to the fact that the problem always involved a PS/2 computer, were there any other common factors? Yes.

All of the problems occurred when the computer was running under a current version of IBM PC-DOS. In the last instance, I know that it was PC-DOS version 4.0, and I can't remember for sure about the other two. They may have been using PC-DOS 3.3. When I put all this together, I knew that the problem always involved a PS/2 computer and a relatively current version of PC-DOS. When I mentioned this to Mike, he remembered that he had received an update disk with a "fix" of some kind from the local IBM computer distributor, and we found a device driver called DASDDRVR.SYS. Mike installed a command line in his CONFIG.SYS file *(DEVICE=C:\DOS \DASDDRVR.SYS)*, rebooted the system, executed the FORMAT command on a disk, copied one file to the disk, and I checked it out on my laptop. Success! I could read the disk with no problem. Special thanks to Mike Wilson for his help on this.

By the way, I also determined that this disk read problem is not confined to Heath and ZDS computers or ZDS MS-DOS. I also tried the "problem" disk on a Toshiba laptop that a colleague was using, and the disk could not be read by that computer either.

In summary, the problem appears as an "Abort, Retry, ..." error that usually includes either a "General failure" or "Data read error" message. To fix the problem, you must obtain the "fix disk" containing the DASDDRVR.SYS device driver from your local IBM distributor and install it in the CONFIG.SYS file *before* you FORMAT a disk that is to be read on another system. That device driver fixes the disk compatibility problem, although I learned that it makes the PC-DOS FORMAT command take a lot longer to format a disk for some reason.

Index Tabs for Manuals

Although I mentioned this general idea in my October column, I was reminded about a simple solution to the problem of finding information in the ZDS MS-DOS manuals because I received a copy of an anonymous letter that was sent to Heath Company. This letter was full of criticisms and invectives about a number of things, not the least of which was the ZDS MS-DOS manuals. The writer apparently did not know that the MS-DOS manuals are not developed by Heath;

they are developed by Zenith Data Systems. In any case, the writer had a partially valid point that he found it difficult to find information in the ZDS manuals, especially the combined manual that includes the User's Guide and the Command Reference. Some of you may recall that I have mentioned this trick before because I have used it for years. It is an easy and inexpensive way to create index tabs and "markers" for any hard copy reference: books, magazines, reference manuals, and printouts.

To create index tabs, buy some 3M Post-it Note Pads. I normally use the 2" by 1.5" size for index tabs, but some of the larger sizes are useful as "special" markers of one kind or another. Take one of these small Post-in notes and write in the appropriate tab entry. Then, stick it to the appropriate page to mark that entry in the document. Depending on the document, I sometimes color-code the entry by using a red pen, but you can also buy different colors of notes if you are so inclined.

In the case of the combined ZDS MS-DOS Version 4.0 User's Guide and Command Reference manual, my first index tab is marked as "COMMAND REF" on the Contents page because I seldom refer to the introductory information in the User's Guide. To make it easier to find commands in the manual, I also have tabs marking the APPEND, DSKSCAN, NLSFUNC, and Hard Disk Commands (Chapter 2), as well as the index. For the ZDS User's Reference, I have tabs only for the Appendix, CONFIG.SYS, Extended Hard Disk Support, ANSI.SYS (the beginning of the device drivers), Using Code Pages, and the Index. I use paper clips at the bottom of a page that contains something I may want to write about (e.g., new commands or features). And because the two spiral-bound ZDS manuals look about the same from the back, I use a black marking pen to create a stripe on the back of the User's Guide and Command Reference so that I can easily identify that on my book shelf.

When I get new software, one of the first things I do (after filling out the registration card of course) is to look through the manual page by page to see what it contains. As I look through the manual, I make up these index tabs on Post-it notes so I can find certain information again. All of this only takes an hour or so, and it is well worth the time saved in looking up something in the long run. This trick is most effective for spiral-bound or perfect-bound manuals, but it also works well for manuals in 3-ring notebooks. Now let's take a look at some gift ideas.

General Goodies

Most of what I call general goodies are consumables: floppy disks, paper, ribbons, laser printer cartridges, and similar supplies. Nearly everyone who has a computer also has a printer that uses all kinds of consumables.

Unlike most of the other items in this article, I won't list a source for these items because most everything is available at an office supply or computer store. Printer ribbons are useful gifts because they tend to dry out, whether you use them or not. And, as a side hint, you can reactivate a dried-out ribbon by carefully removing the cassette cover and spraying the ribbon lightly with WD-40. The only caution about buying ribbons is to make sure that they fit the printer model you have. Ribbons can range from about $4 to $15, depending on the printer and the physical size of the ribbon. 4-color ribbons that are available for some printers obviously will cost more.

Ink cartridges and laser printer cartridges are another possible idea. The ink cartridges are commonly used in the "ink jet" type of printers, and it always pays to have at least one spare on hand. A spare laser printer cartridge or ribbon is also valuable because there is little doubt it will run out just as you have something very important to print that must be done NOW. As a general recommendation, I suggest you always keep a spare "printer cartridge" (i.e., ribbon or whatever) just in case. I have had nearly new ribbons break after very little use. Again, keep in mind that you need to know the brand and model number to buy the correct ribbon or cartridge.

Although paper sounds like a trivial suggestion, there is more to it than you might think. What paper works best in your printer depends on what kind of printer you have. For example, most laser printers work best with paper designed for copy machines, and some manufacturers specifically recommend that. In older printers that used the "ink jet" technology, special paper was a must or the ink would be absorbed into the paper so that the document would look fuzzy. Of course thermal printers require their own special type of paper.

Paper prices are as varied as the number of printers. You can buy a small package of continuous-feed (with the sprocket holes on the sides) paper for $5 or so, but it is much more cost effective to buy a box containing 2,500 or 3,000 sheets, depending on the weight of the paper. If you do work at home, you may want to buy 20 lb. bond for your printer because it looks better, but it is a little more expensive. My personal preference is for the heavier paper because I think it is also a little easier to handle.

If you use cut-sheet paper, such as for a sheet feeder or a laser, you can typically buy a ream (500 sheets) of good 20 lb. paper for $4 or $5. Sometimes you can find a case (10 reams — 5,000 sheets) on sale for $25 or so. As you might guess, I buy paper by the case, although I doubt that many of you use the quantities that I do.

Speaking of sheet feeders, there is a significant advantage to using cut-sheet paper to the point that I always buy a printer that has a sheet feeder, even though they tend to be somewhat expensive. The specific advantage of a cut-sheet feeder is that it is quite easy to use BOTH sides of the paper. I have done this for over five years, before conservation of natural resources became a popular fad. And I began doing that originally because it made good economic business sense to help keep paper costs down, and it more than paid for the sheet feeders that I bought. I have undoubtedly saved lots of trees by doing this, but that was not the original reason I began doing it. If you use a lot of paper — at home or at the office— I would encourage you to invest in a sheet feeder if your printer supports one. Aside from the fact that you can easily recycle the paper once, you will find that it has the added advantage of saving time because you do not have to tear off the pin-feed strips. Not to mention the time savings because you do not have to burst (separate into the individual sheets) the printout. I believe that the time savings, cost savings, and recyclability are all excellent reasons to use a sheet feeder.

Floppy disks — a useful gift for any computer user. There are two physical sizes: one of which will work in virtually all popular computers. The 3.5-inch, 720 K double density floppy disk and the 5.25-inch, 360 K double density floppy disk. If a computer has a high density drive, you can also use the 3.5-inch, 1.4 MB high density floppy disk or the 5.25-inch, 1.2 MB high density floppy disk. If you have a ZDS MinisPort, then you will need the 2-inch floppy disks for that system.

One point about floppy disks: I recommend buying good quality because they are used to store valuable data. I have found that the Fuji brand floppy disks seem to be the most reliable, especially because their 5.25-inch, 1.2 MB high density floppy disks have "hub rings" (sometimes called a reinforced hub). Some people will tell you ALL standard 5.25-inch, 1.2 MB high density floppy disks can be easily identified because they do NOT have hub rings, but that is not true. It is true that some of the less expensive brands do not have hub rings, but the better ones do. I recommend that you always use 5.25-inch floppy disks that have hub rings because they will last longer and be more reliable, which explains why they cost a little more. Depending on the size and density, you should find that floppy disks cost from about $6 to $30 (in packages of 10), although you will certainly find that the List prices are higher than that.

A valuable accessory for any electronic equipment, including a computer, is a surge suppressor. Surge suppressors are easily available, and you can generally find good ones for $20 or less. I have found good

ones with well-known brand names (e.g., General Electric) at the various "home improvement centers" (e.g., Home Depot). Like most items, I recommend buying a name brand because the "cheaper" ones may not protect electronic equipment as well as you might suppose, especially if you have power interruptions like we have in Grand Prairie. We have so many power "blips" (at least one per day) that I have begun adding surge suppressors to other electronic equipment, such as the television, VCR, and even the sprinkler timer. My last sprinkler timer only lasted four years, which is surprising for an electronic unit. As I have mentioned in this column before, I finally had to buy an Uninterruptible Power Supply (UPS) for my system because of the power problems. Buying a UPS is not something I am suggesting for a gift because they tend to cost far more than would be appropriate for most people.

PC-Tools 6.0

Lots of people have told me how great PC-Tools is, but I had never had much need for it. Like most computer users, I generally do not spend much time looking at software that has the same functionality as software I am already using. And PC-Tools happened to fall into that category. Part of the credit for that is due to Richard J. O'Connor's series of articles on "Everything But the Kitchen Sink"; the last two of which appeared in the March and April 1990 issues. In particular, I had decided it was time to take another look at programs to backup and restore the hard drive on my SupersPort 386SX laptop. I had been using the Mace Utilities MB (Mace Backup) and MR (Mace Restore) programs, but they seemed kind of slow and they used a lot of floppy disks for backup. That may not seem to important until you know that I carry a complete hard drive backup for my laptop whenever I travel, just in case. I can think of nothing worse than being a thousand miles from home and losing some software that is critical to my business. It almost happened once, and I have taken care that it does not happen again.

I mentioned this in one of my 1989 columns, and it occurred when I was using Samna Word IV in New York. For whatever reason, Samna clobbered the boot sector on the hard drive on my SupersPort 286, which meant that I could not boot from the hard drive. Fortunately, I had a bootable disk so I could access the drive, and I ended up recovering by recreating the boot sector manually (by using DEBUG) one night in my hotel room. That's not my idea of a good time in New York, but New York is not my idea of a good time anyway.

In any case, PC-Tools has been recommended by a lot of knowledgeable people, and it happens to include backup and restore capabilities among its many features. Sure there are dedicated backup and restore programs, like FastBack, but PC-Tools is considerably less expensive and includes far more than just the dedicated backup/restore programs. It seemed to me that PC-Tools was a far better value, and I have been especially pleased with its backup and restore programs. I bought PC-Tools deluxe Version 6.0 a couple of months ago, and it has an incredible variety of utilities. I have not tried everything yet, but I can tell you that the backup/restore programs are certainly among the best I've seen, even better than Mace. I have done considerable testing on these programs, and they are quite easy to use and reliable. Perhaps the most interesting point is that they are fast (about 2 MB backed up per minute), and the data compression feature reduced the number of backup disks by two (down to 14). The installation is really easy, and it works just fine. Although I have not even begun to look at every feature in PC-Tools deluxe Version 6.0, it is worth the purchase price even if you only expect to use the backup/restore utilities because the cost is less than all of the "special" backup/restore programs I saw. And that includes both the Norton Backup utilities as well as FastBack. PC-Tools deluxe Version 6.0 is highly recommended.

Mace Utilities

Mace Utilities 1990 (the latest) continues to be one of my favorite products because I have thoroughly tested and used it on all my computers. Although it does not have the flash of PC Tools or Norton Utilities, it is a solid, reliable package that performs important tasks.

Mace Utilities contains four programs that I use just about every week. I occasionally try to do things too fast when I am deleting old files from my hard drive, and I need to use the UNDELETE program to reconstruct a file that I deleted by mistake. Then I run the SQZD program to squeeze the directory entries to improve the speed of a path search followed by the SORTD program, which sorts all the directory entries. And finally, I run the UNFRAG program, which performs the "disk optimization" function. It moves files around so they are not fragmented and helps keep my hard drive performing as fast as possible. These are just a few of my favorite programs in the Mace Utilities package, and it continues to be highly recommended.

HUG Software

If you joined HUG in the last year, you will find a wide variety of incredibly useful and inexpensive software in the HUG Library. As a matter of information, I am currently working on a contribution to this library which I have tentatively called the Adney Utilities Disk #1, so you may even want to watch for that announcement. The HUG Library includes all kinds of useful software, such as games, utility disks, application programs, and even books like the *Powering Up* series.

Most of the HUG software is designed for nearly all of the ZDS and Heath computer systems, but there are some exceptions. If you are not quite sure what to order from the HUG Price List, it is important to know that all of the current ZDS and Heath computers are PC compatible. Software listed in the HUG Price List under the "H/Z-100 and PC Compatibles" and "PC Compatibles" headings will run fine on ZDS and Heath PC compatible computers, including laptops. Software listed under the other headings are hardware-specific to older (and discontinued) computer models, such as the H-8, Z-89 and Z-90, and the Z-100, and will *NOT* run on a PC compatible. All other computers, including all laptops and the orphaned eaZy PC, are PC compatible. Specifically, all computers with an 80286 or 80386 processor (check the Specifications page in the Owner's Manual) are PC compatibles for HUG software purposes. Virtually all PC-compatible HUG software will also run on other ZDS compatible systems, including IBM and Compaq.

If you are using a laptop computer, one of the best values around is the LAPTOP UTILITIES. I use the CURSOR program to change the size of the cursor on my SupersPort 386SX, and the REVSCRN program reverses the screen image so that a graphics program, like the GEM Presentation Team, will not look like a photographic negative on a laptop's LCD screen. These are just some of my favorite programs in the HUG LAPTOP UTILITIES package, and they work just fine on a desktop too. The May 1989 *REMark* (page 4) contains information about all programs included in this package. Highly recommended.

HADES II —the HUG Absolute Disk Editing System— is the enhanced version of the original HADES, which is still the best disk editor I've seen yet. This new version of HADES works fine with ZDS MS-DOS 4.0, and I just finished checking that out. HADES II is the easiest to learn and use of all the disk editors I've seen, and I have seen most of them. HADES II is clearly the best in its class and is highly recommended.

The original *Powering Up* book still continues to be a HUG best seller. With a little luck, *Powering Up — Volume 2* may also be available by the time you read this, so you may want to watch for that announcement. If the response to this popular series continues, I think it is reasonable to suppose you will see some additional books in the *Powering Up* series.

Both books contain 15 chapters that include all kinds of information you need to know about setting up and using your Heath and ZDS computer system. These books were especially written for begin-

ners and discusses various things that you need to know about computing and your computer. The original *Powering Up* book includes chapters that provide an introduction to various DOS commands that you must know. Other chapters are devoted to describing, in non-technical terms, how some of the computer hardware works and what you must know about it, especially if you want to upgrade or change it.

Powering Up — Volume 2 includes information on more advanced topics, such as "How to Use the EDLIN Command" and detailed descriptions of what the most common DOS error messages REALLY mean, as well as how to fix the problem. You will also see how data are really recorded on a disk so that you can correctly interpret some error messages and use CHKDSK to fix common disk problems. The chapters in this volume include more advanced information about various computer-related subjects.

Although the each book includes specific information about ZDS and Heath computers, most articles in both books also apply to just about any compatible. Additional information on both HADES II and the original *Powering Up* book can be found in the May 1989 *REMark* (page 4).

Educational Software

If you are interested in today's technology, Heath Company has all kinds of educational software ranging from basic electricity and electronics to robotics and computer fundamentals for both hardware and software. A lot of information about today's technology, such as lasers and fiber optics, is available in these courses. I have bought a number of these courses and have found them to be quite good. As many of you know, I wrote the current MS-DOS course that includes just about everything you ever wanted to know about DOS and then some. This 983-page course also includes 33 experiments that demonstrate how to really use the commands and concepts presented in the text. A program disk is also included with several programs that help demonstrate what a disk directory and File Allocation Table (FAT) is, and the List Directory (LD) program displays an alphabetically sorted list of ALL files (including file attributes). LD also displays the cluster factor for any valid DOS disk, including a hard drive, and it can be used long after you have completed the course. If you are interested in learning about the details of how to really use DOS and its commands, I think you will find this course is the most complete of its kind.

Heath Company has a wide variety of courses available, and if you are interested in other subjects, you may want to write to Heath for a free catalog. The address is listed at the end of this article. All Heath products can also be ordered by phone using VISA, MasterCard, American Express or the Heath Revolving Charge. By the way, many of the Heath products and price information that I mention in this column are shown in the current catalog. Products not specifically listed at the end of each article are usually discontinued —the Z-100, eaZy PC, and Z-171— even though they may be mentioned in an article.

The Imager

As hard drives have more and more capacity, data backup using floppy disks is becoming more difficult and time consuming. Even though PC Tools has an excellent set of backup/restore programs, many users do not have the time or inclination to play the "floppy-disk shuffle" game to back up a hard drive. A tape backup system is an obvious solution, but unfortunately, most tape backup systems are expensive. Although the cost can easily be justified for a business computer, it is far more difficult to spend a considerable amount of money for a "hobby" system.

If you have a Video Cassette Recorder (VCR) for your television, you already have half of the system you need to back up a hard drive. Then, all you need is the Imager and its included software to set up your system for regular backups. In addition to its low initial cost, you can also save a considerable amount of money on backup tapes because even the highest quality VCR tapes can be purchased for about half the cost of the usual cassettes required for other systems. The cost for a backup tape for a dedicated tape backup system can easily exceed $20, and you can find high quality VCR tapes in the $10 range.

The Imager system consists of a full-size board that fits in an 8-bit slot on a PC compatible computer, a disk of software, connecting cables for the VCR, and of course a manual. The Imager fits in a standard 8-bit slot, and it works with nearly all ZDS PC compatible computers (except laptops of course) up to and including the Z-386 systems. The only real requirement is that you must have space with an 8-bit slot for a full-size board, which of course excludes the Z-148 and the eaZy PC systems. I have been using the Imager for several years now, and I use it to back up my 80 MB hard drive on a regular basis.

With today's high-capacity hard disks, it is important to know what kind of recording capacity is available, and I have included Figure 1 to show the basic capacities for common VHS tapes.

Tape Time	Backup Capacity
30 minutes	26 MB
60 minutes	55 MB
90 minutes	83 MB
120 minutes	110 MB

Figure 1
Imager VHS Tape Backup Capacity

I have found the Imager system to be extremely reliable, and it works great on my desktop systems. In order to have that kind of reliability, there are three important factors that must be considered. First, make absolutely sure that your VCR is in perfect shape before you begin to use it for backup. Second, use high-quality tape. The third factor that you need to consider is what class of computer you are going to use the Imager with. This is part of the computer hardware design that includes something called Interrupt Requests, or IRQs for short. IRQs seem to cause more computer problems because they are more than a little obscure.

In general, IRQs are used by the computer to communicate with the hardware. Specifically, the standard Imager board is configured to use IRQ2, which works just fine on a PC/XT-class computer. If you are using an AT-class system (with an 80286 or 80386 CPU), series, you should probably be sure that you request (at the time you order) an IRQ configuration of IRQ5 (normally used for LPT2) or IRQ7 (normally used for LPT1). I mentioned IRQ5 first because few systems need two parallel ports, and there is little possibility for an IRQ conflict. Using IRQ7 in most cases will probably not cause a problem unless you want to run the Imager and use LPT1 for a parallel printer at the same time. The whole idea is to be aware of what IRQs your hardware (including a bus mouse) is using so that you can avoid the problem of an IRQ conflict.

The software has been improved and upgraded, and it has nearly all of the features you will need. I have made some suggestions to the manufacturer for the improvement of the software, and some of them will be included in a future release. Many of them have already been included. The Imager provides an easy and inexpensive way to back up a hard drive system. Even the documentation has been improved. The Imager is highly recommended as an excellent and very cost-effective way to backup your hard drive.

Covox

If you really want a useful accessory that can make your work much easier, I think you will find the Voice Master Key System is a valuable addition to your system. The Voice Master Key System was discussed in some detail in my June 1990 column (with pictures), and it consists of a headset with a microphone, a board that fits in an 8-bit slot inside your computer, and some software. This equipment allows you to actually talk to your computer and tell it what to do. For example, you can tell your word processor to "bold" text by just saying the word. With the included software, you can teach your computer to understand words, which in turn, are associated with macros. In WordStar for example, I have taught my

computer that the word "bold" means to enter the "macro" key sequence CTRL-PB (^PB in WordStar lingo). For Quattro Pro, I can insert a row by saying: "Control I...R...RETURN." And you can do that today.

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. If you can type it and say it, this hardware can "translate" it to one or more keystrokes. I have also found that setting up the Voice Master Key System helped me learn my software better so that I could use it faster when I was using another computer, such as my SupersPort 386SX laptop.

If you are looking for a useful tool to help make your work easier and faster the Voice Master Key System is highly recommended.

Powering Down

In last January's column, I began what possibly may become another "custom" by discussing the various Heath and ZDS computer models. That column was specifically developed to address a question asked by many new users of Heath and ZDS computers: "Why don't you have any articles about MY computer?" From the letters I received, it was clear that many new users found that information quite valuable, and I will "continue" that discussion in next month's column. Due to the various new computer models, that column will be expanded compared with this year's version, but I think many of you will find it useful. I have selected the January issue for this kind of discussion because it is always sent to new members, and I hope it will answer some of the questions that always seem to come up.

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 series number from the first page of 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 board), 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 any questions about anything in this column, or about Heath/ZDS 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 or comment.

Products Discussed

HUG SOFTWARE

HADES II (885-3040) $40.00
Powering Up (885-4604) 12.00
LAPTOP UTILITIES (885-6014) 20.00
Zenith Users' Group
P.O. Box 217
Benton Harbor, MI 49022-0217
(616) 982-3463 (Voice Communications)
(616) 982-3956 (Bulletin Board System)

Hardware

Imager $295.00
$195.00 - HUG Members Only
The Light Pen Company
Box 45255
Los Angeles, CA 90045-0255
(800) 634-1967

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

Software

Heathkit Catalog (free)
Heath Company
Benton Harbor, MI 49022
(800) 253-0570

MS-DOS Course
(EC-1121-A) $59.95
Heath/Zenith Computer Centers
Heath Company Parts Department
Hilltop Road
St. Joseph, MI 49085
(800) 253-7057
(Heath Catalog orders only)

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

PC-Tools 6.0 $149.00
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* ST-238R	32 MEG / RLL / 65 MS / 5.25"	$218.00	$271.00
* ST-277R-1	65 MEG / RLL / 28 MS / 5.25"	$348.00	$401.00
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*** ST-251/Z150 Kit**	**42 Meg, 28 MS,**	**$341.00 SALE PRICED**

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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*** ST-251/Z148 Kit**	**42 Meg, 28 MS,**	**$408.00 SALE PRICED**

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⇨WD1006V-MM2 16 BIT, DUAL HARD, DUAL FLOPPY, 1:1 AT	$99.00
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⇨CVB4581	SAMSUNG Multi-sync VGA 1024x768	$ 429.00
⇨CM1440	SEIKO VGA 1024x768 .25 dot	$ 569.00

VIDEO CARDS

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⇨VGAPLUS	PARADISE AUTOSWITCH 800x600	$ 146.00
⇨VGAPLUS16	PARADISE AUTO 16 BIT 800x600	$ 177.00
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Counterpoint Menu System

Earl R. Zimmerman Jr.
78 Wells Drive
Dayton, OH 45431-1421

What is Counterpoint?

Whether you are a computer novice or an advanced user you probably would agree with the statement "DOS is not very friendly". Because of the unfriendliness of DOS many software companies and shareware developers have developed menu programs that make it easier to navigate around a hard disk.

Many of these programs are very similar. They usually require the user to create a separate file that contains various batch files to run your programs. Sometimes the batch files use standard DOS commands or they may have a language peculiar to the program. These batch files are usually tied to a user defined key or assigned a function key. In addition, program choices usually appear on a menu that appears upon bootup and after an application is exited. Depending on the program, you can choose the application you want to run by depressing the appropriate key or pointing to the program with the cursor and depressing a mouse button. Regardless of the way the program operates the menu is usually stationary, flat, and **text** oriented.

So what makes Counterpoint "different" from all the other menu program? Counterpoint is a **graphical** menu system for the IBM or IBM compatible XT or AT. Menu selections are represented by icons that can be moved around on the screen by the use of a mouse or the keyboard.

Anyone who uses a Macintosh computer at home and an XT or AT on the job would like this program. It offers the simplicity of the Macintosh, yet does not sacrifice the power of AT's or XT's. You can have your cake and eat it too!

This article will briefly cover installation procedures, major Counterpoint version 2.1 features, and customer support and documentation.

Installation

Installing Counterpoint is very easy. First, put the floppy diskette in the A: drive and from the root directory of the C: drive type: **A:INSTALL** [Return]. You will then be prompted to enter the drive you want to install it to (usually C:) and the drive you are installing it from (A:). The Install program will then create the CP subdirectory. You then must enter what type graphics card is in your computer. Counterpoint supports monochrome, CGA, EGA, and VGA video cards. The Install program will then add CP to your AUTOEXEC.BAT file, also modify your path to include the CP subdirectory, and create the file CP.BAT in the root directory.

Features

Icon Based. After typing CP to start Counterpoint a screen similar to Figure 1 appears. Notice on the right-hand side of the screen there are three icons. Icons are small objects or pictures that represent an application program, DOS commands, or in Counterpoint a new set of icons (submenu). Counterpoint will allow you to display 40 icons on the screen at one time.

The Exit to DOS and Edit Logo icons are examples of applications. Applications are DOS commands or separate programs. An application can be selected by moving the cursor to the icon and quickly double clicking the left mouse button or quickly depressing the Return key twice. The DOS Commands & Utils icon is an example of a submenu. Notice how it looks like a file folder. When selected in the same manner as an application icon it takes you to another level where more application icons can be created that relate to the submenu icon. For instance, when the DOS & Utils icon is selected, a submenu appears that contains icons to format 360K and 1.2 MB floppy disks as well as the Print command. Also, an icon to return you to the previous menu is automatically created for each submenu. Version 2.1 allows you to create 100 submenus.

Pull Down Menus. Counterpoint is user friendly and menu driven. At the top of the initial screen there are four pull-

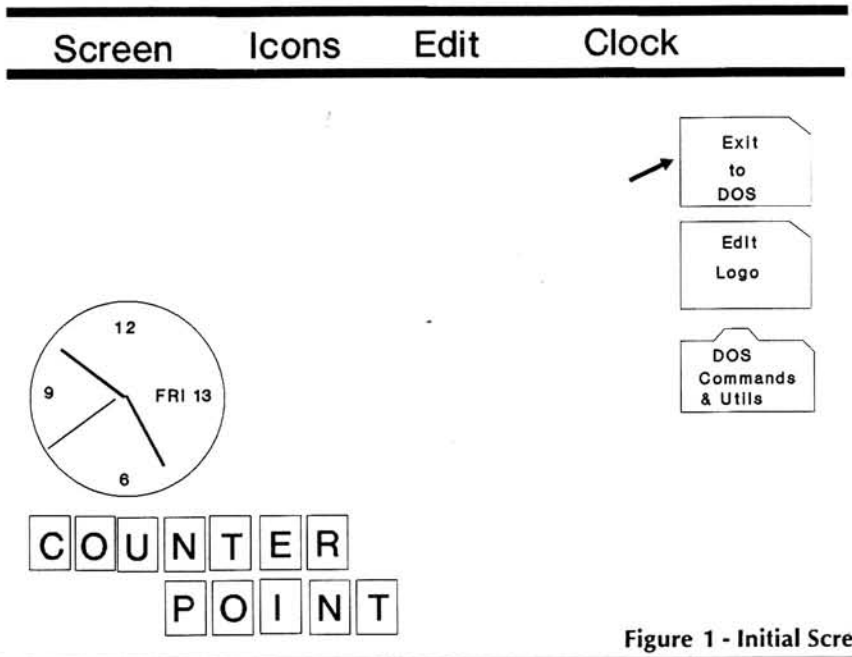

Figure 1 - Initial Screen

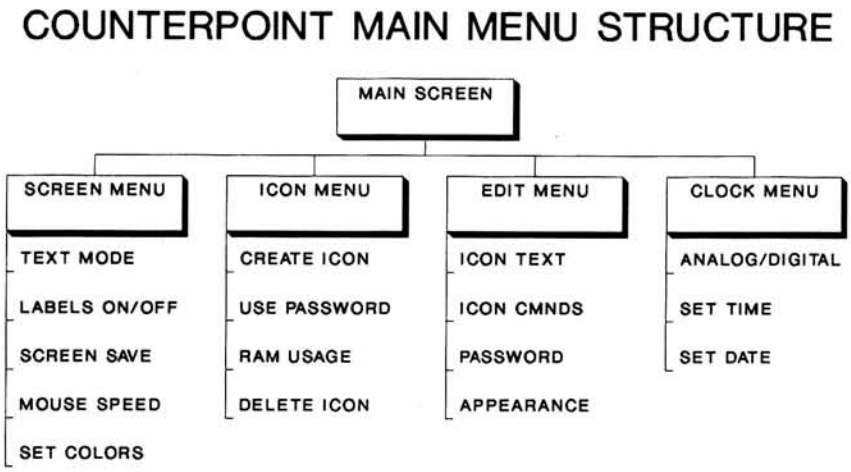

Figure 2 - Main Menu Structure

down menu titles - Screen, Icon, Edit, and Clock. Figure 2 shows the menu structure for each menu. I'll explain each menu in the succeeding paragraphs.

The *Screen menu* is used to switch between graphics and text mode, aid in selecting icons if you don't have a mouse, or somewhat customize the program to your liking.

Normally, Counterpoint operates in the graphics mode. However, on occasion you may need to use a memory resident text-only application such as Sidekick. You can return to the text mode by selecting text mode and return to the graphics mode by depressing F9.

While the preferred way of selecting icons is with a mouse, you can also do it with the keyboard. By turning the Labels feature on, the letters A-G appear across the screen as columns and the numbers 1-7 appear along the right side as rows. If you want to select a particular icon you would just type the letter and number and press Return.

You can also customize your program by setting the screen save timer from 1-99 minutes. To disable it the length is set at 0. If no activity is detected with the mouse or keyboard after the set period of time the screen will go blank, except for the clock which will diagonally move around the screen. Mouse movement speed can also be set at either slow, normal or fast. I recommend normal. If you have an EGA or VGA card you can also set your screen colors to one of five predetermined color schemes.

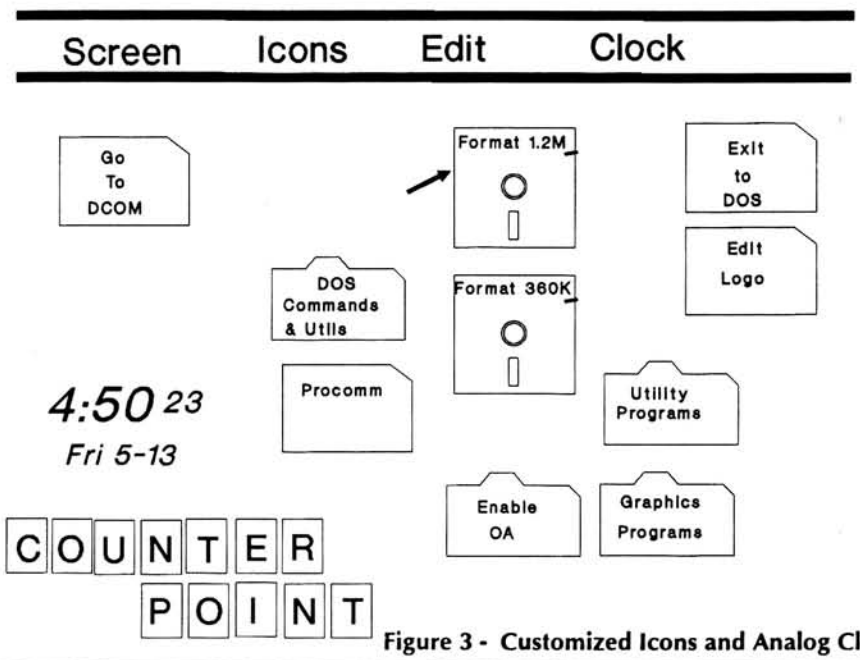

Figure 3 - Customized Icons and Analog Clock

The *Clock menu* controls your clock feature. You have a choice of an analog clock like the clock in Figure 1, or a 3-D digital clock like the one in Figure 3. You can also set the time or date through this menu. I prefer the analog clock because the digital clock seems to have a problem. For instance, the time will appear as 6:20 and some seconds. When the clock changes to 6:21 the top part of the 0 in 6:20 remains thus distorting the 1.

The *Icon* and *Edit menus* work together to create icons. To create an icon you select Create Icon under the Icon menu. You are asked whether you want to create an application or submenu. Application (A) is the default. If you wanted a submenu you would type S. With an application icon you are given the option under RAM Usage to run Counterpoint as a resident program with your application. Yes is the default option. This option isn't present when creating a submenu because submenus only take you to another menu. With large desktop publishing programs, or if you use large spreadsheets, you should select N for No. That way you save the memory Counterpoint uses for the program you are running.

The Edit Menu then appears and asks you to Enter the Icon Text. You enter the name of the program or DOS command you want. The documentation states you can enter three lines of text and each line can contain eleven characters. However, the documentation is not correct. You can only enter ten characters. The limited online context-sensitive help (which is available when F1 is depressed) is correct.

After entering the text the Edit Menu prompts for Edit CMNDS. You enter the same commands that would normally be executed from the DOS command line. You have a limit of 10 lines with 50 characters per line. After the commands are entered you depress RETURN and the standard icon is created. There are also other limitations. For instance, if you forget to type in a command or type a command in the wrong sequence you can't simply insert or delete a line. You must retype all the commands in the correct order.

Customized Icons. An advanced feature of Counterpoint is the ability to create customized icons. You can customize a standard icon by placing the cursor on the icon and clicking the left mouse button or depressing Return once. You then select Appearance from the Edit Menu and select "C" for Custom. The Icon Editor Screen (Figure 4) will appear on the screen.

Notice in Figure 4 a magnified view of the icon you are editing appears in the upper-middle part of the screen, while the actual size of the icon appears in the lower left of the screen. All the customizing is done on the magnified icon. The EGA/VGA color palette appears in the center. You have a choice of 16 different colors. The status box in the lower right

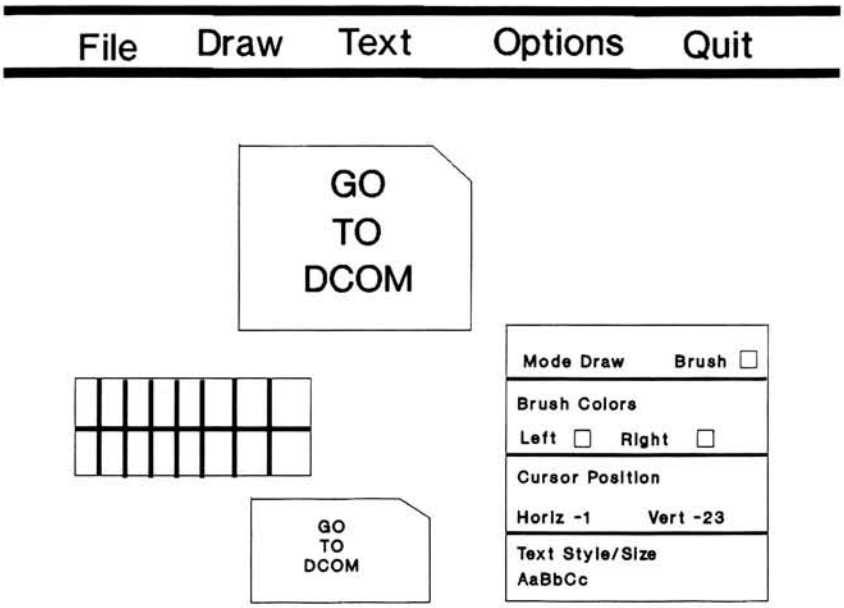

Figure 4 - Icon Editor Screen

corner shows the current settings. It tells you whether you are in Draw or Text mode, the size of your brush, the colors assigned to the left and right mouse buttons, the cursor location, and finally the style and size of the text.

Like the Main screen, the Icon Editor Screen has pull down menus. Figure 5 illustrates what the menu structure is like.

You can activate the draw mode by selecting the Draw Menu and clicking on Draw Mode. In addition, you can control the size of your brush. To set the brush size you simply select Brush - or Brush + and click on these. The size of the brush is displayed in the settings box. Each mouse button can have a color assigned to it. To assign a color to a button you simply move the cursor to the palette color you want and depress the appropriate mouse button.

The text mode is activated by selecting the Text Menu and clicking on Text Mode. Like in the draw mode, you can set the size of your text by selecting Text Size - or Text Size + and clicking on them. The size of your text will appear in the status box. You can also set the shadow on or off. When the shadow is set to off, the shadow color will be whatever color you have selected with the right mouse button.

If you need to center an icon after it's finished you can select Shift Image from the Options Menu. For instance, to move an image one pixel to the right you would have to depress the right cursor key and depressing the Return key. This is a very laborious process. EGA and VGA users can also select Swap Colors to replace the color specified in the left button with the color specified in the right button.

The File Menu is used to clear the icon editing area, save icons you've created, and to copy customized icons to the icon editing area. The most advanced feature is the Copy Icon feature which allows you to copy a customized icon to one of your icons. The floppy disks in Figure 3 are examples of customized icons.

Overall the icon editor function needs improvement. There should be an option to automatically fill the editing area with one of the colors in the color palette. It simply takes to long to fill it in with a brush. Also, it's difficult to judge where to place the cursor when typing in text as the "L" shaped cursor only shows where the baseline of the text will be as opposed to both the baseline and the top of the text. A boxed cursor would probably work better. In addition, once the text is put on the graphic and the left mouse button is depressed, it can't be edited. Finally, before you can use one of the customized icons that comes with the program, you must create a standard icon. You can't directly access this feature from the main screen.

Password Protection. If you have a need to secure some of your programs you can take advantage of the Password feature under the Icon Menu. To use this feature you would point to a created icon and click the left mouse button or depress the Return key once to select the icon. You then select Use Passwd from the Icon Menu. You are given three choices to choose from, No Modify (M), No Access (A), and None (N). "No Modify" means the icon can be selected and executed but no changes can be made to the icon itself without using the Password. "No Access" offers the same features as No Access but also requires a password to be entered before a program can be executed. "None" is used when removing password protection. Passwords can be changed as often as you like by selecting Password under the Edit Icon menu and then entering the old password and then the new password when prompted.

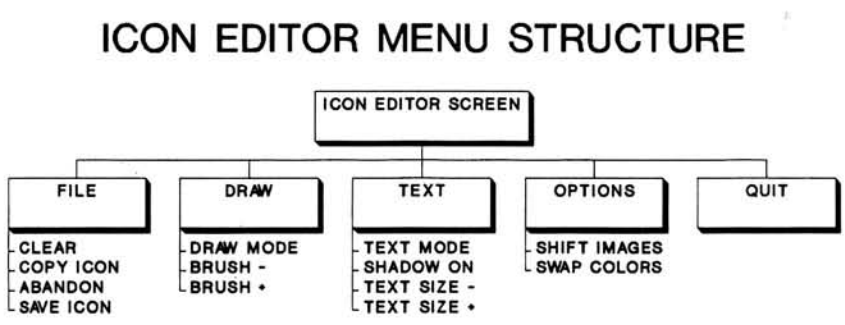

Figure 5 - Icon Editor Menu Structure

Customer Support and Documentation

Counterpoint is well supported by the author. Technical support is available from Busarow by calling the author (Kevin Busarow) at (513) 429-9876 or by logging on to the Busarow Software BBS (513) 429-9874. The BS-BBS is available 24 hours a day, seven days a week at no charge (except price of phone call if you are calling long distance).

Since I live in the local area I dialed the BBS. The support offered included a special message area (Area 6) for technical questions, user-created icons for downloading (File area 2), and downloadable demo versions of future Counterpoint releases (File area 1). For instance, I was

able to download demo Version 2.3 of Counterpoint. No special access was required. The only differences between the demo version and the actual version is that there is a screen that states that this is a demo version and gives the purchasing information, and the main Counterpoint screen has the words "Demo Copy Evaluation Only" around the clock.

I also downloaded the newest icon editor file. My original disk had version 2.1 of the icon editor file CPEDIT.EXE which was dated 03-8-90. The 2.2 version on the bulletin board had a 04-11-90 date. Finally, I downloaded a file that contained 18 user created icon files.

While customer support is excellent and the product is being updated, the documentation needs improvement. The documentation gives a brief description of what each menu item does but fails to tie the various menus together, especially the Icon Menu and Edit Menu. It also does a poor job of explaining how to use the Copy Icon feature.

Summary

Overall, Counterpoint is a refreshing change from the text-based menuing system. It achieves its purpose of making DOS easier to use and serving as a bridge between IBM compatible and Macintosh computers. However, the advanced icon editor features and documentation need improvement. The suggested retail price of $69.95 is rather high. I would suggest trying it out before buying it. Spend a few dollars downloading the demonstration version from the bulletin board rather than buy it and find out it doesn't meet your needs.

Product Ordering Information

Busarow Software
282 Kenderton
Beavercreek, OH 45430
Phone:(513)429-9876
Price:$69.95

*

dBASE III
Part 9

Making Your Programs More User Friendly

D. R. Cool
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Dayton, OH 45424

One of the features that makes programs more user-friendly is to have on-line help screens. The number of help screens provided would depend on how extensive the programming is and how much training the user has received. You might, for example, want to have one help screen for each menu option. If the number of help screens is small, the TEXT...ENDTEXT commands can be used to display the text of the help screens. Listing 1 is an example of a program that could be added to the PROJECTS main program.

For a simple system with relatively few help screens, the TEXT...ENDTEXT structure will suffice. However, for a very large, complex system, this method could become noticeably slow. Also, modifying the help messages as required would necessitate editing a very large program. For a large system, a better method would be to store the help messages in a data base. To create the data base, at the dot prompt type CREATE HELP. The structure should be as follows:

```
Field 1:OPTION character2
Field 2: HELPMSG memo 10
```

At the prompt "Input records? " answer "Y". For the first record option field, type a space followed by "1". With the cursor sitting on the memo field, press CTRL-HOME. This will bring up the dBASE III editor. Indent by pressing TAB twice and type the memo (OPTION 1) as shown in the HELP.PRG (Listing 1). Make sure each line ends with a carriage return. When you are finished typing the memo, press CTRL-W. Advance to the next record and enter " 2" for OPTION. As before, write the memo for option 2 as shown in listing 1. After writing the second memo with CTRL-W, press CTRL-END to exit the data base. Naturally, a large system will have many more help records than the two just created. Now you can index the data base with INDEX ON OPTION TO HELP.

In order to automate the help screen process, the memo fields of the HELP data base can be displayed using the REPORT FORM command. But first, a REPORT

Listing 1:

```
* HELP.PRG
* PROGRAM TO PROVIDE HELP SCREENS FOR PROJECTS
* WRITTEN BY:  D.COOL      05/01/90

do while .T.

   clear
   set intensity off
   store " " to HLP_OPTION
   @ 10,10 say "Enter number of menu option: " get HLP_OPTION;
           picture "9"
   read
   if HLP_OPTION = " "
      return
   endif
   clear

   do case

      case HLP_OPTION = "1"
         text


            Main Menu Option 1 - Update Projects Data Base
            ----------------------------------------------
            Use this option to update the PROJECTS and PROJXREF
            data bases.  The main menu allows searching by drawing
            number, advancing to the next record, going to the
            previous record or updating the data bases.
            The update option allows updating either the PROJECTS
            data base or the PROJXREF data base.

            Project data base update options include "C" for editing
            the existing record, "D" for deleting the existing record,
            "R" for recovering the existing record, "A" for adding
            a new record, and "S" for changing the status of the
            existing record.

          Cross reference data base options include additional options
          of "N" for next record or "P" for previous record.  The "S"
          option is not valid for this data base.

           To exit from any menu, press "X".

         endtext

      case HLP_OPTION = "2"
         text
```

FORM must be created. At the dot prompt, type CREATE REPORT HELP. Leave the Page Heading block blank, but change the left margin to 0. Press PgDn twice to advance to the first field. In the Field Contents, type "HELPMSG". Enter "79" in width and press CTRL-END to write the report form to disk.

Finally, the HELP.PRG will have to be modified. Listing 2 shows the modified program listed as HELP2.PRG. Note particularly the REPORT FORM command which is used to display the help message. The word PLAIN is added to suppress the page number and system date that would normally appear. Also, the option "record recno()" is a scope condition which limits the output to a single record.

In addition to providing help screens, another feature that can be added to any application is to allow the user to access any MS-DOS commands or external program without exiting dBASE. A program which allows for this is shown in Listing 3. It sets up an endless loop on the assumption that user may want to run more than one DOS command without returning to the main menu. Note that in the RUN command, the memory variable is preceeded by the "&" symbol, meaning RUN the command contained by variable "COMMAND". Without the "&" symbol, dBASE III will attempt to run a file called "COMMAND". This program can be written as a stand-alone program or added to a procedure file such as the PROJPROC procedure file.

An area that is too often neglected is periodic backup of data. This is usually the last thing that anybody wants to do, usually because it is so time consuming. Adding a backup capability to an application and having the program menu-driven will not lessen the time involved but at least the operator doesn't have to exit the application and figure what command to type at the dot prompt. Also, a program-controlled backup procedure can force the user to make a backup at periodic intervals. Listing 4 is excerpted from the actual backup routine used within my office for daily backups.

Line 1 retrieves the memory variable BACKDATE from the memory file DATEFILE.MEM. The "additive" modifier assures that any existing memory variables don't get wiped out. Line 2 then compares the BACKDATE, which is the date of the last backup, to the current date. If they don't match, it is assumed that no backup has occurred on the current date. The program then clears the screen and displays a short text indicating approximately how many formatted diskettes will be required for the backup. Line 9 uses the dBASE III RUN command to run the MS-DOS BACKUP program. Note that the program backs up only the DBF files, since index files can always be reconstructed. Obviously if you have data bases that include

```
            Main Menu Option 2 - Monthly Report
            -----------------------------------
            This option is used to print the monthly report.
            The program will ask for the start and stop date.
            You should enter the first day of the month to be
            reported on as the START date and the first day of
            the following month as the STOP date.  The program
            will also ask for the month and year to be included
            in the report heading.

         endtext

      otherwise
         do ERR_MSG with "Not a valid option -- " + PRESS_MSG
         loop

   endcase
   wait
   exit
enddo
return
```

Listing 2:

```
* HELP2.PRG
* PROGRAM TO DISPLAY HELP MESSAGES USING A DATA BASE
* WRITTEN BY:  D.COOL      05/01/90

use HELP index HELP

do while .T.

   clear
   set intensity on
   set confirm on
   store "  " to HLP_OPTION
   @ 10,10 say "Enter number of menu option: " get HLP_OPTION
   read
   set intensity off
   set confirm off
   if HLP_OPTION = space(2)
      return
   endif
   seek HLP_OPTION
   if eof()
      do ERR_MSG with "Not a valid option -- " + PRESS_MSG
      loop
   endif
   report form HELP plain record recno()
   wait
   set confirm off
   return

enddo
```

Listing 3:

```
* RUNDOS.PRG
* A PROGRAM TO RUN MS-DOS COMMANDS OR EXTERNAL PROGRAMS FROM WITHIN
*    A DBASE III APPLICATION
* WRITTEN BY:  D.COOL      05/10/90

clear
do while .T.

   clear
   store space(70) to COMMAND
   @  5,10 say "Enter command or press ENTER to return"
```

MEMO fields, the associated .DBT files should also be backed up. You could do this with the command "run BACKUP *.DB?", the question mark standing for any character.

The BACKUP command uses the /n, /v and /r switches. The /n switch says to suppress the "Do you want to format the diskette" message, the /v switch says to verify each file and the /r switch says give me a prompt when it's time to change diskettes. When the backup is complete, the current date is stored to BACKDATE and saved in the DATEFILE memory file. Note that the SAVE command (line 12) uses the condition "all like BACKDATE". This modifier insures that only the BACKDATE memory variable is saved to DATEFILE. Without this modifier, all variables will be saved.

This program is located at the very beginning of a project management information application, such that the main menu will not appear if the daily backup has not been run. This virtually forces a daily backup, particularly if the user has no idea how to bypass the system.

There are many ways to make dBASE III application programs more user-friendly; everything from well-designed screen displays to very simple things, such as minimizing key strokes. This last item can be a real time saver for someone doing massive amounts of data entry. For example, I have designed several data bases that have a large number of entries that begin with the characters "5962-". For programs that do the data entry for those data bases, I program the F10 function key to say "5962-" whenever pressed using the command "SET FUNCTION 10 TO '5962-'". This saves 4 keystrokes on every entry beginning with these characters, since the user only has to press F10.

Other items such as text and background colors can make a difference in respect to eye strain. If you have the same program being run on more than one terminal, such things as screen colors can be set from a memory file which is tailored to the person using that terminal. This allows the same programs to be used on each terminal without modification. For example, suppose the screen colors are stored in a memory variable called MAIN_COLOR. This variable is stored in a memory file called PROFILE.MEM. The following commands could set different colors for different terminals:

```
restore from PROFILE
set color to &MAIN_COLOR
```

Notice again the use of the ampersand (&). Thus, if MAIN_COLOR = "W/B", the standard display will be white on blue. I use the "profile" concept to tailor not only the screen colors, but determine what menu options are allowed. (Only certain terminals are allowed to do updates, for example.) By using this technique, I need keep only one master copy of the application programming.

In my next article, I will discuss program debugging. *

```
   @ 10,10 get COMMAND
   read

   if COMMAND = space(70)
      return
   else
      run &COMMAND
      wait
   endif

enddo
return
```

Listing 4:

```
 1 restore from DATEFILE additive
 2 if BACKDATE  DATE()

 3    clear
 4    @ 10,10 say "BACKUP PROCEDURE"

 5    @ 12, 0 clear
 6    text
          Backup will require a minimum of 3 formatted diskettes.
          Insert first diskette into drive A:
          Press any key when ready
 7    endtext
 8    wait ""

 9    run BACKUP *.DBF A: /n /v /r

10    BACKDATE = DATE()
11    set safety off
12    save all like BACKDATE to DATEFILE
13    set safety on
14    @ 12, 0 clear
15    ? chr(7)
16    @ 12,10 say "Backup complete -- Press any key to continue"
17    wait ""
18 endif
```

Continued from Page 4

for an extremely awkward, unstable-feeling assembly that repeatedly frustrated attempts to relax-on-the-couch (or wherever), compose a paper with WORD, and print. My solution? GET RID OF THE ADAPTER! I removed the 26-pin connector and installed a 25-pin right-angle connector (from Radio Shack) so that my printer cable could attach directly to the back of the computer.

I must say that I enjoy this little laptop very much, now. For some reason, I feel a rapport with it, and I do like to work with it. When it was being offered in the Heath catalog, there was talk of enhancements, extensions, and improvements (there are two empty ROM sockets), but nothing ever appeared in print.

If anyone is knowledgeable about the ZP-150 and its history, I would be very interrested.

Ed Rockwood
7034 NE Hassalo
Portland, OR 97213

Looking for Compiler

Dear HUG:

Would you mind putting this in your "Buggin' HUG" column, or wherever seems appropriate?

I'm looking for Microsoft's BASIC compiler under hard-sectored, 5" HDOS. Think that you can help? Would need the documentation. Will obtain free and clear license from Microsoft before I use this program. (Purchased the CP/M version (soft-sectored 5") – don't use CP/M, but it was all that I could find – still have it, new, unused. Interrested? IF you can help, write me at the address below.

Thanks!

Cordially,

Mark Hunt
c/o USPHS Alaskan Native Hospital
Barrow, AK 99723 *

The other cats get to sing along!

That's because HEPCAT runs ***with*** your other programs, not ***over*** *them. HEPCAT (HUG Engineer's and Programmer's CAlculation Tool) is a powerful pop-up calculator for all Heath/Zenith MS-DOS and Z-DOS based computers. Unlike other pop-up calculators, HEPCAT does not stop the currently running program while it is popped up. That means that you can do calculations while your computer is busy with something else. For example:*

- *While Lotus (tm) is loading a huge spreadsheet, you can check your kid's math homework.*
- *While Dbase (tm) is sorting a large database, you can add up some grocery prices.*
- *While your computer is busy compiling one program, you can work on number base conversions needed for another program.*

HEPCAT is safe to pop-up during just about any running program — even during disk activity. And HEPCAT has other features the other guys can't touch.

HEPCAT gets along with everyone . . .

HEPCAT supports more video configurations than any other pop-up, and always pops up in the current video mode, rather than forcing the screen into a text mode as other pop-ups do. It also works properly with more programs than any other pop-up. You can pop up HEPCAT over Microsoft Windows (tm) and many other programs that other pop-ups can't work with, and even over some other pop-ups.

HEPCAT works harder . . .

*HEPCAT provides a multi-function floating point calculator and a programmer's binary calculator that work together to do more than the basic four (+, –, *, /). The floating point calculator includes the following built-in functions: powers, pi, factorial, square root, sine, arc sine, cosine, arc cosine, tangent, arc tangent, log (natural and base 10), e^X and 10^X. It also includes the following conversions: degrees-radians, radians-degrees, Celsius-Fahrenheit, Fahrenheit-Celsius, centimeters-inches, inches-centimeters, meters-feet, feet-meters, kilometers-miles, miles-kilometers, grams-ounces, ounces-grams, kilograms-pounds, pounds-kilograms, milliliters-fluid ounces, fluid ounces-milliliters, liters-quarts, quarts-liters. The binary calculator works in these number bases: binary, tetral (base 4), octal, split octal, decimal, and hexadecimal; and it supports these operations: MOD, AND, OR, XOR, SHL, SHR.*

The HEPCAT floating point calculator supports 8 significant digits and can display numbers four ways: floating point, fixed point, scientific notation, and engineering notation. Numbers are handled internally in BCD format to eliminate binary round off errors in addition and subtraction.

HEPCAT eats less . . .

HEPCAT uses less than 18k of memory — less than any other pop-up calculator that we know of. It also uses less than 14k of disk space, so you don't have to worry about where to put it on a small system. The HEPCAT window uses less screen space, too. It shows you more real information than other pop-up calculator displays, but it doesn't waste space by showing you a keypad layout. You already know what your keypad looks like! HEPCAT is easier to learn, too, with commands that make sense.

If you are tired of pop-ups that can only sing solo, give HEPCAT a try. HEPCAT is available from HUG as part no. 885-3045-37 for $35.00. It works on any Z-100 PC, Z-200 PC, or Z-100 (not PC) system and any version of MS-DOS or Z-DOS.

..Setup on a Zenith Data Systems Computer

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

To the average person, the term "compact disk" or "CD" connotes "music." This is the medium that, virtually overnight, replaced the 33-1/3 RPM long play record album and gave audiophiles an entirely new standard upon which to discuss the virtues of their favorite bands.

But for music, a compact disk merely provides the digital representation of an analog medium. The benefit for the connoisseur of sound is that, since a compact disk involves a light-based technology rather than a magnetic or mechanical science, there is virtually no wearout of the information. The thousandth playing of the music is as true to the original performance as the first. What is more, the compact disk is relatively inexpensive to produce and stores easily.

The keyword in the preceding paragraph is "information." Sound is but one of three types of information that can be digitized. The other two - graphics and text - are in the realm of most interest to the computer scientist. Most of us who have even a passing familiarity with programming algorithms are familiar with the principles of digitizing graphics images by translating their bitmap patterns into binary numbers, and, likewise, with representing text and other ASCII data as ones and zeros. It is with little explanation that we can understand the porting of binary data from magnetic disks to compact disks. This article will, then, report on the state of the technology in which we can apply "our" science to advantage in the environment of the brand of computer (Zenith Data Systems, naturally) to which we have chosen to affix our loyalties.

There is evolving a jargon which has (finally!) come to separate (technically, at least) information scientists from music lovers. "CD" or "Compact Disk" is generally the term of choice of musicologists; "CD-ROM" (the acronym, never the completely translated "Compact Disk-Read Only Memory") is the preferred verbalization by programmers. Computer technicians, using the literal function of CD-ROM's, have also adopted the term "optical disks" in their discussions; in fact, the terms "CD-ROM" and "optical disk" are used somewhat interchangeably. For the sake of this discussion, I will stay with "CD-ROM" in order not to confuse the issue.

Overview and Current State of the Technology

CD-ROM's function basically the same as magnetic disks, with the rendering of ones and zeros to describe binary files. The difference is in the physical setup of the medium. A CD-ROM is impressed with lands and pits to represent these ones and zeros. During the write process, a laser beam is focused on a plastic substrate on the CD-ROM proper. With bursts of laser light in synchronization with the "on" or "off" states of the information to be recorded, the beam burns a hole (creating a pit) in the plastic or leaves it alone (making a land). The read process is just the reverse, with the laser beam sensing the presence of material (the land) or the absence of it (the pit) to determine a state of "one" or "zero", respectively.

The advantage of this laser technology is the density of information allowed on the 4-4/5" (actually 120mm) disk. A data track some three and one-half miles long is possible, with a capacity in excess of 500 megabytes (one-half gigabyte) commonly attainable. The track is spiral, not concentric like the tracks of floppy disks and Winchester drives, and the beginning of the data is at the center of the CD-ROM, just the opposite of a phonograph record. And, the CD-ROM drive mechanism is a relatively inexpensive piece of hardware. In fact, if desired, a CD-ROM drive player can be configured to perform double duty as input for a home stereophonic sound system.

The major departure at present - and this is the primary reason that magnetic hard drive manufacturers haven't exhibited mass hysteria - is that what we commonly refer to as off-the-shelf CD-ROM's are only WORM (write once, read many) media. The laser burn process described above is destructive. Although high tech seers have predicted that microprocessor science is on the edge of a breakthrough, the fact is that right now, a low cost, erasable medium laser technology just isn't available. Predictions of availability in this realm have ranged from a few months to a few years, so (at least for the time being), we're discussing an essentially read-only peripheral device. But what is now available is impressive, and the following will outline what is already a magnificent, utilitarian line of peripherals with many end user applications.

Marrying Zenith Data Systems to Available Hardware

As it has been with most newly introduced hardware technology, the IBM, Zenith Data Systems and compatible PCs have enjoyed the advantage of being the first microcomputers for which new CD-ROM inventions were targeted. Thus, the CD-ROM technology favors the desktop units from the Z-151s through Z-159s to Z248's and beyond to the newer 80386- and 80386SX-based machines. Unfortunately, the Z-148s without an expansion slot and the laptops get left behind, at least for now. And without some extensive modification for PC compatibility, the Z-100s are left out as well. The H8s and H-19s are totally excluded, since CD-ROM is essentially a Johnny-come-lately science for which 8088- and 8086-based machines "just made the cut."

Also, as is generally the case with new technology, each of the companies who jumped on the bandwagon had a unique idea about what the interface standard should be. This is a familiar tune to all of us, with the memories of VHS vs. BETA, S100 vs. IBM buss vs. MicroChannel, and CPM/86 vs. DOS freshly in mind. Fortunately, the de facto standard for a CD-ROM format wasn't a battle for long. Most CD-ROM publishers and hardware manufacturers will specify the so-called High Sierra (or later ISO 9660) standard to en-

sure a compatible disk format. Happily also, the matter of incompatibility hasn't surfaced much in the CD-ROM arena, and even given CD-ROM technology's short existence, buyers can purchase with some degree of confidence that their machinery doesn't represent an experimental science.

Because of the relatively high initial cost of the CD-ROM software medium, CD-ROM vendors typically provide a list of drives they have tested with various manufacturers' PCs (Zenith Data Systems included). This suggests that end users and developers generally purchase program media in advance of the hardware. The logic is that the provision of lab and benchtests by the software and media vendors will result in fewer returns of disk-based products. For example, Zenith Data Systems machines have shown to exhibit compatibility problems (BIOS conflicts) with some of the earlier Hitachi drives. This is confirmed in vendors' literature, and I have generally avoided this brand when arranging new workstation setups unless a particular unit is proven compatible by my local Zenith Data Systems reseller dealer.

Hardware and Software Installation

The most typical hardware configuration is that of a drive itself (internal or external) and a separate interface board. In other words, you will probably have to sacrifice an eight-bit buss slot to install a CD-ROM drive. As with other relatively higher-cost, complex peripheral devices, there is not a sixteen-bit board available for the 80286- and 80386-based machines. However, most drives can be cascaded, so multiple drives (usually four) can be daisychained to one interface board.

Those readers who have stocked up on the Z-159s through Zenith Data Systems governmental and educational purchase program should take note: for dedicated workstations, this machine is very economically attractive. The most common complaint regarding CD-ROM drives is with the slowness of data access. Faster clock speeds of the higher-numbered CPUs don't have a significant effect on optimization of this access time. The 8 MHz speed of the Z-159 is ideal, and its usually shipped configuration with 640K RAM makes it very suitable where an environment of multiple information access points at low cost is desired.

Installation of a CD-ROM drive and its interface is relatively straightforward. A few configuration choices have to be made, and it is advantageous to have the Zenith Data Systems documentation at hand along with manufacturers' specifications. It is advised that you make notes of any atypical DIP switch settings in case other cards are added to the computer at a later time. For example, one of the possible interrupt settings on some drives' interface boards can conflict with local area network interrupt requirements. It is best to have these and all circuit board settings noted for each machine, in each PC's relevant paperwork, so that cards won't have to be removed one by one at a later date just to determine forgotten configuration settings.

The Sony interface board is typical. Along with some other brands, I installed several Sony CDU-7101s in Z-159s and Z-248s. DIP switches must be set for I/O channel addresses, interrupts (IRQ and DRQ), and logical drive number designations. Additionally, the AUTOEXEC.BAT file must reflect these settings to invoke the Microsoft Extensions (detailed below). You must also modify the CONFIG.SYS file for an appropriate number of file handles and buffers, typically FILES=30 and BUFFERS=40, and you must increase the number of logical drives (LASTDRIVE=d) so that MS-DOS will recognize the additional number of devices.

Problems With the Increased Volume of Data

As is likely to happen with attachment of any high-volume storage device, MS-DOS literally gags on the mass of data introduced by a single CD-ROM. At first, individual publishers provided device drivers for a few different brands of CD-ROM drives. This was a realistic activity, since their CD-ROM data bases usually were bundled as package deals offering only a few specific brands of drives. The companies' programmers could afford the few hours' extra time required to target specific makes of CD-ROM drives, since the CD-ROM vendors had total control over brands to be used with their products.

As the variety of CD-ROM titles and the number of brands of CD-ROM drives increased, it became evident that there had to be a way to handle high volume loads generically. The biggest problem was that MS-DOS (at the time) couldn't ordinarily handle a disk partition greater than 32 megabytes. Even now, the handling of large partitions requires special attention; thus, the standard of Microsoft Extensions was born.

The Extensions, which are usually not sold as a separate package, are generally provided as OEM (original equipment manufacturer's) software by the CD-ROM publishers and/or CD-ROM drive manufacturers. However, as long as the version numbers are sufficiently high (version 2.0x is currently being shipped as of this writing), one vendor's Extensions will usually suffice for another publisher's CD-ROM products. The Extensions are loaded like any device driver from the CONFIG.SYS file, at boot time, and carry the following switches for a Z-159 installation:

```
DEVICE=DRIVER.SYS /B:300 /M:p /T:1
/U:1 /D:device_name
```

DRIVER.SYS will be named whatever hardware specific tag the manufacturer desires (Sony ships HSONY.SYS and SONYCDU.SYS with its drives, Philips ships HPHILIPS.SYS, etc.). The /B: switch selects the base address (in hexadecimal) for I/O, /M: allows a choice of interrupt driven or device polled setups, /T: selects the DMA transfer channel (1, 2 or 3), /Q: sets the IRQ (interrupt) level, /U: determines the number of drives, and /D: tells MS-DOS the name of the device driver specified in the MSCDEX.EXE command line (described below).

Because of the relative complexity of the DEVICE= line, some elaboration is in order. Most of the various switches have default values, but some conflict with what Zenith Data Systems expects for optimum performance. The /B: switch defaults to an address of 300 hexadecimal. I found that 300h conflicts with a BIOS function in the Z-159s boot routine, and causes a register dump on powerup. The error condition can be ignored if a warm boot is immediately performed; however, this is a nuisance action, and I corrected it by resetting the base I/O address to 340 hexadecimal with /B:340.

The MODE /M: switch is a bit more subtle, and it requires some experimentation. I find that, since I generally "load up" my PC's with network cards and peripherals, on most machines I don't have an available interrupt channel for a CD-ROM drive. I opt for 'p' (polling) in lieu of 'd' (DMA) in order that an IRQ not be required. For the Z-248s, I select the 'h' (high speed polling) to take what slight advantage can be gained with the faster CPU's. Had I chosen an interrupt channel with 'd', a /Q:n (where n = IRQ 2, 3, 4, or 5) switch would have been required. The Z159 uses IRQ 3 and 4 for COM2: and COM1:, respectively, IRQ 5 for the hard drive controller, and (usually) IRQ 2 for the network (LAN) controller card. Facing the option of eliminating one of these channels, I arrange for device polling in nearly all cases.

The /T: switch works in sync with /M:, selecting the DRQ channel number of the CD-ROM host adapter. This circumstance comes into play only if you choose 'd' (DMA transfer) with the /M: switch. DMA (direct memory access) is a hardware facility that transfers data into memory without the active involvement of the CPU. I generally set /T:1 (choices are 1, 2 or 3) if I invoke DMA. If you use DMA, you may need to experiment with this number, depending on the age of your processor's associated boot ROM's. But as a rule, I set the /M: switch for polling, with /Q:*, where '*' signifies software polling (the default), and forget about DRQ channels.

A couple of other switches are optional. The /IT:n (where n = 0-15) switch specifies inactivity time. If you want the motor of the CD-ROM unit turned off after a specific period of inactivity, set n = 1 for each 30 seconds of timeout. Set n = 0 if you want the motor to run continuously.

The /RC:n (n = 1-255) switch sets the number of retries for accessing CD-ROM drives. If no value is set for /RC:, the system will default to 1.

One other step remains, that of including the MSCDEX.EXE extender program for MS-DOS in the AUTOEXEC.BAT file. This invocation and its command parameters have the format:

```
MSCDEX /D:device_name /M:n /E /V
/L:drive_letter
```

The MSCDEX.EXE command line is a bit more straightforward than the DEVICE= line in CONFIG.SYS. The /D: switch tells MSCDEX the name of the device to be recognized, and this name must be identical to the one given after /D: in CONFIG.SYS. /M:n sets the number of sector buffers to be used for caching the path table of a CD-ROM disk. The value of n should be at least 5, and the larger that n is set, the fewer accesses have to be made directly from the CD-ROM drive. /E is a toggle that, when set, places the sector buffers in expanded memory. /V is also a toggle, and it turns on the display of memory usage at boot time. Finally, /L:drive_letter assigns the designation of the first CD-ROM drive. This assignment may have to be changed manually (or by indirect manipulation of the AUTOEXEC.BAT file)–most CD-ROM loader programs (described below) allow the startup drive to be any letter D-Z, but some older data bases, such as ones issued by the Superintendent of Documents (Federal GPO) are hard coded to expect a specific CD-ROM drive designation such as E:.

It is advisable to use the highest version of MS-DOS available to you with any version of the Extensions. I have found that I experience fewer compatibility problems with my Z-159s and Z-248s if I use at least version 3.1; in fact, most CD-ROM products require MS-DOS version 3.1 or newer. Also, you should remove any unnecessary device drivers and TSR's (terminate and stay resident) programs such as *Sidekick* or other popup utilities when running CD-ROM programs and their accompanying loader software. The Extensions and programs that access them are memory hogs, and should be allowed all the room you can spare; otherwise, "out of memory" messages will abound. I have experienced a couple of CD- ROM databases which deny me access unless I warm boot from a floppy disk–demanding even the room required by my hard disk driver and its associated housekeeping/setup routines!

One other quirk of CD-ROM based data bases is that they all seem to have their own unique, individual loader programs. When you purchase a CD-ROM data base, you typically receive the accompanying access/loader program on a floppy disk. This is done for several reasons: one is so that updates of the CD-ROM will be backward compatible with the original disk(s), and the other is to make the installation program simpler. Some CD-ROM products do come with the loader programs on the CD-ROM itself, but publishers generally take the position that it wastes CD-ROM space (?) and that end users are more accustomed to loading their applications software from the A: (floppy disk) drive. Whatever the reason, you are generally spared from having to figure out first how to access the CD-ROM drive before proceeding. This is not a problem with accomplished PC users, but it should be noted that many end users of CD-ROM products have no familiarity with programming techniques or PC architecture.

As mentioned above, the Federal Government's Superintendent of Documents is beginning to issue many of its publications on CD- ROM's. This is a promising medium for the reams upon reams of statistical and tabular data, such as census reports and business forecasts, that are sought by researchers and others in the private sector. Unfortunately, the Federal Government has not settled on a universal access/loader program, and the end user may have to place many invocation programs on the hard disk. I have found that, where many persons will access multiple CD-ROM data bases on the same PC, it is best to call the various loader programs and their data bases from batch files. Upon exit, the machine is reset to its original state to await proper database access by the next user.

Types of Information Available

Because of the high volume of data that can be handled on a single disk, CD-ROM data bases tend to be expensive. This verifies the fact that the buyer is paying for information, not for the medium. And many times, the CD-ROM version of a data base (e.g., for some encyclopedias) is more expensive than the hard copy. It is with the classic, exhaustive reference works, such as the *Oxford English Dictionary* with its 250,000 detailed lexicographic entries, that the (almost) instantaneous lookup provisions of CD-ROM based files really stand out above the crowd. To that end, the *Microsoft Bookshelf*[1] collects an almanac, ZIP code directory, dictionary, style manual, and thesaurus onto one CD-ROM disk and reduces the tedium of frequent lookups that sometimes confronts writers to a momentary task of typing a few search keywords.

The availability of applications and developmental software on CD-ROM is currently the exception and not the rule. One notable departure was (again) made by Microsoft corporation in the company's recent version 6.0 update for its C compiler in choices of 3 1/2" diskettes, 5 1/4" diskettes, or a CD-ROM. Retail store sales of CD-ROM based products are not brisk, either. Egghead Software (East/West coasts and Midwest) displays but a small selection of CD-ROM's, mostly clip art and utility software packages, and B. Dalton Software and Books has recently announced that its stores would test market the medium "in the near future." For many of the commercial (trade) CD-ROM's, mail order is more typical. One comprehensive source is the Bureau of Electronic Publishing,[2] which makes available both database and programmers' references along with a line of CD-ROM hardware.

What other materials are to be found? One of the more promising data bases is the *Microsoft Programmer's Library,*[3] a collection of the company's most popular manuals on one CD-ROM disk. This could be a powerful advantage for developmental programmers–language references to C, Pascal, BASIC, and assembler, along with syntaxes and conventions of those languages, are available online within seconds to the owner of the *Library* and a CD-ROM drive. In writing and debugging a complex program, this can save hours of lookup time; it is logical that other software vendors will follow suit.

Clip art libraries are available in packages such as NEC's *Clip 3D.*[4] This CD-ROM, which runs under Windows, offers 2,500 icons that can be altered, scaled, clipped, and combined to result in a standard TIF (tagged image file) format usable in desktop publishing packages. NEC also makes available an *Image Gallery, Photo Gallery,* and *Type Gallery.* Depending on the reseller, these packages sell for around $359.00 each. The stored graphics images would literally devour even high-density floppy diskettes. For CD-ROM's, the encapsulation of thousands of bit-mapped images is child's play.

One recently issued CD-ROM data base is *The PC-SIG Library.*[5] Persons familiar with the shareware available from this organization will recognize the scope of word processors, spreadsheets, database programs, games, and utilities available. PC-SIG's *Library* contains the equivalent of about 800 floppy disks (there are over 1,000 title entries in the PC-SIG collection), so the majority of the shareware in PC-SIG's catalog is represented. This is an excellent, relatively low-cost library for experimenters, and persons whose roots extend back to the kit days of Heath/Zenith computers would be keenly interested.

A good review of many of the consumer- and programmer-oriented CD-ROM's was published in *PC Magazine* some months ago.[6] "Archives in Miniature" is one of the best summaries I've seen that encapsulates the informational side of CD-ROM technology and provides the potential user with some unbiased, purchase decision data.

The majority of CD-ROM's *are* informational, offering special subject data bases that heretofore were available only

through dialup subscription services. Many of these CD-ROM databases are still handled by subscription; however, the difference is that the end user does not pay any telecommunications charges. Each publisher handles a subscription differently–*Books in Print Plus,*[7] for example, requires the return of the old CD-ROM as soon as the new, quarterly disk is received. *ERIC,*[8] for resources in professional education, on the other hand, does not require the return of disks when the latest versions are delivered.

Some vendors distribute their data bases free, or at nominal cost, to customers intending to use the CD-ROM's for order purposes. EBSCO, a magazine subscription jobber, furnishes a CD- ROM to customers for purposes of placing subscription orders. The data base is coincidentally excellent for performing keyword searches of magazines' titles. The Baker and Taylor Company, a book wholesaler, also makes its inventory available on CD-ROM at nominal costs, and customers have little difficulty in locating a particular book title for order.

Document contents searching has been made simpler through PC based CD-ROM's. Information Access Corporation and University Microfilms both publish indexes to magazines' contents that make locating an article on a particular subject quite easy. These publishers' CD-ROM's are quite expensive (IAC's *Infotrak* is not sold without leased PC hardware) and can probably be examined in your local library. *Silver Platter International*[8] makes available a variety of CD-ROM data bases, including the aforementioned *ERIC, Chem-Bank, PsycLit,* and others, all of which use a common loader software interface. I access the Silver Platter products on several Z159's and Z248's, and retrieval of an abstract from several hundred thousand entries takes from a few seconds to under a minute. One outstanding advantage to the Silver Platter system is that disk swapping of different CD-ROM data bases is accomplished without rebooting or exiting the loader program.

Shared Information Over the Network

For almost a year, one of the hottest topics at professional conferences where automation plays a key role is the networking of PC's with CD-ROM's and CD-ROM drives. I currently use this technology in my library workplace, also with Z-159s and Z-248s, to perform literature searches for students over a Novell local area network. Several advantages are realized with this setup: using the LAN's print spooling provisions, I can complete several CD-ROM searches without requiring students to wait between each one. And, I can send the printouts to a remote station, transferring distracting printer noise to a location away from the main study areas.

Unfortunately, networking CD-ROM's is not just a simple matter of installing multiple copies of the Microsoft Extensions. Several companies have taken on this task of networking as a specialty, each with its own solution on how to fileshare CD-ROM based resources. Any interested parties can write to the individual vendors (see below) for information; for those persons more adventuresome and willing to experiment with various setups, *Thompson and Maxwell's recent article*[9] gives some insight on how to set up CD-ROM networks generally.

For the person already owning a local area network, one might try variations of connections using a utility like *Map Assist.*[10] This is a DOS level peer-to-peer disk access utility, and, with proper setups, it can allow all stations on a LAN to access any other station's CD-ROM drive. The advantage of such a program is that additional servers are not required, and the capital outlay for software is minimal.

On the minus side of a homebrewed configuration, however, it is the responsibility of the installer to ascertain that each CD-ROM based loader program will work properly over a particular network. Also, there is presently some confusion over the interpretation of copyright. CD-ROM disks are not copyable in the same sense as magnetic disks, so there doesn't exist the "pirating" of software in the usual manner. However, over a local area network, does use of a CD-ROM violate the principle of "one program, one machine?" Most vendors admit that they aren't certain; however, some CD-ROM vendors impose a site license (multiple-copy) fee for a LAN installation of their product. It is the responsibility of each network supervisor to ascertain that copyright regulations are followed.

For those who want more than a do-it-yourself setup, a turnkey, prepackaged installation is more appropriate. One of the heavy hitters of this area of technology is *Meridian Data Incorporated.*[11] The company provides network setups of single and multiple CD-ROM drives, and supplies the appropriate network utilities for several popular LAN software packages. *Silver Platter*[8] also provides a MultiPlatter setup which is invaluable if your PC environment makes use of that company's extensive database subscription library.

It is generally agreed that the future of CD-ROM technology will flourish with reasonably affordable read/write drives. The technology is out of the laboratory and available now, but erasable optical disks are currently available only at considerable expense. The price must come down to be accepted by the general PC consumer.

Software Products Mentioned and Sources of Information

Persons who are serious about jumping on the bandwagon of this new technology should broaden their insight of the entire realm of the genre. For an overview of the medium, suggested reading is *CD ROM: The New Papyrus*[12] and *CD ROM: Optical Publishing*[13]. Both books offer considerable detail on the state of the art of CD- ROM technology and the requirements for optical publishing, and both have extensive list of names and addresses of CD-ROM resources. Those wishing to build on their circuit-based knowledge will find *The CD-ROM Handbook*[14] essential.

For news of the broadest aspect of CD-ROM offerings and publications, the monthly *CD-ROM Review*[15] is a must. Articles include material on both technology and related products. Persons responsible for building and maintaining collections of CD-ROM based materials will find the *CD-ROM Librarian*[16] invaluable. A new publication, *CD-ROM Shoppers Guide*[17], is crammed full of addresses and sources for some very obscure and hard-to-find CD-ROM hardware and software products. And for those who would engage in serious research, *Computer Library*[18] provides an index and abstracts to a year's worth of magazine articles on computer science, from about 120 different periodicals. Its monthly issues cover over 55,000 articles, and it is published on (what else?) CD-ROM disks.

[1]***Microsoft Bookshelf,*** *available from Microsoft Corporation, 16011 N.E. 36th Way, Redmond, WA 98073-9717. $295.00.*

[2]*Bureau of Electronic Publishing, Inc., Dept. P, 141 New Road, Parsippany, NJ 07054.*

[3]***Microsoft Programmer's Library,*** *$395.00. See footnote 1 above for address.*

[4]***Clip 3D,*** *available from NEC Home Electronics, Inc., 1255 Michael Drive, Wood Dale, IL 60191-1094. $399.00.*

[5]***The PC-SIG Library,*** *available from PC-SIG, Inc., 1030 East Duane Avenue, Suite D, Sunnyvale, CA 94086. $295.00.*

[6]*Manes, Stephen. "Archives in Miniature,"* ***PC Magazine,*** *January 31, 1989, pp. 185-224.*

[7]***Books in Print Plus,*** *available from Bowker Electronic Publishing, 245 West 17th Street, New York, NY 10011. $995.00/year; quarterly updates.*

[8]Silver Platter Information, Inc., 37 Walnut Street, Wellesley Hills, MA 02181. Write for catalog; this company vends several dozen CD-ROM data bases and some Zenith compatible hardware.

[9]*Thompson, M. Keith and Maxwell,*

Kimberly. "Networking CD-ROMs," ***PC Magazine,*** February 27, 1990, pp. 237-260.

[10]***Map Assist,*** available from Fresh Technology Group, 1478 N. Tech Boulevard, Suite 101, Gilbert, AZ 85234. $250.00

[11]Meridian Data Incorporated, Suite 101, 4450 Capitola Road, Capitola, CA 95010.

[12]Lambert, Steve and Ropiequet, Suzanne. ***CD ROM: The New Papyrus.*** Redmond, WA: Microsoft Press, 1986. Paper, 619 pages, $21.95.

[13]Ropiequet, Suzanne. ***CD ROM: Optical Publishing.*** Redmond, WA: Microsoft Press, 1987. Paper, 358 pages, $22.95.

[14]Sherman, Chris. ***The CD ROM Handbook.*** New York: Intertext Publications (division of McGraw-Hill Book Company), 1988. 510 pages, $59.95.

[15]***CD-ROM Review,*** published monthly by IDG Communications, Eighty Elm Street, Peterborough, NH 03458. Subscriptions, $34.97/year.

[16]***CD-ROM Librarian,*** published ten times per year by Meckler Corporation, Eleven Ferry Lane, West, Westport, CT 06880. Subscriptions, $65.00/year.

[17]***CD-ROM Shoppers Guide,*** published quarterly by DDRI, Inc., 510 N. Washington Street, Suite 401, Falls Church, VA 22046-3537. Subscriptions, $12.95/year.

[18]***Computer Library,*** published monthly by Ziff Communications Company, One Park Avenue, New York, NY 10016. Subscriptions, $790.00/year. ✱

Powering Up Volume 2

Understanding MS-DOS Device Drivers

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More and more of today's programs are using device drivers to perform certain functions. Windows version 3, for example, includes several device drivers, and they may or may not need to be installed depending on exactly what kind of system you have. Even newer versions of DOS, such as ZDS MS-DOS 4.0, include various device drivers that can perform useful functions if you know how and when to use them. Some device drivers, such as VDISK.SYS, have been around for a long time and are generally well known. In this article, we will take a look at what a device driver generally does, how it does it, and how to understand and use some of the device drivers supplied with various DOS versions.

What is a Device Driver?

In the DOS environment, input and output functions are performed by transferring information between various devices. For example, the PRINT command is used to transfer information from a disk drive (one physical device) to a printer (another physical device). The DEVICE DRIVER is the basic program that allows the operating system to communicate with all physical devices connected to the system. This includes such items as the keyboard, CRT, disk drives (and their associated disk controllers), mice, printers, and modems. In general, this hardware is called a *PHYSICAL DEVICE*.

A physical device is more than a little difficult to deal with, and that problem is taken care of by the definition of a logical device. For example, it is much easier to identify a disk drive as "A:" than to think of it as "floppy drive 0 (zero)." In other words a *LOGICAL DEVICE* (i.e., name) is the identifier that you generally use to tell the operating system what PHYSICAL DEVICE you want to use. More importantly, a logical device is defined in the operating system, such as DOS, and a physical device is defined in the system hardware, such as the ROM. As you may remember from Chapter 5 in this book, the BIOS (Basic Input/Output System) performs a "translation" from the logical device name, such as *A:*, to a physical device name like *floppy drive 0 (zero)*.

If you are using a Heath or ZDS computer, you may find that the idea of physical and logical devices is more important because you may need to know about both. If you refer to Chapter 2 in the original *Powering Up* book, you will find that Figure 3 (page 24) shows the ZDS Boot Commands that can be used to boot the system from any valid disk drive. For example, the ROM Monitor's *BF0* command is used to boot the system from floppy drive zero, which is a physical device. That command requires the use of a physical device name because the operating system has not yet been loaded, and the ROM Monitor does not know a thing about logical devices. After the system has been booted and the operating system (specifically the BIOS) has been loaded, then you can use the logical device name to identify the disk drives. Figure 1 shows a general form of the physical-to-logical device translation for disk drives in a standard system.

Logical Name	Physical Name
A:	Floppy Drive 0
B:	Floppy Drive 1
C:	Hard (Winchester) Drive 0
D:	Hard (Winchester) Drive 1 (See text)

Figure 1
Physical and Logical Device

The information shown in Figure 1 is based on the original IBM definition of the mapping from a logical device name to a physical device name, especially for a hard drive. Older IBM hardware and PC-DOS versions simply did not support more than four physical disk drives, and even that was limited to two floppy drives and two hard drives as shown in Figure 1. Older versions of ZDS MS-DOS allowed a user to assign specific logical names to partitions on a physical hard drive (with the ASGNPART command), but current versions automatically assign logical names as shown if there are two hard drives in the system.

There are other logical device names you can use for physical devices, which are sometimes called "ports" on a computer, and these are shown in Figure 2.

CON. *System Console device*, which normally includes both the CRT (monitor) and keyboard.

COM1. *First serial Communications port*, frequently used for a modem or serial printer.

LPT1. *First parallel port*, frequently used for a parallel line printer (LPT means Line Printer).

NUL. *The Null device*, which that allows output to be directed to it, but that output is discarded by the operating system.

PRN. *Printer device*, which is the same as LPT1 in most DOS versions.

AUX. *Auxiliary device*, which is the same as COM1 in most DOS versions.

Figure 2
Other Physical and Logical Device Names

Depending on your system hardware, you may also have additional logical names that you can use, such as COM2 for a second serial port or LPT2 for a second parallel port. Although these are standard logical names, you must have installed additional support hardware for that physical device (i.e., port) in most computers because most standard computer configurations do not include more than one serial or parallel port.

The basic concept behind the use of a device driver is quite easy. A *DEVICE DRIVER* is a "program" that provides an interface between the operating system (e.g., DOS) and the hardware (e.g., disk drives) that comprises a computer system. From a technical perspective, device drivers have been around for years, and they

were initially introduced in the release of DOS version 2. Since that time, there have traditionally been two different ways to "install" or use device drivers: internal and external.

Internal and External Device Drivers

INTERNAL device drivers are part of DOS. They are built-in "programs" (within DOS) that provide some kind of support for system hardware, such as a printer or a CRT. If you have ever used I/O Redirection in DOS, you have probably worked with one or more of the internal device drivers, such as CON (the system console, usually called the CRT) or PRN (printer). For example, you can send the information from the CHKDSK command to a printer (instead of the default CRT display) by using the following command:

```
CHKDSK  PRN
```

Or, you could send that information to a disk file, such as CHKDSK.DAT, by using a command like:

```
CHKDSK B:CHKDSK.DAT
```

Internal device drivers do all kinds of important things that you do not have to think about, but they may be critical if you want to install some new hardware. For example, MS-DOS version 3.1 did not include support for the 1.44 MB high-density 3.5-inch floppy drive, even though that version obviously had a device driver for a floppy disk drive. It is interesting to note that it is a relatively simple matter to add the required characteristics to a special table in the DOS BIOS, which is exactly how the 1.44 MB drives were implemented in later DOS versions. As it turns out, the 1.44 MB drives have become so popular that hardware support was directly implemented in current ROM-BIOS versions too.

EXTERNAL device drivers, such as VDISK.SYS, have also been around a long time. They are a special kind of "external program" which is implemented by a DEVICE= command line in the CONFIG.SYS file and are most often used to provide some special feature that is not something necessarily required by the operating system. One particular feature of all external device drivers is that they are really memory-resident programs which are loaded in addition to the usual operating system programs. The remainder of this article will discuss the most commonly used external device drivers included with ZDS MS-DOS version 4.0 and later versions in alphabetical order. As always, be sure to check your MS-DOS manuals for specific information on the device drivers for the MS-DOS version you are using.

Expanded and Extended Memory

All of the device drivers mentioned here will work with either expanded or extended memory with some limitations that are included as necessary in each specific discussion. Two of them, VDISK.SYS and ZCACHE.SYS, will also work with conventional system memory within the standard 640 K limit.

EXPANDED MEMORY is used to "expand" conventional system memory beyond the usual 640 K limit, and it can be used on any Heath or ZDS computer that has expanded memory installed. Some ZDS computers, such as the eaZy PC, Z-171 laptop, and the Z-180 series laptops, cannot use expanded memory because they do not have the internal space or connections required to install an expanded memory board. Expanded memory may also be referred to as EMS because it was originally defined in the Expanded Memory Specification developed by Lotus, Intel, and Microsoft.

EXTENDED MEMORY is used to "extend" conventional system memory beyond the usual 640 K limit and can only be used on a computer that is capable of addressing more than 1 MB of memory. Specifically, the computer must have at least an 80286 CPU (or 80386 or 80486) to be able to install and use extended memory. Extended memory may also be referred to as XMS (for eXtended Memory Specification) as originally defined by Microsoft.

If you need more information about the three types of memory –conventional, expanded, and extended– you can find it in Chapter 10 (Adding More Memory to Your Computer) in the original *Powering Up* book. And also be sure to refer to the Owner's Manual supplied with your computer, as well as the MS-DOS manuals for the specific DOS version you are using. If you find something different than what is discussed here, by all means follow the manufacturer's recommendations.

EMM.SYS

There are three basic steps necessary for the installation and use of the Expanded Memory Manager, EMM.SYS, that is provided with current versions of ZDS MS-DOS. First, you must have installed the appropriate type of memory that supports EMS. In order to use EMM.SYS, you must have a Heath or ZDS computer that has at least 1 MB of standard memory installed (e.g., the SupersPort 286 laptop or the Z-286/12 desktop). For the Z-386/16 computer, EMM.SYS will only work with the ZDS Z-505 (1 MB) and ZDS-515 (4 MB) memory boards. For newer 80386-based computers –Z-386/20, Z-386/25, Z-386/33– that use SIMMs (Single In-line Memory Modules) for memory expansion, you can use any compatible SIMM for expanded memory. If your computer does not use SIMMs for memory expansion or you do not use ZDS memory boards in a Z-386/16 computer, you *CANNOT* use the EMM.SYS device driver supplied with any version of ZDS MS-DOS. For all of these other computers, such as the Z-150 series, the Z-241, and Z-248, you will need to buy a third-party memory board and use the expanded memory device driver that is supplied by the manufacturer of that specific board. If you need an expanded memory board for one of these computers, I suggest you check with one of the advertisers in *REMark* magazine.

The second requirement for implementing EMM.SYS is that you must configure the hardware for EMS use. For the Z-386/16 with ZDS memory boards, you must set one of the switches on each board to define expanded memory. For computers that have a standard 1 MB of memory or have additional SIMMs installed (more than 1 MB), you must use the ROM-based SETUP command to define the amount and type (either EMS or XMS) memory installed.

The third and last requirement is to add the command line to the CONFIG.SYS file to install the EMM.SYS device driver. When you have completed this change, your CONFIG.SYS file might look like Figure 3.

```
BUFFERS=30
FILES=25
DEVICE=C:\DOS\EMM.SYS
```

Figure 3
CONFIG.SYS with EMM.SYS Driver

The example in Figure 3 assumes that the EMM.SYS device driver is located in the \DOS subdirectory on drive C, and you will have to modify that as appropriate for your system and directory structure. The BUFFERS=30 is an average value that seems to work well in most systems, and I suggest that you use a value no less than 25. The FILES=25 is also an average value that seems to work well in most systems. If you have numbers higher than those shown in this example, then you may want to refer to page 69 in the original *Powering Up* book for additional information on setting these values.

When you have correctly completed all three of these steps and rebooted the computer (to install EMM.SYS), you will see a sign-on message showing the actual amount of expanded memory available. At this point, you may want to install additional device drivers, such as VDISK.SYS or ZCACHE.SYS that are included later in this article. I should also note that EMM.SYS supports EMS Version 4.0, and if you want to use it with any application software, be sure you verify that the application will work with EMS Version 4.0 (check the manual for that application program).

EMM386.SYS

The EMM386.SYS device driver was introduced in ZDS MS-DOS version 4.0. The purpose of EMM386.SYS is to "convert" a computer's extended (XMS) memory to expanded (EMS) memory. This

allows you to permanently set up all memory in your computer as extended memory, and you can easily change that to expanded memory by installing this device driver. It is particularly useful when you use a program (or an operating system like OS/2) that generally requires extended memory, but you also might have some programs that require expanded memory too. For example, you could set up all memory as extended memory in order to run the OS/2 operating system which requires LOTS of memory (4 MB is the minimum currently recommended and more is better). And then if you wanted to run DOS programs, you could simply "convert" that extended memory to expanded memory by simply adding a command line to the CONFIG.SYS file.

As you might guess from its name, this device driver can ONLY be used on a computer which has an 80386 or 80386SX CPU. Check the Specifications page in the Owner's Manual supplied with your computer to be sure that you can use this device driver.

Other than that, the installation steps required for the use of EMM386.SYS are generally the same as for EMM.SYS. First, you must install extended memory (more than 1 MB) in your computer. For example, you must install one of the ZDS memory boards in a Z-386/16 computer or SIMMs in later 80386-based systems.

Second, you must configure the hardware for use as extended memory. For the Z- 386/16 with ZDS memory boards, you must set one of the switches on each board to define extended memory. For computers that have a standard 1 MB of memory or have additional SIMMs installed (more than 1 MB), you must use the ROM- based SETUP command to define the amount and type (either EMS or XMS) memory installed.

And third, you must add the command line to the CONFIG.SYS file to install the EMM386.SYS device driver. When you have completed this change, your CONFIG.SYS file might look like Figure 4.

```
BUFFERS=30
FILES=25
DEVICE=C:\DOS\EMM386.SYS 1024
```

Figure 4
CONFIG.SYS with
EMM386.SYS Driver

As before, the example in Figure 4 assumes that the EMM386.SYS device driver is located in the \DOS subdirectory on drive C, and you will have to modify that as appropriate for your system and directory structure. Also, this example assumes that you have added 1 MB (1024 kilobytes) of extended memory to your system and you want to allocate all of it as expanded memory in the command line. If you do not want to allocate all of the extended memory as expanded memory, you can simply omit the 1024 shown above which will install the default of 256 K; however the ZDS MS-DOS manual recommends that the minimum should be 512 K.

When you have correctly completed all three of these steps and rebooted the computer (to install EMM386.SYS), you will see a sign-on message showing the actual amount of expanded memory available. After that, you may want to install additional device drivers, such as VDISK.SYS or ZCACHE.SYS that are included later in this article.

On page D.14 of the ZDS MS-DOS Version 4.0 User's Reference, there are a number of points that the manual suggests you keep in mind. I prefer to think of them as cautions and specific recommendations on the use of this device driver, and although I will include some of them here, be sure to read the manual for other items.

First, ALL memory above 1 MB should be configured as extended memory. You can allocate whatever portion of the extended memory you added by simply adjusting the number of kilobytes you want as expanded memory in the DEVICE= command line. If you installed 1 MB of extended memory, you can allocate 512 K as expanded memory with the EMM386.SYS device driver, and the remaining 512 K will still be extended memory. And once you have configured the all memory above 1 MB as extended memory and installed EMM386.SYS, it should be obvious that other EMS drivers, like EMM.SYS, are not required (and will NOT work).

Second, the manual says that you should use hardware for EMS support (rather than EMM386.SYS) if your computer has it. If you have a Z-386/16 like mine, that means you should actually change the switch on each board to use EMS when you want to use expanded memory. And in all these computers, you will also have to use the SETUP command to change the memory configuration to EMS. Then you can use the standard EMM.SYS device driver to ensure maximum EMS software compatibility, which brings up the third point.

EMM386.SYS will not work with programs that can run in the PROTECTED MODE, such as Windows 3.0. While that sounds like a serious problem, it is really quite easy to fix. All you need to do is configure the hardware to use expanded memory (see the second point above) and then use EMM.SYS as the expanded memory manager. As a matter of information, the protected mode is a CPU feature for memory management that is required for multitasking programs like Windows 3 and the OS/2 operating system. Nearly all programs that were developed for DOS-based systems (with Windows 3 and supported programs like Word for Windows being the exceptions) run in the REAL MODE, which means that you CAN use EMM386.SYS with those programs.

Although EMM386.SYS seems to work fine as described on my Z-386/16, there is no guarantee that it will work with all software and all hardware configurations for one reason or another. I configured all the additional memory (4 MB) as extended memory, loaded some other device drivers (VDISK and ZCACHE), and everything seemed to work as expected with no problems. Of course I did not test every possible hardware combination, ROM version, and software version, but my software performed as usual. If you decide to use this device driver, I recommend you test all your software thoroughly to be sure that there are no compatibility problems before you use your system for production work. And even though I know that ZDS tests all of their software very thoroughly before it is released, even they cannot test all possible hardware and software combinations that inevitably occur in the field.

As a final note, I should also mention that EMM386.SYS supports EMS Version 4.0, and if you want to use it with any application software, be sure you verify that the application will work with EMS Version 4.0 (check the manual for that application).

HIMEM.SYS

The HIMEM.SYS device driver was also introduced in ZDS MS-DOS Version 4.0, although it is also available in the Windows Version 3.0. This device driver provides a hardware-independent interface to extended memory that conforms to the eXtended Memory Specification (XMS) Version 2.0. In general, this device driver only needs to be used when required by an application program, such as Windows 3.0, although that version of Windows includes the HIMEM.SYS device driver too. In a situation like that, I recommend using the device driver that comes with the application, even though I believe that the one included with ZDS MS-DOS Version 4.0 would work just fine. I always prefer to use software provided with an application, like Windows, to help ensure that I have no unexpected problems.

Installing HIMEM.SYS is easy and a sample CONFIG.SYS file is shown as Figure 5.

```
BUFFERS=30
FILES=25
DEVICE=C:\DOS\HIMEM.SYS
```

Figure 5
CONFIG.SYS with
HIMEM.SYS Driver

As before, the example in Figure 5 assumes that the HIMEM.SYS device driver is located in the \DOS subdirectory on drive C, and you will have to modify that as appropriate for your system and directory structure. I should specifically

note that this device driver is only needed for programs that require XMS Version 2.0. It is not necessary to provide support for other device drivers, like VDISK and ZCACHE, and is only required when an application specifically uses XMS.

Although I have only seen one program at the time of this writing that uses the XMS (Windows 3), I have included it here for reference because future programs may require its use.

VDISK.SYS

The VDISK.SYS is the oldest device driver that has commonly been provided with DOS. The name VDISK is taken from the full name of *Virtual Disk* because it makes part of a computer's memory "look like" a disk drive. The VDISK device driver emulates a disk drive by creating a directory, File Allocation Tables (FATs), and the file area, and you "talk to" that drive by using a drive letter, just like any disk drive; hence the name Virtual Disk. Many people believe that this is new terminology, but terms like Virtual Memory have been used in mainframe data processing for years. A virtual disk is sometimes called a RAM Disk because it can be installed in any of the three types of memory: conventional, extended or expanded. Figure 6 shows the general form of the command line as well as the specific requirements for the CONFIG.SYS file.

General Form:

```
DEVICE=C:\DOS\VDISK.SYS
 SIZE=kilobytes, S-SIZE=bytes,
 DIRS=number
```

For Specific Memory Types:

```
DEVICE=C:\DOS\VDISK.SYS
 SIZE=64, S-SIZE=128,
 DIRS=64 (Conventional)
DEVICE=C:\DOS\VDISK.SYS
 SIZE=64, S-SIZE=128,
 DIRS=64 /A (Expanded)
DEVICE=C:\DOS\VDISK.SYS
 SIZE=64, S-SIZE=128,
 DIRS=64 /E (Extended)
```

Figure 6
VDISK.SYS Commands for CONFIG.SYS

As in previous examples, this one assumes that the VDISK.SYS device driver is found in the \DOS subdirectory on drive C. In the General Form of the command line, you can specify the SIZE of virtual disk you want in *kilobytes*, which is just a number like 64, 256, 512 or 1024 (1 MB). For the SIZE parameter, the default is 64 (kilobytes), the minimum is 16, and the maximum is limited by the amount and type of available memory you have.

The Sector Size (S-SIZE) is the length of each sector in *bytes*. Valid values are 128, 256, 512, and 1024, which are also valid in DOS. The default is 128 (bytes). The Directory entries (DIRS) is the *number* of root directory entries that are created by the device driver. Valid values range from a minimum of 2 to a maximum of 1024, and the default is 64 (root directory entries). And although the manual does not show it, it is perfectly valid to add "comments" to explain what the parameter values are. In this example, I have used SIZE=, S-SIZE=, and DIRS= to indicate what the purpose of each parameter is.

You can install a basic virtual disk in conventional memory by using the command line: *DEVICE=C:\DOS\VDISK.SYS*, which will use all of the default values. That is, you will have a 64 K SIZE with a 128-byte sector size (S- SIZE) and 64 root directory entries (DIRS). Note that these parameters provide the VDISK.SYS device driver with the information required to "format" the disk, so the use of the FORMAT command is irrelevant and you will see an error message if you try to FORMAT a virtual disk. For commands like this, I prefer to explicitly specify all parameters, even if they are the defaults, to be sure I know what will happen. That's why the default values are shown in the various command line examples For Specific Memory Types in Figure 6.

The presence or absence of the appropriate switch in the command line determines what type of memory will be used for the virtual disk. No switch is required to install a virtual disk in Conventional memory as shown in Figure 6. To install a virtual disk in expAnded memory, you add the /A switch to the command line. And to install a virtual disk in Extended memory, you add the /E switch to the command line.

The ZDS manual mentions a possible problem (page D.24) if the VDISK is installed in extended memory, so I recommend that you thoroughly test all software you intend to use BEFORE you use it for production work. I am quite finicky about data integrity, and I avoid potential problems like this by simply not using a feature that potentially could cause loss of data. For that reason, I recommend that you use either expanded or conventional memory for a VDISK if you need one.

ZCACHE.SYS

Depending on what software you use and how you use it, you may be able to significantly improve the performance of your system by using the ZCACHE.SYS device driver. This device driver uses a portion of the computer's memory as a storage area (i.e., cache) for data read from a disk. When the data are stored in memory after the first read, it is MUCH faster to read the data from memory than it is to read from disk, assuming that you need to read that *same* data again of course. Writing data to disk is not affected because a disk write is still made directly to the disk. How much of a performance improvement you see is strictly dependent on what software you are using. Some software, like a spreadsheet for example, normally reads data only once from a disk and then stores it in memory for manipulation and calculations. Therefore, you are not likely to see a whole lot of performance improvement if you mostly use a spreadsheet program. On the other hand, data base software normally performs lots of disk reads and typically will exhibit the most impressive performance improvement with a cache. Whether or not a word processor gains much by using a cache depends on specifically what program you are using and what kind of work you are doing with it.

The ZCACHE.SYS device driver is easy to install and the examples are shown in Figure 7.

For Specific Memory Types:

```
DEVICE=C:\DOS\ZCACHE.SYS
 SIZE=64 (Conventional)
DEVICE=C:\DOS\ZCACHE.SYS
 SIZE=64 /A  (Expanded)
DEVICE=C:\DOS\ZCACHE.SYS
 SIZE=64 /E  (Extended)
```

Figure 7
ZCACHE.SYS Commands for CONFIG.SYS

As before, this example assumes that the ZCACHE.SYS device driver is found in the \DOS subdirectory on drive C. You can install a basic virtual disk in conventional memory by using the command line: *DEVICE=C:\DOS\ZCACHE.SYS*, which will use the default value of 64 K for the cache for a hard drive. And although the manual does not show it, it is perfectly valid to add "comments" to explain what the parameter value is. In this example, I have used SIZE= to show that the number is the size of the cache.

Like VDISK, the presence or absence of the appropriate switch in the command line determines what type of memory will be used for the cache. No switch is required to install the cache in Conventional memory as shown in Figure 7. To install ZCACHE in expAnded memory, you add the /A switch to the command line. And to install ZCACHE in Extended memory, you add the /E switch to the command line. If you want to use the cache for floppy drives too, you can add the /F (Floppy) switch to any of the command lines shown in Figure 7 to improve the performance of floppy disk drives.

One specific note is that more cache memory is not necessarily better. In fact, too much cache memory can actually degrade the system performance. Here's why. When you install the cache, remember that the computer will FIRST read the cache memory in an attempt to find the data requested. If the data are not found, then the computer will read the disk in order to find the data. If the cache is extremely large, say 512 K, the computer

must first read ALL of that, and then it will go to a disk drive anyway if the requested data are not found in the cache.

One rule of thumb I have seen says that the cache should be roughly half the size of the largest file you work with. If you seldom work with a file larger than 100 K, then the default 64 K size (or maybe a little smaller) is about right. If you normally work with a 500 K file, then you might want to have a cache size on the order of 250 K or so. Don't be afraid to experiment with different cache sizes to find out what works best on your system with the software you are using. And don't be surprised if you find out that a cache size that makes one application program perform a lot better causes another program to really slow down. And unless you normally work with large data base files, you will probably find that most of your software will work best with a cache size of less than 100 K.

Now that we have taken a look at the most commonly needed device drivers, let's put it all together in a single CONFIG.SYS file example. While we are doing this, I will illustrate another command feature that has been included in current DOS versions, including ZDS MS-DOS 4.0. According to most of the letters I receive, the VDISK and ZCACHE device drivers seem to be the most useful, so they will be included in the example. And since getting device drivers to work in expanded memory seems to cause more problems, the example in Figure 8 will assume that exactly 1 MB (1024 K) of expanded memory is installed in the computer.

```
BUFFERS=30
FILES=25
REM Install the appropriate
 expanded memory manager
DEVICE=C:\DOS\emsdrive.SYS
 (Expanded Memory Manager)
REM Install a 960 K virtual disk
DEVICE=C:\DOS\VDISK.SYS SIZE=960
 S-SIZE=128 DIRS=64 /A
REM Install a 64 K cache
DEVICE=C:\DOS\ZCACHE.SYS SIZE=64
 /A
```

Figure 8 – CONFIG.SYS with Device Drivers for Expanded Memory

This example is similar to that shown in Figure 3, except that I have shown a "generic" Expanded Memory Manager of emsdrive instead of EMM.SYS. If your computer meets the memory requirements stated under EMM.SYS earlier in this article, then you can simply replace emsdrive.SYS with EMM.SYS. If you are using a non-ZDS expanded memory board, then you must replace emsdrive.SYS with the manufacturer's EMS driver that should have been supplied with that board. It is also critical to note that the EMS driver MUST be installed BEFORE any other device driver, such as VDISK and ZCACHE, as shown in Figure 8.

After the proper Expanded Memory Manager is installed, then a 960 K virtual disk is installed in expanded memory (with the /A switch) with the VDISK device driver. And finally, a 64 K cache is defined using the ZCACHE device driver. At this point, you probably noticed that I included several REM comment lines in the CONFIG.SYS file example (Figure 8). The REM command for the CONFIG.SYS file is one of the new features of ZDS MS-DOS 4.0 and later, and the command is used in the same way as it is in the AUTOEXEC.BAT file.

Some Cautions

It is important to remember that all of these device drivers are installed as memory-resident programs, and like any TSR (Terminate and Stay Resident) program, there can be a conflict with another memory-resident program that you are already using. If you decide to install one of these device drivers, I recommend you thoroughly test it with your existing configuration and ALL of your application software. That will help avoid unexpected and unpleasant surprises, such as a system freeze and loss of data, when you do not have time to troubleshoot problems.

A second caution is that I recommend you "comment out" (by using the new REM command for CONFIG.SYS) all DEVICE= commands and reboot the system before using any kind of disk utilities, such as undelete, disk optimizers, and sector editors. This includes well-known programs such as the Mace Utilities and the Norton Utilities. Although I do not know of any specific problems with any of these utility programs having a conflict with one of these device drivers, I believe it is best to avoid the possibility of a problem and potential loss of data. One easy way to "comment out" the command lines is to use the search and replace feature of an editor (e.g., EDLIN) to search for DEVICE= and replace it with REM DEVICE=. Then, reboot the computer, and you are ready to use whatever utility you need. You can also reverse the process to install the normal configuration.

Next Time

The purpose of this article was to help you generally understand how to use some (but not all) of the device drivers included with ZDS MS-DOS. I have only included the most commonly used ones in this article, and there are others that you will find in the manual. I have not attempted to include every single feature of each device driver discussed here, but rather have tried to illustrate how and when these device drivers might be used.

If you check the manual, you will find that one rather interesting device driver has been omitted from this article. That device driver –ANSI.SYS– has a number of interesting and useful features that require an entire article to describe properly. And so, the next article will discuss How to Use ANSI.SYS.

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.

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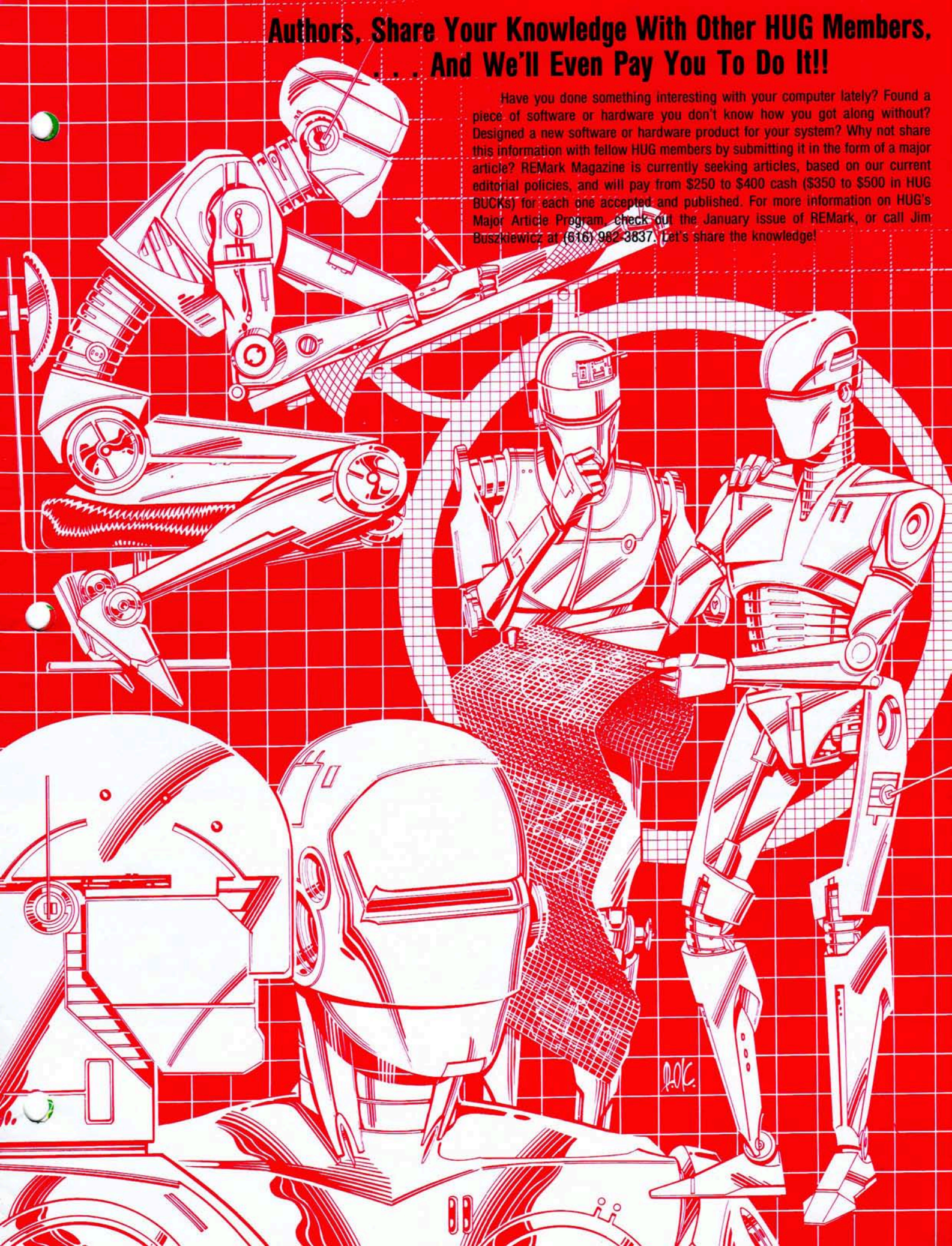

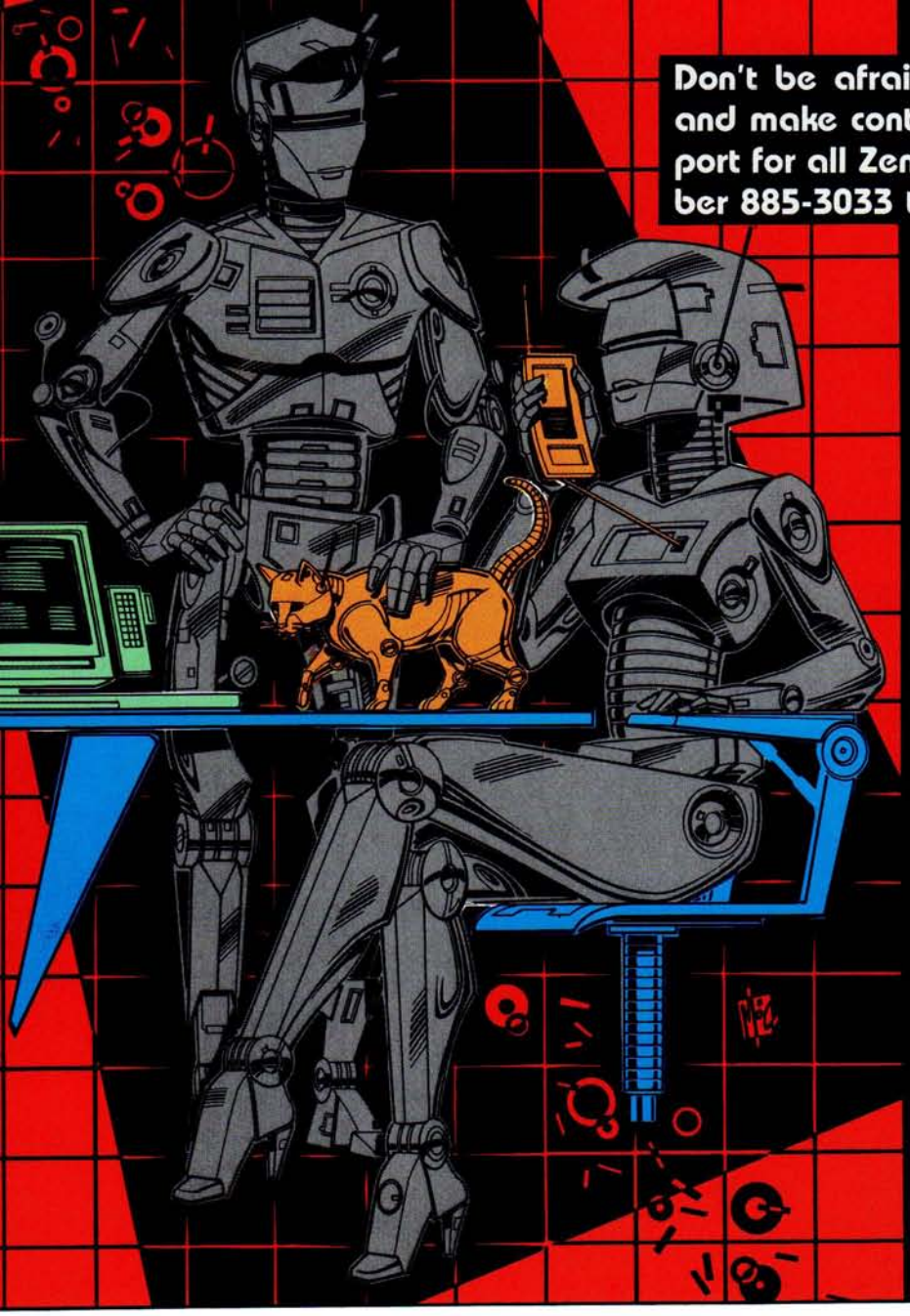

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