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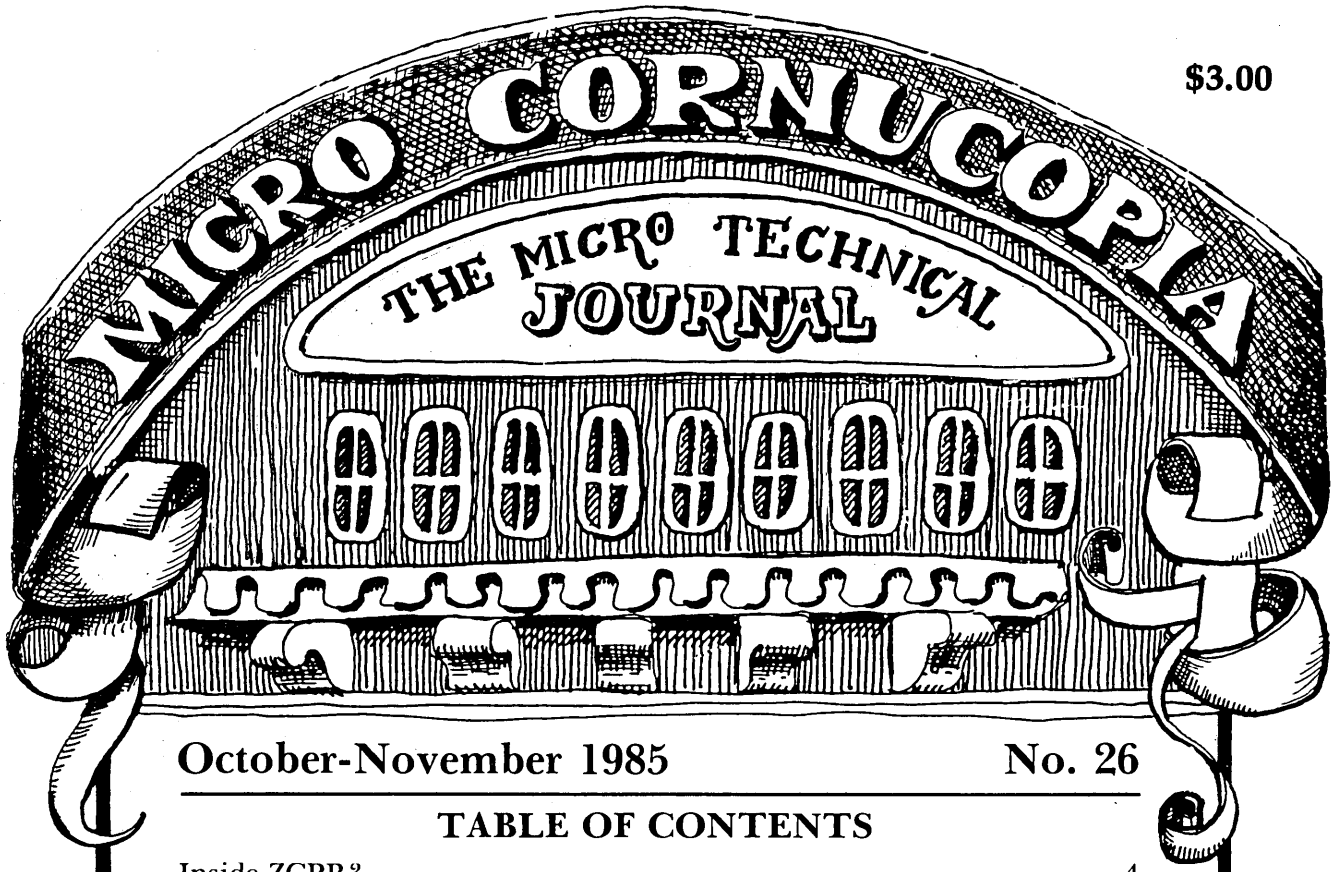

October-November 1985 No. 26

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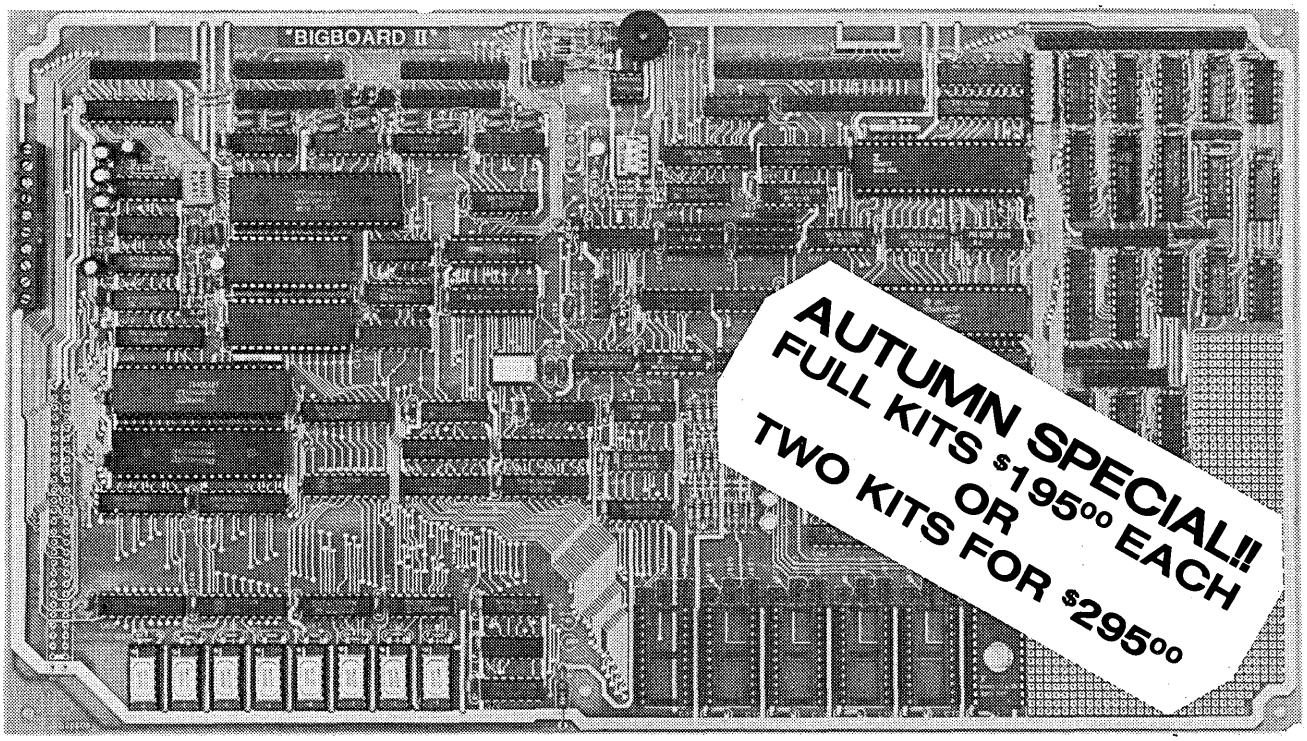
NEW LOWER PRICES! *NEW LOWER PRICES!* *NEW LOWER PRICES!*

"BIG BOARD II"

4 MHz Z80-A SINGLE BOARD COMPUTER WITH "SASI" HARD-DISK INTERFACE



$545 ASSEMBLED & TESTED

Jim Ferguson, the designer of the "Big Board" distributed by Digital Research Computers, has produced a stunning new computer that Cal-Tex Computers has been shipping for a year. Called "Big Board II", it has the following features:

■ 4 MHz Z80-A CPU and Peripheral Chips

The new Ferguson computer runs at 4 MHz. Its Monitor code is lean, uses Mode 2 interrupts, and makes good use of the Z80-A DMA chip.

■ 64K Dynamic RAM + 4K Static CRT RAM + 24K E(E)PROM or Static RAM

"Big Board II" has three memory banks. The first memory bank has eight 4164 DRAMs that provide 60K of user space and 4K of monitor space. The second memory bank has two 2Kx8 SRAMs for the memory-mapped CRT display and space for six 2732As, 2Kx8 static RAMs, or pin-compatible EEPROMS. The third memory bank is for RAM or ROM added to the board via the STD bus. Whether bought as a bare board or assembled and tested, it comes with a 2732 EPROM containing Russell Smith's superb Monitor.

■ Multiple-Density Controller for SS/DS Floppy Disks

The new Cal-Tex single-board computer has a multiple-density disk controller. It can use 1793 or 8877 controller chips since it generates the side signal with TTL parts. The board has two connectors for disk signals, one with 34 pins for 5.25" drives, the other with 50 pins for 8" drives.

■ Vastly Improved CRT Display

The new Ferguson SBC uses a 6845 CRT controller and SMC 8002 video attributes controller to produce a display rivaling the display of quality terminals. There are three display modes: Character, block-graphics, and line-graphics. The board emulates an ADM-31 with 24 lines of 80 characters formed by a 7x9 dot matrix.

■ STD Bus

The new Ferguson computer has an STD Bus port for easy system expansion.

■ DMA

The new Ferguson computer has a Z80-A DMA chip that will allow byte-wise data transfers at 500 KBytes per second and bit-serial transfers via the Z80-A SIO at 880 Kbits per second with minimal processer overhead. When a hard-disc subsystem is added, the DMA chip makes impressive disk performance possible.

$145 PC BOARD WITH 16 PARTS

SIZE: 8.75" x 15.5"
POWER: +5V @ 3A, +-12V @ 0.1A

■ "SASI" Interface for Winchester Disks

Our "Big Board II" implements the Host portion of the "Shugart Associates Systems Interface." Adding a Winchester disk drive is no harder than attaching a floppy-disk drive. A user simply 1) runs a fifty-conductor ribbon cable from a header on the board to a Xebec controller that costs only $295 and implements the controller portion of the SASI interface, 2) cables the controller to a Seagate Technology ST-506 hard disk or one compatible with it, and 3) provides power for the controller-card and drive. Since our CBIOS contains code for communicating with hard-disks, that's all a user has to do to add a Winchester to a system!

■ Two Synchronous/Asynchronous Serial Ports

With a Z80-A SIO/O and a Z80-A CTC as a baud-rate generator, the new Ferguson computer has two full RS232-C ports. It autobauds on both.

■ A Parallel Keyboard Port + Four Other Parallel Ports for User I/O

The new Cal-Tex single-board computer has one parallel port for an ASCII keyboard and four others for user-defined I/O.

■ Two Z80-A CTCs = Eight Programmable Counters/Timers

The new Ferguson computer has two Z80-A CTCs. One is used to clock data into and out of the Z80-A SIO/O, while the other is for systems and applications use.

■ PROM Programming Circuitry

The new Cal-Tex SBC has circuitry for programming 2716s, 2732(A)s, or pin-compatible EEPROMs.

■ CP/M 2.2**

CP/M with Russell Smith's CBIOS for the new Cal-Tex computer is available for $150. The CBIOS is available separately for $25.

***CP/M is a registered trademark of Digital Research.*

CAL-TEX COMPUTERS, INC.
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■■■

MICRO CORNUCOPIA

Oct. - Nov. 1985 The Micro Technical Journal No. 26

Not Funny!

Seriously

Last issue I was short (in a long sort of way), but a lot of people thought I was hilarious. I think they're hilarious, too. So we're even.

Some folks really got a belly laugh when I mentioned Ampro's Jumbo Board. However, Ampro's Rick Lehrbaum wasn't chuckling when he called to ask how I had found out about his massive project. Actually I made it up, but I didn't let on. (It was so absurd that I shouldn't have been surprised the military might fund such a task.)

Anyway, Rick informed me they have a dedicated microwave link so engineers can work at opposite ends of the board without running up large phone bills. (Good idea.)

Now, just so you won't be fooled again, be forewarned that practically everything in this editorial is serious.

The Gap

We get a lot of comments on our renewal forms from people who say we are over their heads technically: "I don't understand half of it, but I like it."

These are the people who renew. The folks who don't renew probably don't understand half of it and probably don't like it, either.

Well, we have been a technical journal from day one. And we will remain technical. There are many good publications for people who are primarily interested in running WordStar, Perfect Calc, and other applications. There aren't very many publications like Micro C which deal primarily with hardware, operating systems, and structured languages.

The problem is that there is a moat between the applications stuff (you know, "hit ctrl-K, ctrl-E to turn off the menu") and high level discussions of new compilers.

Spreadsheets and editors are getting "friendlier," which means the user is having less and less contact with the operating system and the hardware. (That's why we're getting calls from folks trying to boot up a disk under WordStar.)

Magazines such as User's Guide and Profiles can help these people use their software and their operating system. Then if they become interested in how their operating system is put together or how to modify it, they become candidates for Micro C (hooray for new candidates).

So we will be running some get-up-to-speed articles. That way up-and-comers will know intuitively the difference between a hex and a gaggle of fairies. (There is a decided difference, but it's too technical to cover here.)

We'll also be watching for books and other publications which will help. (If you have any recommendations, drop me a note containing a short description plus price, publisher, and where it's available.)

I'll be flagging the introductory articles here in the editorial, plus there'll be special items for beginners in Tidbits and The Last Page.

Where Do We Go From Here?

There's been a continuing undercurrent of frustration, or uneasiness, or queasiness, or something in the Micro C office lately, and though I haven't quite pinned down the source, I have an idea what it might be.

Technically, we're frustrated, and it shows up in our discussions about the relative merits of the new processors, new operating systems, new anythings.

We know the 8080, Z80 world. We know the Z80 Kaypro inside and out. We have paid our dues learning Z80/8080 mnemonics and assemblers. We have a good feeling for what's great

(continued on page 90)

LETTERS

Tandon Blues

I upgraded my Kaypro II to 5MHz last year, and I was the envy of everyone in the Southern Colorado Users Association. But this year, when I changed to the PRO-8 monitor ROM and the Kaypro 4 with DSDD Tandon 100-2A drives, my machine would only run at 2.5MHz. Since we have 10 Kaypros at work, I swapped new drives to see if the problem was my soldering, the PRO-8 ROM, or the RCA 74S04. It proved to be the Tandon 100-2As because the Epson drives from a Kaypro 4-84 and the Shugart drives from a "New 2" all work like a charm at DSDD and 5MHz. Thought readers should know.

Doug Shake
436 Redwood Dr.
Colorado Springs CO 80907

Editor's note:

I'm not too surprised about the problems I'm hearing from Tandon owners. Kaypro began buying Japanese drives because of the quality of the first double-sided half heights that Tandon produced. (And I keep wondering why Tandon doesn't advertise in Micro C.)

Having Your Remex & Using It Too

I have been running the notorious Remex RFD.480 5.25" drives for about five months in a Morrow MD-2 and have several observations about them that may help others who were sucked in by a "good deal."

1. The drives are incredibly sensitive to EMI (electrical interference). To see if this is a problem in your setup, remove the drive from the computer's case and place it several inches away from anything. Alternately place a sheet of steel (not aluminum) between the drive and everything else. If this cures the problem, construct a steel shroud around the drive.

2. The precompensation supplied by some computers (notably Morrow Micro Decisions) is 250 ns. This appears to be more than the poor drives can handle. Recommended precomp is 150 ns or less. On Morrow Micro Decisions, the precompensation can be turned off for 40 track drives by selecting 80 track in byte 1 of the MTAB in the BIOS. This change will turn on precompensation only on tracks greater than 40, which, of course, do not exist. Check the BIOS supplied with the machine to find this location.

3. The maximum specified ripple on the 12 volt supply is 100 mV pk-pk. To help achieve this, I placed 2200 uFd across the supply to ground. Although I found no improvement in operation, it was comforting to have the value in spec.

4. As supplied, the speed adjustments on my drives seemed to be off slightly. While the drive motor's strobe ring is illuminated with a fluorescent light, adjust R30 (the pot on the lower back wall of the drive) until the strobe ring remains stationary.

5. Don't adjust things if you can't measure the results.

6. Be sure the connections to motor control cards are good. Spread the pins on the male connector so they conduct well. If this connector is loose, the drive motor runs open loop and sounds like a possessed sewing machine.

7. Buy someone else's drives!

Mark Sihlanick
121 Twin Creek Terrace
Forest VA 24551

Slicer 10MHz Upgrade

I originally bought a 'B' step 6MHz 80186 CPU with a bare Slicer board. I recently noticed an offer by Hawke Electronics, Amotex House, 45 Hanworth Road, Sunbury-on-Thames, Middlesex, U.K. to supply 10MHz AMD 80186s at L12.50 each. (Editor's note: readers will have to figure out the U.S. dollar equivalent.) An application engineer told me that this was a special by AMD to attract designers. There are no details of an equivalent Intel step version.

I estimated that the price was about 10% of normal list price, so I bought one, plugged it into the Slicer, changed the CPU crystal to 20 MHz, and it works!

There seem to be a few problems that could trip up others trying the same upgrade: (1) Obtaining the part for a good price. This offer will not last forever, and might be restricted to the U.K. or Europe. (2) Having fast enough memory to work with the CPU. Nominal memory speed needed is 120 ns, although I am using 150 ns chips. Also, I suspect that some TMS4500s will not work at this speed, since there seem to be several variants of the chip. Finally, the Z8530 comms chip on the expansion board runs at half the CPU speed, and you will need the Z8530A part if this is fitted.

Other chips may cause a problem, but the CPU clock is not used elsewhere, so this is less likely, and could be cured by adding extra wait states on the chip select programming.

This upgrade is obviously of most use to people running CPU bound programs, such as large compilers, graphics programs, etc. Also, Concurrent CPM/DOS would benefit. The only times I notice the speed improvement are when running CP/M2.2 Adventure, using an 8080 emulator, or when compiling large (1000 line) C programs.

Stephen Hope
16 Lakeside,
Littleborough, Rochdale
Lancashire U.K.

PRO-884 Max

I just wanted to give you some feedback on the PRO-884 Max Monitor ROM. I installed it, a plus-4 decoder board, and a quad density TEAC drive in my Kaypro 4-84. Generally, they all work fine. Your instructions were very clear, and in fact, it was easier to add the third internal drive than you indicate. Anyone with minimal electronics experience (and a hacksaw) should have no problem doing this.

As long as I had my hacksaw out, I installed the four "hidden" keys above the numeric pad. However, I had some trouble finding the right

LETTERS

size keys. My keyboard was made by Maxiswitch of Minneapolis, but they didn't even want to talk to me, much less sell me loose keys. Finally I bought them from a Kaypro dealer. At $8 a key!

Now I have a dynamite three drive ZCPR system — drive A: quad density for my standard programs, drives B: and C: for data and lesser used codes. My dual density Dysan disks took to quad density very well.

A few tips may help other installers.

1. Before tearing things apart, take a test drive. Set the new drive on top of the drive housing, pull the plugs out of old drive A: and plug them into the new drive to be sure it works properly. All the cables should be long enough for this.

2. To unscrew the inside mounting screws on the old drive you might need to remove the CRT. This is easily done with the proper allen wrench. (Don't loosen the coil which is attached to the neck.)

3. More information on the jumpers in the drives would be helpful to be sure they are all in the right locations.

Problems? Very few. The quad density drive uses 4K blocks instead of the 2K blocks on the dual density drives. Thus, small files eat up space quickly. If you run ZCPR, the cursor keys must be reconfigured (using the Kaypro CONFIG program) for use with WordStar. Smartkey seems to have some problems with this setup, but I haven't completely diagnosed them yet. I'll let you know if I do, especially if I find the solution.

David B. Nelson
2311 Spencer Road
Silver Spring MD 20910

Adapting A C. Itoh F10-40

I just picked up a surplus C. Itoh F10-40 that they've been selling for $500. Before you buy it, they tell you it has "Commodore" on the front, which was OK with me. What they don't tell you is that Commodore has customized the thing for their systems. The mail-order outfit suggests you install it (WordStar) as an "IBM Parallel" printer. This at least gets you printing, but no matter how you configure it (I spent many hours trying) it will NOT do variable pitch or variable line height, and it prints the forward direction only, which makes it barely faster than my Juki.

Finally I discovered that if you pull the CPU board and close the "JY" jumper (it is shipped with it open) you can install it as a "specialty" printer, and everything works. This changes the backspace function so it prints bidirectionally. I pass this along so that perhaps I can save someone the hours of frustration I experienced.

Don Hotson
26 Sutters Mill Court
Walnut Creek CA 94596

Video Graphics Boards

Last January I purchased your Pro-Set II and have been very happy with improved performance of both the Pro-Monitor II and Pro-Character II ROM chips. I am considering adding a video graphics board as an upgrade to my Kaypro II (which also has had an SWP Co-Power 88 board added), and was wondering if you might make a board of this type or could recommend a board which is compatible with the Pro-Set II ROM chips.

My Kaypro II was purchased in May 1983, and is S/N 30551.

I am also investigating the various Z80 CPU speed-up kits available and wondered if you had a recommendation which would be compatible with the Pro-Set II.

John J. Mojonnier, Jr.
232 N. Ridgeland
Oak Park IL 60302

Editor's note:

The Gilderfluke board gives you VT-52 (black and white block graphics) emulation on a Kaypro II or 4-83, but I don't think there is room for that board and your +88 unit. If you want color graphics and LOGO you might contact MicroSphere here in Bend (see their ad in this issue).

As for a speed up, you can do it yourself with a couple pieces of wire, a switch, and a Z80B. Your monitor ROM will already run at 5MHz. If you don't feel comfortable doing a little jumpering (Micro C #24 pg. 35 contains an illustration of the mod) contact a local Kaypro group. Someone there will no doubt be an old hand.

Illegal First Byte

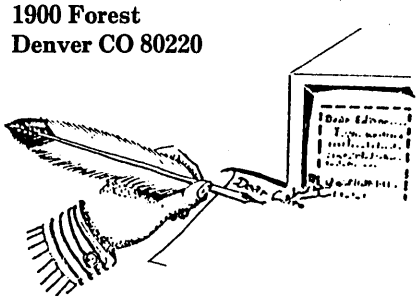
Some issues back, one of your subscribers complained about XDIR hanging, especially on the B drive. We had the same problem, and it was caused by an illegal first byte in the directory. If this byte was not E5 (for an erased file) or 00 for a good file, XDIR went off into the woods. Cleaning up this byte with DU77 or the monitor R command to read and write back a 00 or E5 solved the problem. Some versions of XDIR have this problem and some don't.

Thomas Callahan
35 North Shore Avenue
Danvers MA 01923

Keyboard For Homebuilt Kaypro II?

I am attempting to assemble the equivalent of a Kaypro II ('83) from a surplus board. Most parts and assemblies have been relatively easy to find, reasonably priced, and easy to connect. Unfortunately, that has not been true with a keyboard. I have not been able to find much information about the Kaypro II keyboard, or that any particular surplus keyboard is compatible. I would appreciate hearing from any Micro Cornucopia reader who has information about the Kaypro II keyboard or has been successful in finding a compatible surplus keyboard.

William D. Watson
1900 Forest
Denver CO 80220



Inside ZCPR3

By Richard Conn

6300 Round Rock Apt 3008
Plano TX 75023

Editor's note: CP/M's console command processor (CCP) is the part of the operating system that accepts commands from the keyboard (i.e., it is the part you deal with while you are not running a program).

ZCPR1 was famous for such niceties as searching the A: drive for a program if the program isn't available on the default drive, and for paging 24 lines at a time under the TYPE command.

ZCPR1 was released to the public domain, and as everyone knows, just about everything in the public domain gets revised and expanded. Thus we have seen ZCPR2 and 3. The following is a detailed description of ZCPR3 by its author, Richard Conn.

ZCPR3 is a command processor replacement for CP/M that's both upwardly compatible with CP/M 2.2 and a lot more versatile.

Some of ZCPR3's features are:

— Extensions to the CP/M directory concept and command processing algorithm

— Command search hierarchy and directory search path

— Multiple commands on a single line and chaining

— Command scripts

— An integrated command file monitor.

The Environment Descriptor

The heart of ZCPR3, the environment descriptor (Z3ENV for short) is a data buffer which all ZCPR3 tools examine to determine key aspects of the ZCPR3 environment.

Let's say we locate the Z3ENV above the BIOS (at a convenient location). When Z3INS installs the system's tools, it gives them the address of this data buffer and tells them about the system environment:

1. Locations of the command search path, various system segments (RCP, FCP, IOP, NDR, ENV, and Z3T), command line buffer, message buffer, and the external FCB

2. Location and size of the shell stack (which makes shells like VFILER and MENU possible)

3. Address of the wheel byte (used to determine if a user is privileged)

4. Processor speed (used for software timing loops)

5. Maximum disk and user area that can be accessed

6. Dimensions of the CRT and printer.

All of the buffers in the Z3ENV are at fixed offsets from the beginning of the Z3ENV in all ZCPR3 systems no matter which computer it's installed on. So, by knowing only the base address of the Z3ENV you can access a particular item of data in the Z3ENV by adding a fixed offset.

Listing 1 shows an Environment Descriptor and all of the offsets to its buffers.

ZCPR3 Libraries

ZCPR3 was designed for programmers who frequently reuse functions and need to remember offsets and buffer contents. Z3LIB is a large collection of these frequently-used subroutines.

All Z3LIB subroutines are precisely documented in terms of function, input parameters, output parameters, and side effects. All documentation on Z3LIB is available via HLP files which can be scanned by the ZCPR3

Listing 1 - Structure of the ZCPR3 Environment Descriptor

```
Offset  Definition      Comments
------  ----------      --------

  00    JMP     0       ; LEADING JMP

  03    DB      'Z3ENV' ; ENVIRONMENT ID
  08    DB      1       ; CLASS 1 ENVIRONMENT (EXTERNAL)

  09    DW      EXPATH  ; EXTERNAL PATH ADDRESS
  0B    DB      EXPATHS ; NUMBER OF 2-BYTE ELEMENTS IN PATH

  0C    DW      RCP     ; RCP ADDRESS
  0E    DB      RCPS    ; NUMBER OF 128-BYTE BLOCKS IN RCP

  0F    DW      IOP     ; IOP ADDRESS
  11    DB      IOPS    ; NUMBER OF 128-BYTE BLOCKS IN IOP

  12    DW      FCP     ; FCP ADDRESS
  14    DB      FCPS    ; NUMBER OF 128-BYTE BLOCKS IN FCP

  15    DW      Z3NDIR  ; NDR ADDRESS
  17    DB      Z3NDIRS ; NUMBER OF 16-BYTE ENTRIES IN NDR

  18    DW      Z3CL    ; ZCPR3 COMMAND LINE
  1A    DB      Z3CLS   ; NUMBER OF BYTES IN COMMAND LINE

  1B    DW      Z3ENV   ; ZCPR3 ENVIRONMENT DESCRIPTOR
  1D    DB      Z3ENVS  ; NUMBER OF 128-BYTE BLOCKS IN DESCRIPTOR

  1E    DW      SHSTK   ; SHELL STACK ADDRESS
  20    DB      SHSTKS  ; NUMBER OF SHSIZE-BYTE ENTIRES IN
                          SHELL STACK
  21    DB      SHSIZE  ; SIZE OF A SHELL STACK ENTRY

  22    DW      Z3MSG   ; ZCPR3 MESSAGE BUFFER

  24    DW      EXTFCB  ; ZCPR3 EXTERNAL FCB

  26    DW      EXTSTK  ; ZCPR3 EXTERNAL STACK

  28    DB      0       ; QUIET FLAG (1=QUIET, 0=NOT QUIET)

  29    DW      Z3WHL   ; ADDRESS OF WHEEL BYTE

  2B    DB      4       ; PROCESSOR SPEED IN MHZ

  2C    DB      'D'-'@' ; MAXIMUM DISK
  2D    DB      31      ; MAXIMUM USER
  2E    DB      1       ; 1=OK TO ACCEPT DU, 0=NOT OK

  2F    DB      0       ; CRT SELECTION (0=CRT 0, 1=CRT 1)
  30    DB      0       ; PRINTER SELECTION (N=PRINTER N)

  31    DB      80      ; WIDTH OF CRT 0
  32    DB      24      ; NUMBER OF LINES ON CRT 0
  33    DB      22      ; NUMBER OF LINES OF TEXT ON CRT 0

  34    DB      132     ; WIDTH OF CRT 1
  35    DB      24      ; NUMBER OF LINES ON CRT 1
  36    DB      22      ; NUMBER OF LINES OF TEXT ON CRT 1
  37    DB      80      ; WIDTH OF PRINTER 0
  38    DB      66      ; NUMBER OF LINES ON PRINTER 0
  39    DB      58      ; NUMBER OF LINES OF TEXT ON PRINTER 0
  3A    DB      1       ; FORM FEED FLAG (0=CAN'T FORMFEED, 1=CAN)

  3B    DB      102     ; WIDTH OF PRINTER 1
  3C    DB      66      ; NUMBER OF LINES ON PRINTER 1
  3D    DB      58      ; NUMBER OF LINES OF TEXT ON PRINTER 1
  3E    DB      1       ; FORM FEED FLAG (0=CAN'T FORMFEED, 1=CAN)

  3F    DB      80      ; WIDTH OF PRINTER 2
  40    DB      66      ; NUMBER OF LINES ON PRINTER 2
  41    DB      58      ; NUMBER OF LINES OF TEXT ON PRINTER 2
  42    DB      0       ; FORM FEED FLAG (0=CAN'T FORMFEED, 1=CAN)

  43    DB      102     ; WIDTH OF PRINTER 3
  44    DB      66      ; NUMBER OF LINES ON PRINTER 3
  45    DB      58      ; NUMBER OF LINES OF TEXT ON PRINTER 3
  46    DB      0       ; FORM FEED FLAG (0=CAN'T FORMFEED, 1=CAN)

  47    DB      'SH   ' ; SHELL VARIABLE FILENAME
  4F    DB      'VAR'   ; SHELL VARIABLE FILETYPE

  52    DB      '     ' ; FILENAME 1
  5A    DB      '   '   ; FILETYPE 1

  5D    DB      '     ' ; FILENAME 2
  65    DB      '   '   ; FILETYPE 2

  68    DB      '     ' ; FILENAME 3
  70    DB      '   '   ; FILETYPE 3

  73    DB      '     ' ; FILENAME 4
  7B    DB      '   '   ; FILETYPE 4

  7E    DS      2
```

HELP utility. VLIB, a companion to Z3LIB, provides a number of subroutines which permit terminal control through the Z3TCAP terminal-definition buffer. (SYSLIB, Z3LIB, and VLIB are documented in ZCPR3: The Libraries, and will be available through Echelon in a few months.)

All the subroutines in Z3LIB use the Z3ENV by first calling Z3INIT.

Z3INIT accepts as input the address of the Z3ENV in HL and initializes an internal buffer which all Z3LIB routines later use. If the screen-oriented routines of VLIB are needed, your program must call the Z3VINIT routine (from VLIB) instead of the Z3INIT routine (from Z3LIB).

Accepting the address of the Z3ENV in HL, Z3VINIT initializes the pointers used by both the Z3LIB and the VLIB routines.

Loose Coupling

In an attempt to control the complexity of the code written with these routines I used what's called "loose coupling." In other words, the execution of one routine doesn't affect the execution of another.

For example, the routines PUTUD and GETUD save the current user/disk (which the program is logged into) and restore it. PUTUD and GETUD have no effect on any registers. (There is a side effect — GETUD logs the user into the directory saved by PUTUD — but you needn't worry about it.) The only coupling between PUTUD and GETUD is a shared buffer (which the programmer never sees).

Loose coupling is expensive — each routine in the libraries is a little larger (by a few bytes) and requires more stack space than a routine which doesn't adhere to these rules. But it's worth it.

Programming With Libraries

Listing 2 illustrates programming with libraries.

A user types a command into the command line buffer of ZCPR3 for later execution. The command line gets inserted in front of whatever commands are already in the buffer. If this program is named L2, then the command line

```
ECHO HELLO;L2;ECHO DONE
```

results in the execution of whatever text the user typed during the run of L2.

The routine needs the address of the ZCPR3 Environment Descriptor. It's defined in line 5, and made available in lines 16 and 17 through the call to Z3INIT. The routine PUTCL (lines 9 and 27) from Z3LIB will use this information later in Listing 2.

The prompt 'Enter Your Command' is printed by lines 19 and 20. PRINT comes from SYSLIB, and it displays the string (terminated by a binary 0) on the console. PRINT affects no registers and has no side effects.

The routine BBLINE (from SYSLIB) (lines 22 to 25) inputs a line from the user (lines 22 and 25). BBLINE accepts a capitalization flag in the A register as input (A = 0FFH to capital-

(continued on page 8)

Listing 2 - Programming With SYSLIB Z3LIB

```
1: ;  Sample ZCPR3 System Program to insert a command into the
2: ;  command line buffer.  The inserted command will be the next command
3: ;  to be executed.
4:
5: z3env   equ     0f400h  ;address of the ZCPR3 Environment Descriptor
6:
7:         ext     z3init  ;init address of Z3ENV for Z3LIB routines
8:         ext     bbline  ;an input line editor (from SYSLIB)
9:         ext     putcl   ;stores a command line (from Z3LIB)
10:        ext     print   ;prints a message (from SYSLIB)
11:        ext     crlf    ;new line on console (from SYSLIB)
12:
13:        aseg
14:        org     100h
15:
16:        lxi     h,z3env ;set Z3ENV address for Z3LIB routines
17:        call    z3init
18:
19:        call    print
20:        db      'Enter Your Command> ',0
21:
22:        mvi     a,0ffh  ;capitalize the line input by the user
23:        call    bbline  ;get line from the user
24:        cpi     0       ;see if no characters input by user
25:        rz              ;abort if no input
26:
27:        call    putcl   ;insert command line into Z3 command line buffer
28:        rnz             ;done if no error
29:        call    crlf
30:        call    print
31:        db      'Error - Command Line Overflow',0
32:        ret
33:
34:        end
```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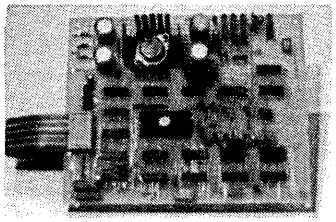

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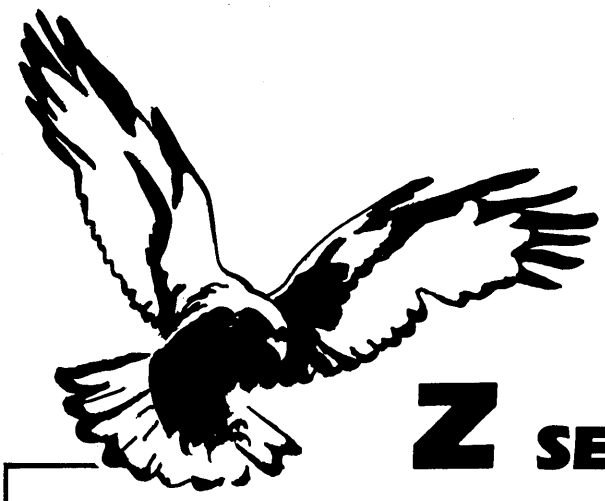

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(continued from page 5)

ize the line after the user types it in) and returns the address of a string (terminated by a binary 0).

On exit from BBLINE, the HL register pair contains the address of the first character of this string, and the A register contains the number of characters in the string. If the user doesn't type anything, the A register returns with the value 0, and the CPI 0 followed by RZ instructions in lines 24 and 25 terminate the program by returning to the operating system.

If the line wasn't empty, execution continues with the call to PUTCL in line 27. PUTCL accepts the address of a string in HL and stores this string in the ZCPR3 command line buffer, so that becomes the next command to execute. If the command line resulting from the addition of this string is longer than the command line buffer, the command line buffer is left unchanged, and PUTCL returns with A = 0 and the Zero Flag set.

The RNZ instruction on line 28 returns the program to the operating system, allowing the command line just stored to be executed if no error occurred. If PUTCL encountered a command line buffer overflow, PRINT displays an error message (lines 29 to 31), and execution resumes with the unchanged original command line.

The PUTCL routine obtains the address and size of the command line buffer from the Z3ENV. The programmer doesn't have to worry about low-level details such as setting the pointers to ensure that execution begins at the first character of a new command. You can concentrate on the high order tidbits like inserting commands into the command line buffer.

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ZCPR3, VLIB, And Shells

Listing 3 is a shell (or MENU) which clears the screen, displays the current disk and user area, and prompts for a command. It uses VLIB routines to manipulate a terminal, clearing the screen, highlighting, and positioning the cursor.

Listing 3 is divided into:

1. Constants and external routines named (lines 1-43)
2. Initialization and ZCPR3 environment check (lines 52-79)
3. Determination of the method of program invocation (lines 85-86)
4. Establishment of the program as a shell (lines 90-115)
5. Message and delay so the user can see the results of his last command (lines 121-123)
6. Screen display, input of user's command, and setup of command line (lines 128-150).

Lines 52-53 establish the address of the ZCPR3 Environment Descriptor for use by the Z3LIB and VLIB routines. The routine Z3VINIT (as opposed to Z3INIT) is used so that the VLIB routines will be able to function as well as the Z3LIB routines.

The shell stack is required for this program (it's an option in any ZCPR3 installation), so lines 57-61 determine if the shell stack is available. The routine GETSH1 returns with register A=0 and the Zero Flag set if there's no shell stack.

The ZCPR3 message buffer option is also required for this program, so lines 66-70 test for the presence of the message buffer. GETMSG returns with register A = 0 and the Zero Flag set if there's no message buffer.

Similarly, lines 75-79 test for the command line buffer. This shell acts as a front end, executing command lines issued by the user, so the command line buffer must be available. All three of these key elements — the shell stack, the message buffer, and the command line buffer — are part of the recommended standard 1K overhead of a ZCPR3 System.

There are three types of ZCPR3 commands:

1. One issued by the user as a normal command
2. One issued by ZCPR3 as a shell
3. One issued by ZCPR3 as an error handler.

When ZCPR3 is ready to accept input from the user, it checks the shell stack. If the shell stack isn't empty, the command line on the top of the stack is executed in lieu of input from the user.

ZCPR3 sets a message to indicate the source of the command line whenever it executes a command (if the ZCPR3 message buffer is available). A

(continued on page 10)

Listing 3 - ZCPR3 Shell

```
1: ;  Sample ZCPR3 System Program to function as a shell,
2: ;  accepting commands from the user and executing them.
3: ;  Once a command completes, control is returned to
4: ;  this program (since it is a shell), and the next
5: ;  command is entered.
6: ;
7: ;  Execution of this shell is halted by issuing:
8: ;                SHCTRL POP
9:
10: ; Address of the ZCPR3 Environment Descriptor
11: z3env   equ     0f400h
12:
13: ; VLIB highlighting control codes
14: dim     equ     1       ;begin standout mode
15: bright  equ     2       ;end standout mode
16:
17: ; Z3LIB/VLIB initialization
18:         ext     z3vinit ;init for terminal processing
19:
20: ; SYSLIB routines
21:         ext     bbline  ;an input line editor
22:         ext     print   ;prints a string
23:         ext     crlf    ;new line
24:         ext     retud   ;return User/Disk in BC
25:         ext     cout    ;output a character
26:         ext     cin     ;input a character without echo
27:         ext     pafdo   ;print A as floating decimal
28:
29: ; VLIB routines
30:         ext     cls     ;clear screen
31:         ext     gxymsg  ;position on screen and print
32:         ext     vprint  ;print with highlighting
33:
34: ; Z3LIB routines
35:         ext     shpush  ;push string onto shell stack
36:         ext     getefcb ;get external FCB
37:         ext     getsh1  ;get shell stack information
38:         ext     getmsg  ;get message buffer information
39:         ext     getcl1  ;get command line information
40:         ext     getcl2  ;get command line information
41:         ext     qshell  ;was this program run as a shell?
42:         ext     putcst  ;set command status message
43:         ext     putcl   ;set command line
44: ;
45: ; Code begins
46: ;
47:         aseg
48:         org     100h
49: ;
50: ; The following sets the ZCPR3 Environment Descriptor
51: ;
52:         lxi     h,z3env
53:         call    z3vinit
54: ;
55: ; The following checks for shell stack facility
```

```
56: ;
57:         call    getsh1
58:         jnz     test1
59:         call    print
60:         db      'Shells are not supported',0
61:         ret
62: ;
63: ; The following checks for the message facility
64: ;
65: test1:
66:         call    getmsg
67:         jnz     test2
68:         call    print
69:         db      'Messages are not supported',0
70:         ret
71: ;
72: ; The following checks for the command line buffer facility
73: ;
74: test2:
75:         call    getcl1
76:         jnz     go1
77:         call    print
78:         db      'Command line buffer not supported',0
79:         ret
80: ;
81: ; The following determines if the program was run by the user
82: ; as a command or by ZCPR3 as a shell
83: ;
84: go1:
85:         call    qshell  ;was this program run by the user?
86:         jz      wait    ;if run as a shell, get next command
87: ;
88: ; This section of code sets up the program as a shell
89: ;
90:         call    getefcb ;get name of program, if possible
91:         jnz     setname ;name available, so continue
92:         lxi     h,def   ;use default name
93:         jmp     setname1
94: setname:
95:         inx     h       ;point to first character of program name
96:         push    h       ;save pointer
97:         lxi     d,8     ;point to after last character
98:         dad     d
99:         mvi     m,0     ;store ending 0
100:         pop     h       ;get pointer to first character of name
101: setname1:
102:         call    shpush  ;put program name on shell stack
103:         jz      chkcmd  ;get command from user if no error
104:         call    print
105:         db      'Could not establish shell',0
106:         ret
107: ;
108: ; This section determines if any commands are following the
109: ; shell invocation command and returns to ZCPR3 in order to
110: ; execute them if so
111: ;
112: chkcmd:
113:         call    getcl2  ;get command line data
114:         jz      getcmd  ;process command from user
115:         ret             ;process rest of command line
116:
117: ;
118: ; Pause so the user can read the display from the last command
119: ;
120: wait:
121:         call    vprint
122:         db      dim,'Strike any key --',bright,0
123:         call    cin
124: ;
125: ; Prompt the user for a new command
126: ;
127: getcmd:
128:         call    cls     ;clear the screen
129:         call    gxymsg
130:         db      5,10
131:         db      'Directory ',0
132:         call    retud   ;get DU in BC
133:         mov     a,b     ;get disk
134:         adi     'A'     ;convert to letter
135:         call    cout    ;print
136:         mov     a,c     ;get user
137:         call    pafdc   ;print as floating
138: getcmd1:
139:         call    gxymsg
140:         db      7,10
141:         db      dim,'Enter Command> ',bright,0
142:         mvi     a,0ffh
143:         call    bbline
144:         cpi     0       ;any input?
145:         jz      getcmd1 ;issue prompt again
146:         call    putcl   ;store command line
147:         mvi     a,0     ;this is a normal command
148:         call    putcst
149:         call    cls
150:         ret
151: ;
152: ; Default command name in case the External FCB
153: ; is not available
154: ;
155: def:
156:         db      'L3',0
157:
158:         end
```

End of Listing

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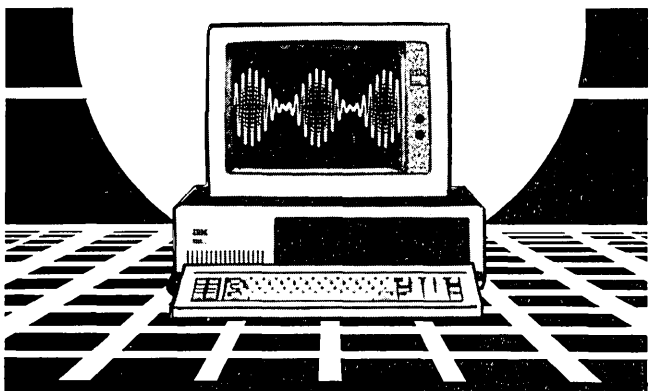

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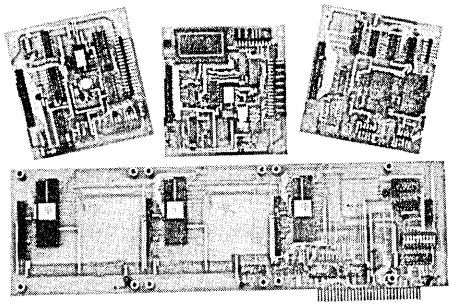

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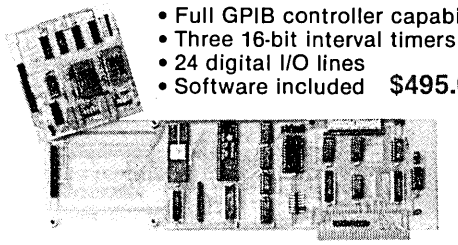

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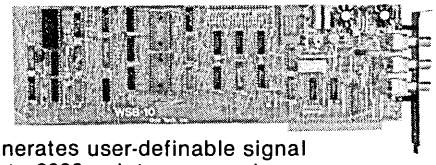

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(continued from page 8)

program (such as a shell) can read this message and determine how it was invoked.

A shell either installs itself, if it was invoked by the user, or executes, if it was invoked as a shell.

Lines 85 and 86 determine if the program in Listing 3 was invoked as a normal command or a shell. The QSHELL routine of Z3LIB returns with register A = 0 and the Zero Flag set if the message set by ZCPR3 indicates invocation as a shell.

If invoked as a shell it enters a WAIT routine (lines 121-123). Then you can examine the results of the command before the shell clears the screen and prompts for input.

If not invoked as a shell (you must have issued a command to run this program specifically) the program installs itself as one in lines 90-115.

Lines 90-91 test to determine if the External FCB is available.

ZCPR3 places the name of the command into the External FCB before the command executes. The GETEFCB routine returns with register A 0, the Zero Flag clear, and the HL register pair containing the address of the External FCB, if the External FCB is available.

Lines 94-100 use this information to place a 0 after the last character of the command name. After line 100 executes, HL contains the address of the first character of a 9-byte string (8 bytes for the command name and an ending 0). This is the command to be pushed onto the top of the shell stack.

If the External FCB isn't available, GETEFCB returns with register A = 0 and the Zero Flag set. In this case, lines 92-93 set HL to point to a default command line (see lines 155-156).

With or without the External FCB, execution resumes at line 101 with HL containing the address of a command line string (terminated by a null) to be pushed onto the top of the shell stack. The SHPUSH routine in line 102 pushes a string onto the shell stack, and SHPUSH returns with register A = 0 and the Zero Flag set if it was successful. If not successful, PRINT displays the error message at line 105, and exits to the operating system (the RET instruction in line 106).

Since the shell stack exists (we tested for it in line 57 with the GETSH1 call), failure by SHPUSH might be caused by the command line being too long for the buffer reserved for a shell stack element, or the shell stack being full.

If the SHPUSH routine succeeds, execution resumes at line 112. At this point, GETCL2 is called to determine if there are any more commands in the command line buffer. If the shell program was "L3", for example, the command line could have been

```
L3;another command
```

CHKCMD (Lines 113-115) checks for this other command, and if it finds it, GETCL2 returns with register A 0 and the Zero Flag clear. The rest of the command line is executed by returning to the operating system (line 115).

If there's no following command, execution of the shell resumes with its main function: a display and prompt for user input (lines 127- 150).

The visible part of the routine occurs in the routine at GETCMD (lines 127-150):

1. Clear the screen
2. Display "Directory", followed by the current disk/user starting at line 5, column 10 on the screen
3. Prompt the user for input with a highlighted command prompt "Enter Command' starting at line 7, column 10
4. Input a command line from the user
5. Place the command line into the command line buffer and return to the operating system for execution of the user's command.

CLS, a VLIB routine called at line 128, determines the byte sequence (defined in the ZCPR3 TCAP buffer) to send to the terminal and clears the screen by sending that sequence of bytes to the console.

The programmer doesn't have to worry with details about the terminal or the sequence of bytes that cleared the screen.

Lines 129-131 use GXYMSG to place the cursor on the screen and display the word "Directory". GXYMSG uses cursor positioning information specific to the user's terminal which it gets from the ZCPR3 TCAP buffer. It positions the cursor at the address indicated by the first two bytes following the call (in this case, row 5 and column 10 as indicated in line 130 of Listing 3).

"Directory" is followed first by a letter indicating the disk, and then by a number indicating the user area which the user is currently logged into.

Line 132 calls the SYSLIB routine RETUD, which returns with register B containing the number of the current disk (B = 0 if current disk is drive A) and register C containing the number of the current user area.

Lines 133-135 convert the number in B to the appropriate letter and print it. Lines 136-137 print the user number.

Lines 139-141 print the "Enter Command' prompt, which is printed beginning at line 7, column 10. Highlighting comes from surrounding text with the DIM and BRIGHT command codes (which are interpreted by GXYMSG to turn on and turn off highlighting). "Enter Command' will be dim on some terminals, reverse video on others.

Lines 142-143 get a command text from the user via the BBLINE routine. With register A = 0FFH, the line is capitalized after it's input (the line fed to the command line buffer doesn't have to be capitalized in ZCPR3).

BBLINE returns with the HL register pair containing the address of a null-terminated string and the A register containing the number of characters in this string (not counting the ending null). If register A = 0 (no input entered — the user simply hits the RETURN key), it prompts again for input (lines 144-145).

If a command line was entered, processing resumes at line 146. PUTCL stores the string pointed to by the HL register pair in the command line buffer. (In this example, the error return code was ignored since an error such as command line buffer

overflow simply results in the shell being reinvoked.)

Finally, lines 147-148 set the command status message of ZCPR3, indicating that the command was supplied by the user. In case the command is another shell, this message will be read later by this new shell in a manner similar to the QSHELL call on line 85 and interpreted correctly. The screen is cleared on line 149, and control is returned to ZCPR3 to execute the command (the RET instruction on line 150).

Assembling

Listing 2 and Listing 3 can be assembled and run on your ZCPR3 system. You'll need M80.COM and L80.COM to assemble and link the files. SYSLIB.REL, Z3LIB.REL, and VLIB.REL are the relocatable object files containing the three ZCPR3 libraries. If you call Listing 2 L2.MAC and Listing 3 L3.MAC, then the following procedure is followed to generate L2.COM and L3.COM for execution:

```
M80 =L2

L80 /P:100,L2/N,L2,Z3LIB/S,SYSLIB/S,/U/E
```

to assemble and link L2.MAC, and:

```
M80 =L3

L80 /P:100,L3/N,L3,VLIB/S,Z3LIB/S,SYSLIB/S,/U/E
```

to assemble and link L3.MAC. It is assumed that L2.MAC, L3.MAC, VLIB.REL, Z3LIB.REL, and SYSLIB.REL are in the current directory.

Overdue Note On ZCPR3

ZCPR3 is not in the public domain, and is copyrighted by Richard Conn. ZCPR3 has been released for non-commercial use (through SIG/M) to the "user community" effectively allowing people to use it for non-commercial purposes as though it were in the public domain while retaining copyright protection for the author. Complete source code to ZCPR3, including the SYSLIB, Z3LIB, and VLIB libraries, is included in the SIG/M distribution. You're invited to study and use this code for non-commercial purposes.

The first release of the ZCPR3 system can be found in SIG/M volumes 184 to 192. An update was issued in volumes 200 to 202, and a second update is now being prepared. The current version of the ZCPR3 system can also be purchased from Echelon which updates its ZCPR3 configuration more frequently than SIG/M.

Where To Look Next

This article just broaches the concepts behind the operation of ZCPR3. If you're interested in finding out more, contact Echelon, Inc., 101 First Street, Suite 427, Los Altos, CA 94022, 415-948-3820

The telephone number for the main ZCPR3 (Z System) electronic bulletin board, Z-Node Central, is 415-489-9005.

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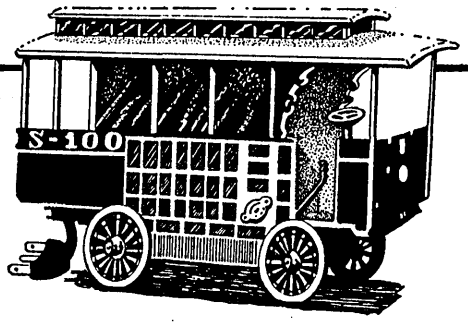
The S-100 Bus



By Dave Hardy

736 Notre Dame
Grosse Pointe MI 48203

Bus arbitration is one of the features of the IEEE-696 (S-100) bus that makes it so useful in a multi-processing environment. By allowing different processors to control the S-100 bus in a prioritized manner, the performance of an S-100 computer can easily rival (and sometimes exceed) that of a mid-sized computer system.

Bus Arbitration Made Easy

Probably the nicest thing about the S-100 arbitration scheme is its simplicity. Figure 1 shows a bus arbitration circuit (taken from the IEEE-696 specification) that would typically be found on each processor board in a multi-processor TurboDos-based system.

The S-100 bus can handle up to 16 temporary bus masters in the same frame. Arbitration among these 16 is controlled by the S-100 bus' four open-collector TMA (temporary master arbitration lines, TMA0 - TMA3).

Each temporary master on the bus has a unique priority that it can assert onto these lines whenever it wants to take over control of the bus. The bus arbitration circuitry (which must be present on each temporary master board) will then decide if that board may have control of the S-100 bus. If the bus is busy, the arbitration circuitry will deny access to the bus.

Waiting In Line

In addition, the arbitration circuitry on each board must also determine if there are other boards that are also requesting the bus. If others are requesting access, then the arbitration circuitry must decide which requesting temporary master has the highest priority, and see that bus control is turned over to that board.

This is easier than you might think. The TMA lines are open collector, so the arbitration circuitry on each board only needs to look at the TMA lines to determine if other boards are requesting control of the bus.

If any other processors are requesting the bus then the signal levels on the TMA lines will not agree with the value that the board's own arbitration circuit is outputting. The circuit can then determine which board has the highest priority (after removing its own signals from the TMA lines).

Looking At Figure 1

Here's how the arbitration circuit shown in Figure 1 works: The temporary master (whose board must include the circuitry in Figure 1) requests the bus by asserting the IWANT (occasionally know as the GIMMEE) line. If no other processor already has the bus, the requesting board outputs its priority to the TMA lines and gets control of the bus immediately (the MINE line turns on) by asserting the HOLD* line.

If pHLDA is inactive (the master processor has the bus), or the HOLD* line is active (another master has the bus), then the requesting board must use the arbitration procedures described above.

If the bus is being used by lower priority boards, the new board asserts the ISME* line, which eventually enables the MINE line (saying that the bus request is successful).

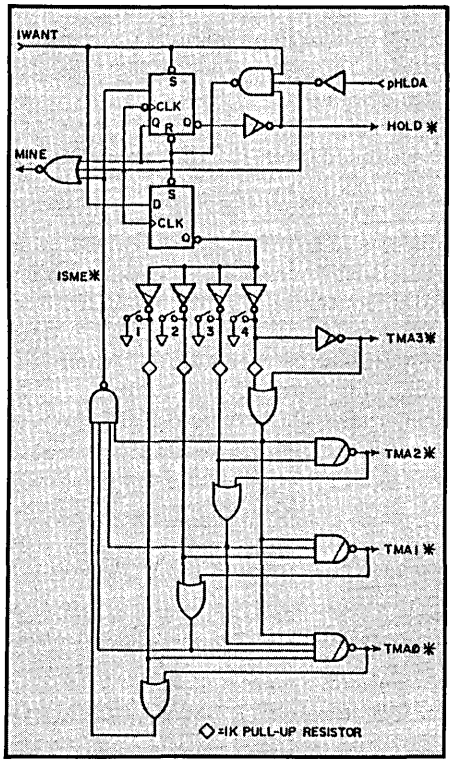
When the requesting board has finished using the bus, it turns off the IWANT signal, which causes HOLD* to be released, and resets the MINE signal. Afterwards, the master processor can release pHLDA and take back the bus.

Figure 1 shows the switch settings for board priority selection. The board has the lowest priority when all the switches are closed; it has the highest priority when all the switches are open.

Simple DJ2D Relocation

Morrow Designs' old DJ2D floppy controller boards can get a new lease on life from this information sent to me by Ken Piggott, a long-time S-100 enthusiast:

"The problem with most DJ2Ds is that they require address space from 0E000H to 0E800H, which limits the size of the operating system (usually CP/M) to 56K. It would be nice to relocate the board to the top of memory (0F800H), but there are two obstacles, an EPROM and a PROM, that must be reprogrammed to do this. Burning a new EPROM is no real problem, since Morrow Designs supplied the source for the EPROM. But the PROM programming information is not provided, and PROM updates are no longer available from Morrow Designs for this board.



"The solution is to burn a new EPROM and move a couple of traces to trick the PROM into thinking that the 0E000H page is being addressed when actually the F800H page is selected. Fortunately, there is an unused NAND gate available in the DJ2D's vectored interrupt circuit (which is not used by the DJ2D software), which can be used to trick the PROM. Here is how to do the relocation on a DJ2D model B, rev 2.:

"Assemble the EPROM source code for 0F800H, burn it into an EPROM, and install it into the DJ2D to take care of relocating the DJ2D's I/O routines and boot loader software.

"Then lift out pins 12 and 13 of the 74LS38 NAND IC at position 8B.

This gate was used to drive a vectored interrupt line, but was never used in any Morrow Designs software. Similarly, lift out pins 6 and 7 of the 6301 PROM IC at position 8C. Connect a wire from board position J1A (the output of the 74LS38 NAND gate at 8B) to the 6301 PROM's pins 6 and 7.

"Finally, connect the inputs of the 74LS38 NAND gate to S-100 bus lines A11 and A12 (one wire from S-100 edge connector pin 85 to IC 8B pin 12, and one wire from edge connector pin 33 to IC 8B pin 13). That's all there is to it!"

I have used this modification myself on several DJ2Ds and have had no problems at all. However, this modification only works for DJ2Ds origined at 0E000H, and it disables the DJ2Ds vectored interrupt output (which I don't use either), so use it with some caution if you are not a software wizard.

More Goodies

Next time, a simple circuit for adding a 32-character type-ahead to a serial I/O port, more IEEE-696, and some reader feedback.

■ ■ ■

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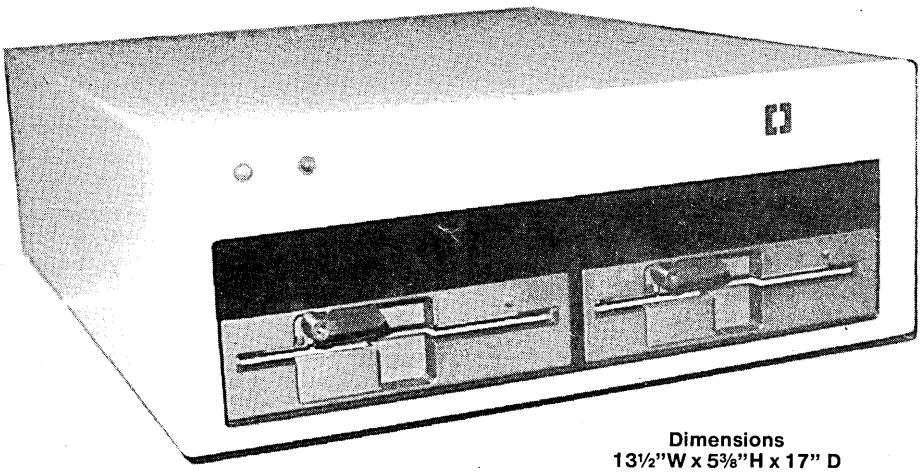

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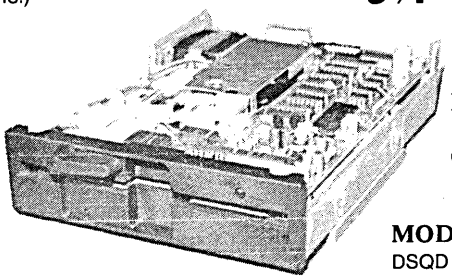

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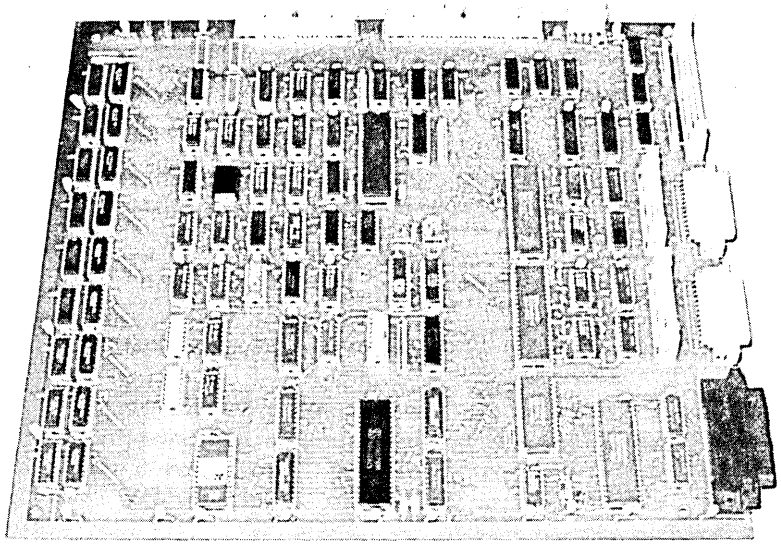

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The Public Domain

By Stephen M. Leon

200 Winston Drive
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Scattered through the public domain libraries and on the bulletin boards are a collection of programs that run from two to 20K but give you gigabytes of power. There are commercial vendors of some fine utilities, such as POWER or NORTON, but nowhere else is the adage "you get what you pay for" proved so wrong as when we talk about the nuclear power of public domain — the public utilities.

If you read some of the classified ads in "Computer Shopper" or some of the real small ads in the magazines, you see there are a few people trying to sell individual utility programs, usually pricing them from $29.95 and up. Even if the utility isn't just a ripoff of a public domain utility, then it is still, in most cases, available elsewhere at no charge. Moreover, in all probability, the free version is superior to the one that's for sale.

Perhaps that's why the better commercial utility vendors put together packages of programs. Fortunately for the users, the best in utilities is available in public domain software.

Programs You Must Have

It's hard to believe that there are people in this world who have never heard of UNERA. The last release in CP/M 80 was on SIG/M Volume 147. A version for CP/M Plus is on 212, and one for CP/M 86 can be found on 172. A comparable program for PC-DOS called UNDEL is on PC/BLUE Volume 121.

The file management utilities are also a must. WASH, DISK, SWEEP, NSWEEP, and VFILER all allow you to go through the files on your disk, view them, copy them, delete them, rename them, etc. Some of the newer versions of NSWEEP allow you to squeeze and unsqueeze. A lot depends on your own tastes and the amount of disk space you can spare. I prefer VFILER simply because it allows me to view a screenful of files and move the cursor to make selections. The PC-DOS version even lets me change directories. However, a screen oriented file manipulator requires terminal customization. You may want to try one of the other manipulators if a custom version is not available.

VFILER for the PC is on PC/BLUE 121. PC-SWEEP is on 105. The original Rich Conn CP/M 80 version of VFILER is on SIG/M 145. Harry Van Tassell's CP/M 86 translation is on 146. A version for the NEC APC is on 207. DISK 7, WASH, SWEEP, and NSWEEP are found respectively on Volumes 170, 86, 110 and 152.

FINDBAD And DU For Your Disks

Another utility which should be in your library is FINDBAD. It checks disks for bad sectors and locks them out. Some people prefer to use it every time they format a disk. Others, such as yours truly, run it only if they have a problem with a disk. The CP/M 86 version is on Volume 146, the CP/M 80 version is on Volume 86, and the MS-DOS version (called SCAVENGE) is on SIG/M 177.

Another must utility is DU. With it you can read, write, repair, etc., files on your disk. The CP/M 86 version is on SIG/M 172, and the CP/M 80 version is on 152. DU was written by Ward Christensen, revised by Ron Fowler, modernized by Rich Conn, and translated by Harry Van Tassell. Along the way lots of other people added to it. It is well documented and easy to use. A more recent program, EDFILE, does much of the same — but only on Z80 systems. It is on SIG/M 228.

Finding Strings And Disks

Being neither a squirrel nor an attributer, I find things the old-fashioned way — looking and looking. To find programs in the catalog, we have FIND which locates strings of text. A current version of FIND is always on the catalog disk (Volume 00). The version that appears on the catalog disk depends upon whether we are using a single or multiple catalog file, squeezed or unsqueezed files, and have room for both CP/M 80 and CP/M 86 versions. Various versions of FIND are found on Volumes 212, 203, 197, 173, 165, 156, etc.

Other people far more ambitious than I use Ward Christensen's Master Disk Cataloging System to keep track of their programs. To set up the system you need FMAP.COM on SIG/M 072 for a multi-drive system. Use NEWQCAT.ASM on 070 for a single drive system. You also need CAT.COM and UCAT.COM on Volume 50. PC/BLUE has a disk file catalog program on Volume 70.

Another thing people do is keep track of their files by setting update attributes. My PC automatically date stamps the files so, like it or not, I can always tell what is the most current file. An archival program in CP/M 86 is on Volume 147 of SIG/M. The original version of the program by Kelly Smith and Kim West DeWindt appeared in the August 1982 "Lifelines" (page 34). The article includes a version which should run under CP/M 80. (Programs in magazines are usually copyright protected and are not in the SIG/M libraries unless released by the copyright owner.) A file archiver written in C is on SIG/M Volume 179.

Worth mentioning before we get off the topic of utilities is SURVEY on Volume 76 which gives you a system memory map, BDOS, BIOS, ROM, ports, etc. In the PC area we have EQUIP on PC/BLUE 81 which tells you what you have on board. Both are quite useful.

Giving Yuppies Heart Attacks

I don't think we have to go through every utility in the book to get across the point that there are a lot of these little helping hand programs in the public domain which will make your computer handling easier. If there is one fault with them, it is that many of them are updated so often that some Yuppies have heart attacks trying to keep up with the latest version. Bruce Ratoff's SD (sorted or super directory) was a handy utility to show disk contents and file size when it was written years ago. But people have taken to rewriting it — almost at every sunrise — so the version numbers are up in the stratosphere.

The public domain libraries generally don't update a file until a major revision takes place. We have versions of SD for CP/M 80 on Volume 233 and

CP/M 86 on Volume 146. There is a PC-DOS version (Vol. 66), but up to now I have not seen one which works as well as the CP/M versions. SDIR (Vol. 47) or XDIR (Vol. 108) in PC-DOS are better choices. Other utilities in the public domain allow you to page files (including bidirectionally). You can squeeze and unsqueeze, create and use libraries, type files in libraries (squeezed and unsqueezed), run programs in libraries, print files, remove high bits, erase files, rename them, set your printer, set your baud rate, etc., etc.

Take a look at the SIG/M or PC/BLUE library, or browse around on a bulletin board. There are lots of these programs around to help you. A word of caution, however. In this world of sickies, there are people who download programs with "worms" to the bulletin boards. On a board where the operator does not have the first opportunity to review a new file (or where he or she does not do that), you may have a problem. Always run new, unknown programs from a write protected disk.

Bulletin Board Software

The Capital PC Users Group (Box 6128, Silver Spring, MD 20906) has been leading the rest of the pack when it comes to PC bulletin board software. Their RBBS programs are now available in the PC/BLUE library. Volume 74 contains version 12.2b, a single user system. This was upgraded to version 12.2c, another single user system, on PC/BLUE Volume 79. Volumes 109 and 110 contain version 12.3b, a multi-user system. We have seen relatively inexperienced users go from zero to full operation with these systems within an hour.

Another bulletin board system available on PC/BLUE is FIDO-NET (Volumes 77 and 78). Our inclination would be to stick with the Capital System when setting up a PC bulletin board.

When it comes to including CP/M bulletin board system software in SIG/M, I have to confess being guilty of suppressing same. The CP/M bulletin board operators rate tops among computerists. They have a network which provides them with the latest software updates for their systems. Therefore, SIG/M hasn't even tried to keep up with them. Our advice to anyone thinking of setting up such a system is to contact a BBS operator for the latest updates and how to join the network.

If you want to see the software first, take a look at SIG/M Volumes 112 and 130. Another system, CITADEL, a bulletin board in C, is on Volume 150. An RBBS system in C is on Volume 178. Volume 92 also has some BBS software, as do other volumes in the library. We have also been promised a bulletin board system in Turbo Pascal. As soon as it arrives, it will be released on a SIG/M disk.

BIG NEWS

The August 1985 SIG/M releases contain several volumes of extreme interest to all. Volume 241 has on it the official newly revised XMODEM protocol. XMODEM now supports optional 1K blocks for those who use the new 2400 baud modems. Paul Homchick has done the revision, with testing by the who's who of computing. On the same disk, Ron Fowler has updated MEX to the same 1K standard. Beware, however — MEX114 and XMODEM110 are the OFFICIAL versions. At least one member of the three-revision-a-day crowd is trying to sabotage the standard (because he can't count to 16 bits), so watch out for higher numbered "revisions" on the bulletin boards.

SIG/M Volume 238 contains the CCIT X.25 Packet Standard (all 3 levels) configured for the Big Board (but adaptable). More on both of these volumes and the "Protocol Wars" next issue.

News From PC/BLUE

The PC/BLUE library has three new data base management programs: the 3by5 Information Manager on Volume 125, File Express on Volumes 126 and 127, and PC-DMBS on Volume 131. The other day we went over to Hank Kee's office and found him testing the latest in freeware for PC/BLUE. SIDEKICK now has a freeware competitor called DESKMATE on PC/BLUE Volume 133.

Again I repeat that I don't think freeware is good for computing, and I certainly would not recommend anyone ever sending money to the freeware peddlers. However, if you want a copy of something that looks and acts like SIDEKICK and don't want to spend money for it, try DESKMATE. Hank told me an interesting bit of news which I will pass along to the next bum I meet on the Bowery — seems as if one of the freeware people is now asking for a contribution of $150!

Hank was also busy testing another program which looks like a natural for the kids. PC/BLUE 133 has "Origami, the Japanese Art of Paper Folding." You need color graphics to run it in BASIC, but it looks like a lot of fun.

Next issue we are going to cover some of the more exotic programs in public domain.

How To Order Volumes

SIG/M volumes are available on 8" SSSD disks for $6 each ($9 foreign) directly from SIG/M, Box 97, Iselin, NJ 08830. Printed catalogs are $3 each ($4 foreign). Disks in a variety of formats may be obtained through the worldwide SIG/M distribution network. The distributor list is included with the printed catalog. A disk version of the catalog (Volume 00) is available for $6. PC/BLUE Volumes are $7 each ($10 foreign). The printed catalog is $5. Both are available from the New York Amateur Computer Club, Box 100, Church Street Station, New York, NY 10008.

■ ■ ■

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C'ing Clearly

By Ron Miller

1157 Ellison Dr.
Pensacola FL 32503

One of the pitfalls of language columns and software listings is that they discourage the weekend hacker by making him feel decidedly inferior. Each loop, each test, each routine looks as if it had sprung full-blown from somebody's forehead. This guy can read the allocation vectors, redo the directory, and bank-switch four times in the length of code it takes the rest of us to find item number two in a sorted list of four. It's enough to make a guy take up gardening. After all, anyone can grow better tomatoes than Safeway.

As a public service I'd like to allay such self doubts by citing a few of the stupidities committed along the route toward a program that, I like to think, looks pretty darned slick. Plus, the program might even be useful, and you can use this tale as a source of comfort when you mess up your next undertaking.

A Project

But first, a confession. I bought an IBM compatible. Oh, I didn't WANT to, and I feel like a lemming; but prospective clients with shiny new XTs like their code written for the 8088; and besides, Lotus graphics are a constant wonder. But it's not just my loyalty I'm worried about. It's salvaging something from the capital investment of wordprocessors, utilities, and skills derived from two or so years of obsessive dependence on my Kaypro and the Z80.

The obvious answer is hardwired communication between my zippy-do, 5MHz, quad density, RAM disk-equipped Kaypro II chassis and that beige-colored MBA graduate sitting stuffily over there on the other desk. Just how fast can I send source code and 100K+ databases back and forth between the Kaypro, with its good old Perfect Writer, and the Zenith, with its new Turbo 3.0 compiler? The answer — after a weekend of agony — is 19,200 baud for 8 bits, and at the flick of a finger, too. By Ward Christensen, it works.

Hardware

The solder job was easy. Twenty feet of 25-strand ribbon cable, plus one male and one female subminiature connector. Wire 2 goes to wire 3 on the other end, and wire 3 to wire 2. Do the same with wires 4 and 5. A null modem, they say. To defeat the Kaypro's mysterious DTR handshaking, just jumper wires 6 and 20 together at one end or other. Handshaking can be handled by sending a character back from the receptor computer. I haven't lost a byte yet.

Setting Up For Monster Baud

A long dip into the IBM tech manual and the Kaypro ROM listing yielded the needed port calls. (The ports and initialization are the same for all Z80 Kaypros.)

Though I've included some assembly language in the listings, many implementations of C provide in- and out-port routines. The assembly routines shown in Figure 1 work for Software Toolworks C/80.

The Overall Design

What evolved was a C routine that runs, with minimal tinkering, on both computers. Two modes of operation are possible. Without a command line argument, the computer goes into the receive mode and waits for a null-terminated string, which it uses for the file name.

After opening the file, it squirrels away the stream of bytes, until receiving eight ASCII 4s in a row. Then it closes the file and waits for the next file name. No self-respecting file, text or binary, would have eight ASCII 4s in a row — would it? Please tell me that's so. Anyhow, if the waiting computer gets an ASCII 4 as part of the next file name, it's over-and-out.

In the send mode, the command line argument (wildcards are a natural for C) provides the file or files to be sent. Not to slow down the chatting at 19.2K, the donor computer, like the receiver computer, uses a nice A000H (40K) buffer to store the bytes for loading and unloading using high speed low-level I/O.

Figure 2 is the final listing. Now, isn't that smart? Look at those clever ways to count ASCII 4s and handle multiple file transfers. It's efficient, it works, and it's practically a seminar in C control features. I just saved $300+ by not having to buy an MS-DOS word processor. Now don't you feel inadequate?

A Child's Garden Of Stupidities

So did I, after my initial glee. Overcoming the residual urge to use PIP and COPY to do the transfers, I was quickly able to get the computers to acknowledge one another — using Turbo Pascal, I admit. In Turbo's memory mode, the two computers could spit a stream of single characters at one another all day. The real game in C seemed easy.

To raise the following doleful yarn above the personal level, I'll list a few morals as we go along.

C Is Not Pascal

The computers were sulky and uncooperative. Sometimes they would talk to one another like country neighbors. Often not. Sunday afternoon, when the coding was almost finished, I finally saw the pattern. If I used the simple Turbo routines as a quick test for character flow, the C code would work until a restart on either machine. C wouldn't initialize the ports!

After staring at the numbers and my in- and out-port routines for two or so hours, all the while tinkering with enabling and disabling interrupts, I concluded that Turbo does something truly magical with port calls. My dreams Sunday night were feverish visions of disassembling Turbo in two separate environments. Would my dean let me take a leave of absence to do it? Would one semester be enough? Could this be a doctoral thesis?

Of course I could just run Turbo first and then demonstrate my amazingly powerful C routines.

Drinking coffee and tidying up on Monday morning, I glanced at the main() routine and noticed that "set_serial" didn't have parentheses after it. Omygosh! I've been slumming in Pascal too long; I used the

(continued next page)

(continued from page 19)

procedure name by itself to make a call. I was telling C to cram the address of the initialization routine into the transfer register, and, cooperative little language that it is, C did it. The ports were never addressed at all. Though it may have an obese runtime package and may defeat wildcarding utterly, plodding old Pascal would have caught that sort of perversity in one whirl of the compiler. "Who's to say what's normal?" must surely be the motto of Kernighan or Ritchie, or both.

Read The Manual

On Sunday, even during the random moments when the C programs were running, transfers from the Zenith to the Kaypro would zip merrily along until the end of the file and then, boom, the Kaypro would go whacko and fill the RAM disk — all half a meg of it — with strange and wondrous characters. Since I was very uneasy about file handling in MS-DOS C, I spent at least an hour poring over MS-DOS hex 21 services and directory modes. Whatever they are.

I finally pulled out the C/80 manual for a line-by-line comparison of function descriptions, and there it was: low-level I/O routines in C/80 expect arguments in even multiples of 80 hex. I forgot. A bit of "div" and "mod" work and the file size stayed finite.

Don't Clobber Control Variables

Finite but not right. My accursed drives would sometimes shut down after a few whirls and sometimes produce 60K files out of 2K sources.

Back to the MS-DOS file descriptions, plus an hour or so trying to figure out how EOFs (-1s) were leaking into the loops. I ANDed everything in sight. I rewrote routines. I renamed variables. I called my ex-wife (boy was she surprised). I tried to phone my mother. I exited from wild places in the program. I considered prayer.

And then I saw that I had named my file buffer (buffer-ell), not (buffer), and was reading and writing to the address of the structure (buffer), which contained the array pointer at its very beginning. Every write wiped out my index. Talk about random access. It was a matter of stupid naming. Doesn't everyone always write to buffers? If I had named the structure "sam" and the array (sambuffer), I'd have had time to go motorcycle riding on Sunday afternoon.

Slow Down With The Word Processor

The Kaypro surrendered. The Zenith still had the nasty habit of saving the contents of the previous file and adding it to the current file. That seemed easy. Obviously I was using some append mode for file opening. Consulted Peter Norton. Switched mode codes. In desperation, erased files from DOS. Changed disks. Took a shower. Filled the tub. Ran off hardcopy and returned to the tub. After getting thoroughly wrinkled, looked at the code and saw that the line initializing the buffer pointer to zero had gotten itself erased while I was slinging about wild alternatives during my last agony. Start the array at zero, and the file size at least has a chance of coming out right.

Song Of The Man

And so on and so on. If I had time, I'd tell you why it's not useful to read ports while initializing them and why interrupt 21 hex and interrupt 21 decimal tend to differ slightly in their effects on an MS-DOS machine. It took me, say, 15 hours to write this program, and about 11 of them were utterly wasted by the sort of carelessness and thoughtlessness that a good accountant's mentality would surely have avoided by instinct. Why do naturally disorderly folks play with computers at all, when they evidently have no talent for them?

Because there's NOTHING around (no, young folks, not even sex) that

Figure 1 - In- and Out- and Set Serial Routines

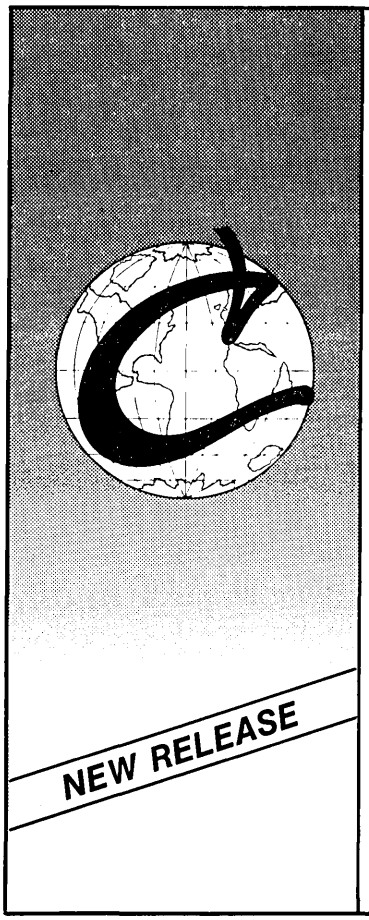
```
char inb(b)
  char b;
{
#asm
        POP    H
           POP    B           ;port # into C
           PUSH   B
           PUSH   H
        MVI    H,0
           DB     0EDH,068H    ;Z80 IN r, (C) command--char into L, return in HL
#endasm
}
outb(b,port)
 char b,port;
{
#asm
              POP    H
              POP    B       ;port into C
              POP    D       ;char into E
              PUSH   D
              PUSH   B
              PUSH   H
                 DB     0EDH,059H ;Z80 OUT (C),r -- r=E
#endasm
}
And here are the ""set_serial'' routines for the Kaypro and COM1 on
an IBM or compatible:

set_serial()    /* KAYPRO VERSION */
{
    outb(0x18,6);                   /*reset control port--#6*/
    outb(0xf,0);                    /* 19200 baud-- baud port=#0 */
    outb(0x4,6);                    /*bit set control*/
    outb(0x44,6);                   /*one stop bit, 16x clock*/
    outb(0x03,6);                   /*receop)]:=Succ(y);
         On(Succ(y),x);
         top:=(top+2) And maxsp;
      End;
   End;
End;
```

beats that wonderful well-done-thou-good-and-faithful-servant feeling that comes when the beast cooperates and you can go back to cover up your tracks and make it look as though you'd never failed to initialize that pointer, and never failed to put the "&'s"in scanf, and had never, never, never looped that array index off into the next variable.

Do you think that Leor Zolman has ever neglected to put '*' on a pointer, thereby spraying odd bytes about the operating system? Noooooo — surely HE never does that! I've got to believe in something out there while I try to figure out how to talk between parallel ports to speed up this boat anchor of a program.

■ ■ ■



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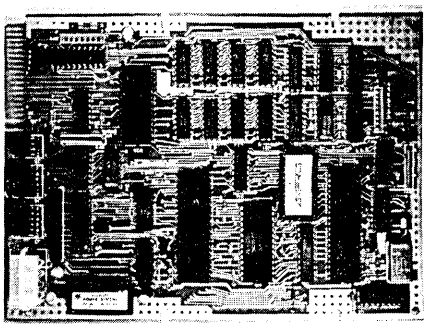

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Xerox 820 Column

By Mitchell Mlinar

1225 Fonthill Ave.
Torrance CA 90503

SOG! For me, an acronym for Somewhere Outside the Galaxy. The name suggests a far-far-away place where lots of Xerox, Big Board, and Kaypro users gather to share their knowledge and learn some new tricks.

Imagine a town as far away as possible from ANYWHERE. If you can't, that's OK. If you think you can, you need to travel to Bend to recalibrate your thinking. If man never landed on the moon, landing in Bend would be a comparable achievement. Don't get me wrong; Bend is a beautiful town (and not all that small). Just don't get lost on the way ....

Anyway, I learned quite a bit at SOG and met people I had only heard or read about (George Morrow of Morrow, Jack Dennon of "CP/M Revealed," Dave Rand of Definicon, Ezra Shapiro of BYTE, etc., etc.).

Ferguson 256K RAMcard

The 256K RAMcard from Ferguson Engineering is a small board that sits right on top of the 32 16K RAM chips on the Xerox 820-I board. (It will NOT work with the 820-II). What you get is a 4x6 inch card that plugs into the 820 board in place of several chips.

You need to remove chips U71, U72, U73, U74, and U76. Take your time removing them and follow Jim's advice. (I did mine hastily at 2 a.m. and ended up jumpering a couple traces.) Once the chips are out, adding the socket headers is easy. This is a good time to test your board. I recommend buying the replacement chips along with wirewrap sockets (about $10 worth of parts).

The next step is to build the Ferguson card. This is a breeze! The fastest way is to install all the sockets, soldering only pin 1 and the opposite corner pin (8 or 9). Make sure the sockets are flush. Using the art of "hand wave-soldering," you can solder the other pins in minutes. Now add the remaining parts, plug in the board, and away you go ... into the ozone.

Well, that's what happened to me. You see, I didn't really read the instructions, which clearly specify that the board MUST be initialized on power-on so that the four logical banks are mapped into different physical banks of which there are 16 (16x16K=256K). Once I modified my ROM to initialize the board and resolved a couple other items (like a cold solder joint), then the RAMcard took off. If you have never had a RAM disk, you don't know what you're missing! (Answer: speed.)

Z80 Interrupts

The last time I talked about the Z80 family, I discussed the CTC chip. This time, I'm going to discuss interrupts as they are used on the Xerox 820 (both -I and -II).

An interrupt is a combination of hardware and software which makes the Z80 appear to do several things simultaneously. "Appear" is an important point, as the Z80 really only does one thing at a time. Let's take a look at the Xerox 820, where the keyboard and real-time clock have interrupt routines.

Under normal operation, the Z80 chip is sequentially executing code, say compiling your favorite Startrek program. When the system PIO detects a keypress it pulls down on the Z80's interrupt line. Immediately after completing the current instruction the Z80 responds to the interrupt.

If the interrupt software is written correctly, the interrupt routine will fetch the key, set the proper flags, and return to execute the next compiler instruction; the compilation will continue as though nothing happened. Similarly, every second there's an interrupt from the CTC forcing the Z80 to update the real-time clock and the screen display. Again, the compiler hasn't the slightest idea that the processor took a detour.

When the Z80 feels its interrupt pin pulled low it must figure out which interrupt routine to execute. The Z80 family does this best with vectored interrupts. In a vectored interrupt, the Z80 gets an address from an internal register (the high 8 bits) and from the interrupting device (the low 8 bits).

Anyway, to support vectored interrupts the system must be set up as follows:

1. The hardware (CTC, SIO, PIO) must be chained together (wired together through special INTE and INTI lines). How these chips are chained together determines the interrupt priority. As shown in Figure 1, the SIO is at the start of the chain with the CTC last. Although the software could utilize the fixed hardware priority to allow servicing of several interrupts simultaneously, the 820 does not do this.

2. The Z80 must be programmed for interrupt mode 2 operation and have its I(nterrupt) register set to the high byte of the table. A vectored interrupt means there is a table of "service routine" addresses as shown in Figure 1. Each vectored interrupt slot contains the ADDRESS of the service routine, if one exists. Only the routines marked with an asterisk (*) are available in the normal 820, although you could add code to support all of them if you wished.

3. The CTC, PIOs, and SIO must be programmed with their respective interrupt vectors, which is the low byte of the starting address. Each chip should contain a unique value. In the 820, the SIO vector is 00H, the CTC vector is 10H, the system PIO is 18H, and the general PIO is 1CH.

Note that the addresses of the routines are set in software. You could move the entire vectored interrupt table down to FA00H, and the only change required would be to set the Z80 I register to FAH instead of FFH. Also, the ORDER of the vectored interrupts in the table has nothing to do with actual priority. We could just as easily have the CTC start at 00H, followed by the general PIO at 08H, the system PIO at 0CH, and the SIO at 10H. Disaster is waiting if, say, the PIO and SIO vector slots overlap AND their interrupts have been enabled.

As an example, let's see what happens when the CTC real-time counter interrupts the Z80. (The CTC and Z80 are already programmed.) When an interrupt from the CTC

(continued on page 25)

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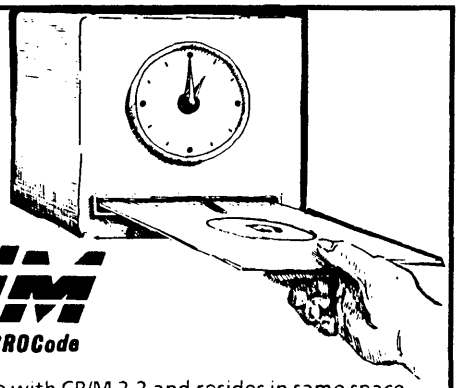

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(continued from page 23)

occurs, it may not happen immediately (interrupt pending). The CTC will wait until it is granted access both in software (through the EI or Enable Interrupt instruction) and in hardware (through the interrupt priority chain). It also disables any interrupts which are lower in the priority chain (the CTC is the lowest, so nothing else is affected). If a keyboard character is currently being processed, the CTC will have to wait until the keyboard routine is finished.

When the Z80 detects another interrupt (once it has finished the keyboard interrupt) it challenges the anonymous interruptor (a famous old-west marshal and chip designer) to show his vector.

The CTC's base vector is 10H, which means that CTC3 will send a 16H back to the Z80 via the data bus. The Z80 combines this low byte with the I register high byte to form the vector address of FF16H. The 16-bit value at this location is the start address of the routine. Assume that the TIMER routine starts at F517H. The Z80 will put the current program counter on the stack, disable interrupts, and start executing at F517H.

At the end of the TIMER routine, two instructions are needed: EI followed by RETI. EI re-enables interrupts, and RETI is a special return from the mode 2 interrupt routines. RETI is decoded by the CTC, SIO, and PIO so the interrupting device (in this case, CTC3) knows that the Z80 is done and CTC3 can raise its interrupt enable output and re-enable the priority chain.

If you are careless and use the RET instruction instead of RETI in the keyboard routine (which has higher interrupt priority than the CTC), the interrupt chain below the keyboard (the CTC) will be unable to perform an interrupt!

In The Weeds

Before I get lost in the weeds this September (being an "almost good" student at USC), I'll try to finish a couple hardware projects so I can write about them. I hope to finish the Z80 saga next time.

■ ■ ■

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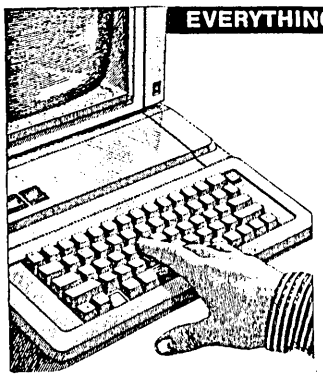

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Figure 1 - Xerox Vectored Interrupt Table

```
FF00:   DW   SIOBEMP   ;SIO B xmit buffer empty
FF02:   DW   SIOBEXT   ;SIO B external/status change
FF04:   DW   SIOBRCV   ;SIO B receive data available
FF06:   DW   SIOBSPL   ;SIO B special receive condition
FF08:   DW   SIOAEMP   ;SIO A xmit buffer empty
FF0A:   DW   SIOAEXT   ;SIO A external/status change
FF0C:   DW   SIOARCV   ;SIO A receive data available
FF0E:   DW   SIOASPL   ;SIO A special receive condition

FF10:   DW   CTCI0     ;CTC channel 0
*FF12:  DW   CTCI1     ;CTC channel 1 (millisecond)
FF14:   DW   CTCI2     ;CTC channel 2
*FF16:  DW   TIMER     ;CTC channel 3 (one second tick)

FF18:   DW   SYSA      ;System PIO channel A
*FF1A:  DW   KEYBR     ;System PIO channel B (keyboard)

FF1C:   DW   GPIOA     ;General PIO channel A
FF1E:   DW   GPIOB     ;General PIO channel B
```

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Xerox In Black And White

By Anders W. Gustafsson

Kaptensgatan 2A5
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I prefer a black on white display to green or amber on black when I'm word processing, as long as the white is crisp white and the black really black.

When I sell wordprocessors I tell my customers the Xerox Star is just super because the display is black on white. But they say, "Sounds good, but a Star is too expensive. What's cheap?"

So I try to sell them the 820-II with low-profile keyboard, function keys, floppies or hard disk, WordStar and the works, at a fraction of the price of an 860.

"And the display?" they ask.

Then I'm caught in a web of trying to explain why a black on white display isn't so desirable. To get out of this uncomfortable situation, I decided to modify the 820's display.

Cheap Logic

To make a cheap computer you use cheap parts. One way to make a monitor cheaper is to remove parts until it stops working. Then put back a few, and you have the original 'El Cheapo' monitor. A close look at the monitor's printed circuit board (PCB) revealed a space reserved for additional circuitry.

Just inverting the video will turn your display into a mess — dark gray characters on a light gray background. And for no extra charge you get random lines everywhere. This is due to:

1. Insufficient rise times in the video output (the bandwidth is OK, but you should see what the video amplifier does to a squarewave)
2. No horizontal retrace blanking
3. Parasitic oscillations in the horizontal output transformer.

The Mod

I've modified the Motorola MD 3970 monitor, one of the most common in the U.S. If your computer has the Ball BCX-200 monitor (which is very similar), skip step 4.

Step one gives a black on white display of fair quality. By step four it should look very good.

Figure 1 - Inverting the Video

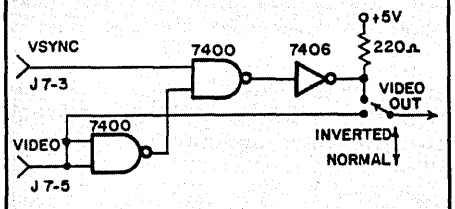


Figure 2 - Old-fashioned Pulse Feeding

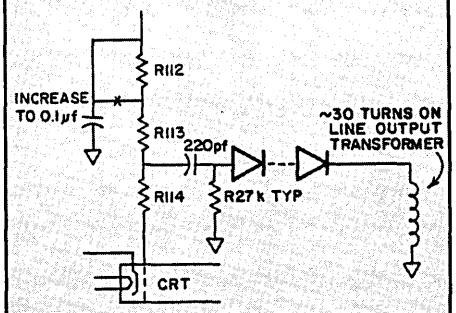
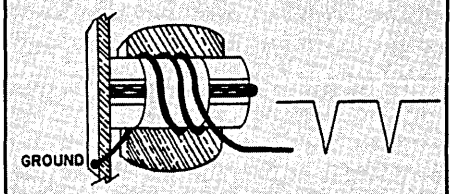


Figure 3 - Coil



I'm convinced that anybody with a reasonable knowledge of the inner workings of a TV, given the time and money, can make an even better display. Let me know if you do.

Step 1

Invert the video and gate with the vertical sync pulse to eliminate some of the retrace lines. See Figure 1.

Step 2

Decrease the rise time of the video output stage.

Remove C103.

You'll find room for an inductor (L101) on the PCB. Remove the link that's been substituted and experimentally find the inductor value which gives the shortest rise time without oscillations (try 4.7 uH).

Fill a portion of memory with zeroes and dump it to the screen. Then observe the rising edge on Q101's collector.

Step 3

If you get dark vertical bars, carefully adjust L301 (length) and L303 (width). The bars might be coming from parasitic oscillations.

Step 4

In this last and most complicated part of the mod, we'll incorporate line retrace blanking. We could have handled this digitally in step 1, but no suitable pulse exists. Instead we'll use the old-fashioned method of feeding pulses to a grid of the CRT. See Figures 2 and 3.

Wind a coil on the line output transformer (about 30 turns). The winding should produce negative pulses, 50-80 volts peak to peak.

Move C104 from the point where R112 and R113 meets to the point after R113 and increase its value to .110 uF.

Connect diodes, capacitor, and resistor according to the schematic. If you get "waves" (try not to make them) on the left edge of the screen, it's due to ringing. Experiment with the value of R and choose the one which produces the best results.

Good luck and happy viewing.

■ ■ ■

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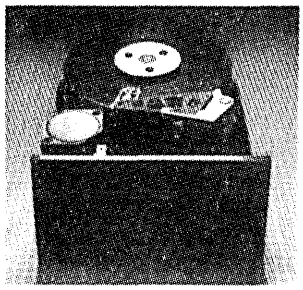
Per Drive	5.40 Mbytes
Per Surface	1.35 Mbytes
Per Track	8.45 kbytes
Per Sector	256 bytes
Transfer Rate	5.0 Mbits sec
Access Time	
Track to Track	16.2 msec
Average	99 msec
Maximum	215 msec
Average Latency	8.33
Start Up Time (Tvp)	12 sec

Functional Specifications

Cylinders	160
Tracks	640
R W Heads	4
Disks	2
Index	1

DC Voltage Requirements:
+12Vdc ± 5% 1.8 A typical (4.0A max. starting for 6 sec.)
+5Vdc ± 5% 0.9A typical (1.5 A max.)

Ask about quantity pricing.



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IDE CardEdge	3.00	3.00	3.00	4.00	4.25	4.50	4.50	8.00
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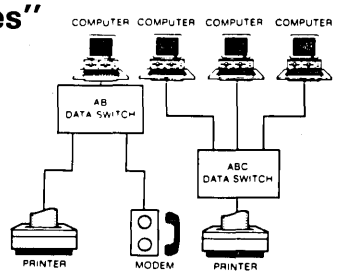

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New PIO For The Big Board

By Robert S. Regan

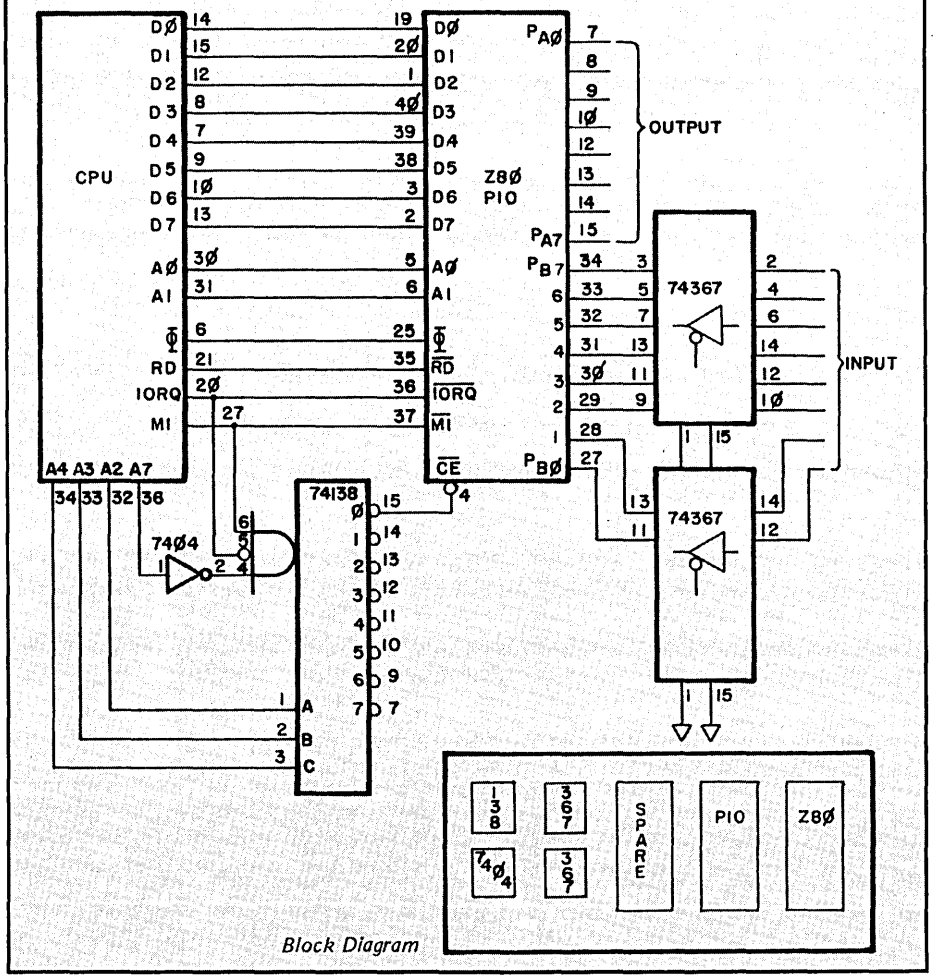
P.O.Box 6511
Lake Charles LA

After purchasing a PC board and software from Andratech for their EPROM programmer, I decided it was time to add another PIO to the BB.

The Andratech programmer interfaces to any CP/M computer using two 8-bit ports — one input and output.

Since I was already using the GP PIO on my BB for printing and satellite antenna positioning, I chose to expand the BB I/O. I used the circuit in Figure 1. The decoding closely follows that of the original circuit.

Figure 1 - Expanding the Big Board I/O



Building

I built the circuit on a piece of vector board 2.75" by 5", soldering a 40-pin dip carrier on the bottom side and mounted a 40-pin socket on top. I soldered together all the corresponding pins.

This carrier plugs into the Z80 socket on the BB. The Z80 plugs into the socket on the I/O board. The Z80 sits on stilts, so to speak, which gives me access to all its data, address, and control lines.

I mounted another 40-pin socket next to the Z80 for the PIO. Then I ran jumpers from D0-D7, A0-A1, CLK, IORQ, RD, and M1 pins on Z80 socket to the corresponding pins on the PIO socket.

The PIO's chip enable is decoded by a 74LS138 3 to 8 decoder and an inverter for A7. Thus the decoder looks for ports above 7F (not used in the original BB) providing selects for eight more PIOs, SIOs, CTCs, PROM blasters, laser zappers, slug squishers, etc..

For buffering I used 74367 hex tri-state buffers because they were handy, but 74LS243s would be better, since they allow directional control.

The circuit fits on the vector board with ample room for an additional PIO.

Finally

I've programmed over two dozen EPROMs with this mod, and no errors!

Hope you can use the circuit.

■ ■ ■

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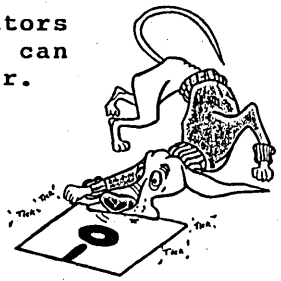

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THIS AD WAS PREPARED ON AN OKIDATA 92.

Faster Screen Output With Turbo

By John Donovan

PO Box 961
Brandon MB Canada R7A 5Y1

This little routine will speed up the video on Xeroxes, Big Boards, and old Kaypros.

Banks

Big Boards and pre-83 Kaypros use banked video RAM, switching in (for screen read/writes) and out before returning to TPA memory (same as ROM accesses).

Newer Kaypros (with graphics) go through a 6845 to video memory which is strictly I/O addressable. The system addressing of the records assignment statement in procedure Bank_Copy (see Figure 1) can be re-written as a stream of I/O for these machines, but don't count on using the auto-increment feature in the 6845. It doesn't always work in the 84 Kaypros.

Pascal Reasoning

Pascal's assignment statement (:=) transfers data into simple (char,boolean,integer,real) variables. But direct assignment is not allowed between arrays. If you want to fill an array with data you must do it one element at a time using some kind of loop.

Pascal does allow direct assignment between variables declared as records. A record can contain (or reference) any Pascal type(s) — including arrays. Thus, an easy-to-read record-variable assignment (recvar1 := recvar2;) can often replace an array assignment loop.

Besides better readability, the compiler's record-to-record assignment machine code loop is quicker than one compiled from Pascal loop statements.

And Turbo Solution

Turbo's default code start address for my Kaypro CP/M is 1FCB. Since the relevant (assignment) code lies in the same address space as the screen data memory bank, switching banks causes the program counter to read its next instruction from the new (wrong) bank. Beware.

Turbo's <o>ptions menu provides the solution. Select a <s>tart address higher than your banked RAM's ceiling — $4000 on a Kaypro. Resultant code starts there, above bank switching, and is safe unless the Turbo library is accessed for math (or something else). Math can be done on a "SCRATCH" or "TEMP" image, and then transferred. This method costs heap (upward) and recursion (downward) "headroom," because the object code block has been "pushed up" in the TPA.

■ ■ ■

Figure 1 - Video Speed-Up

```
program VIDEO_SWAP;                (* Turbo for non-graphic Kaypros.          *)
CONST                             (*              BigBrds amend: VideoRamBase *)
      VIDEO_RAM_BASE = $3000;     (*                             RamColumns   *)
      RAM_COLUMNS = 127;          (* <--Kaypros Note: Hidden"fold" = 64..111 *)
      FOLD = 63;   HIDDEN = 49;
      ROWS = 23;
      JUNK = ' bla';
TYPE
    video_ram = record
                    rc : array [0..ROWS, 0..RAM_COLUMNS] of char; (*ascii*)
                end;

VAR scratch, temp : video_ram;
    screen  : video_ram absolute VIDEO_RAM_BASE;
    i, j : byte;
    ch   :  char;

procedure BANK_COPY ( var v1, v2 : video_ram );
begin
        port[28] :=port[28] OR $80;         (* select Rom&Video Bank       *)
        v1 :=v2;                            (* ram-to-ram copy(contiguous) *)
        port[28] :=port[28] AND $7F;        (* deselect                    *)
end;

BEGIN clrscr;
        for i:=1 to 20 do writeln( junk: trunc(i*3.47));

        bank_copy( temp, screen );
        writeln('SCREEN IMAGE COPIED TO TEMP BUFFER  ---->   hit a key');
        read(kbd,ch); (* pause *)
        for i :=0 to ROWS do begin
                for j :=0 to FOLD do
                    scratch.rc[i,j] := ord('L');
                for j :=FOLD + HIDDEN to RAM_COLUMNS do
                    scratch.rc[i,j] := ord('R');
                end;
        write(^M, ^X, 'NEW INFO READY   --> hit key to copy to screen');
        read(kbd,ch);

        bank_copy( screen, scratch );

        repeat
          write(^M, '  Fast, huh? Hit any key to restore old screen       ');
          read(kbd, ch);

          bank_copy( screen, temp );
          write(^M,^X,' <A>ny key for more, or <Q>uit');
          read(kbd,ch);  ch := upcase(ch);

          If ch <> 'Q' then bank_copy(screen, scratch);
        until
          ch = 'Q';
END.
```

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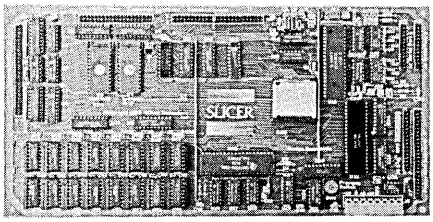

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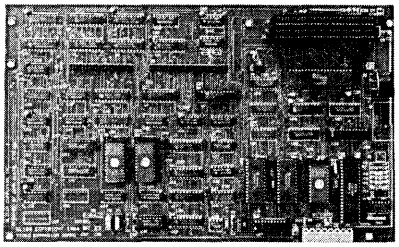

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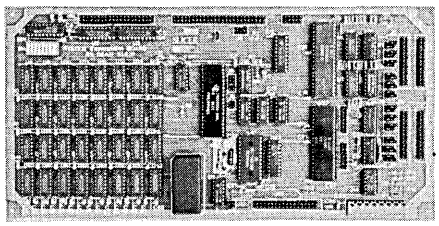

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86 World

By Laine Stump

Micro C Staff

In this episode of 86 World, I'll fill you in on a few new products introduced at this year's SOG, and also give some broad hints on installing 512K of memory on the main board of the Slicer (using 256K DRAMs). The assembly language I mentioned last issue will have to wait until later; this stuff is just too important.

X-16 (The Computer, Not The Plane)

I (along with the rest of the world) finally got to see a working unit from PC Tech (you know, Dean Klein and Earl Hinrichs of Slicer fame). Their new board, called the X-16, is an IBM compatible that can directly replace IBM's original board (all the same mounting holes, sockets, I/O ports, etc).

The big difference between the X-16 and the IBM is the 10MHz 80186 in the middle of the board. But it uses the same chips as IBM for its interrupt controller, counter timers, etc., so these portions of the 80186 are left free for your own applications.

The X-16 includes 512K of RAM standard, with room to expand to 1 Meg onboard. The SIP (single inline package) DRAMs they're using have been dropping in price at about the same rate as standard DRAMs, so although they are still slightly more expensive than the standard 41256s, the cost is quite reasonable.

Dean also included on the X-16 a SASI port for connecting winchester drives and other SASI type peripherals. Since the PC expansion slots are totally IBM compatible, you can hook a winchester up that way, too.

Another feature of the X-16 is the EPROMs. Yes, you actually do get EPROMs with PC compatible calls. Earl says this is something to watch for when looking at kit-compatibles, since most manufacturers sell their boards with no software, expecting you to steal a copy of someone's IBM ROMs. Naughty, naughty.

Speaking of software, the X-16 boots standard PC-DOS, CP/M, or Concurrent PC-DOS. Unlike the EPROMs, the operating systems can be purchased legally at any computer store for a very reasonable price.

No Problem

The X-16 IS compatible, too. Dean and Earl had their display unit running flight simulator nearly constantly, just to prove their point. "No problem" became a common phrase around PC Tech's table: "Will it run Lotus?" "No problem." "Can I use the Definicon 32032 with the X16?" "No problem." "What about copy-protected software?" "No problem." "Flight Simulator?" "Read my LIPS!" "Okay, then, will it change my kid's diaper?" "Immediately after your IBM demonstrates the process..." (And it'll be so fast the kid'll never know what hit him.)

The only compatibility problem encountered so far has been with software that uses hardcoded loops for timing. Some things (Flight Simulator, Pinball) just run faster; others (some winchester device drivers) don't work (yet).

Besides being IBM compatible, the system is FAST. Until the X-16, I had never seen the sample CALC program that comes with Turbo Pascal compile in under 10 seconds.

While there is no video circuitry on the main board, you can add any IBM video card you like and, even though the video memory is on the 8-bit side of the data bus, screen output is still quite impressive. I didn't notice it to be any slower than my Slicer PC video board (all of the Slicer's video memory is on the 16-bit bus).

Along with the X-16, PC Tech is selling IBM type cabinets and power supplies, etc. The entire system can be put together for about the same cost as a real IBM!

PC Tech is also offering custom CAD work to those of you who have a dream board all planned out on paper and are wanting to take the next step towards reality (what a concept...)

Little BIG Board

Ampro was also at the SOG showing their new Little Board 186. This machine is the same size as their Z80 Little Board (the same size as a 5" disk drive). It reminds me a lot of Slicer's uSlicer 188, except that it has a parallel port and uses standard DRAMs instead of SIPs.

The Little Board 186 is (of course) based on an 8MHz 80186. It comes standard with 128K of RAM (512K as an option), two serial ports, a Centronics parallel port, a connector for 5" floppies, and an SCSI master/slave bus for networking and connecting winchester drives. It doesn't have built-in video though, so you'll have to connect it to a serial terminal.

On the software side, the Little Board 186 will boot standard PC-DOS and run most generic MS-DOS software (compilers, etc), but won't run IBM specific programs like Lotus, etc. They have a Z80 emulator running under PC-DOS that may come with the board (but don't quote me on that). Ampro is also working on networking software for connecting multiple 186 and Z80 Little Board systems.

It Slices, It Dices

Slicer Computers also showed up in force at the SOG. Besides the new 1 Meg expansion board and Concurrent CP/M, they had some industrial strength controllers based on the 80186.

Interfacing To The Real World

I had a chance to see Slicer's controllers when I was in Minneapolis recently, and I was extremely impressed. They have a system with multiple 80186 CPUs running Concurrent CP/M. One board handles switching and external interrupts (the PIC or "Peripheral Interrupt Controller"), while another controls machine arm movement in six axes (the MAC or "Machine Arm Controller"). These boards show what can be done with the power of an 80186. To hell with number crunching — let's bend some iron! Anyway, if you are planning on installing a 200 ton metal punch turret in your garage, definitely talk to Slicer first.

Schizophrenia

Concurrent CP/M is loads of fun to play with. It is just wonderful to be

(continued next page)

(continued from page 33)

editing, compiling, and debugging — all at the same time. The Slicer implementation of Concurrent is more advanced in its multi-user capabilities than the IBM version. Slicer's allows for several physical consoles, each with several windows. IBM's only allows windows on one console and only one or two other physical consoles (without windowing).

DRI put in all the handles necessary for running multi-user in a "friendly" environment (one where nobody works at crashing the system). A full complement of file locking and record locking system calls are provided, as well as calls that allow communicating between processes using queues and calls to handle device locking (for direct disk access, use of I/O ports, etc). I'm really interested in using their queues, so I'll probably have something to say about that in the future.

Speaking of Slicer and concurrency and all that, a heckler at the SOG asked Dean Klein (PC Tech, formerly Slicer) when the X-16 is a better choice and when the Slicer is better. Dean replied that the Slicer is much better suited to multi-user and multi-tasking systems; the X-16 is better for someone who wants 100% IBM compatibility.

Slicer PC Board Compatibility

About compatibility: people constantly ask what will run on the Slicer PC board and what won't. Just for reference, Lotus, Vedit, and Turbo Pascal (IBM version) run just fine; Framework and Symphony don't. The problem with these two is that they're copy-protected, and the copy protection scheme tries to access the disk directly. Since the Slicer disk hardware isn't the same, it won't run. Basically, programs that only need the IBM video will run; copy-protected software will not.

Rich Baker at Slicer says they'll try to put together a list of which programs work and which don't sometime in the future. In the meantime, this is my experience: the Slicer video board has run every program I've needed (editors, compilers, etc.); the big problem is (and always will be) copy-protection.

Takes A Dicing And Keeps On Slicing

I have always known Slicer equipment was reliable, but I didn't know how reliable until recently. I just spent six weeks traveling 2500 miles across the Northwest with all my equipment in the back of my pickup. The only hardware problems I encountered in the entire trip were a bad cable on my winchester and a chip that needed to be reseated in its socket (I should have soldered it like Dean said. Then I wouldn't have had any problem at all).

Interestingly enough, my 3-year-old Big Board made the same trip with no problems either. Good thing I don't own an IBM AT or anything with Tandon drives ...

I certainly hope Slicer's reputation remains unblemished. Next week, everything gets packed for a two month boat trip across the Atlantic and the Mediterranean (whimper, whimper). The only thing I don't expect to make the trip alive is the winchester (I've heard they're prone to seasickness), so I'll be copying everything down to floppies and possibly buying a spare drive.

Thick Slice

You've all heard of the "Fat Mac"? Well, now I'll tell you about the "Thick Slice." A recent letter opened my eyes to a method of putting 512K on the main board of a Slicer using 41256 DRAMs. I must warn you that I haven't done this myself, so I don't know the exact pin numbers, etc. I hope this lack of detail will keep the novices away so they don't get in trouble.

The Thick Slice should be a simple modification. The only extra circuitry required is a new chip select line for the TMS4500 RAM controller and

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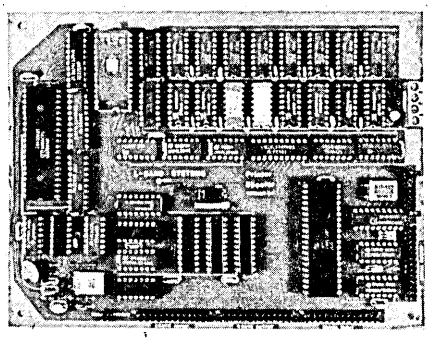

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two new multiplexed address lines (for chips with four times the capacity each). I won't go into great detail, since I don't have it, but this should be enough to get you running. Anyone who does this mod PLEASE send in a step-by-step guide for less adventurous types.

Chip Select

This one is extremely simple. Currently, CS (chip select) for the TMS4500 on the main board is handled directly by the 80186's built-in memory chip select logic. Whenever the LCS (Lower Chip Select) signal is asserted, the RAM on the main board is selected. LCS is now active whenever a memory access occurs in the bottom 256K of memory (00000-3FFFF).

We want to select the 4500 any time a memory reference is in the bottom 512K (00000-7FFFF). This would be trivial if the chip select programming in the 80186 allowed for memory regions that large; unfortunately it doesn't, so we'll have to manufacture our own select line. The required signals for decoding chip select are S2 (memory reference) from the CPU and A19 (low if in bottom 512K). Just disconnect the current CS and hook up the output of a NAND gate combining these signals. Remember: CS is asserted low, S2 is asserted low, and A19 is asserted high, so you'll have to figure in the proper inversions of the signals.

Multiplexed Address Lines

This is easy, too. All you need is a 2 to 1 multiplexer (an LS157) with A19 and A18 on its inputs and RAS0 (from the TMS4500) as the select line (the one marked "A/not B"). Now hook the output of the MUX to A8 on the RAMs with a 33 ohm resistor. You should probably drive the select line from RAS0 with two inverters in series. The chip select for the MUX can simply be tied to ground (always active).

More tips: Use 74Fxx parts for all additions. Just solder the supply and ground pins of new chips to existing chips on the board, bend out the remaining pins, and use wire-wrap wire for all other connections to the chips. Brian Schieferstein and Richard Herr (who sent details of this mod for the expansion board) said they also replaced U10 and U12 with 74S373s and changed U13 to a 74ALS244 (presumably to clear up timing problems).

With the price of 256K RAMs under $3, one of you guys should be willing to try this. If you are successful, send details so we can let everyone else know about it.

That's It, Folks

No more room. No more time. Will the sadness never end? Next time, I'll show you some MS-DOS assembly language for sure. I also hope to have some information on the 80386 soon (and maybe some in-depth of the 186 and 286...).

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PAGE.CMD/A86: Displays text files 24 lines at a time.
MUCHTEXT.CMD/A86: Counts words and lines in a text file.
PRINT.CMD/A86: File printing routine. Puts a header at top of page.
ERQ.CMD/A86: Selective erase.

DISK 86-2 — DU and Modem Programs
DU-V75.CMD/A86: The popular disk utility translated from CP/M-80. Read, modify, and write disk sectors.
MODEM4.CMD/A86: A simple modem program set up for the Slicer.
MODEM7SL.CMD/A86: MODEM7 set up for the Slicer. Used with XMODEM for file transfers.

DISK 86-3 — Small C
C86.CMD: The original Small C compiler which appeared in Dr. Dobbs Journal in 1980. Generates assembly language to be assembled with DRI's ASM86.
C86.COM: An 8086 cross compiler. Runs under CP/M-80 but generates 8086 assembly langage for assembly with ASM86.CMD or ASM86.COM (cross assembler).
C86LIB.A86: Runtime library for Small C.
C*.C: Source code for compiler. Small C can compile itself!

DISK 86-4 — IBM Mainframe Interchange/ RESOURCE 8086
XBIOS.A86: A new BIOS that supports a real time clock.
RES86.CMD: A disk management program for transfering files between CP/M-86 and IBM 374X mainframe environments.
SDI86.CMD: An 8086 version of the RESOURCE disassembler.

DISK 86-5&6 — FIG Forth
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BDSPATCH.A86: Patch to Slicer monitor to allow use of 1.6 meg. 5 inch floppies. (SA475, et al).
UNERA31.CMD/A86: UNerase files. Works with CCP/M and CP/M.
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The Kaypro Column

By David Thompson

I wrote this review of the Kaypro 2000 on a Kaypro 2000. And to make this truly a "working review," I used the 2000 on a daily basis to write and edit Micro C. This is my favorite way to review a system, because it gives the system a chance to point out crannies I wouldn't have thought to look for. Plus, if there are bugs hiding in the crannies (or out in the open) I might even have time to find solutions.

Text Editor

The 2000 comes with all the Star stuff (WordStar, etc.), but WordStar doesn't work for me. I'm infinitely annoyed by a text editor that spends its time (and mine) accessing the disk. So I'm using good old Vedit and it's working beautifully.

Vedit keeps at least 35K in memory (which is larger than any of my text files — even my editorials). It reads the file off the disk when the editing begins, and it writes it out when the editing ends. In between, editing is faster than blue blazes. (Laine's new editor seems to work just as fast and is a lot cheaper; however it's limited to Z80 systems, so I can't try it here.)

Anyway, Vedit is a particularly good editor for working on this system because running the disk drive takes a big chunk of power. So it's nice to minimize disk accesses.

The Kaypro 2000 contains batteries that can run the system for four hours (from a full charge), assuming 10% (24 minute) disk access time. By using Vedit and mostly doing text editing, the batteries should last a bit longer.

Display

The display is low power, and reportedly it will display Flight Simulator (graphics and all). Those are the good things. The rest of my feelings about the display are listed under "Irritations" below.

Kaypro is looking diligently at new displays, including some of the fancy plasma devices. (Hooray, I hope they update the older units.)

Keyboard

I really like the keyboard on this system. It has a light touch but isn't chintzy like the recent 2s and 4s.

There is no separate numeric keypad, but you can hit a special num lock key and get a fairly good substitute using the J,K,L,U,I,O, 7,8,9,M keys for 1,2,3,4,5,6,7,8,9,0. I would imagine, however, that the strange relationship between the numbers will drive 10-key operators nuts.

Otherwise, I really like the layout of the keys. The control key is right next to the A key (hooray), and the return is right next to the apostrophe. The layout is much closer to the CP/M-80 Kaypros than IBM's kludge.

I was particularly excited about the removable keyboard. Gee, finally someone designed a system for us lap keyboarders. But because the whole system sits on my lap, I seldom have a reason to remove the keyboard. I still like the idea.

Irritations

Even though this system is practically identical to what I would have built for myself (given unlimited budget) it has some shortcomings.

Screen Angle

First, to get the best contrast, the screen must be tipped back farther than the hinges allow. (When tipped back extra far, the contrast is very good and the screen easily readable.) So I prop up the front (keyboard) edge of the cabinet. Unfortunately, it's sometimes impossible to do this, such as when I have the system in my lap (which is how I would work in a car or plane).

Data General included both a contrast control (like Kaypro) and a screen angle control on the unit I saw. The screen angle control adjusted the screen electrically. It worked quite well. Kaypro needs to add a screen angle control.

Traveling Bag

They included a very nice looking fabric carrying case. Unfortunately, they didn't take a hint from Sony, Panasonic, and all the other electronics manufacturers who designed their cases so you don't have to remove them to use the machine.

Look at portable cassette recorders. Their cases protect but don't get in the way of standard operation. The only time you have to remove the case is to change batteries.

Weight

The Kaypro 2000 weighs in at 11 pounds. That's less than half the weight of a Kaypro 2, but who'd dream of putting a 2 in a brief case. The 2000 is still quite heavy for true portable use.

Inside its case, it is small enough to haul around like a shoulder bag, but it would be uncomfortably heavy if you had to walk very far. A good share of the weight is cabinet, display, and batteries. But I wouldn't want to reduce the operating time to under four hours, so the batteries shouldn't be made lighter.

The cabinet is also fairly heavy. It's strong and very nice looking — it should not have much trouble passing the FCC tests — but it's heavy. For all its fanciness, there are definite gaps where water, dust, and other environmental baddies can get in.

Charger

The charger is a strange affair. It looks like an off-the-shelf DC supply plus a custom down-converter. The custom down-converter is a square box that doesn't match the quality or style of the rest of the system. It looks like an afterthought. When traveling, its corners could scratch other items, and it doesn't fit into the case. I'm unimpressed with this part of the 2000. (The latest 2000s are shipped with a single charger module, but I hear it's still big and heavy and square.)

The 2000's user guide recommends you keep the system charging all the time and that the batteries will discharge in two weeks even if not used. I assume from this information that the batteries are lead-acid gel cells. Not a bad choice for this kind of use.

I opened up the battery compartment, and it appears that the plastic-wrapped battery contains three cells, generating about 6.4V under load. That would correspond nicely with the output of lead-acid type cells.

(continued on page 39)

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(continued from page 37)

In fact, most of the system's weight is right here in this bundle. See Figure 1 for information on charger current (with fully charged batteries) and for the current supplied to the system by the battery.

I was surprised how much current the system draws. The keyboard alone takes 90 milliamperes. That's as much as I would expect a keyboard on a standard system to draw. (Kaypro is now shipping low-power keyboards and will update older units. See your dealer.)

The main system (including keyboard) draws about 400 mA (fully stuffed with RAM). The drive draws almost an amp more.

The charger is set so that it delivers a trickle current of about 50 mA when the battery is fully charged. I measured a 1.5 amp output when the battery was down and the system was running.

Getting Into The Battery Compartment

You can get into the battery compartment by removing the four #0 Phillips screws, two on either side of the handle. Then pull back the rubber cover and remove the exposed #1 Phillips screws (there are 12 of them). Remove the cover and handle to gain access to the area. You may have to open the system lid to remove the battery.

Also inside the battery compartment is a 9 amp, FSE type fuse. It is an unusual enough type that you might want to get a couple to have on hand. Chances are slight that you would need one, but if the system dies completely, and even the reset probe doesn't work, you might have a blown fuse. Connect up the charger and see if the charger light glows. If it doesn't, then the fuse is probably bad.

Data Transfers

The way you get data (or software) into and out of the 2000 is via the single serial port. They send Mite with the system, and Mite is OK except that a couple of bugs cost me a day and a half of frustration.

Mite Bug 1

Mite lets you set the system for either 7 or 8 bits per character. Mite comes set for 7; the standard for transferring data is 8 (8 bits/char, one stop bit, no parity).

After setting up the parameters and saving them in a file, I started transferring files. Always, the first one worked; any additional files failed. It turns out that after Mite sends a file it sets itself back to 7 bits per character. It doesn't change anything else, just the bits per character.

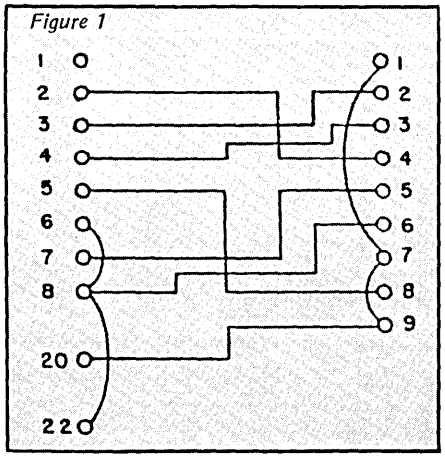
Mite Bug 2

If you're sending files to Mite in Modem7/B mode, any file that has a "/" in its name ("B/W.TXT") will cause Mite to dump you back into MS-DOS and announce that the disk is full (the disk had over 400K of free space). I had fun figuring out this one.

Serial Transfers

Kaypro will sell you a cable that directly connects the 2000 to one of their 16s. The cable is expensive but you can build your own. See Figure 1 for the diagram of Kaypro's cable.

Figure 1



Chances are if you hooked up pins 2, 3, and 7 on the 2000 connector to pins 4, 2, and 5 on the K16 connector it would work fine.

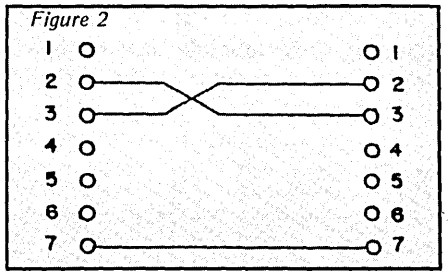
I hooked the 2000 and the 16 together and transferred data at 9600 baud. The 2000 had no trouble displaying data as moved across. The 16, however, couldn't keep up. It displayed the first few lines and then bits and pieces of the rest. The 2000 didn't miss a character. (If you think that I'm not impressed with the 16, you're right.)

Talking To A K2

The 2000 can talk to a Z80 Lunchbox (Kaypro) if you have Mite for the 2000 and Mite or any of the Modem7 programs (disk K28) running on the lunchbox. The cable is very simple; just 3 wires, a male RS-232 (db-25) connector, and a female RS-232 (db-25) connector.

Just connect pin 7 on the male to pin 7 on the female. Then connect pin 2 on the male to pin 3 on the female, and pin 3 on the male to pin 2 on the female. That's it. (See Figure 2.) Just 3 wires for 9600 baud (with four or five wires, who knows how fast you could go).

Figure 2



Setups In Mite

It's easy to direct-connect the 2000 to another computer, and their Mite isn't too expensive. But the setups for Mite may not be obvious. I set up Mite for 9600 baud (as fast as Mite will go), 8 bits, 1 stop bit, no parity. The protocol is Modem7/B which is batch mode for Modem 7, and be sure to tell Mite that this is a direct connection (it's a menu selection). Turn CRC checking on if your modem7 supports it; otherwise use the checksum.

Take a careful look at the option and parameter menus (for speed and connection settings). Then get into the binary file transfer menu and set the protocol. I use binary transfers for all my files.

Data transfers below 2400 baud are very noisy and slow because the drive turns off between accesses. When it restarts, the head homes and then

(continued next page)

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steps out to the track. So you get a loud brzzt brzzt every time it writes to the disk. At 9600 baud it is fast and quiet.

Quiet!

I especially like the 2000 because it's quiet. In fact, the only time you hear it at all is when the drive is running, and even that's quiet, as long as it's not constantly starting up and shutting down.

Tiny Disks

There's only one built-in drive, and I swore I'd never willingly go back to a single-drive system. After all, I'm the guy who needs 400K of tools before I sit down to jot off a note. Well, if I'm going to live with a single drive, a 720K drive is going to make the living a lot easier. The 3 1/2" drives look identical to a quad density 5" drive (as far as the computer is concerned), so there shouldn't be much problem hooking up a standard quad unit to the 2000.

The 3 1/2" disks should be good travelers. First, there's a nice, protected spot inside the system to store two disks. Second, the disks have their own rigid plastic cases (and they fit into a shirt pocket).

If these solid little disks will be dependable performers like my 8", then I won't have to worry about doing all those nasty backups. However, the 2000 and I spent a day traveling in a hot car, and some of the files I'd been able to read very consistently are now giving me read errors (though everything is cool again).

One thing I noticed in the car was that the 2000's black aluminum case gets very hot very quickly when exposed to the bright sun. Black is the best color for radiant heat absorption, and aluminum conducts heat very quickly. It's a great package if you want a hot computer.

Adding RAM

The 2000 comes stock with 256K of dynamic CMOS (low power) RAM. There is room inside the machine for three sets of 256K parts; each set is 8 parts (no parity). All you have to do to have 640K of usable RAM is stuff 16 more CMOS dynamic RAM chips into the empty sockets. Unlike the K16, there are no switches to change, no additional parts to add.

Kaypro says it will be providing information on how to use the unused extra 128K as a buffer.

Of course, you have to take the 2000 apart to add the RAM, and disassembly can be scary. I mean, the task seemed a lot more like taking apart a Leica than opening Darth Vader's lunchbox. (Kaypro is upgrading systems inexpensively, so you might want to take them up on it.)

Static Comments

This little system is full of static sensitive devices. We all know that standard ROMs, RAMs, processors, and PIOs are static sensitive, but a lot of us have gotten used to working

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with them and we've gotten pretty casual about it. Don't be casual inside the 2000!

NMOS is the stuff we've been working with. This isn't NMOS — this is CMOS, and there's a big difference. Some CMOS chips are very well protected (the HC and HCT parts that we all handle like LS). But others, like CMOS 8088s and CMOS RAM, are VERY sensitive.

The reason they're so sensitive is that their inputs are very high impedance (they look a lot like open circuits). These high impedance inputs are nice because they don't suck much power out of the chips that are driving them.

On the other hand, if a small static charge reached that line, there would be nothing to drain that charge away before it destroyed one or more inputs.

So, work in an area with no rugs (concrete or wood floors are best). Sit on a wooden chair (no pad), and use a wooden table (no Formica). Wear cotton clothing (no polyester or nylon — including your underwear). Use a wrist strap and connect yourself to metal on the 2000. You can use a long clip-lead, clipping one end to the 2000 cabinet, and the other end to your watch band so the metal from the clip lead is either contacting your skin directly or contacting metal which is touching your skin. If the air is dry, humidify it before starting (or wait for rain).

The CMOS RAM chips should not be handled any more than necessary. Always touch the tube they're in, or the conductive foam they're stuck into, before touching any chip. Never set a chip down unless you are putting it into its tube, onto conductive foam, or into its socket.

Don't move around a lot while handling CMOS chips. Rapid motion, rubbing two things together, scratching your head, sliding a chip on its back across a table top — all these things create static. (Don't even fraternize with someone who might give you static.)

Opening It Up

Now that you're totally freaked about static, but you've got the ideal spot (sitting on the lawn under a running sprinkler holding a cotton umbrella), your next task is to open this thing up.

In fact, it's your duty to open up this cute little system, just to appreciate how they put it together. I mean, this system was really designed, and the mechanical engineer was an artist. Anyway, here's how I did it:

1. Disconnect the system from the charger.

2. Open the top to the first clickstop. (I know, the thing turns on.)

3. Remove the keyboard and its cable.

(continued next page)

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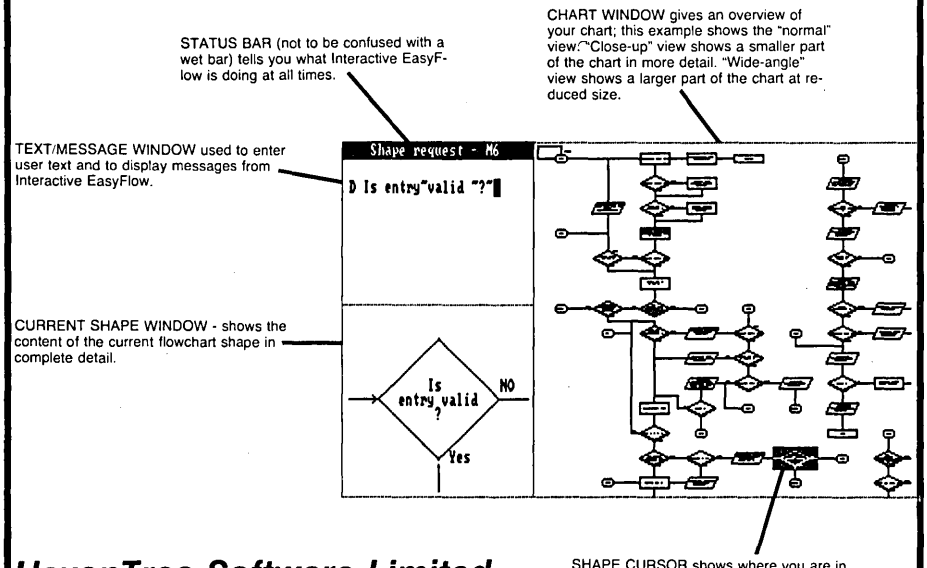
The sample screen display shown below is typical of what you see while editing a chart. Other screen displays are provided for entering titles, changing options, getting "help" and so on.



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(continued from page 41)

4. Raise the disk carrier to a vertical position.

5. You've just exposed a deeply inset Phillips screw (facing up, near the keyboard cable socket). Loosen the screw completely, but you don't need to remove it.

6. There is another tiny Phillips screw facing the front of the 2000 and located near the disk drive hinge. Remove this screw completely and store it in a small box (the box for your 3 1/2" disks works fine). In fact, you can mount a strip of masking tape sticky side up and then place the screws on this tape in the order they are removed. (An old camera repair trick.)

7. Now lift up the front edge of the plastic module that has the keyboard cable socket, the RS-232 jack, and the identification tag.

8. This plastic module has two fingers which insert into the metal below the screen hinges. I had to lift the module up until the front edge cleared the rear of the disk drive before I could finally lift the rear free.

9. Once this plastic cover is out of the way you'll see two connectors in the left rear corner of the system. Unplug both of them. One is to the RS-232 interface, the other is the power cable from the batteries. Note how they were connected. They can't go on backwards, but you might notice how they're done anyway. Now the system is off.

10. Unplug the drive by removing the white cable from its socket (the cable itself plugs straight down into the connector on the main board). Just pull straight up.

11. Now remove the other five tiny Phillips screws that you can see facing upward (in the area where the keyboard used to reside).

12. Once the screws have been removed, jocky this metal panel (and the drive) loose and lift them out of the way.

(Note, from here on, you can zap the 2000 into oblivion without knowing anything happened. Use super caution with what you touch, and do not proceed if you don't have a non-static area and a wrist strap!)

13. Remove the black plastic sheet which covers the bottom of the board.

14. Remove the insulated spacers (small rings) from the metal posts. Put them into your screw box.

15. Tip up the unit and you'll notice underneath near the back feet a rubber strip that goes about half way across. Start at one end and gently pull this strip loose. This rubber strip covers the 100-pin expansion connector.

16. Now back on top, unscrew the screw at the right rear of the circuit board. Lift up the board and take a look at the component side.

17. Unclip your wrist strap from the cabinet and clip it to either of the legs of one of the bypass capacitors which line the top RH side of the board (you're looking at the component side now. The board is standing up with the keyboard ribbon cable still con-

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nected at the bottom and the edge that was nearest the front pointing upward).

18. At the top right, you'll see the single row of RAM (150ns parts) in place (41C256 or equivalent). There are two rows of empty sockets just below the standard RAM.

19. Very carefully, very slowly, take your time (don't get nervous), plug in your new parts. The sockets are very tight, so if you aren't an experienced parts plugger, find one.

20. Make sure the pins are absolutely vertical and absolutely straight before trying to plug in a chip. Rock the part gently and watch very closely to make sure EVERY pin is started properly before pressing downward firmly. Rock each chip as you press down.

21. Once you have seated a chip, look closely at each pin. If everything didn't go perfectly, you're going to have to pry it up and carefully straighten pins. (It doesn't hurt to have a couple extra chips, but at $15-$20 each, that can be expensive.)

22. When you have finished installing the chips, you can test your work. Just lay the board back down, connect up the power cable (farthest left rear), and watch the screen. You should see the test progressing. At the end it will tell you how much good RAM it saw. If the test failed, then you need to recheck your work. If the test didn't happen at all (the screen stayed blank), try resetting your board with the white insulated stick that came taped inside the unit. There is a small reset hole near the right front underneath the cabinet.

23. If everything went fine, disconnect the power and install the screw in the rear right-hand corner. (I forgot this one my first time.) Then install the spacers, the black plastic cover, the disk drive cable, the metal cover and drive. Plug in the RS-232 connector, then the power connector. Make sure the keyboard interface (looks like a telephone jack) is reinstalled in its slot, and then mount the plastic disk holder/cover in place (remember that the plastic fingers must fit into slots in the back of the cabinet).

Now you've done it. If it didn't work, it won't be the first time. Kaypro has been getting quite a few systems that have been zapped by dealers. However, if you took your time and stayed away from rugs and such you should find it's just a matter of plug and go. And the going's great.

Finally

So far, this is the kind of system I've been waiting for. I wanted at least one disk drive, cassettes are worthless. I wanted to be able to run real compilers (like Turbo), to use my favorite editor (Vedit), and not play games with tiny amounts of memory. I also wanted battery operation for easy note-taking, and I wanted a 25 by 80 screen.

I had assumed I'd get all that in a CP/M machine. I didn't get it.

However, this system runs so much like a CP/M system (since I'm running MS-DOS versions of the same software) that it's very easy to forget I'm really running under an alien power.

There is no question in my mind that this is the best thing Kaypro has done since releasing the first Kaycomp. The 2000 is definitely going to spend a good deal of time in my lap. (I wonder if it knows how to type?)

Kaypro seems to be getting its act together in terms of product support. They called me about the upgrades to the 2000. They charge for some of the upgrades, but the charges are very reasonable.

Upgrades include: 1. Increase to 840K of RAM, 2. Low power keyboard, 3. A SideKick-type program, and 4. A new copy of MS-DOS (they didn't say what it fixed). The low-power keyboard and MS-DOS portions of the upgrade are free for the older (how could a 2-month old machine be older?) machines.

■ ■ ■

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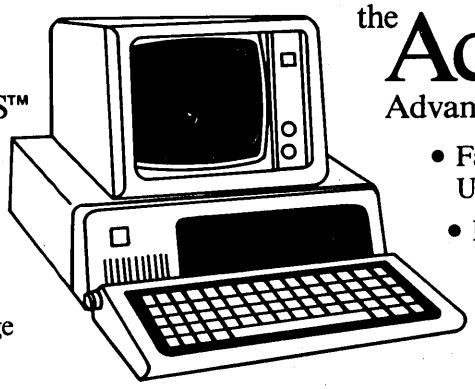

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Cleaning Up Your Screen — Video Adjustments

By Stan Sulkes and Don Carter

9555 Plainfield Rd.
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Have some of the screen settings on your Kaypro drifted a bit with age? Is your text sloping? Characters fuzzy? Too much space between the right-hand margin and the edge of the screen?

Take heart. You can have a normal screen (whatever that is) in less than an hour without spending $45 at the repair shop. Interested? Then get a good grip on a Phillips screwdriver and read on.

Setting Out

The screen adjustments are on the video board at the bottom of your Kaypro directly behind the CRT, so you'll need to remove the Kaypro's top cover.

In each adjustment (except for the horizontal width adjustment) you'll be tuning what are called trimpots. These are coin-sized disks — some as small as a dime, others as large as a nickel — standing upright on three legs. Trimpots have a knurled ring on them, which can be turned with your fingers or with an insulated rod or kitchen match.

When turning the knurled knob, make small, careful adjustments, checking for the effects of the change. Use a felt marker or a dab of white-out to indicate the starting position of the knob, in case you later decide to restart from the original settings. You might see a dab of paint already marking the settings. If the paint is across the part of the trim pot that moves, then it is being used to lock its position. You'll need to scrape away the paint before making adjustments.

Before we start, though, some general words of caution:

Words Of Warning

High voltages hang around the CRT. In particular, the suction cup attached to the side of the picture tube and the wire connecting this cup to the video board carry high voltage. You can also get a nasty nip from the strangely shaped transformer that generates the high voltage for the CRT. All these items are insulated, but stay away from them. Even after the unit has been off for a few minutes, these components will still hold some residual charge. Not usually dangerous, but not fun, either.

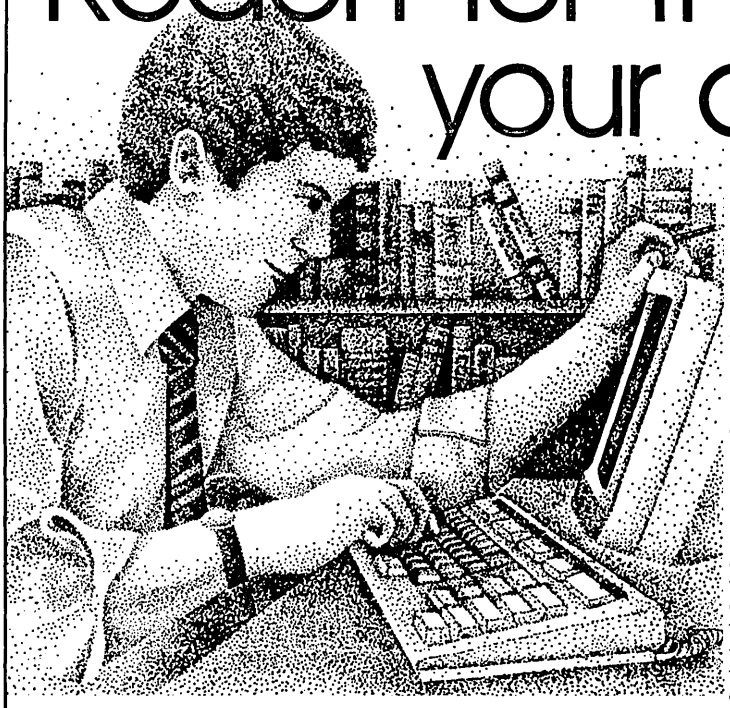
Also, we strongly recommend you purchase a plastic alignment tool (about $1) at a good electronics supply store or Radio Shack. It should have an allen wrench on one end and a screwdriver blade on the other. They are usually made of plastic. (Editor's note: a long matchstick works well to adjust slugs — see below — and a taped screwdriver works fine on the trimpots.)

Now For The Intrepid

So let's get to it. In most cases trimpot functions are marked on the video board (the small board tucked underneath the CRT). If the functions

(continued on page 46)

Reach for the height of your craft...



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CLEANING UP YOUR SCREEN

(continued from page 45)

aren't marked, you probably shouldn't twiddle.

It's safest to have the system off while adjusting things, but it's a lot slower because you can't immediately see what effect you are having on the screen. If you haven't done this before, turn it off while poking.

Sloping Screen

Sloping screen is usually caused by a misaligned yoke (a densely-wound coil of wire wrapped around the neck of the picture tube). To adjust, first locate the metal clamp ring which secures the yoke to the picture tube. Begin by loosening the clamp screw until the yoke is free to turn; then slightly rotate the yoke, and re-tighten the screw. Power up the machine to see if you corrected the problem. Be patient: it may take two or three tries to realign the yoke properly. Note that the ring must be re-tightened each time or you'll get misleading results, because tightening the screw generally changes the adjustment slightly.

Horizontal Width And Centering

When the horizontal width is not correct, characters will appear either skinny or fat. The following MBASIC program will help you determine both width and centering.

```
100 FOR I = 1 to 1920
110 PRINT $(31)
120 NEXT I
```

This program creates a series of white blocks covering the screen. If this image is centered both horizontally and vertically, and their widths look reasonable, the adjustments are correct. If not, see the instructions below.

First locate the horizontal width adjustment coil. It stands up on the video board like a small smokestack.

This coil controls the character width. Insert the insulated, plastic alignment tool into the cylinder. This hex-shaped tool will enable you to adjust the screen with the machine powered up, thus saving you time. Should you use a metal allen wrench — an alternative we don't recommend — unplug the computer first, or you may damage the horizontal control. Make trial and error adjustments until you're satisfied. Try a full turn each time.

Vertical

If the vertical size is off (squashed or elongated), locate the vertical adjustment trimpot. You'll find a knurled knob on it which you can rotate with your fingers or with the insulated alignment tool mentioned above. (Power can be on during this adjustment, but take care to keep your hands away from other components.)

If the picture isn't centered vertically, both the vertical linearity and vertical hold knobs may need to be adjusted. If you turn the hold knob too far, the picture will "roll," as it does on a TV screen. Make sure the squares are uniform and the pattern is centered.

Fuzz

Use a magnifying glass to check for sharpness (don't cut yourself). If the setting is correct, you'll see each character as a clearly defined string of dots. If not, you can adjust for maximum clarity with the focus adjustment trimpot. Note that the best focus for the center of the screen may make the corners unreadable. You may need to compromise a bit.

Contrast

The most common misadjustment problem is green background fog or raster lines (bright diagonal lines). These can be eliminated with the brightness trimpot.

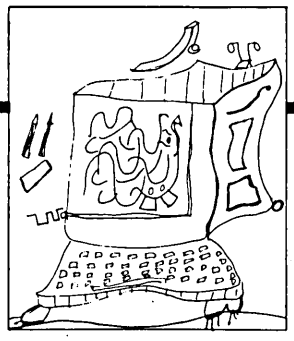
Warm up your computer for at least five minutes and then adjust the brightness until background fog and raster lines barely vanish but foreground characters maintain normal brightness (if you over adjust, the screen characters will grow dimmer). Check by turning the computer off for several minutes, then powering up.

Finally

If you have trouble locating or setting any of the adjustments, contact a dealer or your closest Kaypro computer club for assistance. In a pinch, you might even ask a friend who is handy with TVs.

Editor's note: you may find a linearity control on your monitor. The linearity and vertical height controls are part of the vertical oscillator and so they effect each other. Changing the height may cause letters on part of the screen to stretch while others squish. Using the linearity control to correct the stretch and squish will probably change the height. Before changing either of these pots, mark them. You may be very glad you did.

■ ■ ■



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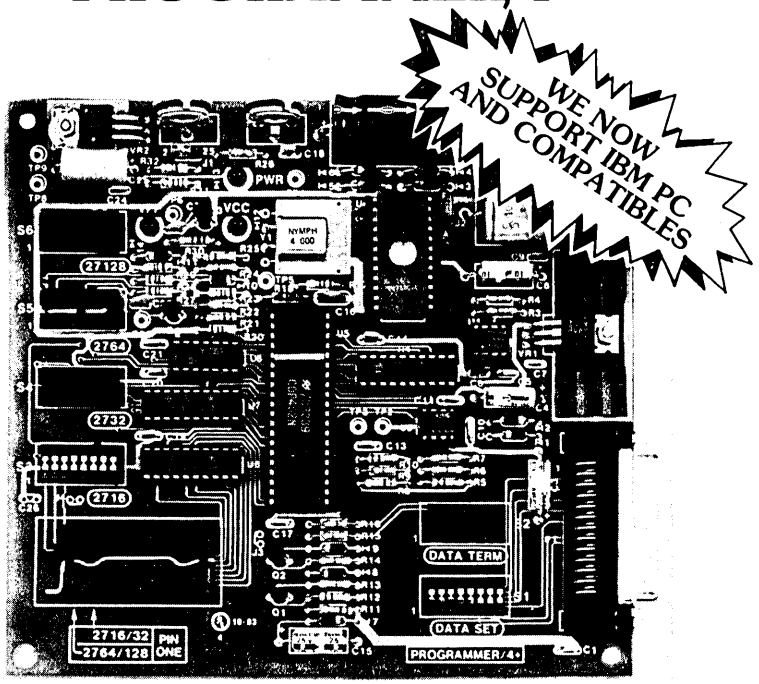

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dBASE To Bibliofile In Small C

By Michael Marsh

5432 Adobe Falls #4
San Diego CA 92120

I'm a graduate student in biology and write many formal papers requiring bibliographies. I use NewWord and dBASE II on my Kaypro 4-84 for writing and data base management, and I like them. But I hadn't succeeded in producing printed bibliographies in standard format.

Enter Bibliofile

Then a new program, the Martz Bibliofile, promised to solve my problem — to search text and write the bibliography automatically from the citations in the text.

Bibliofile works great, but it's picky about format. It expects:

1. Each field on a separate line
2. Each field prefixed with a certain character — ("/x")
3. Records separated by a blank line
4. Six fields per record.

See Figure 1.

Notice the /a before every record's author field, the /y for every year, etc.. But that's not how it was stored in dBASE.

I already had 238 citations keyed into my dBASE data base, and I didn't want to type them again. Instead, I wanted to convert them from dBASE data to Bibliofile data. That meant I needed to know how the two file formats differed.

Comparing The Formats

I told dBASE to output a text file

```
COPY TO BIBLIO.TXT DELIMITED
```

But I wasn't happy with the output because commas were delimiting fields, and there were commas inside the fields. A comma was obviously not the best delimiter. So I changed to a delimiter I knew wouldn't show up in the records — "".

Now the dBASE command was —

```
COPY TO BIBLIO.TXT DELIMITED WITH |
```

Listing 1 - Turning The Algorithm Into C Code

```
A<-B
A0>type db2bf.c

/* db2bf.c -- (dBASE to Bibliofile) a program to translate a text file made *
 * using dBASE II (tm) into a format the Martz Bibliofile (tm) can use.     *
 *                                                                          *
 * Copyright 1985 (C) by Michael Marsh - Released to the Public Domain for  *
 *                                       non-profit use only..              */


#include <stdioa.h>
#include <iolib.asm>
#include <call.asm>

#define EOL '\n'

char prefix[]  = { 'a' , 'y' , 't' , 's' , 'l' , 'k' } ;
char space     = ' ' ;
char slash     = '/' ;
char delimiter = '!' ; /***** CHANGE THIS FOR A DIFFERENT DELIMITER *****/
char comma     = ',' ;
int  counter   = 0   ;

main()
{
  int c ;

  while ( ( c = getchar() ) != EOF )
        {
          if ( c == delimiter )
             {
               if ( counter > 5 )
                  {
                    putchar(EOL) ;                    /* print a blank line  */
                    counter = 0 ;                     /*   zero the counter  */
                  }
               else if ( ( c = getchar () ) == comma ) /* next char is comma  */
                    ;                                  /*     discard it      */
               else
                    {
                      putchar(EOL) ;              /*    start on new line     */
                      putchar(slash) ;            /*                          */
                      putchar(prefix[counter]) ;  /*  add prefix to new line  */
                      putchar(space) ;            /*                          */
                      putchar(c) ;                /* write the first character*/
                      ++counter ;                 /*   bump counter by one    */
                    }
             }
          else putchar(c) ;       /* output character */
        }
  putchar(c) ;   /* write the EOF character to end of file */
}

/*
** lib.c -- function library
**
** Copyright 1982 J. E. Hendrix
*/
#define NOCCARGC /* don't pass arg count to functions */
                 /* called by these functions */

#include "abs.c"
#include "dtoi.c"
#include "itod.c"
#include "itou.c"
#include "itox.c"
#include "left.c"
#include "out.c"
#include "printf.c"
#include "sign.c"
#include "strcmp.c"
#include "utoi.c"
#include "xtoi.c"
```

End of Listing

Figure 1 - Bibliofile Text File Format

```
/a Author
/y Year
/t Title
/s Source (journal or book)
/l Location (volume, number & pages)
/k Keywords (searches by keywords)
```

Figure 2 - Original File Created by dBASE II

```
|Zedler, J.D., P. Jorgenson, W. Magdych, G. Kramer.|,|1984|,|Salt
marsh monitoring and historical analysis of Tijuana Estuary:  a
proposal to the National Atmospheric and Oceanographic Administration
Office of Coastal Resource Management Sanctuary Programs Division.|,|
Unpub. Manuscr.|,|6 pp.|,|proposal; thesis; salt marsh; Salicornia;
Tijuana Estuary; aerial photos; streamflow analysis; vegetation
monitoring;|
|Duff, C.B., and N.D. Iverson.|,|1984|,|Forth meets Smalltalk.|,
|Journ. of Forth Appl. and Res.|,|2(3):7-26|,|Forth; Smalltalk; Neon;
programming; computers; programming languages; systems programming;|
|Kempthorne, O.|,|1978|,|Logical, epistemological and statistical
aspects of nature-nurture data interpretation.|,|Biometrics|,
|34:1-23|,|statistics; data analysis; data interpretation; IQ tests;
analysis of variance; correlation; independence; nature-nurture;|
```

Figure 3 - Algorithm In C

```
While (it isn't the End Of The file)
  if the current character is the delimiter ('|')
    and if it's the next record
      write an End Of The Line
    else if the next character is a nasty comma
      discard the nasty comma
    else
      start a new line
      write the proper prefix
      put the next character on new line
    else no it's not the '|' character
      then write the character
if it IS the end of the file
   write EOF character and stop
```

Figure 4 - Resulting File After Feeding the File in Figure 2 through DB2BF

```
/a Zedler, J.D., P. Jorgenson, W. Magdych, G. Kramer.
/y 1984
/t Salt marsh monitoring and historical analysis of
Tijuana Estuary:  a proposal to the National Atmospheric and
Oceanographic Administration Office of Coastal Resource
Management Sanctuary Programs Division.
/s Unpub. Manuscr.
/l 6 pp.
/k proposal; thesis; salt marsh; Salicornia; Tijuana Estuary;
aerial photos; streamflow analysis; vegetation monitoring;

/a Duff, C.B., and N.D. Iverson.
/y 1984
/t Forth meets Smalltalk.
/s Journ. of Forth Appl. and Res.
/l 2(3):7-26
/k Forth; Smalltalk; Neon; programming; computers; programming
languages; systems programming;

/a Kempthorne, O.
/y 1978
/t Logical, epistemological and statistical aspects of
nature-nurture data interpretation.
/s biometrics
/l 34:1-23
/k statistics; data analysis; data interpretation; IQ tests;
analysis of variance; correlation; independence;
nature-nurture;
```

But it still wasn't right — my dBASE file had 8 fields per record.

One of my 2 extra fields was extraneous (bookkeeping stuff), so I deleted it. But I needed the other one, a field for page numbers.

Bibliofile combines volume, number, and pages in one, but I had used a separate field for page numbers. So I changed my data base to conform with Bibliofile, then typed

```
COPY TO BIBLIO.TXT FIELDS AUTHOR,
YEAR, TITLE, SOURCE, LOCATION,
KEYWORDS DELIMITED WITH |
```

(See Figure 2.) Notice that each field is contained within vertical bars, but is also set off by commas. It's still not right for Bibliofile.

```
Kramer.|,|1984
```

C Solution

I wrote the algorithm in Figure 3 to get rid of those nasty commas. Listing 1 shows the solution in Small C. I call it DB2BF. Figure 4 is the successful output in Bibliofile format.

Using DB2BF

DB2BF uses I/O redirection (see Hendrix's "Small C Handbook," pages 87-88) to read from and write to disk files. The phrase

```
DB2BF <BIBLIO.TXT >BIBLIO.BIB
```

expects a file called BIBLIO.TXT as input and writes the converted file to a file called BIBLIO.BIB, which should be a text file output by dBASE's COPY TO...DELIMITED WITH command. The phrase

```
DB2BF <BIBLIO.TXT
```

reads the file BIBLIO.TXT and sends the converted output to the screen (since CONSOLE is the default for stdout).

■ ■ ■

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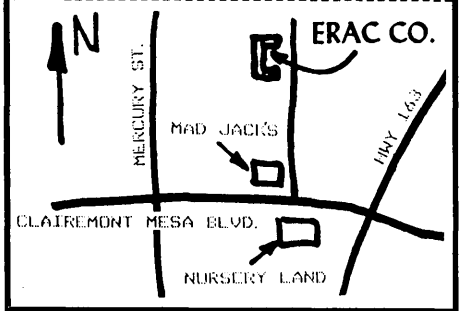

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Two Megabytes And More On The DSI-32

By Gary Entsminger

Micro C Staff

If you bought Definicon's 32032 co-processor board/kit and want to add more memory, there's a cheap alternative. It'll only cost you some memory (about $100 for a megabyte), $49.95 for system software from Definicon, and a little soldering time.

What's The Story?

The 2 megabyte version of the DSI-32 (with 10MHz CPU) sells for $2995 assembled and tested. Definicon doesn't sell a 2 megabyte kit, but you can purchase a 256K "slower" (6MHz) starter kit for $995.

Trevor Marshall (a hardware designer at Definicon) says they don't sell untested 2 megabyte boards because of the problems they've encountered (using "special" sockets) in production. To get the arrays to work they have to trim the legs on the ICs, then insert the lower array, test it, and then insert the upper array. The arrays have to be tested separately because the lower one doesn't always make good contact.

But you don't need to use the "special" sockets, and we won't for our mod. We'll use standard dual in-line 256K packages like the RAM that comes on the 1 megabyte board. The 256K board uses 64K packages.

Definicon will likely use single in-line memory packages requiring "special sockets" similar to those used in PC Tech's Project X 80186-based PC compatible for future memory expansions. This RAM has staggered teeth and is very expensive, but will allow you to add a lot of memory (maybe 8 megabytes) to the DSI-32.

But for now, let's stick to standard dual in-line and 2 megabytes.

From 256K To 1 Megabyte

If you started with 256K, you'll have to upgrade first to 1 megabyte. Just reconfigure the JB1 jumper for 1 megabyte (see Figure 1) and replace those 64K RAMs with 256K RAMs. You can buy 256K (150ns) dynamic RAM for a little over $3 each, a bargain, from Microprocessors Unlimited.

That's it. You should now have access to a megabyte.

From 1 To 2 Megabytes

To go from 1 to 2 megabytes, you'll need to work a little harder. First, buy another megabyte of RAM, and then solder your new 1 megabyte array of chips to the lower array. See Figure 2.

All the pins are common except for pin 4 — the RAS line. Bend out pin 4 and jumper (run a wire) from pin 4 down to the hole in the circuit board (next to pin 4) for the RAS for the upper array of RAM. That's all; without any other changes, your board will contain 2 megabytes.

From 6 To 8MHz

If you have the DSI-32 starter kit (256K RAM and slower, 6MHz clock), you'll be pleased to learn the 32032 CPU on board will probably run comfortably at 8MHz. The problem with speeding up your 6MHz board lies in the FPU (Floating Point Unit), not the CPU. If the FPU will run faster (many will), then you're off to the races. Just change the 12MHz system crystal to 16 MHz and you have 8 MHz.

It's a cheap 2MHz upgrade, and most of the current 32032s rated at 6MHz will run faster (as high as 9MHz) according to the Definicon group. George Scolaro, who wrote the DSI-32 assembler and linker, says he's run the 10 MHz 32032 at 11MHz, but he doesn't depend on it.

Wrap Up

If all goes well, and you haven't soldered your fingernails together, you've got an 8 (or, of course, 10) MHz 32-bit CPU and 2 megabytes of memory — if you started out with 6 MHz, you've got 2MHz and 1.75 megabytes more power than you had when you started, and it only cost you about $150, a lot less than list.

■ ■ ■

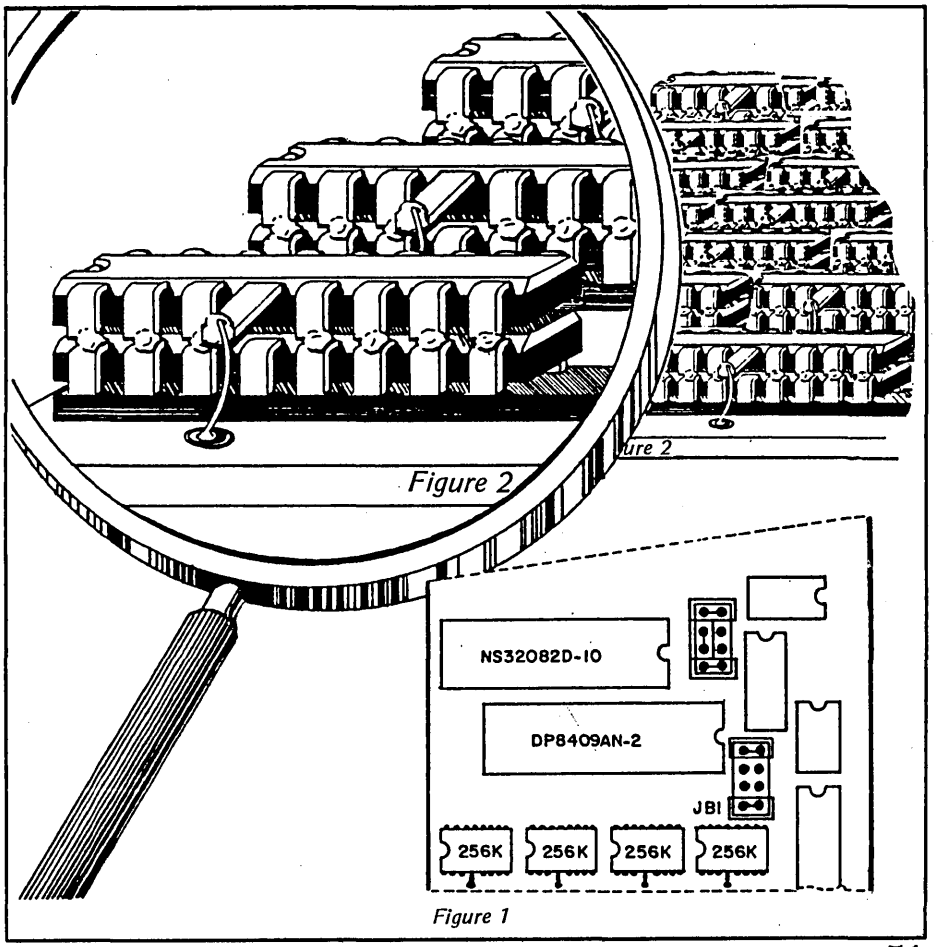


Figure 2

Figure 1

SOG IV

By David Thompson

It's easy to write about the SOG, but it's hard to do it justice. A lot of folks told me they were attending because of my glowing reports of SOG III (and my anticipatory journalism — see #25). They had assumed I was exaggerating, but were still willing to give it a try.

I can't tell you about everything that happened at SOG IV. Neither can anyone else. There were just too many sessions going on, too many people getting together, too much information being passed around for any single person to get it all (though a number of us tried). It was a classic case of multi-use, multi-process, and multi-insomnia.

Late Night Forums

The dorm acted as a focal point for the after-hours discussions, and unlike previous years where talk ended when the SOG site closed for the day, this year's discourses simply moved up to the dorm's fireside room.

Saturday night's informal forum was going strong at 5:20 a.m. — the next day. And Sunday's official (OK, semi-official) sessions began again at 8:00 a.m., so some hardy souls were caught sleepless.

A lot of folks had compiler-error bags under their eyes for the duration, and the young couple who played house parents (at the dorm) were impressed with SOGger staying power.

The speakers thought their audiences were uniquely talented, excited, knowledgeable, and exhausted. The audiences thought the speakers were uniquely talented, excited, knowledgeable, and exhausted.

George Morrow

George Morrow (of Morrow Computers) came away from his talk convinced he'd gained more than he'd given — and he gave a lot. (See the excerpts from his talk in this issue.) He definitely wanted to come back next year and spend more time.

He arrived at the Redmond airport (20 miles from here) at 12:30 p.m.; he began speaking just after 1 p.m.; I cut off his talk at 2:50 p.m.; Sandy got him back into the car at 3:05 p.m.; his flight departed the Redmond terminal at 3:30 p.m. — and he was on it.

Feelings

There was a subliminal feeling among some of the attendees — a feeling that perhaps this was a unique event, something that couldn't be repeated.

I don't know. I felt the same way after SOGs I, II, and III. Each of the SOGs has been more intense — more attendees and more speakers. It's like radioactive material: you get enough computer freaks together in one place, and unpredictable things happen. I don't know how close we are to critical mass, but each year is different. And I think better.

Announcements

This SOG was unique because there were many more announcements of new products than ever before. Last year's excitement was the Slicer. The Slicer was back again this year, but it was overshadowed by some newer systems: two 80186 systems, one 32032, one 68000, and a 64180.

X-16

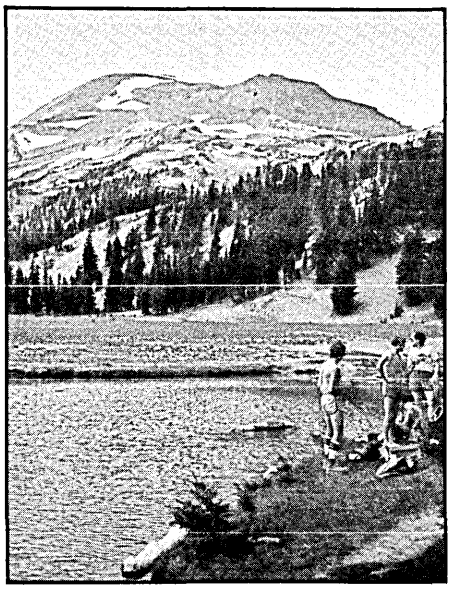
This is the latest and most IBM compatible product from Dean Klein and Earl Heinrich. Dean and Earl used to work for Slicer, but they have since split off on their own. Their board, the X-16, has a completely compatible IBM graphics section (it ran flight simulator). The graphics section has its own clock, so it can simulate (i.e. run just as slow as) an IBM. On its own, the 80186 zips along at 8 or 10MHz. The X-16 also has IBM compatible board slots.

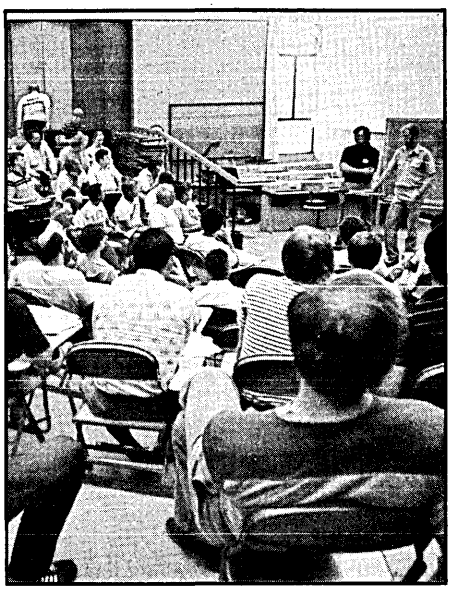
You can't use all the features of the 186 if you're going to be completely PC compatible, so the X-16 won't be quite as fast as the Slicer. But it is faster than a PC.

80186 Based Little Board

The Ampro 80186-based little board shares two things with its Z80 cousin — it's the size of a 5" drive and has no video section on board. You run it from a separate terminal so it doesn't

George Morrow





pretend to be compatible with software that uses the PC graphics.

Both their Little Board/186 and their Z80 Little Board/Plus have SCSIs (small computer system interfaces) on board. Ampro is promoting the SCSI as the general purpose way to connect their boards to winchesters, PIOs, remote floppy controllers, up to 64 devices that need to talk to a Little Board.

DSI-32

This screamer is absolutely incredible (see issue #25). All I can say is the only way you're going to have a faster system is to put a proximity detector on your return key. That way you'll get the answer before your finger hits ENTER. (Run time of -.05 seconds.)

The DSI system makes a lot of sense because it runs under MS-DOS. Thus you can run all the cheap and widely available PC software on the PC's 8088 or 8086 (or 80186 on the X-16). If you're programming, you enter your source in WordStar or whatever you use, and then compile it on the DSI for faster results (like 20 times).

With the Greenhill Pascal, C, and FORTRAN compilers, plus FORTH, BASIC, and Small C from the public domain, the DSI board looks like a winner. What a neat package for people doing statistical analysis or other power hungry jobs. (Trevor won an award at the SOG for "Turning an IBM into a computer.")

68008

Dave Bridger showed his Helix UniQuad computer, the first 68000 system to be demonstrated at a SOG. It's a 68008 based Little Board-style, multi-user, single-board system that fits alongside a 5 1/4" drive.

The UniQuad comes with the OS-9/68000 operating system (small but UNIX-like, it got its start with the 6809), word processor, spreadsheet, and BASIC P-code compiler.

To make a complete system, you attach one or more drives (hard or floppy), a power supply, and from one to four serial terminals. The board comes with 128K of memory, and is limited to 512K. The 68008 runs at 8MHz. Price is $995.

64180

We got our first look at a D64180-based board — this one, the MSC-LAT1 from Southern Pacific Computer Products.

The Hitachi CPU, the 64180, is Z80 upward compatible, runs at 6MHz, and uses an MMU (memory management unit) to handle up to 512K.

The single-user version runs CP/M Plus (banked), and the multi-user version runs MP/M II or Turbo DOS.

SOG attendees were really excited about this zingy board (eager to save CP/M), but cost ($649) and the operating system (CP/M Plus isn't fully compatible with CP/M 2.2) might hurt its chances.

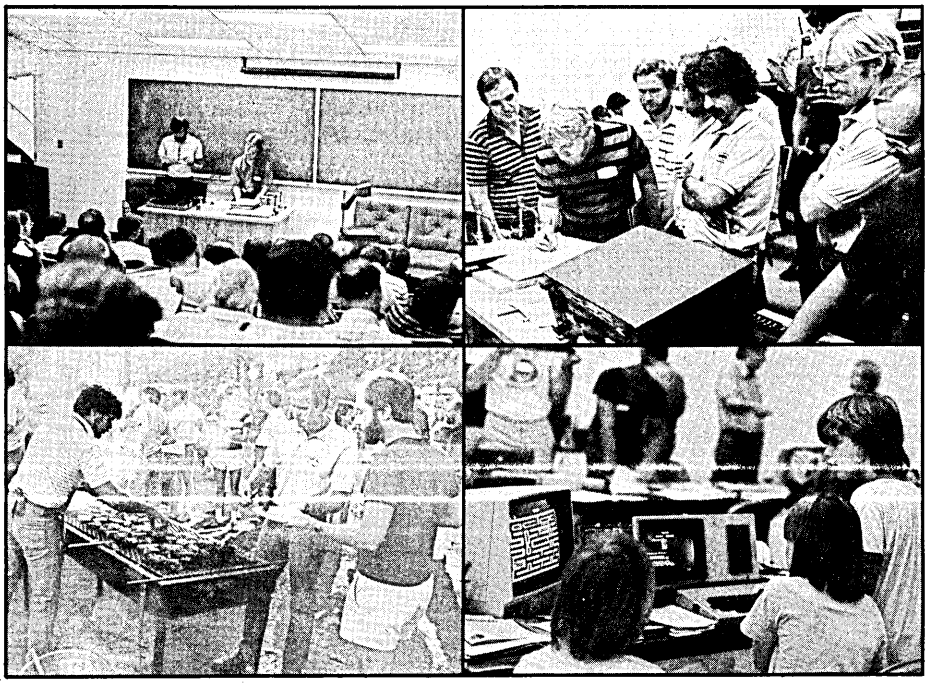
Express

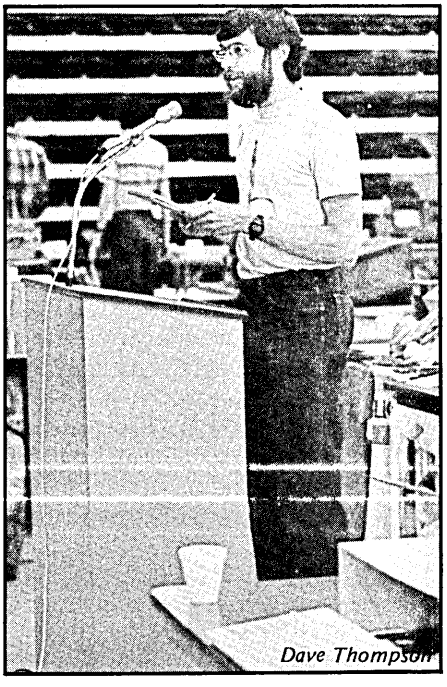
Laine showed off the text editor he's been working on for the last two years. He has two versions, version 1 and version 2 (isn't this exciting so far?).

Version 1 is one of the best examples of freeware I've seen, and it's the only one I know of available for CP/M 80. Version 1 is free. Public domain. Yet it is very fast and very powerful (beats WordStar and Perfect hands down). No text formatting built in, but it comes with ROFF, a public domain formatter. There are no games in this freeware. It's a viable commercial product, but it has no pitches for money.

Chances are, though, once you get familiar with version 1 you're going to want version 2 (Laine had quite a line-up of takers for version 2 at the SOG). Version 2 is a copyrighted program. You pays your money and you gets the deluxe version.

(continued on page 54)





Dave Thompson

SOG (continued from page 53)

Version 2 Upgrades:

1. You can edit files which are too big to fit into memory.
2. You can move blocks of text larger than 1K.
3. You can look at the disk directory, delete files, rename files, and more from within the editor.

Both versions let you configure their commands so you don't have to go through a major retraining to use Express. Version 2 is $35.

For information on the products mentioned above, contact the following people:

X-16
PC Tech
904 N. 6th St.
Lake City MN 55041
(612) 345-4555

80186-based Little Board
Ampro
P.O. Box 390427
Mountain View CA 94039

DSI-32
Definicon Systems, Inc.
21042 Vintage St.
Chatsworth CA 91311
(818) 341-5654

Helix UniQuad
Hazelwood Computing
907 E. Terra
O'Fallon MO 63366
(314) 281-1055

MSC-LAT1
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■■■

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MS-7 ..... Fig-Forth Source

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MS-11 ....RBBS 12.3: Multi-user system
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MS-12 .. RBBS 12.3 Source

MS-13 Editor & Formatter
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MS-14 ..... Forth 83

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The Future Of Computing

Excerpts From A Talk By George Morrow At SOG IV

I've been in the computer business for something like 10 years now, and I've seen the good years, and I'm beginning to experience some of the lean years. So I've given a lot of thought to what the future holds for computers, and I've tried to apply some lessons from the past to the future. I want to share a little of that thinking with you today, and perhaps a little bit of what the future holds.

There have been three computer waves — mainframes, minis, and micros. To think there's not going to be another is to think the sun isn't going to rise.

There will be another wave of new computers, and those computers have to be as different from micros as micros were from minis. None of us, including yours truly, can see the shape of that. Because we're all part of the present wave, just as Data General and DEC had no idea what was happening in micros, there's no reason to think we will be any smarter about what will happen next.

Fuel From The Past

I think I have a candidate for the technology that will shape the next wave, and let's get at it by examining the technology that fueled other waves.

Mainframes were fueled by the transistor. Big computers existed before transistors, but the big rollout of mainframes occurred with the invention of the transistor. The transistor was invented and improved during the period the big computers were being built.

Somewhere in the '60s when the mainframes were on a big roll, the fuel for the next wave, the minis, began to get into place — the integrated circuit. Small and medium scale integrated circuits were the technology of the mini computers.

I can remember seeing the cover of Electronics Magazine with a picture of the Data General circuit board, and the big surprise was that they'd managed to put a complete CPU on one 15"x15" circuit board. They did it using SSI circuits. Things called 7489 and 74181 were invented to make it possible to put a CPU on a 15"x15" circuit board.

That machine processed information in groups of 4 bits — a big step forward from single bit computers. (Editor's note: let's not forget all the two-bit computers, some of which are still being built.)

In 1972, '73, '74, mini computers were on a big roll, and what was being invented in the laboratories of Silicon Valley was the micro processor, the fuel for our wave. So each new wave of technology comes in the midst of its predecessor.

CMOS

Each technology has its window. The window opens, and if the technology gets through it, great. If the technology doesn't get through, the window usually closes. CMOS is a notable exception.

Its window opened up around 1970. But the companies making CMOS refused to come down on the price. RCA and Motorola told us we were always going to pay 25% to 35% more for CMOS. But TI came along and cut them off at the knees.

If you look back to around 1970, the 4000 series of CMOS logic had a completely different pinout than TTL. There was a considerable premium for that logic, and at the time, low power logic did not exist.

There was standard TTL, low power TTL (74L), and high speed TTL (74H). And there was this completely unmanageable stuff — Shotkey.

TTL was too power hungry, and the low power stuff was far too slow. And they didn't compete effectively with CMOS.

What TI did in '72, '73 was come out with low power Shotkey which matched the speed of TTL. Low power Shotkey cut power requirements by 4 or 5 times, and they got right down to the same price. And then they got cheaper.

This completely annihilated the CMOS. Although CMOS was more cost effective from a power point of view at 100KHz, at 5MHz low power Shotkeys were even with CMOS. CMOS had missed its window. It had a second chance, though, thanks to the Japanese.

What Business Are We In?

When the computer industry was beginning to blossom, we began to get religion. We began thinking about management and wanting to become more than a mom and pop company. It was a mistake.

My wife ordered a subscription to the Harvard Business Review. With the subscription they sent a set of reprints of famous articles of the past. One of the articles, "Market Myopia," was about businessmen not recognizing what business they're in.

If the railroad people, for example, had realized they were in the transportation business, they would have offset the slump in railroads by investing in airplanes. Instead of United Airlines, it would be Southern Pacific Airlines.

If the telegraph company had known it was in the communications business instead of the telegraph business, they could have bought all the telephone patents in 1880 for $40,000. Now you have to add a digit to that to get an idea of how much it's worth today. Why didn't they buy it? Because they thought they were in the telegraph business, not the communications business.

I believe we're supposed to learn something from our own mistakes, and if we can, learn something from other people's mistakes, too, which is what we're going to get into in a minute. So I asked myself, "OK, smart guy, what business are you in?"

I didn't know. I have asked hundreds of people, and they've given me all kinds of answers. IBM thinks it knows what business it's in — information processing — and it's very successful.

So I said, will I be as smart as IBM? Or will I hear a description of what business I'm in without recognizing it? I claim that's possible, and I claim that's why the telegraph people didn't realize they were in the communications business. And I'll tell you why I don't know what business I'm in, and why the telegraph people

couldn't possibly have known to invest in telephones. Because the telegraph was the first instance of the communications industry.

Does this apply to trains? The distinguishing feature about trains was that they used steam engines, and as it happens, the steam engine was implemented in ships almost the same time it was implemented in railroads. So the railroads, and simultaneously ships, may have been the first real instance of the mechanized transportation industry. So how would they know to invest in airplanes if it was the first instance? Maybe the computer is the first instance of some kind of business we're in.

Mistaken Identity

You hear often that those who don't remember history are condemned to repeat the mistakes of history. It's a misquote. A closer rendition is: progress, far from consisting of change, depends on retentiveness, and those who do not remember the past are condemned to fulfill it. Most problems, most difficulties, can be recast from the past.

The computer business is in the pits right now. Is it going to recover quickly? It's common to hear people say now, "Gee whiz, all we have to do is get another spreadsheet, make computers user friendly, and everything will take off again."

I used to say that myself. Now everyone's saying it. When the herd starts to move in one direction, I always try to stop and ask myself if I'm heading for a cliff.

Now that I'm hearing people say that computers should be user friendly, I'm suspicious of that idea. Is it just that we need a new piece of software, something like a spreadsheet to reignite sales? That was something I thought for several years.

So I asked myself — what is "user friendly?"

To be really user friendly, a machine ought to be able to understand what I meant and not what I said.

Suppose we made a machine that was intelligent. If I were a machine and I were intelligent and I were competing for scarce resources, and I looked around at human beings, I think I'd decide they were redundant. And if I ever needed to find out the way they did anything I could just get a movie out and run it, and that's the way I'd find out. Why put up with humans? I don't want something like that.

Machines (computers) are very user unfriendly. The UNIX operating system has been described as user hostile. dBASE II is certainly user hostile. If I'd had something that could have temporarily maimed the author's leg for a week or two when I first started on dBASE II, I would have used it.

Hardware Solutions

To get a proper perspective of the computer business, imagine a fence. It's tall. On one side are hardware makers, and on the other side is a wild area with animals you don't want to get near.

Now we make hardware, and we throw it over the big fence, and we look to see where the animals gather. We aren't interested and don't have the slightest idea how they're to use our hardware. We're throwing them solutions. We have 17 solutions here, and we hope to God there are people around who can take these solutions and put them with problems. (Remember, our business is not solving problems, it's selling solutions. And we don't know what solution we're selling.)

Reading, Writing, And Printing

So I asked myself: Is there something as user unfriendly and basically unfamiliar to human experience as the computer?

How about reading and writing?

There was a time when the printed word was relegated to a very small minority, to the priesthood almost. What was it good for? Well, we had the Bible to explain the words of God — where we were going, where we were coming from, and why things were difficult where we are now. And we had encyclopedias and a few stories like Dante's Inferno and things like that. Nobody needed the printed word. The town crier came and told you if there was a fire. If you needed a job, you apprenticed yourself at age 12 or even before that for 6 or 7 years. Nobody needed to use the printed word except for a very small priesthood.

Except for cuneiform, every language, every written language, has gone through two metamorphoses. First was visual. The first languages were pictures — Chinese, Egyptian.

Cuneiform, I'm told, was phonetically based from the very beginning. The languages that kept the visual image died. Chinese, by the way, changed from being strictly visual to being a mixture of visual and phonetic. But now our languages are phonetically based. So we approach this business of writing down our languages in two vastly different ways — one having to do with the eye, and the other having to do with the ear.

Now the ear is more natural, but the marks are more abstract. We didn't realize at first that it was actually better to model our recording of information based on our sounds of the mouth rather than our eyes.

Could it be that the way we communicate with computers now — by if,then/and,else logic — isn't the right way? Maybe there's a methodology for conveying to these machines what we want them to do that is as different from current logic as pictori-

(continued on page 59)

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*Time in seconds

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Time comparison of 3 common Logo programs currently offered:

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Circle test	10 seconds	3 seconds	22 seconds
PolySpiral1	17	4	11
PolySpiral2	out of stack	7	out of stack
Square Test	27	10	41
Four Bugs (req. 4 turtles)	78	6	N/A

Times provided by The Lisp Company... (note: out of stack indicates inadequate implementation of "tail recursion") DR LOGO is copyright Digital Research Company, Apple Logo is copyright Apple Computer Company, and TLC Logo is copyright the Lisp Company.

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(continued from page 57)

al language is from phonetic language.

Printing And Computing

The computer is like the printing press. If you believe IBM, IBM is in the information processing business, so computers are primarily used as a medium for storing, manipulating, transmitting, doing things with information. If that's true, you can make the analogy of the computer and the printing press. Paper is like memory. Paper is almost a free good. But at one time it was very expensive.

Also keep in mind that, as far as I know, there isn't a single technology that has made it that didn't have an almost overwhelming entertainment component attached to it.

The reason today that you think of Victor rather than Edison when you hear the word "phonograph" was because of Edison's attitude toward the phonograph. Edison hated the commercial/entertainment aspect of his invention. He once said, "Jazz music is the same backward or forward."

Think of the computer as a new kind of printing press. If it doesn't find an entertainment component, it can't survive. I have the same sickness Edison had, because I don't like to use the computer for games. The only difference between Edison and me is that I realize it. I don't think Edison ever realized how badly it hurt him — his business, at least with the phonograph — in not being able to recognize the need for an entertainment component along with the technology.

Why did the printing press get invented, and what might have happened to it? The reason we had a printing press, I think, was because of the population growth. During the Dark Ages and prior to that, when the population of the world was relatively stable, you had a cadre of monks who copied Bibles, encyclopedias, and that was it. The Renaissance comes along, there's a big growth of the population, but Bible copying is a 7 year or 10 year process. You put a monk in one end and 10 years or so later a Bible comes out the other end.

Learning To Read

Imagine what it was like learning how to read and write in those days. There were no rules of grammar. Everyone spelled the way they wanted to, and God help you if you came along and told somebody how to spell. Imagine walking up to Chaucer in the 1300s and saying, "Look, jerko, these double f's aren't going to make it! They really should be s's." He would've told you to get lost, because he learned how to spell from the fellow who taught him, and after he became a master he decided how words should be spelled. There were so few people who could read. How did they teach? It was a one-on-one thing.

So there was a big pipe between getting monks in and getting books out. Because if the population grew you had to have more Bibles, or you had people straying from the proper way. And they would stray from the proper way whether they were Moslems or Christians, it doesn't matter — all human beings like to stray. And then be brought back. Gently.

So the printing press was a way to get more production out of copying. I'm told that if you were an author and wanted something printed, they created a typescript especially for you — they looked at your writing and created a typescript. What were they doing? They were copying writing.

Now think of the early days of the printing press. Here you've just invented this widgit, and instead of having a cadre of copiers, you've got a printing press that makes doing these things a lot faster. Now we do spreadsheets fast; then you created words fast.

So we invent the printing press and turn it on. There must have been a 10,000-fold increase in productivity, right? How long did it take to fill the need for Bibles and encyclopedias. And what happened to all these poor devils who put in printing presses after the pipe was full?

Vertical Markets

I'm a guy trying to figure out how to sell computers, so what do I think about vertical markets. Let's go back and see how that works.

I've got a printing press now, and I've sold all the Bibles and encyclopedias the world needs for the next 10 years, and this thing's sitting here idle. I've invested all this capital; I have this plant. It's always easier to gain weight than to lose weight, and now I've got all this fat. How am I going to get rid of it?

Well, I've got to use it some way. Maybe I'll go into vertical markets. Well, what could I do? Maybe I could gather information about metal and sell it to blacksmiths so they could make other goods as well as horseshoes.

So I print the book. I take it to the blacksmith. I say, "This is the greatest thing since canned rice. Look what you'll be able to do with it."

He opens the book and says, "What is this? This is definitely not user friendly."

"Well," I say, "you'll have to hire a reader to come and read for you."

"How much will he cost me?"

"Probably three apprentices."

"Oh, really. Well, does he tell me anything?"

"No, he just reads."

"Does he know anything about the metal business?"

"No, all he does is read. But he'll read anything you want. He may mispronounce words because they are not always spelled the same. But nevermind, you'll get over that."

And I'm gone, off into another vertical market.

A New Priesthood

Just as everybody reads and writes today, I want everybody to program. Am I going to try to make a Shakespeare out of everybody? No, I just want everyone to be able to read and do a little writing.

Now how do you translate that to computers? If you can read, then you can use the computer. And if you can write, maybe you can do a database for the dBASE II or III or whatever.

(continued on page 61)

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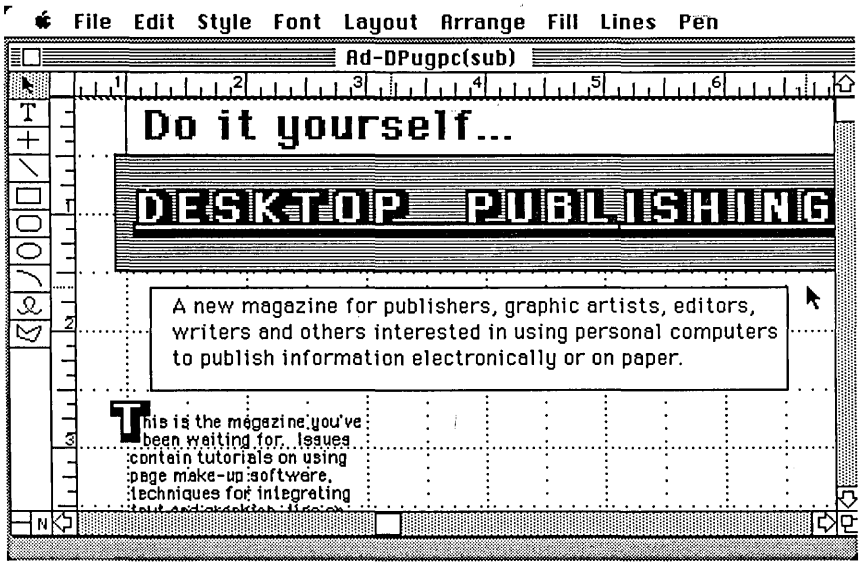

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(continued from page 59)

You have to learn the rules of grammar; you have to learn the programming language. You have to learn how to spell.

So I said, "This doesn't stand a chance, because why would anybody ever learn. How did it ever happen?" Then I asked myself, "How did our education system ever happen?"

Before the printing industry could get where it is now, we had to embark on this huge program of educating everybody. Where were the fringe benefits? There weren't any. There was no benefit to learning how to read and write. None!

The church started the school system. Why? Because they wanted to spread the word of God. The monks couldn't remember everything that was in the Bible, so the church taught them to read, put the Bible under their arms, and pointed.

And so it started as a fairly modest program: you took a certain subset of the clergy, people who didn't have the university benefits, and began creating a system to teach them to read and write. Later, I guess, counting, adding, and subtracting were added. And it slowly grew.

In those days church and government were a lot closer than they are today. So if the church decided it was a good deal to educate a certain portion of the population, it had almost the force of law. As benefits began to accrue, it began to spread. And it spread fairly rapidly when you consider how unfriendly the printed word is.

Have you ever seen people who don't read well, and watched their mouths? They're not reading; they're talking to themselves. That's how unfriendly the printed word really is. Yet we have adapted ourselves to it. Why? Because of the tremendous benefits. I maintain that it's possible for everyone to learn how to program. The kind of benefits that might accrue, while probably not as profound as everybody learning how to read and write, still are quite considerable.

Then I asked myself, "Is there any force today like the church was then — that could force everybody to read and write?"

Now maybe I'm wrong here, but I have the right to play with it. I think we're going to turn into a completely subservient debtor nation if things go on the way they are economically. We are no longer able to economically compete with the rest of the world. Our technology's all gone. We don't produce things as well or as fast as other people do in any area, and the few areas that are left are rapidly disappearing. We rely on our economic growth from foreign capital right now. The deficit is so huge, that if we didn't have a lot of foreign capital, we would not have the excess money to finance the economic growth necessary to fuel the growth of the population and new jobs.

If we were to completely automate our entire industry, top to bottom, north to south, east to west, then I think we would enjoy productivity. How could you have any productivity advantage over a machine that runs well? Machines do work better than humans.

The Future Of Computing

The upshot is that I don't see the computer industry doing all that well now, because I think we're at the first wall of the printing press.

The vast movement of the computer industry isn't over, except it's over for guys like me. I'm very happy that it's not over for guys like IBM and Sperry and NCR, because they're gonna hit the wall a year or a year and a half from now worse than we ever did.

Right now, the government is buying computers like they're going out of style. But I think the government is going to stop buying just as abruptly as the consumer stopped. They're spending borrowed money now, but they will stop as soon as the computers start falling off the desks, when they become as underutilized there as they did in the homes.

And at that time these big guys are just going to be revved up, turning the crank, turning the flywheel at a real good clip — and it's going to stop, just like it did with us. And there's going to be blood and guts and bones, and I'm going to be sitting there saying, "Well, you got yours."

What'll happen afterward is that the big guys will leave the business, and then we'll just have the two of us who are left, and we'll have a good business, because there is a need for computers, but we just don't have a need for as many computers as we have right now.

If my analogy of the printing press is correct, we are the readers, the university graduates of the 1400s. But I maintain that we haven't started the rules of grammar yet.

We were the proper wave to decide the operating system issue. What is good and what is not good in an operating system is now generally recognized. I think the next wave may make an environment to settle these language issues. And I look forward to that, because we've got to have an idea of what makes up a good language before we can decide on what the rules of grammar are.

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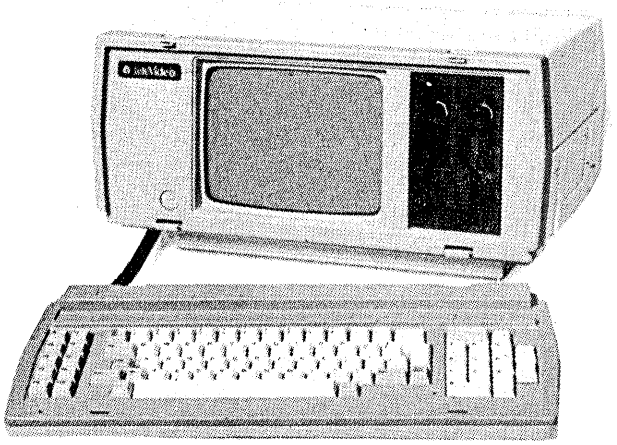

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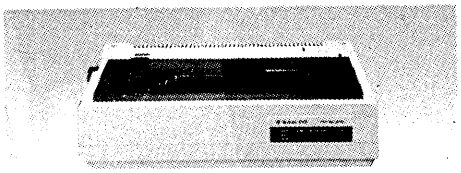

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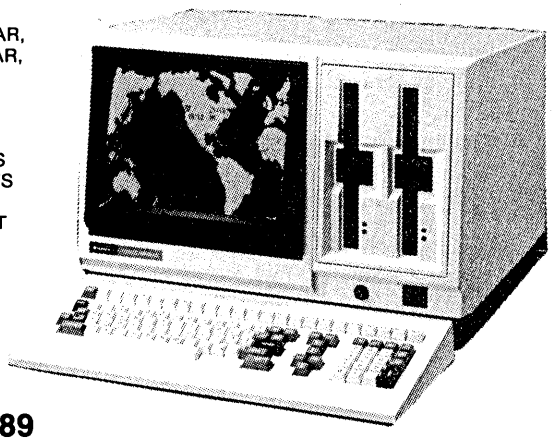

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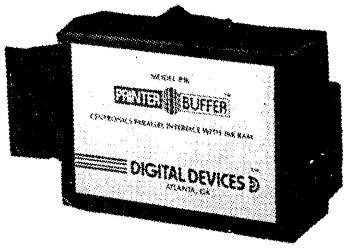

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MS-DOS In The Public Domain

By Gary Entsminger

Micro C Staff

If you're like me and need (at least occasionally) to use MS-DOS, you'd probably rather not pay even $50 for every program you use. (If you're really like me, you can't afford it.)

One reason CP/M has survived this long is poverty (speaking money) and affluence (speaking talent and heart) in the public domain. MS-DOS would have a larger following among hobbyists if not for its fortunate marketability.

So ironically, MS-DOS commercial software is flashier (and bigger), and good MS-DOS "free" software is harder to locate.

A few groups do cull the MS-DOS public domain for good programs, either for themselves or for redistribution to folks who don't have time, access, or the inclination to do the culling themselves.

"Free" seems like an ambiguous word when distributors charge for programs, but you have to realize it's the weeding and the parts you're paying for, rather than the programs themselves. And at their (and our) prices, no one's getting rich.

PC-Blue, PC-SIG, And Micro C

PC-Blue, for example, charges $7 per library volume (or disk) plus $3 shipping and $5 for a catalog. They're not strict about what they distribute through their library, but they get lots of volumes (or disks) out into the public domain.

PC-Blue and PC-SIG (which now has over 300 volumes and sells an IBM manual sized catalog for $8.95 and a directory of its catalog on disk) circulate a lot of programs that wouldn't otherwise reach a wide public. Often these large library groups are a software writer's only alternative for publication.

Micro C (just now entering the MS-DOS public domain) charges $12 per disk, including shipping, gives away a catalog, and distributes fewer more carefully edited disks.

We promote the programs we think are the most useful, the most fun, or the most challenging. We're convinced our weeding helps — by letting the good programs get better known and encouraging good programming.

On every disk, we include each program's documentation (as much as we can find or make up) and a disk-doc file of our experiences with the programs. (If our experiences are too hairy, you won't see the programs.) If we have the program's source, we distribute it.

In general, we pass on the "free" programs we're using, and encourage you to pass them on yourselves. We don't knowingly distribute "crippled" programs — i.e., ones with key features disabled that require expensive updates or licensing. And we discourage programmers' long pitches for contributions.

If a programmer wants to pitch for dollars, let him pitch in his manual, or dial for dollars. His name (and copyright) — not spitballs — belong on screen 1.

A programmer who releases a program into the public domain expects to have his work copied (perhaps improved), left on bulletin boards, or even frisbeed around. He's promoting the hacker ethic, and we thank him for his kindness.

I met Dave Rand (author of SWEEP and NUSQUEEZE) at SOG IV and found he had definite ideas about the distribution of his programs. He doesn't want anyone to make a bundle off his contributions, but he enjoys knowing they're out there being used.

Before SOG IV I was a little worried he wouldn't approve Micro C's charging to distribute.

"Are we OK even a little," I asked.

"You're OK,"he answered, "as long as you continue to support the programs."

The Micro C MS-DOS Library

And now for something new and different — Micro C's MS-DOS public domain library. Let us know what you think.

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Disk #2 — "CHEAP ASSEMBLER AND DISASSEMBLER"

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Disk #4 — "RBBS, SINGLE-USER SYSTEM"

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Three really fun games — CASTLE (a graphic and conversational adventure), TREKRUN (Star Trek command adventure), and BOUNCING BABY (a neat finger exercise).

(continued next page)

PUBLIC DOMAIN MS-DOS

(continued from page 63)

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Disk #10 — "MODEMS"

QMODEM and KERMIT

DISK #11 — "RBBS 12.3, MULTI-USER SYSTEM"

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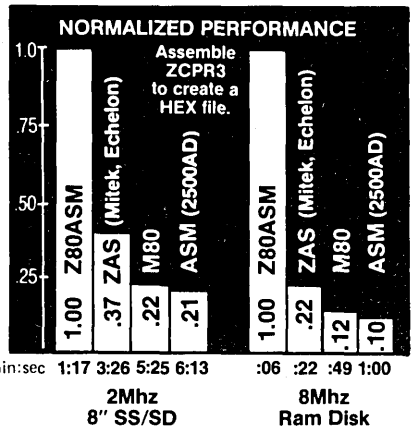

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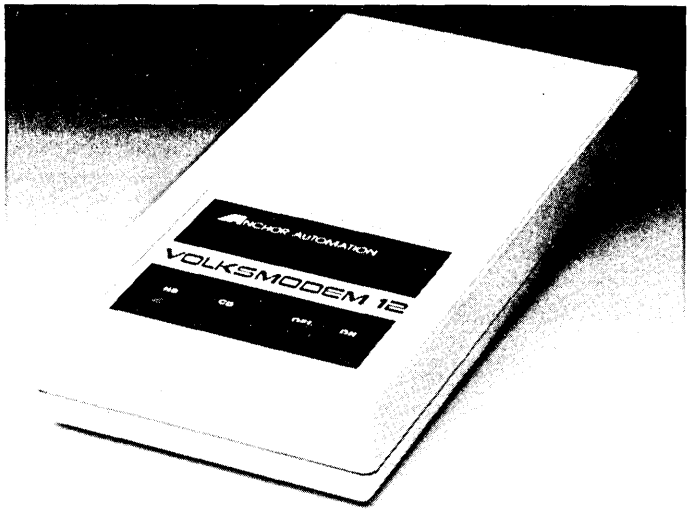

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According to leading publications, the PC market is in the midst of a fullblown shakeout. IBM, KAYPRO, OSBORNE and most other PC manufacturers are initiating cutbacks and layoffs due to slumping sales. Their increasing advertising dollar brings less & less results. At the same time sales for the ZORBA portable computer, the computer that is only advertised in a few choice periodicals and relies heavily on satisfied user testimonials, are showing a steady increase.

It's no secret, the public is learning what industrial users have known for years. That is: that for daily operation of word-processors, spreadsheets and databases, the trendy options are rarely used and the flashy machines that house them are really no faster, no more reliable and much more expensive.

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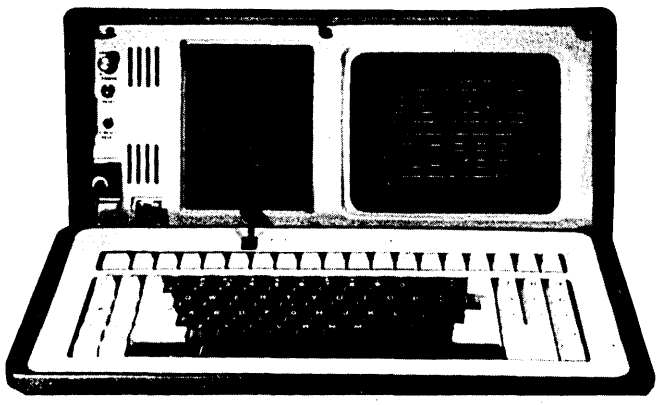

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ZORBA uses CP/M, the industry standard operating system, which means that a wide range of existing software is readily available to the user.

The ZORBA users manual covers operation of the unit, all supplied software and all interface and internal information. A system diskette is supplied with all system files and utilities. A second diskette contains the sources for all ZORBA software including BIOS, SETUP, FORMAT, and PATCH.

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Keyboard communicates serially with CPU
Detachable with 2 foot coiled cord
95 keys in standard QWERTY format
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Disk System

Controller:	WD1793
Drives:	5.25 Double Sided, Double Density, 400K 48 TPI

Built-in disk interchange formats: Xerox 820 (SD, DD), Kaycomp (DD), DEC VT-180 (SD), Osborne (SD) and IBM-PC (eg. CPM/86) and Televideo 802 (Read/Write and Format compatibility) (Expandable to 82 Formats)

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Width	-17.5 inches (44.45 cm)
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Depth	-16.0 inches (40.64 cm)
Weight	-24.6 pounds (11.1 Kg)
Power	-80-130 VAC or 190-245 VAC 50/60 Hz 170 watts max

Display

Display Tube:
9" diagonal, Green or Amber
High resolution display circuitry
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Display Format:
25 lines x 80 columns
5x7 Character Font with full descenders
128 ASCII Characters
8x9 32 Characters Graphic Font
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CPU Board

Z80A CPU running at 4 Mhz with no wait states
64K bytes of 150 ns RAM (58K after CP/M loaded)
16K bytes of EPROM (2732) can be switched in and out by software
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1793 Floppy disk controller, SMC data separator
Bipolar proms configure 10 addresses
Fully structured interrupts prioritized by bipolar proms

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FORTHwords

By Arne A. Henden

1288 Nantucket Avenue
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I started this column years ago to present an alternative to traditional languages when approaching a certain class of real-time problems. This month, I discuss NASA's Massively Parallel Processor, review the Qua Tech modular data acquisition system, and show how FORTH can be used to control the real world.

As you might guess from the byline, I've moved. Ohio State University is in the process of building the world's largest optical telescope and they have asked for my assistance (or was it the other way around?). Therefore, I picked up Unified Software and relocated. I intend to have more travel time, so expect to see me at FORML and other conferences.

Benchmarks

The June/July issue of Micro C dealt heavily with benchmarking 16- and 32-bit microprocessors. My experience from benchmarking these processors differs a bit.

For example, a FORTRAN benchmark which calculated square root, sine, cosine, exponent, arctangent, and addition — 26,400 times — gave the following results:

Processor	Time (mins)
10MHz 68000	0.9
VAX 11/750 FPA	0.6
AT/80287	4.5
PC/8087	4.8

My conclusion is that the AT is at least as fast as the PC for floating point operations, and is typically 2.5 times faster for integer functions. Benchmark charts need to include information on language, operating system, and optimization.

My interest is in scientific processing and real-time control. The 8086 family is best for the latter because of its I/O chips. The 32-bit processors are better for scientific number crunching.

For more common functions, like word processing or spread sheets, I think the computer, application program, and operating system are more important than raw horsepower.

The MPP

The Massively Parallel Processor at Goddard Space Flight Center is a tremendously exciting computer. It's numbers are handled like single integers. Users with unique data type requirements just need to add a set of operators for that data type and interactive debugging speeds development time. A unique computer deserves a unique approach, and I think FORTH fits the bill.

User's Corner: Laboratory Data Acquisition

While computers may be a luxury in the home market, they are essential in the laboratory.

Ten years ago, the big lab had PDP-11s with I/O, A/D, and D/A conversion. They cost between $50-100K. Microcomputers have changed that story dramatically.

You can use the Vesta system described in the last column for parallel, serial, A/D, and D/A operations for under $500. Even the high-speed Cypher board has 12-bit A/D and D/A built in.

The IBM PC has caused a minor revolution in this field. Its open bus architecture has led to a proliferation of boards designed for data acquisition. A computer, interface board, and software costs $3000-5000 and is as powerful as older $100K systems.

I've used several data acquisition boards for the IBM PC, and find the Qua Tech series well made and reasonably priced. One customer is using these boards to monitor electric power stations, keeping a time history of all surges and brownouts. Another is using the bare PXB-721 to bring in CCD solid-state detector images at 128Kb/sec.

The Qua Tech system is modular. The motherboard (PXB-721) plugs into the PC bus and provides 72 I/O lines using three Intel 8255 parallel I/O units. Three sockets on the motherboard, one for each 8255, can be used for expansion modules. Qua Tech provides A/D and D/A converters which connect to these sockets.

The ADM12-10 A/D module will be used here as an example of how the Qua Tech system works, and how so exciting, in fact, that I'm collaborating on a FORTH for the system.

Few people have heard about the MPP. It is best viewed as a large array processor. It has 16,384 microprocessors operating in parallel, arranged in a 128x128 array. Delivered to NASA by Goodyear Aerospace in 1983, the MPP has matured enough that it is now viewed as a national facility, and NASA accepts proposals from prospective users.

An array processor's most common use is processing. Often you apply the same algorithm to each pixel in the image, and a traditional computer operates on the pixels, one at a time.

The MPP can handle 16,000 pixels per clock cycle. In fact, the MPP has been clocked at 6 billion operations per second (BIPS) for 8-bit data, or over 420 million floating point operations per second (megaflops). This is much faster than the Cray or other supercomputers. (Editor's note, earlier this year Cray brought out a system that does 1.2 gigaflops.)

Landsat images that take hours to process on a VAX are handled in seconds on the MPP. Much of the synthetic aperture radar images taken from the space shuttle are reduced on the MPP.

The MPP is composed of three basic modules: an I/O Control Unit (IOCU) that interfaces the MPP with its host VAX; the Processor Element Control Unit (PECU) that handles the processor array itself; and a Main Control Unit (MCU) that handles the IOCU and PECU.

The processor elements are dumb but fast — basically 10MHz bit-slice processors. The PECU acts like a microcontroller, and contains microcode (or subroutines) for such functions as integer and floating-point arithmetic. The MCU is remarkably like an LSI-11/23, having a set of registers, symmetric addressing modes, and 64K of memory.

FORTH in a natural language for this system. It is compact, so most applications will reside entirely in the MCU. The processor array will be used as another stack, where arrays of

(continued next page)

(continued from page 67)

FORTH can be used in the laboratory.

The module uses an ADC80 A/D converter capable of a 12-bit conversion in 25 microseconds; a precision instrumentation amplifier (gains of 1 and 10); and a high-accuracy sample/hold circuit. The module can handle 16 single-ended (0-2.5V or 0-5V) or 8 differential (+-2.5V or +-5V) inputs.

Manuals

The Qua Tech manuals are pretty minimal. They include board switch settings but no schematics.

You can get assembly language interfacing information from the company, but the manuals assume that you are using the LabStar data acquisition language (included with the package).

Using The Interface

Before using the A/D converter, you must initialize the 8255 to use ports A and B for input and port C for output. To acquire an A/D sample:

1. Select the channel to be sampled by sending the channel code to port C
2. Start conversion by pulsing (0-1-0) bit C4
3. Either enter a software loop for 25 microseconds, or sample the high bit of port B to detect end of conversion
4. Read the converted data value from ports A and B
5. Convert the A/D value from Complemented Offset Binary (COB) form to regular binary.

Figure 1 shows the FORTH code necessary to define the port numbers, initialize the 8255, and acquire an A/D sample. Since the four 8255 ports are contiguous, I have hard-coded PORTA, and then offset the constants PORTB, PORTC, and PORTD from that base. If another A/D module were used, or the port addresses changed, you'd need to change only one number.

The 8255 control word has the bit assignments shown in Figure 2, where port bits set indicate input, and clear indicate output. We will use mode 0 (polled I/O) for this example. Therefore, we need to set modes (bit 7), group A mode 0, port A input, port C output, port B input, or

1 0 0 1 0 0 1 0

for a control word value of 92H. The FORTH word INIT sends this value to the control port.

START performs the 0-1-0 pulse on bit C4 to start the A/D conversion. WAIT "waits" on bit B7. This bit is normally low; when a conversion starts, the bit goes high, then it returns low when the conversion is completed.

The routine might never return to

caller if there is an incorrect calling sequence, missing or malfunctioning A/D converter.

You should consider an "escape route" out of WAIT in case of an error, but an escape adds time to the conversion. I added a ?TERMINAL escape for debugging, but removed it in the final product.

FETCH reads ports A and B, combines the data value, and converts it to normal binary format. Since ports A and B are contiguous, and since the IBM PC uses an 8-bit bus, you could perform a 16-bit I/O fetch. I don't think this trick would work on a 16-bit bus since both portA and portB would get the read request at the same time, and the 8255 couldn't service both simultaneously. Therefore, I used two separate reads.

Also note that WAIT reads port B (to check to see if conversion is finished) and its last read (conversion is finished) contains good data. So WAIT could pass port B data to FETCH, and FETCH would only have to read port A.

Translating To Binary

The COB to binary conversion is accomplished in two steps. First, we complement the 12-bit returned value, then XOR it with the highest (sign) bit. The process is not intuitively obvious, but gets the job done. Note also that bits B4-B7 could contain garbage, so we AND off the lower 12 bits (clearing the high bits) to be safe.

Finally, word A/D@ selects the desired channel, and then combines all of these lower-level words to fetch the analog data. How fast can this high-level conversion be accomplished in FORTH? The word MANY gives a simple test: 10,000 samples acquired and discarded. It takes 9.0 seconds on the IBM PC using the UNIFORTH Sampler. Removing the empty loop time yields a 1.2KHz throughput.

This speed may be adequate for your project, or you may need something faster. How can we optimize the acquisition?

We could combine all the primitives into one high-level handler as shown by FASTER. This gives a 1.8KHz throughput.

Since the conversion takes only 25 microseconds, WAIT is not really needed since the colon word overhead is sufficient to ensure conversion. Removing WAIT from FASTER gives you a 2.4KHz throughput.

Writing A/D@ in assembly language cranks FASTEST up to 12.5KHz.

The conversion throughput should approach 40KHz. What's going on? First, the acquisition of a single

(continued next page)

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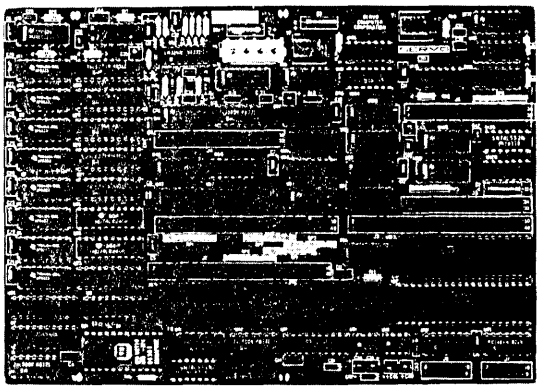

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(continued from page 69)

sample has been optimized with FASTEST, but multiple samples still use the stack for storage. The absolute best would be to pass a buffer address and count to FASTEST, and have it fill the buffer before returning.

Even then, we can't reach 40KHz. The 8-bit architecture is a contributing factor, since two fetches are necessary to acquire the 12 bits. We could turn off the COB-to-binary conversion during acquisition, performing the conversion after filling the buffer. Time is required to start the next sample, which could be eliminated if the A/D converter could be run in an automatic recycle mode (perhaps an external, clocked trigger).

Interrupt Mode?

You might think that hardware interrupting would be faster than polled status waiting. Not so! On the IBM PC, interrupts are handled by an 8259 vectored interrupt controller. To handle an interrupt, the following sequence is necessary:

```
Hrdware respond to intrupt 51 cycles
Reading A/D                ...
Reset of 8259              12 cycles
Return from interrupt      24 clocks
```

for a minimum overhead of 87 clock cycles. The polled loop has a 27-cycle overhead, so polling is faster than interrupts. However, interrupts free the computer for data analysis or other tasks while the data is being acquired.

To complete the example, I've included a high-level word (MULTI-A/D) to fill a data buffer with a user-specified number of channels. The UNIFORTH array word VECTOR is used to create the buffer A/DBUF. Also, the word PLOT continuously reads the A/D, followed by scaling and output of an asterisk on the screen in a stripchart simulation. It's slow, but gives you a very easy way to plot data.

Value Of FORTH

When I started this project I was told that bit B7 was normally high, was low during conversion, and returned high at end of conversion. Reading port B showed that bit 7 was normally low. Was my information wrong? Or was B7 disconnected?

I used a modified FASTEST to check. After starting conversion, I read port B 200 times and placed the data on the stack. Then printing the stack showed that B7 went high (not low) during conversion. This interactive debugging is impossible in any other language.

This example was meant to show the speed and ease of using FORTH to acquire A/D data. The Qua Tech system has good performance and sufficient accuracy to meet most laboratory requirements. FORTH is also handy for controlling relays, reading triggers, and setting LEDs.

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ERATA

My column in issue 25 has some typos that crept in during Micro C's editing. Under "The FORTH Processor," remove "best" after "NEXT." Starting on page 65, you can remove the capitalization on "BASIC" whenever that language is not being discussed.

■ ■ ■

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Figure 1 - FORTH Screens

```
SCR # 1
  0 HEX \ Elementary A/D functions                    081785AAH
  1 300 CONSTANT PORTA  ( first port of A/D)
  2 PORTA 1+ CONSTANT PORTB
  3 PORTB 1+ CONSTANT PORTC
  4 PORTC 1+ CONSTANT PORTD
  5 VARIABLE CHAN  ( where channel select will be stored)
  6
  7 : INIT ( -- ..initialize 8255)  92 PORTD IOC! ;
  8 : START  ( -- ..pulse bit C4 to start A/D)
  9    CHAN @ DUP 10 OR PORTC IOC! PORTC IOC! ;
 10 : WAIT  ( -- ..wait for end-of-conversion)
 11    BEGIN PORTB IOC@ 80 AND 0= UNTIL ;
 12 : COB>BIN  ( n1 -- n2 ..convert COB to binary)
 13    NOT 800 XOR OFFF AND ;
 14 DECIMAL -->
 15
SCR # 2
  0 HEX \ fetch a/d data                              081585AAH
  1 : FETCH  ( -- n ..read A/D, convert)
  2    PORTA IOC@ PORTB IOC@ BSWAP + COB>BIN ;
  3 : A/D@  ( chan -- data ..read a/d)
  4    DUP CHAN ! PORTC IOC! START WAIT FETCH ;
  5
  6 : FASTER  ( chan -- data ..combined)
  7    DUP 10 OR PORTC IOC! PORTC IOC!
  8    BEGIN PORTB IOC@ 80 AND 0= UNTIL
  9    PORTA IOC@ PORTB IOC@ BSWAP +
 10    NOT 800 XOR OFFF AND ;
 11
 12 DECIMAL -->
 13
 14
 15
SCR # 3
  0 HEX \ code word form                              081585AAH
  1 CODE FASTEST  ( chan -- data ..fetch and convert)
  2    AX POP,                          ( channel number)
  3    PORTC # DX MOV,                  ( necessary cuz of 8088)
  4    10 # AL OR,   AL DX OUT,         ( 0>1 transition)
  5    10 # AL XOR,  AL DX OUT,         ( 1>0 transition)
  6    DX DEC,  BEGIN,  DX AL IN,       ( wait for bit 7 clr)
  7             AL AL AND,
  8             PL UNTIL,
  9    AL AH MOV,                       ( save hi 4 bits)
 10    DX DEC,  DX AL IN,               ( fetch lo 8 bits)
 11    AX NOT,  800 # AX XOR,           ( COB > binary)
 12    OFFF # AX AND,
 13    AX PUSH,                         ( place on stack)
 14    NEXT,  END-CODE
 15 DECIMAL -->
SCR # 4
  0 \ buffered a/d + plot                  081585AAH
  1 : MANY  ( chan -- ..test)  10000 0 DO DUP A/D@ DROP LOOP DROP ;
  2
  3 200 VECTOR A/DBUF  ( space for 200 samples)
  4
  5 : MULTI-A/D  ( chan# cnt -- ..read multiple)
  6    0 DO DUP A/D@ I A/DBUF ! LOOP ;
  7
  8 2VARIABLE RATIO  ( scaling factor for plot)
  9 80 4096 RATIO 2!  ( cnt of 4096 = 80th column)
 10
 11 : PLOT-POINT  ( val -- ..plot point on screen)
 12    RATIO 2@ */ 1- SPACES  A' *  EMIT CR ;
 13 : PLOT  ( chan# -- free running plot until keypress)
 14    INIT CR BEGIN DUP A/D@ PLOT-POINT ?TERMINAL UNTIL DROP ;
 15 ;S
```

Figure 2 - Bit Assignments

```
bit  7   6   5   4   3   2   1   0
     |   |   |   |   |   |   |   |
     |   |   |   |   |   |   |   |-- portC lower
     |   |   |   |   |   |   |------ portB
     |   |   |   |   |   |---------- mode, group B
     |   |   |   |   |-------------- portC upper
     |   |   |   |------------------ port A
     |   |   |---------------------- mode, group A
     |   |-------------------------- mode, group A
     |------------------------------ mode set flag
```


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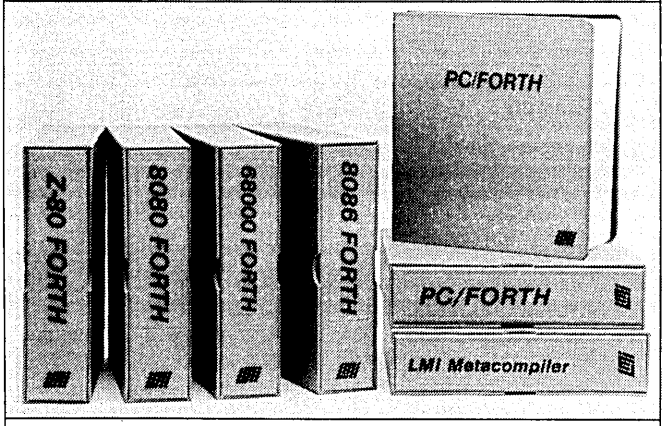

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Selecting A Drive Within CP/M

By Thomas A. Geldner

3746 29th Street
San Diego CA 92104

I've just returned from Micro C's SOG-IV Technical Conference and true to its title, I needed an IV to recover (not to mention other bad jokes like getting SOGgy).

Last issue we learned how to "Beep the Bell" with BDOS. This time we'll log a few drives with BDOS.

The primary reason to use BDOS calls is to do things a high level language doesn't support. Figuring out the currently logged drive is a good example.

The listings which follow are written for Turbo Pascal. (Pascal statements end with a semicolon, and some have been split onto two lines so they'll fit in the column.)

A Brief Review

Last time we used Turbo Pascal's BDOS function 25 (19 hex) to view the current drive. BDOS($19) returns the current drive as 0 for "A", 1 for "B" and so forth. Adding $41 (41 hex) turns a 0 into a 41h. Char tells Pascal to use the 41h as the letter "A".

```
var CurrentDrive: Char;

begin
  CurrentDrive :=
  Char(Bdos($19)+$41);
  Writeln(CurrentDrive);
end.
```

Then we can use CurrentDrive as part of a filename so the system will always access the same file on the same drive even if the default drive is changed.

```
FileName :=
   CurrentDrive + ':' + FileName;
```

Drive/User Number

CP/M keeps the current drive and user number (user 0 for instance) in two places. BDOS has its drive/user storage location, but there is also a location in low memory (at address 4) where this info is stored. When you warm boot, information from address 4 is sent to BDOS. Thus, a program can select any drive/user combination while it's running, knowing that the user will wind up back at his original drive/user location after everything's finished.

Address 4 (the fifth byte from the bottom of memory) contains two 4-bit numbers. The least significant 4 bits represent the drive, and the most significant the current user number. For example:

HEX	USER	DRIVE
00	0	A
01	0	B
10	1	A
11	1	B
F2	15	C

The following code illustrates how to read and display address 4.

```
var DriveUser:  Byte absolute $0004;
    Drive:      Char;
    User:       Byte;

begin
  Drive :=
  Char((DriveUser mod $10)+$41);
  User :=
  DriveUser div $10;
  Writeln('Drive / User =  ',
          Drive,User,':');
end.
```

The statement "DriveUser mod $10" will mask out the four high order bits of drive/user leaving just the drive code. Again, adding 41H turns it into the equivalent ASCII capital letter.

"DriveUser div $10" performs the same masking operation on the four low order bits leaving just the user number (from 0 to 15).

One interesting peculiarity about CP/M — BDOS lets you select user numbers between 0 and 31. The CCP only understands users between 0 and 15 (and there are only 4 bits available in address 4 to store the user number).

Doing Something

The drive/user number is used by the CCP to restore the default drive and user number after a warm boot. The CCP (CP/M's command reader and doer) checks byte 4 for drive and user number and then calls BDOS's SELECT DISK (0EH) and SET USER CODE (20H) so that the drive and user selection match those set in address 4.

Twiddling The Drive, Etc.

Changing the default disk drive is pretty easy in Turbo. Note the error checking to trap invalid drives. (Though their pelts are no longer worth much.)

```
var DriveCode: Byte;
    Drive:     Char;

begin
  repeat
    Write('Enter letter of
    drive to be selected: ');
    Readln(Drive);
    Drive := UpCase(Drive);
    if not (Drive in ['A'..'P'])
    then Writeln(^G);
  until Drive in ['A'..'P'];
  DriveCode := Byte(Drive)-$41;
  Bdos($0E,DriveCode);
  Drive := Char(Bdos($19)+$41);
  Writeln('Current drive =  ',
          Drive,':');
end.
```

Next, you might change user areas. Again, this is done in Turbo with a BDOS procedure using the BDOS GET/SET USER CODE function (20H). This is a two-way function.

If an FFH is placed in the E register, then the A register will return the current user area. If a valid user area number is placed in the E register, then the default user area will be changed.

```
var UserArea: Byte;

begin
  repeat
    Write('Enter User
    Area (0 - 31): ');
    Readln(UserArea);
    if not (UserArea in [0..31])
    then Writeln(^G);
  until UserArea in [0..31];
  Bdos($20,UserArea);
end.
```

So far we've been changing drive and user in BDOS. When the user warm boots everything will be back to its original state. If we don't want the original state, we can simply change the contents of address 4.

(Editor's note: Give me a random number generator and address 4 and I'll give you some very confused warm boots.)

```
var DriveUser:  Byte absolute $0004;
    Drive:      Char;
    User:       Byte;

begin
  Write('Enter Drive letter: ');
  Readln(Drive);
  Drive := UpCase(Drive);
  DriveUser := Byte(Drive)-$41;
  Write('Enter User number: ');
  Readln(User);
  DriveUser := DriveUser + User*$10;
end.
```

■ ■ ■

PS Computers Presents the...

PS Turbo 640

For those of you that mistook for Bill Gates from Microsoft, let me clarify things. I'm Dave Carlin from PS Computers in Palm Springs, California. The differences are pretty basic. Bill reads the Wall Street Journal, wears glasses and writes great software. I on the other hand read USA Today, wear soft contacts and build great hardware.

Now that you know who I am, or at least who I am not, let's get to the point of this ad.

Since I got into computers two years ago they have been a constant source of fascination and frustration.

Fascination due to the immense power and control that the personal computer has allowed me over my daily business activities; frustration due to the hundreds of hours I've spent making hardware and software cooperate with one another.

No doubt about it, once you get the all the pieces put together correctly you have at your command an incredible tool. There is absolutely no limit to the number and type of tasks that you can accomplish with greater speed, better accuracy and stronger impact; all with far less effort. The trade off however has been the time, energy and uncertainty involved in finding the best buy on the right equipment, then getting all the parts to function as one.

Because I have personally gone through hours of long distance phone calls to hardware manufacturers and waited days for call backs that never happened. Because I have found myself so many times in front of a screen filled with meaningless greek characters at 2 AM unable to get the computer to print a simple business letter. Because I would not wish this type of agony on anyone. This is why I have put together the PS Turbo 640.

What happened was. . .a few months ago I discovered a source of computer mother boards that run IBM type software faster than the IBM PC. They're a genuine product of Taiwan and they are beautiful. I bought cases, keyboards, cables and disk drives; built the Turbo 640 and put it to work. Right now I have three PS Turbo 640s linked as a network running Dbase III and Lotus day in and day out in my business. The PS Turbo 640 works, it works well and it works faster than the IBM PC.

An oral surgeon friend saw my network and asked me to build one up for him. One of the Turbo 640's on the network is in his operatory. It runs a program I wrote in Turbo Pascal for his anesthesia records - not a single glitch. (The 640 seems totally immune to the effects of Nitrous Oxide.)

Though I have a private pilot's license and quite a few hours flying high performance aircraft, I've never taken the time to learn to use the Flight Simulator program from Microsoft. Some of my friends have and it runs beautifully on the 640. The phrase "IBM compatible" is an understatement with my computers; the PS Turbo 640 is just flat out a better machine.

Peter Norton publishes a program that rates computers as to speed and compatibility with the IBM PC. In the normal mode of operation the PS Turbo 640 rates a 1.0 which indicates a 1 to 1 equivalency. In the high speed mode (selected with two keystrokes, no switches or rebooting) the 640 scores a 1.4; that's 40% faster than an IBM PC.

Here are the specs: 640 K of memory (the maximum contiguous memory that the PC can address - and they're all 120 nanosecond chips) . A keyboard that is very similar to the Key Tronics 5151 (yes all the horror stories about the keyboards that come stock with IBM PCs are true). Two serial ports, a parallel printer port and a game port (you can't beat that). Battery powered clock (keeps track of the time and date while the PC is off). A monochrome graphics card that lets you use color and graphic software on a monochrome monitor displayed as sixteen shades of grey (amber). An amber monitor (very chic). Two 360 K disk drives (AKA Double Sided Double Density). Two front panel LEDs (one to indicate that you left the computer on from the night before [it's ok, that doesn't hurt it] and the other to tell you if the processor is in the high speed mode or just going IBM speed). Eight full length expansion slots (two are used by the multifunction card and monitor card, six are available) Five ROM sockets and two buss connection points (load programs stored on your own ROMs). 135 watt power supply (ready for upgrading to a hard disk). User's book and complete technical information (the user's part is easy - the tech part is very technical).

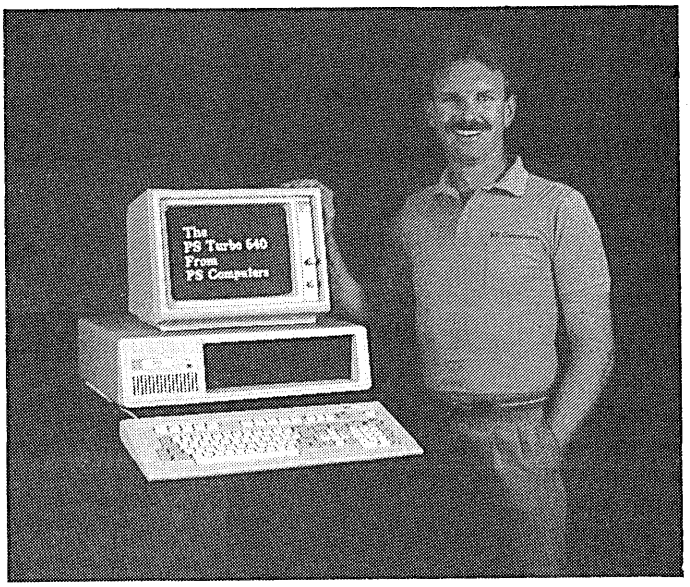
A computer without software is basically a solid state boat anchor and a rather poor one at that. When you buy the Turbo 640 I want you to be able to start using it the moment you take it out of the box; therefore the 640 comes with software.

To start with there is Microsoft DOS. DOS is the program that brings the computer to life. Typically some version of it is run on all IBM PCs prior to running application programs. "And it came to pass that this was called booting the computer". I'm not crazy about the term, but everyone does it. The full DOS manual from Microsoft is included.

There is complete software for the multifunction card that allows you to partition your memory into RAM disks and a printer buffer.

Perhaps you've heard about Sidekick from Philippe Kahn at Borland. Infoworld voted it the Software Product of the Year. Well it's good code but I'm not including it with the Turbo 640. What I am including is a product that I like better, has essentially the same functions but in my opinion is easier to use - PopUps from Bellsoft. Regardless of how deep into your spreadsheet, database or master's thesis (revisions) you might be, two key strokes will put a notepad, calculator or any of 5 other utilities on your screen. Make notes, perform calculations, set an alarm, check your calendar or perform DOS functions. When you're finished just hit the escape key; the PopUps disappear from the screen and your back into your program. This is the PopUp Deskset from Bellsoft, it's potent software and it's part of the PS Turbo 640 system.

If you're ready for this kind of computing then the PS Turbo 640 is the machine you need. Call me with your American Express card number or mail me a cashier's check. I will personally see to it that a Turbo 640 is shipped to you via UPS the next business day. Open up the box, plug the monitor and the keyboard into the computer then plug the computer into the wall socket. Turn the computer and monitor on, stick in any software designed to run on the IBM PC and go to work. No chips to put in backwards, no little multicolored wires to



push onto the wrong connector and no switches to set.

If the PS Turbo 640 doesn't perform like I've said it will then return it to me. Just put one copy of your invoice in the box and send it back. I will make sure that credit is issued on your credit card or a cashier's check is mailed out to you, the same business day that we receive the unit.

I've told you quite a bit about what you get when you buy the Turbo 640; now let me tell about something you won't get. You won't get put on hold if you have occasion to call the technical support division number. That's because there isn't a technical support number. Once the machine is on it looks like, acts like and runs like a properly configured IBM PC, just a little faster.

This is the part where I have to get a little tough. I've sold you what I feel is the ideal configuration of an IBM type PC. You have gotten the absolute best buy for your money on earth. I can not however learn how to use it for you. Follow the directions in the book, remember that no matter how much you pay for your software it's probably not perfect, and most of all don't give up - whatever time it takes to get proficient at your particular software application will ultimately be all worthwhile.

The warranty on the Turbo 640 is simple. If anything goes wrong in the first six months, send it back. The unit will be repaired and shipped back to you two days after we receive it.

In case of an out of warranty hardware problem (how many million dollars does it cost for the space shuttle to place defective satellites into random orbit?) or if you have a question concerning operation (that isn't answered by the manual), you have three options:

One, write me a card or letter. These are answered the same day as received via MCI Mail. Two, sign onto the PS Computer 24 hour bulletin board, post your message and then sign on later for the answer. (admittedly hard to do if you didn't decide to get a modem or the computer I sold you broke [see option one]) Or three, find out where I live (probably the least convenient for both of us).

About placing your order. The 800 number puts you in touch with an operator here at PS Computers whose function is to take the necessary information, quickly and accurately, period. I've given you the highlights of the system in this ad. If you need to know more about specific features drop me a line. Sure it seems like it might be a bit more trouble than calling; but you won't be reaching a busy signal and your answer will be in writing.

You have my word that the PS Turbo 640 has been accurately represented on this page and is in fact the absolute best buy for your dollars. If for any reason you don't like the 640 then you also have my word that upon our receiving the system, those dollars will be returned to you, immediately.

If you want to know for sure if the Turbo 640 is the computer for you, buy it. The local book is 100 to one that once you have one, you'll never part with it.

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$2,200

The (really) fine print:
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Pascal Procedures

By John P. Jones

6245 Columbia Ave.
St. Louis MO 63139

This time we'll look at global and local variables and variables passed as parameters.

Review

Since the visibility of a variable (local or global) is related to the block structure of the program, let's review how a Pascal program is structured. (Procedures and functions are structured the same way.)

A program is divided into the program heading part and the program part. The program part is further divided into the declaration part and the statement part. The declaration part is made up of LABEL, CONSTANT, TYPE, VAR, and PROCEDURE/ FUNCTION declarations, normally in that order. All of these are optional. Figure 1 is a valid, though incomplete, program to illustrate this structure and many of the points I'll make here.

The declarations that reside between the program heading and the first procedure are the GLOBAL declarations. They will be visible to the entire program.

Note that all declarations will be known or visible to every subsequent routine at the same or deeper nesting level. Conversely, nested declarations override those at higher levels and will not be visible outside the current block. In Figure 1, the variable X declared within BATTLE overrides the global declaration for X. References to X within BATTLE will be to the local variable, not the global. This will also be true for procedure/function declarations. Function DICE_ROLL is nested within BATTLE and cannot be directly called by any routine outside it.

Standard Identifiers

The standard identifiers known to the compiler are declared one level above the program and can be redefined within the program. For example, if your application uses only integers in the range 0..255, the following declaration will replace the standard type integer:

type integer = 0..255; [this is equivalent to some compilers' type BYTE]

Compare the procedure headings for MOVE_PARTY and BATTLE. The presence of the VAR prefix for BATTLE's parameter list indicates to the compiler that these variables are to be passed by address and can thus be modified by the procedure. If the VAR prefix is absent, parameters are passed by value. They can be used and modified by the procedure, but any modifications will be local to the procedure. Function DICE_ROLL uses the parameter NUMBER as a loop counter, and when executed will decrement its value to zero. Only the local copy of this variable will be modified.

As a general rule, it's wise to avoid modifying non-local variables directly in a procedure. If a global variable is to be updated by a procedure, it should be passed as a VAR parameter. Functions should never modify global variables. Everything going into a function should be in the parameter list (when it's called) and only one value should be returned (the value of the function).

Side Effects

Modification of a global value by a procedure is called a side-effect. In some cases, it is what was intended by the programmer, and will not be harmful. But careless side-effects can cause bizarre and unexpected results. If you're in the habit of using inscrutable variable names like X, I, and Z (I'm guilty of it to a certain extent) and forget to declare one of them locally when you need a temporary or loop counter, then the next higher declaration for that variable will be used. Hard to find when you're debugging!

CONST and TYPE declarations are usually best when global to the entire program. In addition to the benefits of efficiency, the program will be easier to understand if these declarations aren't buried somewhere in the middle of the code. An exception is a type that's only needed within a single procedure.

The partitioning of data and procedures that Pascal provides is taken to its logical extreme in Modula 2. In Modula 2, variables and procedures must be specifically IMPORT/EXPORT(ed) in order to be known to other modules. This provides more control over variable and procedure utilization to the programmer, and improves maintainability.

To sum it all up, Pascal provides mechanisms for the partitioning of both data and code within a program. This lets you write programs to minimize unwanted and unexpected side-effects, and improves maintainability.

TURBOHLP

Bill Mabee recently sent me a copy of a Turbo Pascal utility program called TURBOHLP. He says it's the first of several utilities he plans to market both for 8- and 16-bit operating systems. I spent some time with the 8-bit version, and I like it. TURBOHLP is a menu driven, screen oriented help facility for Turbo Pascal programmers. The program is designed to provide summary information, a few convenience utilities, and some source file maintainence from within Turbo by using the eXecute command.

Installation is with a program generated by Borland's GINST utility and should be no problem to anyone who has installed Turbo Pascal on his own system. After some start up messages, the main menu allows selection of these functions:

— ASCII table : control codes / functions, printable characters with hex and decimal values

— Compiler directives : list with brief description

— Number base conversions : from/ to binary, octal, decimal, and hex

— Editor commands : default (WordStar)

— Standard functions : list with brief description

— Standard procedures : list with brief description

— Calendar : lets you look at any month this century, then flip forward/ back

— Turbo Access bug fixes : details source changes to fix them

(continued next page)

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PASCAL PROCEDURES

(continued from page 75)

Utilities Sub-menu:

— System information : odds and ends about YOUR system

— BDOS calls: lists function and parameters needed for CP/M 2.2, 3.0 and MP/M 2.1

— Procedure/function lister : 1. Generates a list of all that you have defined in your program, 2. Gives dated, paged listing of source to printer, and 3. Lets you view a file on screen.

— Source code formatter : really, a keyword capitalizer

— Version 2.0 bug fix : user area bug

— Version 3.0 additions : what's new with 3.0

— Error messages : runtime and I/O error descriptions, correspondence between Ioresult return value and I/O error #

— Help files for assemblers : ASM, MAC, M80/L80

The .COM and .DAT files take up about 120K of disk space, and so can share a disk with Turbo and its error message file on even a SSDD 5" disk.

Even considering the overhead involved in saving the current work file, loading and running TURBOHLP to find the information needed, then reloading the work file, in most cases using TURBOHLP will be faster than digging through the manual. A lot of the information the program provides isn't even in the manual! Of course, if you're running a hard disk or RAM disk, the save/load overhead will be reduced, making the program even more attractive.

Contact Bill directly about price and available disk formats. I looked only at the CP/M-80 version of the program. The MS-DOS version probably has some differences.

William L. Mabee
540 West Main
P.O. Box 538
Edmore MI 48829

■ ■ ■

Figure 1 - Program d and d

```
program d_and_d;

const
  max_rounds_per_battle = 5;

type
     species = (wizard, dwarf, human, halfling);

     coordinates = record
       x,y,z  : integer;
     end;

     player = record
       character : species;
       name      : string[16];
       strength  : integer;
       charisma  : integer;
       hit_points: integer;
     end;


var
  party : array [1..20] of player;
  campaign_day : integer;
  position : coordinates;
  x,y,z    : integer;


procedure move_party (x, y, z : integer);
begin
  position.x := position.x + x;
  position.y := position.y + y;
  position.z := position.z + z;
end;

procedure battle (var attacker, defender : player);
var
  battle_round : integer;
  x            : integer;
  current_pos  : coordinates;

function dice_roll (number, sides: integer) : integer;
var
  roll : integer;
begin
  roll := 0;
  while number > 0 do
  begin
    roll := roll + random(sides) + 1;
    number := pred(number);
  end;
  dice_roll := roll;
end;

begin
  { the body of procedure battle goes here }
end;


{  other procedure/function declarations go here }


begin
  {  the body of program d_and_d goes here }
end.
```

End of Listing

Attention Okidata µline 92/93 owners . . . Announcing

FEDIT

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FEDIT is a complete system for designing and defining characters for the downloadable character graphics generator (DLCG) in Okidata µline 92/93 printers. The designed fonts are kept in individual files on disk available for editing and/or sending to the printer; all by FEDIT utilities.

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FEDIT is currently available on 8" SSSD CP/M™ v2.2 for Big Board I (using the on-board video) and Xerox 820. FEDIT is also available on 5¼" CP/M for Kaypro (2, 4, 10). Cost is $19.95 US / $25.95 CAN. For information and orders contact:

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MTBASIC is available for CP/M, MS-DOS, and PC-DOS systems for $49.95. MTBASIC with 8087 support is available for MS-DOS for $79.95. Shipping is $3.50 ($10.00 overseas). MD residents add 5% sales tax. MC, Visa, checks and COD accepted.

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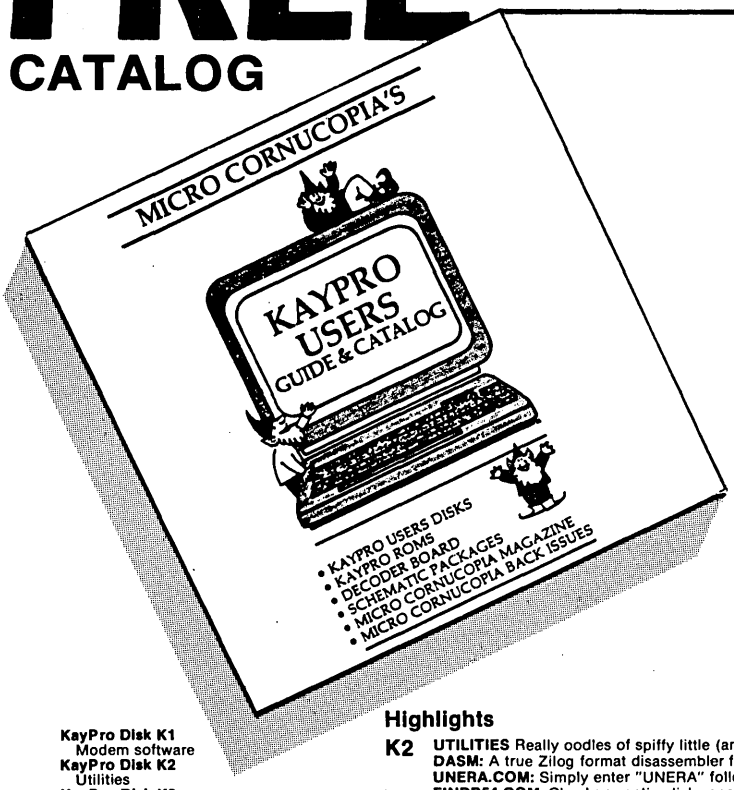

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Highlights

K2 **UTILITIES** Really oodles of spiffy little (and big) programs to help you get full use of your KayPro.
DASM: A true Zilog format disassembler for 8080 and Z80 object (.COM) files. Now you can turn .COM files into .MAC files.
UNERA.COM: Simply enter "UNERA" followed by the name of the file you just erased and presto, the erased file is back! A lifesaver!
FINDB54.COM: Checks an entire disk, reports bad sectors, and then creates a special file containing those sectors. You save a bundle on disks.
CAT2: Programs which create and maintain a directory of all programs on your disks. Keeps track of programs which are and aren't backed up.
UNSPOOL.COM: Use your KayPro II and print files at the same time. Doesn't slow down system response!
DUMPX, DU-77, COMPARE, SUPERSUB, FORMFEED, DIRDUMP . . . and all have documentation on disk.

K4 **ADVENTURE** - This disk contains one 191K game. Adventure. ADV/.COM: This is the latest, greatest, most cussed adventure ever devised by half-mortals, 550 point version, so the cave is greatly expanded and the creatures are much smarter.

K11 **LIBRARY & CHECKBOOK PROGRAMS - CHECKS:** A very popular group of programs. Categorizes checks so you can keep track of which are tax deductible and which get charged to which projects. Includes source and example check files. Very powerful. **LIBR:** A complete set of library routines which let you group files into a single file called a library. Then CP/M sees them as a single file, but with the library routines, you can list them out separately, run them separately, or divide them up again. Almost like a UNIX environment..
DISPLAY, VLIST, PGLST: Additional screen and print utilities.

K18 **SYSTEM DIAGNOSIS** - Just as we finished editing the routines on this disk, we received a copy of KayPro's diagnostic disk. The memory test and drive exercise routines on this disk are more powerful than KayPro's versions. (Plus, it's only $12) Setup for KayPro II & 4.

K21 **SBASIC ROUTINES & SCREEN DUMP - SBASIC:** Finally a disk of SBASIC software. Good examples of structured programming (including one program written both ways so you can see the difference).
SCREEN DUMP: For all KayPro's new and old. You can buy a similar package eslewhere for $60.

K22 **ZCPR (Again)** - This disk is filled with ZCPR files. You get ZCPR for the KayPro II, KayPro 4, and the KayPro 10. This version is fixed so you can pass control characters from the keyboard to the printer, and you can choose to have it recognize the semi-colon for drive select (as well as the colon). So you can enter "B;" or "B:" to select drive B. Super Neat! **ZCPR** makes CP/M a lot friendlier. It searches drive A for any .COM file it doesn't find on the current drive, the TYPE command scrolls text 24 lines at a time, and a new LIST command outputs a file to the printer.

K24 **MBASIC GAMES & KEYBOARD TRANSLATOR** - We sifted through many games before coming up with these games. All will work on any KayPro and all come in MBASIC source. **USOPEN** shows you the fairway on the screen. You select the club and direction for each stroke. After you reach the green the display shifts to show details of the green and flag. For one to four players. **DUCK** is an offshoot of aliens. Hunter tries to shoot down the ducks while ducks try to bomb the hunter. (Much fairer than real life.) **CASTLE** is an adventure in which you select your attributes (strength, dexterity, and intelligence). Great documentation and a very interesting game. **KSTROKES** is a keyboard translator similar to Smartkey. You can create and save translation files on disk. The program even includes a table which generates WordStar commands from the KayPro's keypad! You can define 8 keystrokes at up to 63 characters each.

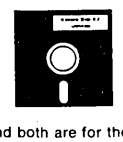
K27 **TYPING TUTOR** - A complete typing tutor for beginners and experts. Written in Australia, it comes complete with source. This was customized for KayPro II, 4 and 10 by Barry Cole of WLAKUG. The documentation says you can learn to touch type in 8 hours.

K31 **TURBO BULLETIN BOARD** - Complete Bulletin Board Package for only $12.

K33 **A SUPER UTILITIES DISK CONTAINING** - NewSweep, Nulull, Sperzap, & VDO-KP.

K34 **FIVE GAMES PLUS SOURCE (MOSTLY TURBO)** - Includes improved Othello and Eliza.

K35 **SMALL C COMPILER & SOURCE - VERS 2.1** - Requires Microsoft's M80.



New ROMS for 84 KayPros

The wait is over! We now have two new ROMS and both are for the 84 series KayPro 2 and 4.

Pro-884
This ROM provides the benefits of the original Pro-8 to the 84 owner. With the Pro-884, you can run any mix of quad density (784K) drives and double-sided double density drives as A: and B:. Plus, if you plug-in the decoder board, you can run up to four drives.

Pro-884 MAX
The MAX gives you all the advantages of the Pro-884, plus faster screen scrolling, ZCPR in ROM (you "warm boot" on any disk, whether it has system tracks or not), screen dump, ctrl-p type printer output, and VT52H/19 terminal emulation in addition to the original ADM3, to name a few. (We worked on this hummer for nearly a year.) If you need more information on the Pro-884s or our '83 compatible ROMs, call, write, or yell for our KayPro Users Catalog.

Pro-884	$59.95
Pro-884 MAX	$79.95
Decoder Board	$39.95

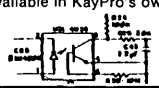
Schematic Packages

Finally, a complete schematic of your processor board, logically laid out on a single 24" by 36" sheet, plus a very complete, illustrated, Theory of Operation that's keyed to the schematic. You'll get information that's available nowhere else.
For instance, those of you with the 10 and new 84 systems get a thorough rundown on your video section complete with sample video control programs in assembly language. Of course, all packages contain serial and parallel port details and programming examples as well as complete coverage of the processor, clock, I/O, and disk controller (information that is not even available in KayPro's own Dealer Service Manual).

KayPro Schematic Packages

KayPro II & 4 (pre-84)	$20
KayPro 10 (pre-84)	$20
KayPro 84 series (II, 4 & 10)	$20

All prices include postage.



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UPGRADES

Schematic Packages
Finally, a complete schematic for your portable Kaypro, logically laid out on a single 24" by 36" sheet, plus a very complete illustrated Theory of Operation that's keyed to the schematic. You'll get detail information on your processor board that's available nowhere else.
For instance, those of you with the 10 and new 84 systems get a thorough rundown on your video section complete with sample video control programs in assembly language and Pascal. Of course, all packages contain serial and parallel port details and programming examples as well as complete coverage of the processor, clock, I/O, and disk controller (information that is not even available in Kaypro's own Dealer Service Manual).

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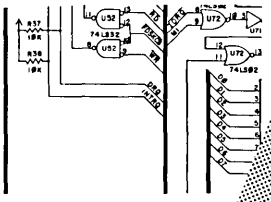


ROM'S from Micro Cornucopia

Pro-8 Version 2 for Kaypro 4

NEW!!

Guess what we've just upgraded. The venerable Pro-8 now has a version 2 and it's really neat! The new features include:

1. Screen dump with selectable dump character.
2. Select slow or fast step rate for each drive.
3. ROM that automatically figures out what type of drive you are using.
4. No more delays when using both single and double sided disks.
5. And, it's still only $49.95 for ROM, disk, and manual!

Of course, you get all the original Pro-8 features such as: user selectable cursor (blinking or not), ignores nulls, and your choice of 1-4 drives of the 191K, 390K, and 784K variety. (Use of 3 or 4 drives requires drive decoder.)

Installation requires no cuts or jumpers. The ROM simply plugs into a Kaypro 4-83 (or II-83 with a Kaypro 4 processor board). If you have a Kaypro II with the original II processor board then you must do the II to 4 upgrade. See issue # 21 for details. Your Kaypro II has the original II board if the monitor ROM (a 20-pin chip with paper stuck to its top) is marked with 81-149. The 4 ROM is marked 81-232.

If you already have a Pro-8, you can upgrade to version 2 for half price. Call or write for details.

Pro-884 Monitor

NEW!!

The long-awaited PRO-8 ROM for the Kaypro 2-84 and 4-84s is ready! You have not saved your nickels and dimes in vain!

The PRO-884 ROM does everything your old Kaypro ROM does, plus it:

1. Gives you 784k bytes of storage per disk (with quad-density 80-track, double-sided drives).
2. Uses any combination of Kaypro II, IV, or quad-density drives.
3. Includes software to let you format and copy II, IV, or quad-density disks.
4. Comes with complete printed instructions on ROM installation and tips on installing quad-density drives.
5. Runs up to four drives with the Plus-4 Decoder Board.

Installation of ROM takes just five minutes and requires no cuts or jumpers.

Pro-884 Max Monitor

NEW!!

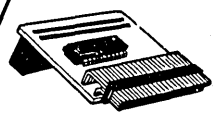
The ROM that does everything but wash the dishes is here! There's so much stuff in this ROM, even we didn't think it would fit!

The PRO-884-MAX ROM does everything the PRO-884 does, PLUS IT:

1. Emulates a DEC VT-52 or Heath H-19 video terminal (both the display and keyboard).
2. Does FASTER screen output.
3. Has ZCPR1 in ROM, eliminating the need for a system disk in drive A: during a warm boot.
4. Dumps the screen to your printer at the touch of a single (user definable) key.
5. Sends characters going to the screen to your printer regardless of the program you are running.
6. Displays the time on the Kaypro's status line (Kaypro 4-84s only). Because of battery backup, the time does not have to be re-entered each time you power up.
7. Inserts the time and date into text while you are running your favorite text editor (4-84 only).

Prices:

Pro-8 Version 2 Pkg. **49.95**
Pro-884 Pkg. **59.95**
Pro-884 Max Pkg. **79.95**



PLUS-4 Decoder Board

With this nifty little plug-in board, your Pro-8 ROM can access up to four 5¼" drives. You just plug a four-drive 34-pin cable into this board and you can add up to two additional drives.

Now you can run any mix of 191K, 390K, and 784K drives as drives A, B, C, and D. You can run your original drives as A and B then add 380K or 784K drives outboard as C and D. You can even run four half-wides inside your original Kaypro!

The Plus-4 Decorder Board for only $39.95

Watch for 4-84 and 10-84 compatible ROMs coming soon.

SPECIAL PRO-884 NOTE:

The Pro-884s are sensitive to the version of CP/M you are running.

1. Neither the Pro-884 nor the Pro-884 Max will run on CP/M 2.2U. However, if you can locate a CP/M 2.2F or 2.2G system disk (your dealer should have a copy) you should be able to run our 884 monitors. (Don't try to boot F or G before you change monitors.)

2. There are two distinct versions of CP/M 2.2G. Only the Pro-884 Max is sensitive to the version of 2.2G you have - it's the ZCPR in ROM that's the problem. (If you have CP/M 2.2F then you have a Normal CP/M.) So, before ordering the Max, boot up your original system disk and read the sign-on. If it's CP/M 2.2G then we need to know whether it is the high (normal) version or the low (minus) version.

To determine your G version (you'll become a G Whiz!):

```
A DDT cr
L5 cr
(ddt's response)
```

The first line of the response will be a JMP D600 or a JMP D800. The JMP D600 means that you have a low (minus) version, and the JMP D800 means that it's a normal version. When you order your Pro-884 Max, be sure to specify whether you want the normal Max or the minus Max. Otherwise, we'll just guess that you need the normal Max.

Graphics in Turbo Pascal (For Any System)

By D. Griffith

1567 Tibbits Ave.
Troy NY 12180
(518) 274-5671

Have you ever wanted to write your own graphic routines? With Turbo, it's easy.

We'll use two simple primitives in each graphic routine to display asterisks or blanks at specified locations as shown in the figure below.

```
Procedure On(x,y: Integer);
Begin
   GotoXY(x,y);
   Write('*',^H);
   screen[y,x]:=True;
End;

Procedure Off(y,x: Integer);
Begin
   GotoXY(x,y);
   Write(' ',^H);
   screen[y,x]:=False;
End;
```

Basics In Turbo Pascal

Three variables (x,y, and screen) will be global (please don't yell at me, Mr. Wirth) to all of the routines. Put them at the beginning of your program.

```
Const
   miny=1; maxy=24;
   minx=1; maxx=79;
Var
   y,x: Integer;
   screen:
   Array[miny..maxy,minx..maxx]
   of Boolean;
```

Animation

By combining our primitives with two little procedures (Box and Cls, which use our primitives), we can create and move a "snake" about the screen. See Figure 1.

Box draws a border (it assumes that the second point passed to it — y2,x2 — represents the lower right corner of the box). If y2 is less than y1, or x2 is less than x1, it'll draw a dot instead of a box. Also, if x2 is greater than x1, but y2 is not greater than y1, it'll draw a horizontal line. If y2 is greater than y1, but x2 is not greater than x1, it'll draw a vertical line.

So one procedure does one of three things depending on the parameters it receives.

Directions are generated randomly until either y or x isn't equal to zero. In Turbo, the random number generator returns a non-negative integer less

Figure 1 - T Graphics

```
{  Program Drawsnake --
   Draw border,
   Animate "snake."  }

Const
   miny=1; maxy=24;
   minx=1; maxx=79;
   length_of_snake=75;

Var
   y,x: Integer;
   screen: Array[miny..maxy,minx..maxx] of Boolean;
   snakey,snakex: Array[0..length_of_snake] of Integer;
   head, tail, dy, dx, count: Integer;
  i,j: Integer;

Procedure On(y,x: Integer);
Begin
   GotoXY(x,y);
   Write('*',^H);
   screen[y,x]:=True;
End;

Procedure Off(y,x: Integer);
Begin
   GotoXY(x,y);
   Write(' ',^H);
   screen[y,x]:=False;
End;

Procedure Cls;
Var
   i,j: Integer;
Begin
   For i:=miny to maxy Do
      For j:=minx to maxx Do
         Off(i,j);
End;

Procedure Box(y1,x1,y2,x2: Integer);
Var
   i: Integer;
Begin
   For i:=y1 to y2 Do Begin
      On(i,x1);
      On(i,x2);
   End;
   For i:=x1 to x2 Do Begin
      On(y1,i);
      On(y2,i);
   End;
End;

Begin

   ClrScr;                          { Clear the screen. }
   Box(miny,minx,maxy,maxx);        { This draws the screen border. }

   For i:=0 to length_of_snake Do Begin      { Initialize snake. }
      snakey[i]:=(maxy+miny) div 2;
      snakex[i]:=(maxx+minx) div 2;
   End;
   head:=length_of_snake;
   tail:=(head+1) Mod length_of_snake;
   count:=0;
   Repeat
      dy:=Random(3)-1;
      dx:=Random(3)-1;
   Until (dy<>0) or (dx<>0);

   Repeat

{ Draw snake. }
      On(snakey[head],snakex[head]);
      Off(snakey[tail],snakex[tail]);

{ Update pointers. }
      tail:=(tail+1) Mod length_of_snake;
      i:=(head+1) Mod length_of_snake;

{ Move snake. }
      While ((screen[snakey[head]+dy,snakex[head]+dx])
         or (Random<0.01)) and (count<20) Do Begin
         dy:=Random(3)-1;
         dx:=Random(3)-1;
         count:=count+1;
      End;
   { If snake is stuck, count will be greater than 19.
     and we will move its head. }
      If count>19 Then Begin
         snakey[i]:=Random(maxy-miny-1)+1+miny;
         snakex[i]:=Random(maxx-minx-1)+1+minx;
      End
      Else Begin
         snakey[i]:=snakey[head]+dy;
         snakex[i]:=snakex[head]+dx;
      End;

      head:=i;
      count:=0;

      For i:=1 to 75 Do;               { This slows things down. }

   Until KeyPressed;

End.
```

than the value passed it. So in the first loop, the number generated will be 0, 1, or 2. Subtracting 1, we get -1, 0, or 1 which we can use for direction. If you use the random number generator without a value, it returns a fraction between 0 and 1.

The MOD operator returns the remainder of a division. We can use it to keep the head and tail pointers within the snake coordinate arrays. When a pointer reaches the end of the array (it's then equal to the length of the snake), the MOD operator makes it zero, the start of the array.

Lines

Lines are pretty straightforward. We'll pass LineOn (see Figure 2) two points, which we want connected by a line. To connect the points, LineOn calculates the slope between the points and turns on the block.

Setting Graphic Characters

Many computers have graphic characters which can be set by primitives. Let's change our On and Off primitives and redefine our screen size to work on 84 Kaypros (Figure 3). Other systems will probably have different primitives.

The screen array will now use a lot more memory than before. The 24x79 screen used less than 2000 bytes of memory. The 100x160 screen, however, will use 16000 bytes, so it might be costly in a big program.

We can save memory, though, by giving up a little speed. In the process, we'll be making it harder to tell if a dot is On or Off, so let's make it easier with Pix. Its boolean returns True if a dot is On and False if a dot is Off. See example in the figure below.

```
Function Pix(y,x: Integer): Boolean;
Begin
   Pix:=screen[y,x];
End;
```

The CLS procedure (it clears the graphics screen) will be slower now as well, so let's speed things up a bit with the Pascal procedure FillChar, which fills a block of memory with a specified value. Since our graphics screen is 16000 bytes we can clear it with FillChar(screen,16000,False).

Circles

After looking high and low for years for a fast, round circle drawing routine, I settled on the one in Figure 4.

We're passing the coordinates for the center of the circle and a point on the radius to the procedure. The procedure draws eight dots at symmetrical points along the circle and then increments x.

Here's the heart of the routine. If the distance from the center with new x is farther than it would be with a smaller y, we decrement y. So we keep moving out in the x direction until we're outside the circle. Then we move

(continued next page)

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- External Libraries
- Full Memory
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System requirements: IBM PC/XT, AT, or PC with hard disk; MS or PC DOS version 2.0 or later. 512K, minimum internal memory. Printers: IBM Matrix or Graphics; Epson MX, RX, or FX 80 or 100; Okidata 92 or 93 (with Plug'n Play).

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(continued from page 81)

Figure 2 - Procedure LineOn

```
Procedure LineOn(y1,x1,y2,x2: Integer);
Var
   ty1,tx1,ty2,tx2: Real;
   dist,dy,dx: Real;
Begin
   ty1:=y1; tx1:=x1; ty2:=y2; tx2:=x2;
   dist:=Sqrt(Sqr(y2-y1)+Sqr(x2-x1));          { Compute distance. }
   If dist>0 Then Begin
      dy:=(y2-y1)/dist; dx:=(x2-x1)/dist;      { Calculate slopes. }
   End Else Begin
      dy:=0; dx:=0;                            { Calculate slopes. }
   End;
   On(y1,x1);                                  { Draw first point. }
   Repeat
      ty1:=ty1+dy; tx1:=tx1+dx;                { Add slopes.       }
      On(Round(ty1),Round(tx1));               { Draw next point.  }
   Until (Abs(ty2-ty1)<0.5) and (Abs(tx2-tx1)<0.5);
End;                                           { Loop until there. }
```

Figure 3 - Procedures On and Off

```
Const
   miny=0; maxy=99;
   minx=0; maxx=159;

Procedure On(y,x: Integer);
Begin
   screen[y,x]:=True;
   Write(Chr(27),'*',Chr(32+y),Chr(32+x));
End;

Procedure Off(y,x: Integer);
Begin
   screen[y,x]:=False;
   Write(Chr(27),' ',Chr(32+y),Chr(32+x));
End;
```

in (in the y direction) which brings us back inside the circle. We keep going until our values pass each other.

Since we're always drawing symmetrically, we're calculating about 1/8 as often as some circle routines. If you try this with our new primitives, you'll get a fairly round circle. If you use the old ones, expect very tall, narrow ones. Explanation — on the graphics screen, the x and y distances aren't the same.

You get a rounder circle if you multiply the x coordinates by 10/3.

Figure 4 - Procedure Circle

```
Procedure Circle(cy,cx,y1,x1: Integer);
Var
   r: Real;
   y,x: Integer;
Begin
   r:=Sqr(cy-y1)+Sqr(cx-x1);
   x:=0; y:=Round(Sqrt(r));
   Repeat
      On(cy+y,cx+x); On(cy-y,cx+x);
      On(cy+y,cx-x); On(cy-y,cx-x);
      On(cy+x,cx+y); On(cy-x,cx+y);
      On(cy+x,cx-y); On(cy-x,cx-y);
      x:=x+1;
      If Abs(Sqr(x)+Sqr(y)-r)>Abs(Sqr(x)+Sqr(y-1)-r) Then y:=y-1;
   Until y<x;
End;
```

Filling In

We can use our screen arrays to check the status (on or off) at any set of coordinates.

Let's suppose we're playing a game, and we need to know whether a "ball" hits a "wall." We just check the screen array at those coordinates. If the block is On, we know it's occupied by a wall.

Or if we want to fill a screen, we start at some point and look around it. If the surrounding points aren't On, we turn them On and store them for later use. If they are On (filled), we've hit a "wall." See Figure 5.

Saving Memory

We can save some memory by altering four primitives.

Turbo compiles Boolean (True/False) variables to occupy one byte of memory. Since they're only going to be true or false, we could actually make do with one bit.

But there's a problem — it's easier to find a byte of memory than a particular bit. So, we'll use part of a byte to store the status of two points. (One byte can hold the status of up to 8 points.)

Figure 6 has the new primitives.

Try substituting these primitives into the sample programs. They generally run a little slower, but it's not always noticeable, and you'll save a lot of memory.

■ ■ ■

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Figure 5 - Procedure Fill

```
Procedure Fill(starty,startx: Integer);
Const
   maxsp=511;
Var
   top,bot,x,y: Integer;
   stack : Array [0..maxsp] Of Integer;
Begin
   top:=2; bot:=0;                          { Initialize the stack. }
   stack[0]:=startx;
   stack[1]:=starty;
   while (top<>bot) Do Begin
      x:=stack[bot];
      y:=stack[Succ(bot)];
      bot:=(bot+2) And maxsp;
      If (x>minx) Then If Not Pix(y,Pred(x)) Then Begin
         stack[top]:=Pred(x);
         stack[Succ(top)]:=y;
         On(y,Pred(x));
         top:=(top+2) And maxsp;
      End;
      If (x<maxx) Then If Not Pix(y,Succ(x)) Then Begin
         stack[top]:=Succ(x);
         stack[Succ(top)]:=y;
         On(y,Succ(x));
         top:=(top+2) And maxsp;
      End;
      If (y>miny) Then If Not Pix(Pred(y),x) Then Begin
         stack[top]:=x;
         stack[Succ(top)]:=Pred(y);
         On(Pred(y),x);
         top:=(top+2) And maxsp;
      End;
      If (y<maxy) Then If Not Pix(Succ(y),x) Then Begin
         stack[top]:=x;
         stack[Succ(top)]:=Succ(y);
         On(Succ(y),x);
         top:=(top+2) And maxsp;
      End;
   End;
End;
```

Figure 6 - Four Turbo Graphic Procedures

```
Var
   screen: Array[0..49,minx..maxx] of Byte;

Procedure On(y,x: Integer);
Begin
   If (y in [miny..maxy]) and (x in [minx..maxx]) Then Begin
      screen[y div 2,x]:=screen[y div 2,x] Or Succ(y Mod 2);
      Write(Chr(27),'*',Chr(32+y),Chr(32+x));
   End;
End;

Procedure Off(y,x: Integer);
Begin
   If (y in [miny..maxy]) and (x in [minx..maxx]) Then Begin
      screen[y div 2,x]:=screen[y div 2,x] And Not Succ(y Mod 2);
      Write(Chr(27),' ',Chr(32+y),Chr(32+x));
   End;
End;

Function Pix(y,x: Integer): Boolean;
Begin
   If (screen[y div 2,x] And Succ(y Mod 2))>0
   Then Pix:=True
   Else Pix:=False;
End;

Procedure Cls;
Begin
   FillChar(screen,8000,0);
End;
```


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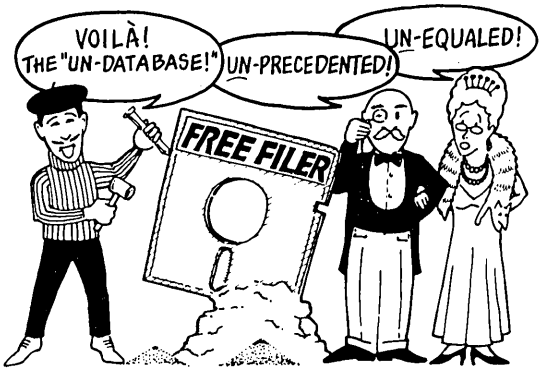

Database programs make you organize information into a form. That's fine for an address list where every entry contains the same old boring things. But how do you "database" your free-form text files, like novels, business letters, screenplays, annotated bibliographies, personal correspondence or client case histories? With a database program you're just plain out of luck!

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On Your Own

By Hampton Miller

PO Box 816
Carpenteria CA 93103

Two things can throw a monkey wrench into a computer consultant's economic plans: yearly cycles and a recession economy. This double whammy goes something like this: businesses frequently plan on closing down the last few weeks of the year. With this in mind, they are not looking to gear up for important work in the last quarter. Add to this a recession and there is no way a company will put out real money to bring in a hot-shot consultant for the short term. Since you probably can't change this situation, you must anticipate and plan for it. Let's take a look at what I've done to prepare for the bad times, and maybe it can help you.

Building A Nest Egg

I had been charging a reasonable fee for my services before trouble hit me in the last quarter of 1984, so I had a sizable nest egg built up. (Being on you own requires that you have this kind of fiscal maturity. Otherwise, if you blow your income as fast as you make it during the good times, you won't be ready for the bad times which most assuredly are ahead.)

A "reasonable fee" is determined by what the market will bear, but make sure it will cover all your overhead expenses plus provide enough for several months of bad times. Since I work through a broker, I let her tell me what a reasonable fee is for a particular job and location. She has a lot more experience in this area and has a vested interest in getting me a job at a good fee. After all, she gets paid 30% of what I do. So if the fee is too low, then she loses a little money, but if it is unrealistically high, then I lose the placement and she loses a buncha bucks.

During the good times, remember to amass enough funds to see you through the bad times. View this money as a potential low-interest loan to yourself, and never "borrow" against it unnecessarily. Save it up for that rainy day.

It's To Your Credit

After my business had been going like a house afire for six months, I had my accountant produce a profit and loss statement. With this in hand, and my nest egg in a money-market account, I went to my savings and loan and established a nice, fat line of credit. (This is in addition to my two Visas and one Mastercard, each with a several thousand dollar credit limit.) Financial institutions are funny that way. They just love to extend credit to people who don't need it!

When I went in to apply for the line of credit, the branch manager was extremely helpful and showered me with goodies like free checking, free travelers checks, free safe deposit box, etc. We had become instant friends! And why not? That's what they're in business to do. You just have to plan ahead to take advantage of it. "Actual mileage may vary," but good deals are available with higher-than-passbook interest for your nest egg.

It may or may not have been the best deal, but I had secured this credit at the peak of the good times instead of waiting for the bad times to hit and having to beg for a loan. But remember, because of the high interest rate you pay for this "cushion," it is to be used only after your nest egg is exhausted or severely threatened.

But what if you find you're unable to build that nest egg quite yet, and you don't like the idea of strapping on a heavy load of crippling debt? How are you going to make those rent/mortgage payments?

Keeping The House

A part-time job can be a two-edged sword. Sure, it can get you over some of the rough spots, but it may also tie you down so you're unable to jump at some other larger opportunity. You'll have to weigh the benefits. Also, part-time work which suits your needs can be hard to find.

I have been teaching computer science part-time at the University of California for over a year. I teach one course per quarter, two days a week. I like the monthly checks, but having to be on campus two days a week severely limits my ability to rocket off to some exotic place for great huge piles of money. Fantastic deals frequently come in month-sized chunks, but having to commute long distances could quickly eat up any benefit.

On the other hand, a college or university can provide you with valuable resources which may not be available any other way. Sophisticated computing equipment and an international telecommunications network are two such resources. And where else can you find eager young minds

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just hanging on your every word? I have found it very rewarding and exciting to share in the adventure of learning with my students. And what better way to keep yourself up on things than by researching, teaching, and getting paid for it?

I teach 9 months and get the summer off. Every month I get a check for one-twelfth of my total pay. The first time I teach a course, I have to spend about four hours preparing for each hour of class, but after that, it's much less demanding. I bought a Macintosh just to prepare the illustrations, quizzes, and exams for class. (Love them graphics!)

So, while teaching may not pay as well as consulting, it certainly beats not working at all, and has many valuable fringe benefits. It might even enable you to keep your house in the bad times.

I Oughta Write A Book

Another part of my "long-range plan" consists of publishing books based on my own experience and teaching research.

An excellent reference is "The Self-Publishing Manual" (ISBN: 0-915516-37-3) by Dan Poynter). Like teaching, writing demands an organized and analytical view of your work. In addition, you can require that students buy your book. (Hey, that's perfectly legitimate!) Last, but certainly not least, a book or two may bring in some bucks to get you through those bad times.

Why keep your special knowledge to yourself? Why not take the slow times, when they come, and use them to write a book? Today there are piles of introductory books in bookstores, and another one will just get lost. Instead, why not produce a book which addresses the vast number of people who have already read those low-level books and now have nothing more to help them? Why not write that book and run ads for it in Micro C? Those of us hard core types owe it to the neophyte subscribers. Where else can they turn to find the kind of information which has helped make us successful?

Conclusion

Because of circumstances beyond your control, you can expect bad times. Plan for them! Building savings, establishing emergency credit, teaching part-time, and self-publishing have all worked together to help me weather the bad times. Perhaps your own special blend of diverse methods will help you survive the bad times, on your own.

■ ■ ■

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TECHNICAL TIPS

Clearing Screen In MS-DOS

Owners of Kaypro 2s and 4s with SWP Co-Power 88 boards installed, running MS-DOS 2.11, this is for you. This is not for MS-DOS 2.11A on '84 boards.

There is a nice little command to clear the screen in MS-DOS called CLS. The bad news is that the Kaypros respond to ADM-3A commands, not ANSI commands. To defeat the curse of SWP, you need to patch the COMMAND.COM file on your MS-DOS boot diskette. The procedure is not difficult and can be done by a nonprogrammer by following the following instructions:

```
Put a diskette in A: containing
      DEBUG.COM and COMMAND.COM
A>DEBUG COMMAND.COM (cr)
RR3959(cr) 01(space) 1A(space)
    00(space) 00(space) 00(cr)
-W(cr)
-Q(cr)
 A>
```

The "-" is DEBUG's prompt. The "(space)" represents the space bar, the "(cr)" represents the RETURN key. Other characters will appear on your screen, so just key the above text as DEBUG will accept it.

You are altering 5 bytes from 04H,ESC,[,2,J to 01H,1AH,00H, 00H,00H.

Now switch your brain to CP/M mode, and I'll point you to the arrow key values when in MS-DOS. Using DDT you can change the Kaypro's arrows to match WordStar or whatever. This is accomplished by altering bytes 44A7h thru 44AAh in MSDOS.COM. The numeric pad is in this neighborhood, too! I chose to replace the original 0B, 0A, 08,0C to WordStar compatible 05, 18, 08, 04. Here again, this is for the MS-DOS 2.11, not 2.11A. Good luck.

Terrance Benjey
Route 1 Box 497-B
Wilmington NC 28405

CBIOS Fixes

I've found two errors relating to my extended single density CBIOS as published in Micro C. The first bug relates to the handling of disk errors. When a disk error occurs, it is not reported back to the BDOS. The following change should be made to the CBIOS:

```
Change:

DOREP:    CALL     REPORT
          RET      NZ
RW4:      LD       A,(HSTTRK)

To:

DOREP:    CALL     REPORT
          JR       Z,RW4
          LD       (ERFLAG) ,A
          RET
RW4:      LD       (HSTTRK)
```

The second bug affects any CBIOS which uses the CP/M blocking/deblocking routines. The bug occurs when files are updated without expanding the size of the file. The last block updated will not be written to the disk. This bug will typically occur with editors that do not create backup files (e.g. Nevada Edit). To fix this bug, you must patch CPM60.COM and then go through the SYSGEN procedure to incorporate the new BDOS on the system tracks. The patches necessary are shown below:

```
A>ddt cpm60.com
DDT VERS 2.2
NEXT PC
2300 0100
-a1c52
1C52 nop
1C53 nop
1C54 lxi h,0
1C57
-g0
A>save 34 cpm60.com
```

Larry J. Blunk
2972 Briarcliff
Ann Arbor MI 48105

Battery Supply Solutions

The Kaypro emergency power supply described in "Alternative Power Supply For The Kaypro," issue #24, page 42, is not suitable for the use intended.

The -12 and the +12 volt regulators will not regulate because the lead-acid cell batteries will not afford sufficient source voltage even when the batteries are at full charge.

The positive 3 terminal regulators typically have a dropout voltage of 2.0 to 2.5 (78H12A, 12V-5A) so the source voltage must be a minimum of 12 + 2.0 = 14V at a 5A load.

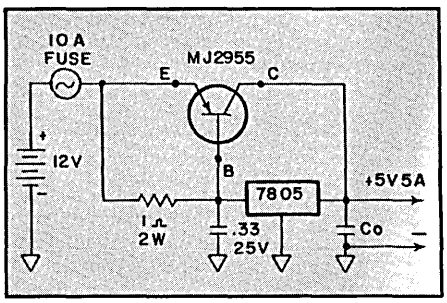
Negative 3 terminal regulators (7912, 12V-1.5A for example) have a dropout voltage of 1.1 volts at 1A, so a source voltage of 12 + 1.1 = 13.1 minimum is required.

A lead-acid cell for auto service will have a cell voltage that is closely given by S.G. + .84 volts, where S.G. (specific gravity) is 1.260 in auto service, and this gives 2.1 volts/cell at full charge. A 6 cell battery ('12' volt) is thus 12.6 volts at full charge. This is not sufficient for either a positive or negative 3 terminal regulator at any load. The cell will have a voltage of 1.75 at full discharge or 10.5 volts for a 6 cell battery.

The 11 volt output reported by Mr. Torney for his +12 regulator indicates that it is not regulating, since 3 terminal regulators typically will have a combined line and load regulation of 50 mV.

There is no point in regulating the + or - 12 battery supplied voltage in any event. IC devices requiring 12 volt supply voltage specify 12V +or- 10% or a range of 10.8 to 13.2, and the 12 volt battery will furnish this from full charge to near full discharge state. Regulation to 12 volts is not possible and not needed.

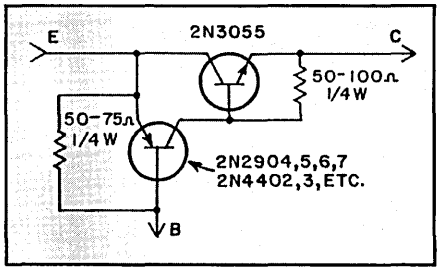
Regulation of the +5V supply can be done at less cost by using an ordinary 1.5 amp 3-terminal regulator such as the 7805, LM309, LM340-5 together with an inexpensive 15A PNP "wraparound" current booster arrangement for the 5V - 5A supply. A practical circuit is attached.



Missing from Mr. Torney's account is any mention of fuse protection. Storage batteries are capable of furnishing very large currents, and sup-

TECHNICAL TIPS

ply leads should be fused at or near the battery terminals.



If you have 2N3055 NPN on hand, make PNP equivalent. Use in lieu of MJ2955.

E. A. Wingfield
26 Belmont Dr.
Little Rock AR 72204

Fixing Hardware Glitches

I have had a couple of hardware problems. The first was after I changed to 5MHz. My machine did unwanted cold boots after it had been running a while. The answer was to add a heatsink to the Z80B. I took a 2 inch square of aluminum sheet, bent it up at two of the edges, and superglued it to the top of the chip. I used some silicone heatsink compound to aid conduction of heat and some clear tape around chip and metal in case the superglue came unstuck (I hate to think of a large bit of metal clunking around inside the box.) See the accompanying photo.

The second problem was a failure of the printer interface. Suddenly my printer would go wild, repeatedly printing the same character until switched off. If switched back on, the problem was still there, and only a hardware reset of the Kaypro would help. The character was always the last character that had been sent to the printer. I discovered that the printer strobe line was floating, and a cold solder joint was to blame. I'm really glad I bought that schematic last year, or my printer interface wouldn't be working today!

Dr. Michael W. D. Liddle
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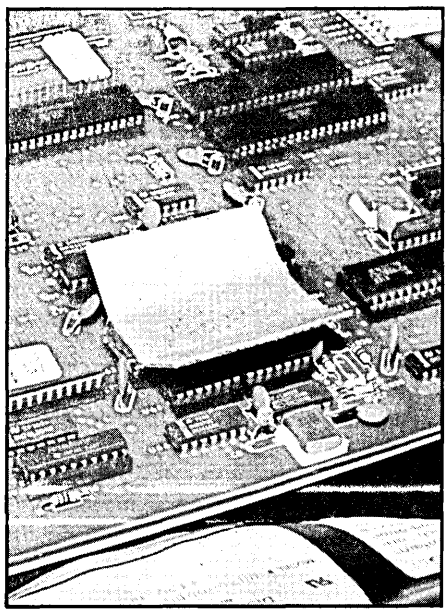
Adapting A Parallel Printer

If someone gives you a parallel printer with a built-in auto line feed, don't throw it away. Instead, build yourself a little black box to eliminate the unwanted extra signal.

This particular printer is a Wang 2221W. It is a heavy duty, 150 cps dedicated dot matrix printer. Wang BASIC was used to control the line feed, but I don't use Wang BASIC. The solution to the problem is applicable to any parallel machine. I used a perforated board to mount a 2716 EPROM, a 74LS244, and a single pole, double throw switch.

Program the EPROM so that the address equals ASCII (i.e. address 41H contains the value 41H, address 42H contains 42H ...). The only exception to this is that address OA (line feed) should contain a 00H (null). This will filter out the unwanted line feed. The printer is programmed to insert a line feed when it senses a Carriage Return. This gives you the desired single spaced format instead of the double format. You can either build an external 5 volt supply, or tap into the printer for the power requirements. The 74LS244 allows you to bypass the 2716 EPROM if you want. This is good for printing double-spaced draft copies.



Aluminum Heatsink

IN				*OUT*
36-pin female		*2716 EPROM*	*74LS244*	*36-pin male*
#2	A0	8	11	
#3	A1	7	13	
#4	A2	6	15	
#5	A3	5	17	
#6	A4	4	8	
#7	A5	3	6	
#8	A6	2	4	
#9	A7	1	2	
		9	9	#2 D0
		10	7	#3 D1
		11	5	#4 D2
		13	3	#5 D3
		14	12	#6 D4
		15	14	#7 D5
		16	16	#8 D6
		17	18	#9 D7

2716 EPROM	*74LS244*
21 +5V	20 +5V
24 +5V	10 GND
12 GND	
19 GND	
22 GND	
23 GND	

18,22 Switch 1,19 Switch

A single throw double pole switch is used to enable the EPROM and disable the LS244 or V.S. Use the LS244 only if you wish to retain the auto line feed.

Wire the switch as follows:

1. Pins 18 and 22 of the EPROM go to one pole of the switch.
2. Pins 1 and 19 of the LS244 go to the other pole.
3. Center pole of the switch goes to ground.
4. Use a 1K pullup resistor from pins 18 and 20 of the EPROM to +5V.
5. Use a 1K pullup resistor from pins 1 and 19 of the LS244 to +5V.

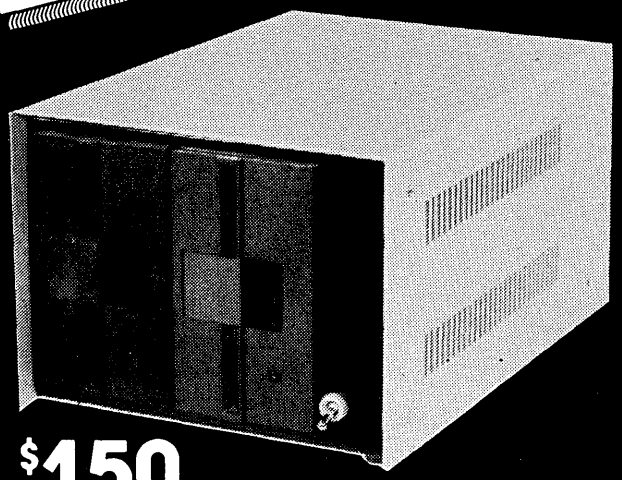
All other cable pins are wired straight through, i.e., female #1 to male #1, female #10 to male #10, etc.

Use your monitor (or DDT) to write the EPROM program in memory, starting at 100H. Use CP/M's SAVE command (I named it ASCII.OBJ) to store it on disk. You can burn an EPROM directly from ASCII.OBJ.

Anthony J. Gasbarre
Box 70
Sullivan NH 03445

■ ■ ■

NEW AMPRO "Little Board" MAIN/FRAME



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- Fan & Dust Filter
- Hefty +5 & +12 Regulated Supply Runs Floppy Drives & Computer Boards
- Accepts 5¼ Drives, Full or Half
- 2 ea DB25, 1 ea Centronics Connector Cutouts
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- Power Harness From Supply to Drives & Board
- Line Fuse, EMI Filter, Detachable Line Cord
- I/O & Drive Data Cables Available Separately
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AMPRO & Little Board are TM AMPRO computers.

$150 (1 Piece) *

2800 5¼ Drive & Little Board Enclosure (includes power supply & fan)

* Call for quantity pricing.

(Disk Drives and Little Board not included)

Write or call for our brochure which includes our application note. "Making micros, better than any ol' box computer."

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DRIVE ENCLOSURES

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WINCHESTER 5" & 8"

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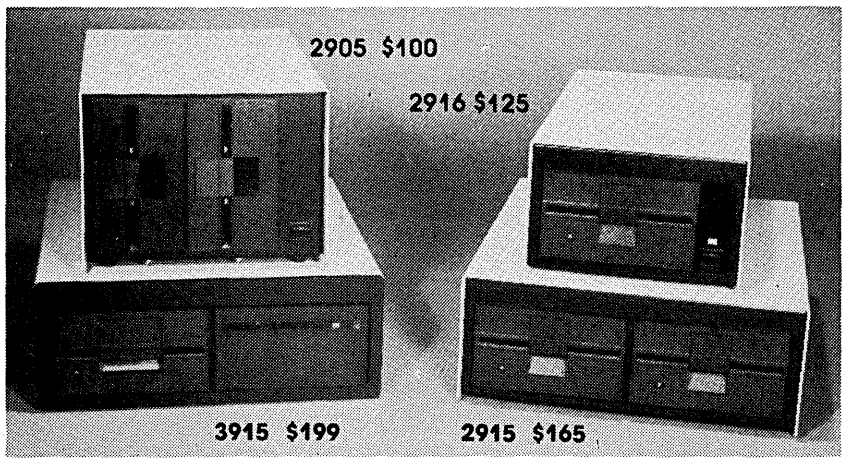

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- Heavy Duty All Metal Cabinet
- Fan & Dust Filter*
- Hefty Power Supplies
- Full or Slim Drives
- Power Harness From Supply To Drives
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- Cabinets & Supplies Available Separately

* = Most Models (Disk drives not included)

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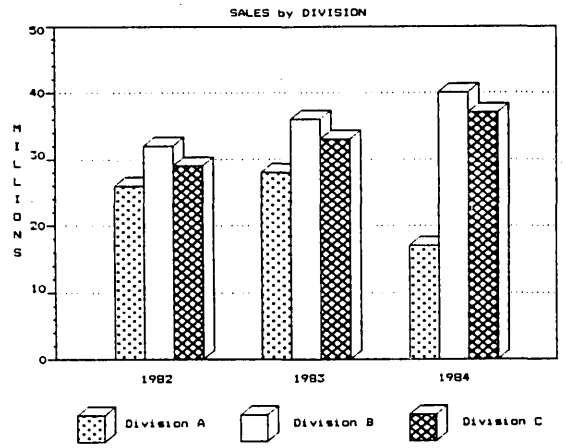
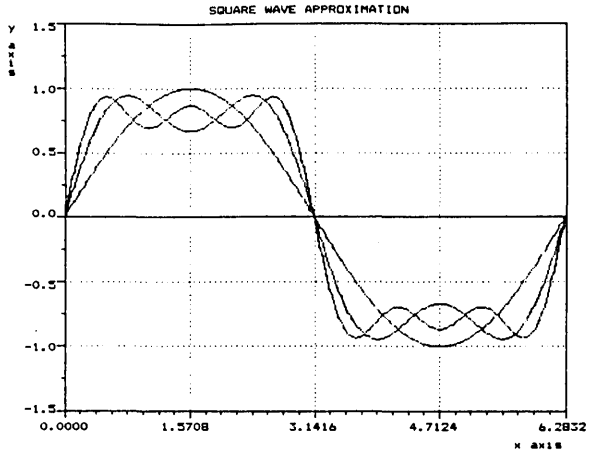
32 Page Free Fakt Pakt Catalog

Introducing GRAF 3.0

$49.95 CP/M-80 **$69.95** MS-DOS / PC-DOS

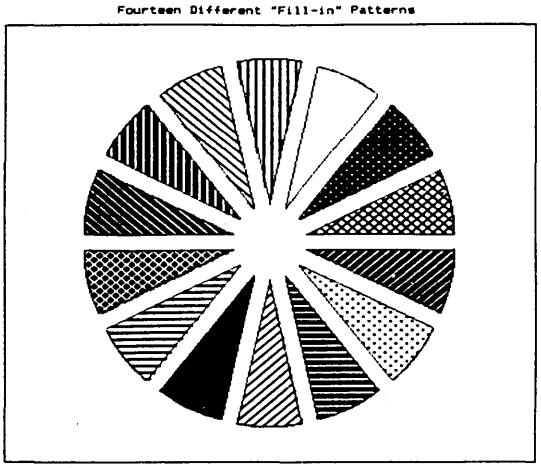
the complete **BUSINESS** and **SCIENTIFIC** printer graphics program





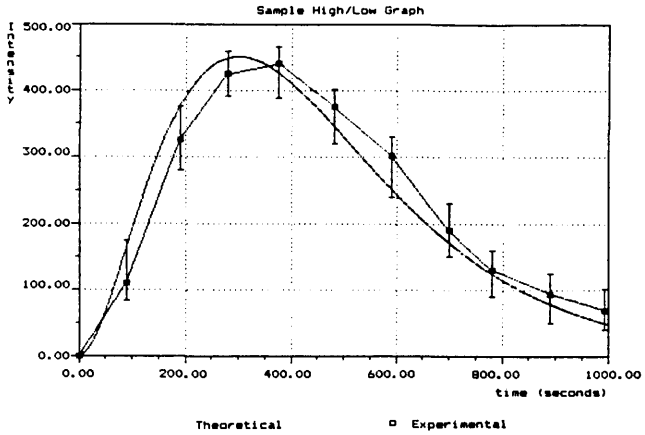
BUSINESS APPLICATIONS

* display floating point data directly from spreadsheets, data bases, and word processors (or the keyboard) in a wide variety of bar, pie, line, and scatter plots
* plot and group up to 6 different variables on a single graph, distinguished by up to 14 different "fill-in" patterns and 8 different point-plotting symbols
* menu driven operation supporting automatic graph scaling, labeling, and legend creation
* program default values may be set once and for all



SCIENTIFIC APPLICATIONS

* simple interface allows plotting floating-point data obtained from all popular programming languages
* plot any number of curves (e.g. experimental data vs. theoretical values) on the same graph, choosing from 8 different plotting symbols.
* automatically created legends distinquish variables
* add up to 5 different-density grid lines, and choose from a wide variety of numerical labeling options
* high/low graphs are supported directly



TERMS: We ship via first class mail. The above prices include $5.00 for s/h. (Orders outside USA require additional $5.00 for postage. NJ residents add 6% tax.) When ordering you MUST state your computer and printer make and model. We support MS-DOS (PC-DOS) version 2.0 or later on computers with at least 192k RAM, and CP/M-80 version 2.2 or later on Z80 computers (other than Apple) supporting a TPA of at least 54k (requires 64k of RAM). Most soft-sector disk formats are available. (If you can read several formats, please send us a list.) GRAF 3.0 works with any printer fully compatible with one of the following: Epson FX, RX, LX, MX (with GRAFTRAX), or LQ-1500; C. Itoh Prowriter; NEC 8023A, Star Micronics Gemini 10X, 15X, SG-10, SG-15, IBM Graphics Printer, Okidata 192, and earlier Okidata models equipped with the "IBM Plug 'n' Play" chips. (If you have an Okidata printer, other than the 192, the Plug 'n' Play chips are required!)

GRAF 2.0 Update Policy: Returning your original GRAF 2.0 disk to MSC entitles you to $20.00 off the above prices.

MSC Microcomputer Systems Consultants

301 North Harrison Street CN5279, Suite 228 Princeton, New Jersey 08540

CP/M - DRI MS-DOS - MicroSoft

(continued from page 1)

and what's not so great in the CP/M world.

Now we get to start over. It's kinda fun in a way.

Intel?

Intel? MS-DOS? What we get with this combination is an old, convoluted architecture (the famous 64K segments) and the most common chip in this arena is the 8088 (slow). Plus, IBM doesn't give me any warm fuzzies. (Actually, I haven't gotten so much as a stuffed rat.)

However, there are a lot of machines, a lot of software, and not a lot of technical information in this arena. Look at PC Tech Journal. It's filling its pages with how to select and use applications programs. Interesting, I suppose, but not technical.

The 80386, Intel's upcoming 32-bit processor, is supposed to maintain compatibility with the rest of the 86s, but is also supposed to let you make the segments any size you want. So, theoretically you could set it up for one segment the size of your memory and then unsegment your code completely. (Of course, then you couldn't run your unsegmented program on any previous Intel processors.)

Motorola?

Motorola? OS-9? CPM68K? UCSD-P? UNIX? The plethora of incompatible operating systems hasn't helped the 68000. The fact that none of these operating systems deals with graphics or sound (UNIX may be huge, but it hasn't said a mumblin' word) has also hurt. However, the 68000 was designed to use large memories. You get real linear address space (without playing games), so this processor is much easier to program than the XXX86. (Or is it the #%!&86?)

The 68000 is not a static design. The 68010 has some really zingy instructions (including a very fast loop on previous instruction that makes just about anything run like an LDIR). And, I've heard they've borrowed some good ideas from the 32000 series...

National?

National? MS-DOS? XENIX? UNIX? Actually, the 32032 doesn't really see MS-DOS, but it can run on a PC running MS-DOS if you have Trevor's board. One interesting thing about this processor is that its instruction set is orthagonal, i.e. you can use all addressing modes with all instructions. (The number of combinations is incredible.) Also, the instructions were especially designed to make it easy to write compilers and multi-user operating systems. Wirth is using the 32016 in his next work station.

Like the 68000, however, there is no standout operating system for the 32000 chips, and there is no operating system which supports graphics or sound.

Off-The-Shelf

Maybe the best bet is to find a 68000 off-the-shelf system that supports sound, graphics, everything. If it became a standard, people would no doubt come out with hardware clones.

We could all get in early, spend the time and effort to get up to speed, and then be comfortable for a few years. The Amiga looks like such a system. Unlike the ST and the Mac, it's fast (Philippe Kahn loves his), it does super graphics in B&W and color, has super sound, supports expansion, and at $1295, is relatively cheap.

However, we don't get to build it! If the system becomes a standard (and it well could), then we might see some kits (here's the clone trip all over again) coming down the pipe.

But What A Downer!

The Big Board was state of the art when it appeared, and the only way you could own one was to build it. You really paid your dues. The Xerox 820 and Kaypro hit the market much later and even then were more expensive than building a system yourself (at least for awhile). We builders were on the front edge of the technology. (Hooray for the front edge of technology!)

Now we can build an X-16, Dean and Earl's 80186 based whizzer that is very very PC compatible, or we can build a Slicer. But with few exceptions (the DSI-32 a notable one), kits and boards are generally following the technology, not leading it. And, they aren't a significant bargain if all you want is compatibility. Compaq Deskpros sell complete for $1200 (from discounters) and they have fast 8086s. You can buy a Zenith computer ready to run for less than the equivalent Heathkit.

But does all this matter? Do we care if we're using the best selling operating system? We just want to build and modify systems, write utilities, swap software, take a handful of parts, and create life.

Of course, if we want to swap software or design products that other people can use, we have to have a standard. If we want to keep building and learning then we'll eventually have to move beyond the Z80. If we want to stop, look at what we've accomplished, smell the roses, and pick the daisies, that's OK too.

But daisies aren't the leading edge of technology. At least not any longer.

In This Issue

In the Xerox Column, Mitch Mlinar covers a very poorly understood part of the Z80. Interrupts. Interrupts are supported on the Big Boards and the 820s, and they are a really neat way to support all kinds of I/O sorts of things (like keyboards, serial ports, and parallel ports) without tying up the processor. Our fast terminal software for the Kaypro uses interrupts. A neat discussion.

In his ZCPR3 article, Richard Conn, gets right into the gnits and gnats of his fancy CCP replacement. If you have a pretty good feel for the insides of CP/M, this detailed look should give you a functional understanding of this neat environment. (I've heard that a lot of the ideas for MSDOS's later versions came from ZCPR2 and 3.)

Steve Leon talks about utilities in this issue's public domain column. He exposes some real finds for both CP/M 80 and MSDOS, programs I couldn't live (very well) without.

The Kaypro Column is devoted exclusively to Kaypro's current best seller. It's the 2000. Surprised? This snappy little package should be labled

Darth Vader's Mousetrap (you heard it here first). The keyboard draws too much power (they are recalling units for free upgrades) and it looks like all units will have 784K built in (640K usable) instead of the 256K that mine came with. As far as compatibility is concerned, it has a single 3 1/2" drive, and no slots, but it will run Flight Simulator. And if it runs that, what more could any lemming want? But dang it all, I really like the little beast.

One of the highlights of the SOG was George Morrow. Gary excerpted George's talk on the future of computing for this issue. In one sense this article is very easy, interesting reading. However, the issues he brings out are very important and very thought provoking. These are issues we'll have to deal with as this computer revolution reaches its first wall. We are the new priesthood, it's time we understood what that means. I encourage all of you who have something to add to this discussion to take keyboard in hand. Please share your thoughts.

Speaking of the SOG, it seems like everyone in-house (and out-house) mentioned the new systems demonstrated at SOG. See 86 World for the most detailed (and probably most interesting) look at some of the new systems.

Ron Miller covers an issue that is dear to my heart in his C column. That issue is software reliability vrs power. His well-documented struggles with a simple C routine (well, not so simple C routine) show dramatically how much difference there is between C and Pascal (or Modula). C gives you easy access to everything, Pascal, on the other hand, isolates (some say protects) you from the system but it catches many of the little mistakes that make programs go daisy picking. The trade-offs are obvious in his column. Thanks Ron.

Home Computers

Why are most people buying home computers? To plan the menu? To balance the checkbook? To spreadsheet the beds? To write to Aunt Martha. No.

People are buying home computers to entertain and educate the kids. (Don't get offended. I know that us technical folks use computers to entertain and educate ourselves.)

There is a lot of fun software out there, at least for the game machines like the Commodore, Apple II, Mac, and IBM. There isn't much educational software. I mean really educational software.

I'm not talking about the typing trainers (fjfjfjfjfjfjfj...), or the drillers; "What's 2 + 2? Good Ronny! 57 is very close!" I wonder about any kid who is dull enough to stick with that kind of stuff more than 5 minutes.

The best thing that computers can do is interact with users. You interact with the system when you write a program. You interact with the system when you play an adventure game. You interact with the system when you create your own graphics, or write an article.

So what we need for kids are tools they can use — spreadsheets for lemonade stands, simple text editors for homework papers, and simple languages like Logo.

Why doesn't someone create an adventure game that is fun — just pure fun? A 7-year-old wouldn't spend hours upon hours trying to solve a puzzle just so he can open the door to the safe. (A lot of adults wouldn't either.) Even the simplest Infocom games are way above these users.

What if it were easy to open the door but something strange happened as it opened? What if that something were unpredictable? Exciting? What if it were really easy for the user to create his own adventure? Or expand his current adventure?

What would the child (or adult) learn then? They'd learn that computers are magic slates for the mind. And that wouldn't be such a bad thing. (It might be cunning and sneaky but it wouldn't be bad.)

Cheap Drive Supplies

If you want a head load pad for your Tandon, Shugart, or whatever drive (the single-sided variety have a soft pad which forms the disk around the read/write head), drop a note to Allyn Franklin of Drive Masters. He called and offered them free, but I insisted he accept $1 each. (I've paid $5 each for pads and been grateful to get them.)

After six months to a year, most head load pads get hard, flat, and full of oxide particles. A bad pad can scratch the back side of a disk and is not able to shape the media around the head. Thus, bad head load pads are a major cause of BDOS errors (the worst kind).

He also sells 83mm metric screws (those hard to find jobbies you need to fasten down most half-heights) for $1 per set of eight. (Beat that!)

Send him a self-addressed stamped envelope, a note telling him the brand and model drive(s) you have, the number of pads or sets of screws you need, and $1 for each.

Allyn did an impromptu session on disk drive repair at the SOG. He's making these parts available because he's so excited about what's going on in the group. Thanks, Allyn.

Drive Masters
489 S. Robertson Blvd.
Beverly Hills CA 90211

California Digital

Allyn Franklin uses Computer Components Unlimited, Jade, and Priority One (read Priority One's fine print for drive guarantees). He has had trouble with California Digital.

Vote For Mitsubishi Drives

Rick Draganowski from Servo Systems says that the only 5 1/4" drives he uses are the Mitsubishis. According to his exhaustive tests (he didn't sound exhausted, but one never knows) these units outperform all others.

He gets his Mitsus from Memory Marketing, 714-492-7745. Tell them you heard about them in Micro C. Who knows, maybe they'll advertise. (And then again maybe they won't.)

KIPS Clipped

Those of you who have read the ads in Profiles during 1983 and 1984 should recognize the name "KIPS." I saw them at the West Coast Comput-

(continued on page 93)

Goodies From Micro Cornucopia

BB I, BB II, and XEROX 820 USERS DISKS

The following are full 8" disks of software. Each program has a .DOC (documentation) file and many come with source.

8" Users Disks $12.00 each

USERS DISK #1
1-Two fast disk copiers
2-The manual for Small C+
3-Crowe Z80 Assembler
4-Two disk formatters
5-Modem 7
6-Othello
7-Serial print routine-Port B

USERS DISK #2
1-Two single disk drive copy programs, both with source
2-Crowe Z80 Assembler source
3-New Crowe.COM file, debugged version
4-New CBIOS with parallel print driver & other extensions for CP/M 1.4 & 2.2
5-Disk mapper with source

USERS DISK #3
1-EPROM burning software for BB 1
2-Reset bit 7 (unWordStar a file)
3-Disk file CRC checker
4-New fast copy program & source
5-DU77, disk inspector/editor
6-FINDBAD, isolates bad disk sectors
7-Print fancy page headings

USERS DISK #4
1-CBIOS, custom bios for Tandon drives
2-ZCPR, dynamite CCP checks drive A for missing .COM files; improved commands
3-ZCPRBLOC, identifies CCP location

USERS DISK #5
1-CAT, disk cataloging routines
2-Modem 7 for Port A
3-Modem 7 for Port B
4-PACMAN, the arcade game
5-FAST, buffers the disk to speed up assemblies
6-NOLOCK, removes BB 1 shift lock
7-VERIFY, cleanup & verify a flaky disk
8-DUMPX, enhanced for BB 1
9-UNLOAD, create .HEX file from .COM file

USERS DISK #6
1-REZ, 8080/Z80 disassembler, TDL mnemonics
2-PRINTPRN, prints Crowe listings
3-RUNPAC, run-time utility package for 8080 assembly language programs. Has 51 functions. Includes source which assembles under ASM.

USERS DISK #7
1-CHNGPFM, PFM monitor mods
2-TERM, terminal routines let you set up BB as simple terminal, as a file receiver, or as a file sender
3-Checkbook balancing package
4-Disk Utilities - copy to memory, from memory, and dump.

USERS DISK #8
1-BDSCIO, custom BDSC I/O for BB 1 (both .h and .c)
2-YAM, Yet Another Modem program in source & COM form. Turns BB into paging intelligent terminal, complete with printer interface, baud rates to 9600.
3-ROFF, text formatter
4-SIGNS, prints large block letters

USERS DISK #9
1-ADVENTURE, expanded 550 pt version
2-Keyboard translation program
3-CBIOS, serial & parallel printer interface
4-EPROM programming package for BB II, for 2732s only

USERS DISK #10 - Lots of Disk Utilities
1-REBOOT, sets up the CP/M auto load
2-SWEEP, directory/file transer routine
3-A, Lets BB I recognize a double sided drive as one drive with 494K of usable space
4-FIX, super disk utility, does everything, much easier to use than DU77
5-Compare files routine
6-UNERA, retrieve erased files
7-FIND, check all drives on system for a file
8-MENU, menu program for CP/M
9-NEWCAT, enhanced disk catalog program
10-Single drive copy program that does track by track copies rather than file by file

USERS DISK #11 - Printer Utilities
1-Microline 92 printer routine
2-Graphics display package for MX-80 with Graftrax, very fancy
3-Epson MX80 setup for BB 1 with 59.5K CP/M
4-Epson MX8 setup for any CP/M, lets you set print modes.
5-Micro Tek print driver, Ports A & B

USERS DISK #12 - Games for BB I
1-ALIENS, a fast, exciting arcade game
2-ZCHESS, chess with a 1-6 level look ahead
3-MASTERMIND, match wits with the computer
4-BIO, Biorhythm charts complete with graphics on the BB I
5-LIFE, so fast it's real animation!
6-CRAPS, see how much you'd lose in Vegas
7-WUMPUS, a caver's delight, kill the Wumpus or be killed
8-PRESSUP, similar to Othello
9-Games, 7 games in one program, includes blackjack, maze and animal

USERS DISK #13 - General Utilities, BB 1
1-ZZSOURCE, disassembles to real Zilog mnemonics
2-EX14, superset of submit or supersub
3-MOVPATCH, lets you use MOVECPM on other copies of CP/M
4-XMON, 3K expanded BB I monitor, use in ROM or as overlay.
5-CURSOR, prompts you for cursor char you want
6-UMPIRE, very fancy RAM test
7-ZSIDFIX, display improvement for ZSID
8-PIPPAT, modify PIP so you can reset system from within PIP
9-@, Lets you use the BB as a calculator, including HEX
10-SORT, sort package written in C80.

USERS DISK #14 - BB II Software
1-PRO32, latest 2732 reader & programmer
2-SMODEM2, lets BB II talk to Hayes Smartmodem
3-GRAFDEMO, demonstrates BB II graphics (in BASIC)
4-ATTRTEST, demonstrates BB II graphics (in JRT Pascal)
5-INITSIO, initializes port B for 300 or 1200 baud
6-MENU, displays menu of .COM files, enter number to run file
7-SETCLK, sets realtime clock built into BB II
8-PRINT2, modified print which accesses BB II clock
9-BOX, draws a thin line box on screen determined by HL and BC
10-ALIENS, space invaders arcade game
11-LISTSET, printer interface, auto-enables RTS, ignores DCD.

USERS DISK #15 - Word Processing
1-EDIT, very fancy line editor similar to EX (Unix). Includes help menu, programmable key, and full manual on disk.
2-TED, simple minded line editor, easy to learn & use. Very fast.
3-TTYPE, typing training program written in BASIC
4-TINYPLAN, very simple-minded spreadsheet. Whets your appetite for a fancy one.
5-C80 Text Utilities
6-CHOP, cuts off file after N bytes
7-ENTAB, replace spaces with tabs where possible
8-MS, double or triple spaces a file to output
9-RTW, removes trailing spaces from file
10-TRUNC, truncates each line to specified length
11-WRAP, wraps at column 80, plus pretty pretty printing, page #s . . .

USERS DISK #16 - BB I Modem Software
1-RCPM27, list of U.S. bulletin boards
2-SMODEM, interfaces BB I with Hayes Smartmodem
3-PLINK66, easy to use with non-CP/M host, for port A
4-BBPAT, menu selection of BAUD rate, bits/char, parity, & stop bits
5-MODEM 7+, Modem 7 plus BBPAT, lets you talk to anything from port A

USERS DISK #17 - Small C version 2
SMALLC2, this substantially expanded version of Small C now includes for, goto, label, switch (case); external declarations; new preprocessor commands; expanded I/O includes redirection; initializers; plus 12 new expressions. The I/O and runtime libraries have been greatly expanded (including printf). Source & documentation on one full disk.

USERS DISK #18 - FORTH
IFORTH, this is Idaho FORTH which can be burned into ROM or loaded from disk. It replaces the PFM monitor & handles all the monitor functions. See issue #11 FORTH column for more info about IFORTH and this disk.

USERS DISK #19 - BB I Double Density
New BB I Monitor, BIOS, character ROM, Winchester Interface, ZCPR, and formatter from Trevor Marshall. See BB I expansion article in Issue #11.

USERS DISK #20 - Assemblers
CROWEASM: This is the Crowe assembler modified so that it runs on any CP/M system (including the BB I, BB II, Xerox . . .). Includes .COM .Z80 and .DOC files.
LASM: This assembler is similar to the ASM that comes with CP/M except that it can link files at assembly time.
PRINTPRN: Print routine for CROWEASM .PRN files.
LIBRARY: Utilities which let you combine many files into one, then you can run, type, or extrace any file within the larger system.

USERS DISK #21 - Winchester Utilities
BACKUP: Helps you back-up the winchester onto multiple floppies. Creates a catalog of the files on each disk and includes the date of the latest backup. Will not back-up an unchanged file more than once. Plus many more super features.
FLOPCOPY: Lets you make floppy copies (with only one floppy drive) by using the winchester as a buffer.
BIGBURST: Backs up a very large winchester file onto multiple floppies. Joins the copies to recreate the original file.
MULTCOPY: Use this like PIP but it prompts you to change disks. Accepts ambiguous file names.
MDIR: Displays files in all user areas on selected drive. Many features.
MAKE, MOVE: PIP-like utilities that make it easy to move files between user areas.
SWEEP: The famous disk cleanup and transfer routine that does just about everything you can do with TYPE, ERA, DIR, and PIP.
UNSQ: This is the latest, greatest file unsqueezer. Enter UNSQ *.* and it will check every file on the disk. All squeezed files will be unsqueezed.

USERS DISK #22 - Pascal Compiler
This is a real Pascal compiler. It supports only a subset of the language (no records, pointers, booleans, reals or complex) but it generates a real .COM file. Everything is on this disk: the compiler, its source, example programs and documentation.

USERS DISK #23 - Xerox Utilities
This disk contains Xerox specific utilities including a screen dump fromWayne Suga;(with source); modifications for the SWP package including ZCPR, a new monitor, and a clock/calendar from Mitch Mlinar; and Jim Mayhugh's new monitor (see issue 19). A very special disk for Xeroxers.

USERS DISK #24 - Prowriter Graphics
This is a complete Prowriter printer graphics package written by the same Micro C subscriber who wrote the MX-80 graphics package. Plot points, lines, circles, boxes, and more. Examples, documentation.

USERS DISK #25 - Z80 Macro Assembler
This is a real Z80 macro assembler! Syntax closely follows RMAC and MAC. Also includes pseudo-ops to support conditional assembly etc. No phase or relocatable code.

USERS DISK #26 - BBII CP/M 3.0 Banked BIOS/ Winchester Support
CP/M 3.0 Banked BIOS implementation for the BBI. Roy Epperson's software to support the Adaptec ACB-4000 SCSI and the Rodime R204 5" Winchester on the BBII (see issue #19). Plus more Winchester programs.

USERS DISK #27 - BYE Remote CP/M System
BYE programs to run your BBI, BBII, or XEROX 820-I as a remote CP/M system using a Hayes Smartmodem compatible modem. Includes programs to allow restricted access.

USERS DISK #28 - VFILER and Extended Single Density
VFILER is a screen-oriented file manipulation utility, similar to SWEEP, CLEAN, and DISK. Also, Larry Blunk's documentation and software for implementing extended single density (334K) on eight inch disks.

USERS DISK #29 - MODEM740
The latest incarnation of the immortal MODEM7 program. Too many features to list. Versions for both ports of BBI (Xerox 820) & BBII.

MICRO CORNUCOPIA • *P.O. Box 223 Bend, Oregon 97009 Order number (503)382-5060 PST*

(continued from page 91)

er Faire in April, passing out their "magazines."

Well, on May 20, the State of California closed them down.

Cecil Lindsey sent me a clipping from the Fresno (CA) Bee. The Bee article mentioned that The Fresno County Superior Court had issued an order barring Gary Kiehl, owner of Custom Electronics (KIPS) from operating as a state-registered electronics service dealer.

The judge in the case stated that Kiehl "systematically required his employees to mislead, deceive and defraud the customers of his business and instructed his employees on techniques of accomplishing those activities."

The article also mentioned that Kiehl had changed the name of his business and moved to another Fresno location while the case was pending in court. "He failed to notify the court ... of his new business name, HITECH Unlimited, as required by law."

I think I'd avoid all new Fresno mailorder firms for 50 years or so.

Magazine Rumor Department

Rumors are flying fast and thick about the demise of more computer magazines. Two most mentioned are Creative Computing and Popular Computing. Both are old standbys in this industry (like Microsystems or Computers and Electronics). In fact, Creative picked up some of the unexpired subs from Computers and Electronics.

Creative Computing has been the more technical of the two (closer to my heart), so I called to see if there was any validity to the rumor.

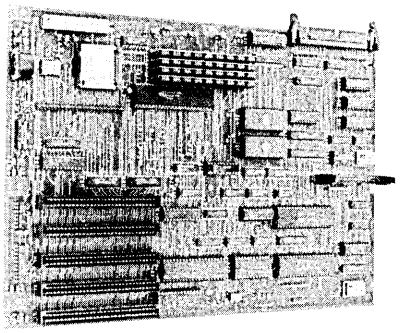
It doesn't appear there is. I talked to Paul Grosjean, reviews editor. He told me they were definitely working on the October issue, and that there had been no word about things folding.

Paul is a central figure at Creative, since they are moving more and more into applications software and reviews. A reader poll conducted by their reader poll department (who else?) showed that the vast majority of their readers are no longer into hardware projects. They want to be told which programs or systems to buy and how to use them.

David Thompson
Editor & Publisher

■■■

"THE X16"



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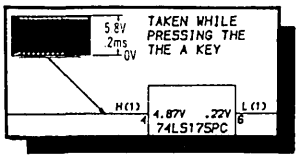

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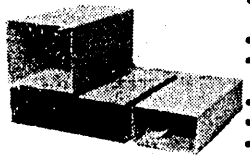

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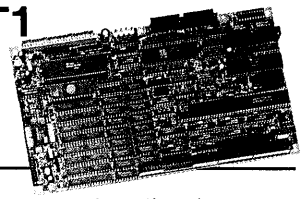

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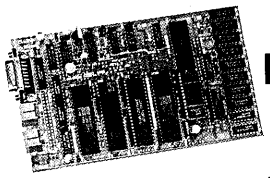

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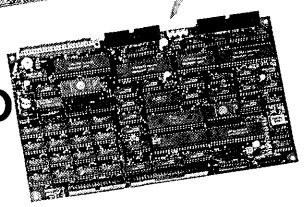

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Star Wars

The Reagan administration announced recently that it's hiring programmers to write software for its Strategic Defense Initiative Program (Star Wars).

"Software, not hardware, will be the biggest hurdle we face, so we're going to start processing immediately," a source close to the president admitted.

The administration became aware of the problem when a computer scientist (name withheld by request) resigned from the nine-member Star Wars advisory panel (no doubt in a panic). He'd worked with the Naval Research Laboratory since the early 1970s, and helped develop battle software for the Navy.

On resigning he said, "Because of the extreme demands on the system and our inability to test it, we will never be able to believe with any confidence that we've succeeded."

Reassuring, Isn't It?

The advisory panel estimates that identifying, tracking, and destroying thousands of missiles and tens of thousands of warheads in under 30 minutes will require by far the largest single computer program ever written (between 19 and 35 million lines). And generating the code will require 100,000 man-years and a miracle, the panel concluded, not counting the missiles.

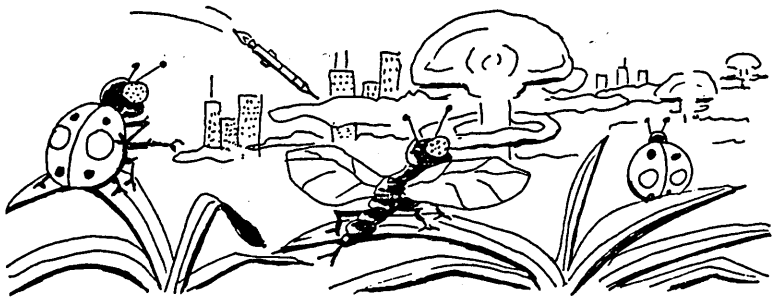
"Of course, this really isn't unreasonable, if we start soon enough," the source close to the president continued. "We just need a lead programmer who can teach ADA. Then we'll hire 99,999 BASIC programmers and retrain them.

Just Academic?

According to M.I.T. physicist Herbert Lin, "A computer system as complex as Star Wars can be expected to contain tens of thousands of errors. Some would be eliminated by testing components, but when the components are put together, new bugs inevitably would turn up. In the first field trial of Aegis, a computerized system designed to defend ships from air attack, the weapon failed to stop 6 of 116 targets. If the Star Wars software can do as well on its maiden run, only 37,000 out of every 100,000 warheads, 37 per cent, would penetrate our defenses."

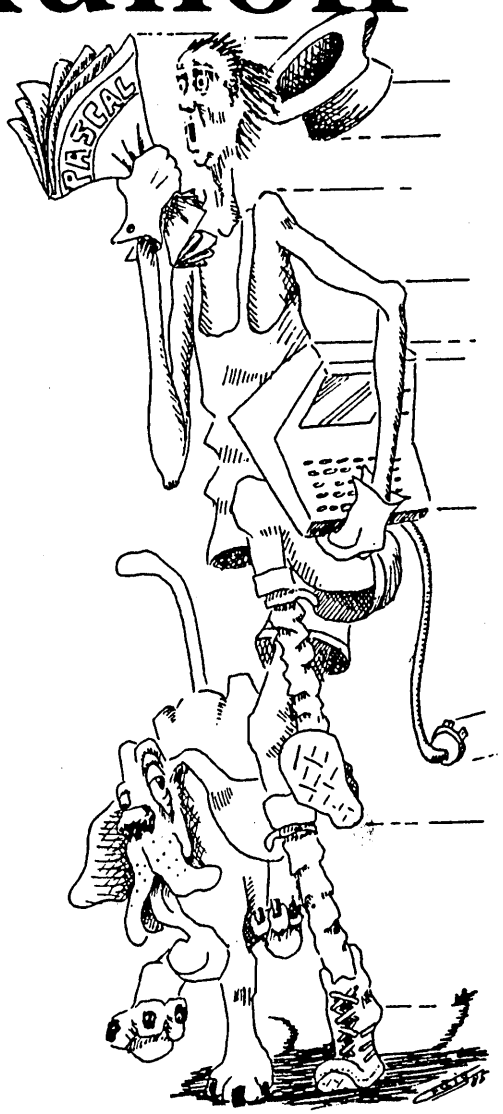
So it goes. Government officials are betting that one or two little battles will be sufficient to test Star Wars.

"We'll just have to pick a fight with one of the smaller nuclear powers," the source concluded.



"Looks like 37% was about right ... "

The Pascal Runoff



I'm not going to beat around the bush about this contest (see the Editorial for bush beating). In short, we're having a contest, you're invited (in fact, we're not inviting anyone else), and the prizes are really spiffy.

So Let's Get To The Prizes

The Grand Prize is your choice of a Microsphere 1 Megabyte RAM DISK or Trevor Marshall's 32032 Coprocessor kit. It's the full 1 megabyte 32032 board that plugs into the K16 or any other PC clone.

Each of the Next Five Scorers receive the following:

Choice of two products from Borland (including the Modula 2 Compiler) AND . . . choice of $100 worth of products from Micro C.

What To Do To Get A Prize

To enter just write a program in Turbo Pascal and send it to Micro C. Make sure you specify "Turbo Pascal Contest" on the envelopes, so we'll know it's an entry. If possible, include a listing on paper along with your disk.

We're not looking for a magnum opus, just something useful or interesting (or both). It doesn't have to be long - a lot can be said in Turbo in 100 lines.

This contest is intended to encourage concise, clear programming style.

Contest deadline is November 1, and we'll announce the winners in the February-March '86 issue of Micro C.

Scoring

Programs will be judged by Philippe Kahn and the Micro Cornucopia staff on a point system. Total points decide the winner.

0-15 for ALGORITHM
0-15 for READABILITY OF CODE
0-30 for FUNCTIONALITY
(including ease of use)
0-20 for ORIGINALITY
0-20 for DOCUMENTATION

So Start Programming . . . An editor, a business application, a game, a utility, something educational - anything that interests you probably interests us. Just make sure the program you submit is original, unpublished, and written by you in Turbo Pascal during 1985.

PS -

Hackers in other languages, stay tuned. Your contest is coming.

Any version of Turbo Pascal is OK — 2.0, 3.0, CP/M, MS-DOS

Program
Title: _____
Purpose: _____
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NOTE: I hereby release this program to the Public Domain and give Micro Cornucopia the right to print this listing.

Signature _____

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Please list all people involved in the development of this program _____

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Wanted — S-100 boards: Konan or Alloy 9 track tape and SMD disk controllers; SASI host interface; CompuPro system support; LDP Hazitall; DMA FDC; programmable serial I/O; static RAMs; clock/calendars; Box 1870B, Garden Grove CA 92642 (714) 539-7330.

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Disk Drive Sales & Service — Shugart SA 800-2 $79, SA 850 $129, SA 851R $139, MPI 52S 5 1/4 DS/DD $70, TEC FB501 5 1/4 SS/DD $59. Case w/pwr sup for 2 — 5 1¢4 1¢2 ht. $59. Disk Drive Service SA 800/801 $25, SA 850/851 $35, 5 1¢4" SS $25, DS $35, 8" SS $40, DS $50. All drives and service guaranteed for 60 days. Prices do not include parts or shipping. LDL ELECTRONICS, 13392 158 St. N, Jupiter, Fl. 33458 (305-747-7384).

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TURBO CHEQUES! A complete Family CheckBook Management Program. Written in Turbo Pascal. Available now for the Kaypro 2,4, and 10. $49.95 (plus $3.25 CA sales tax) includes a 130 page Users Manual. A Demo Disk is available for only $15. Send your order to: CompuTech, P.O. Box 7000-309, Redondo Beach, CA 90277.

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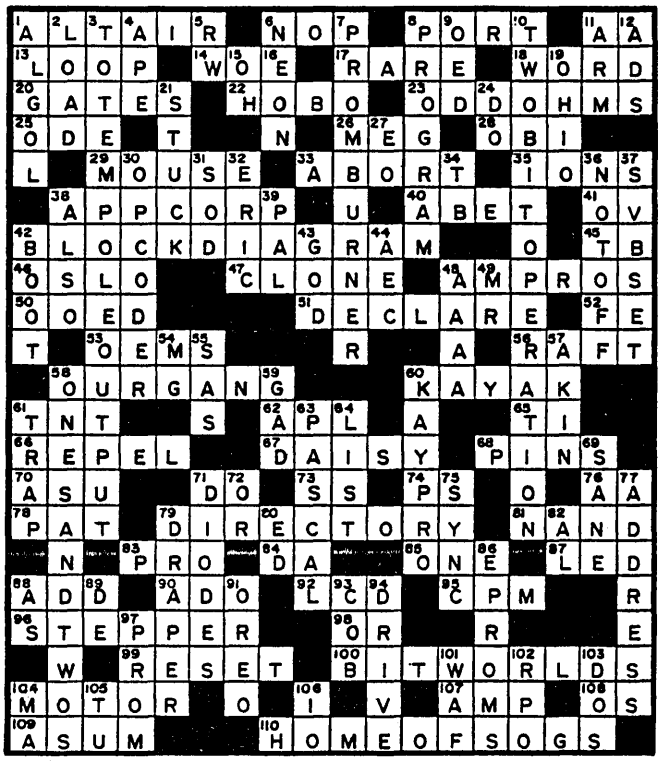
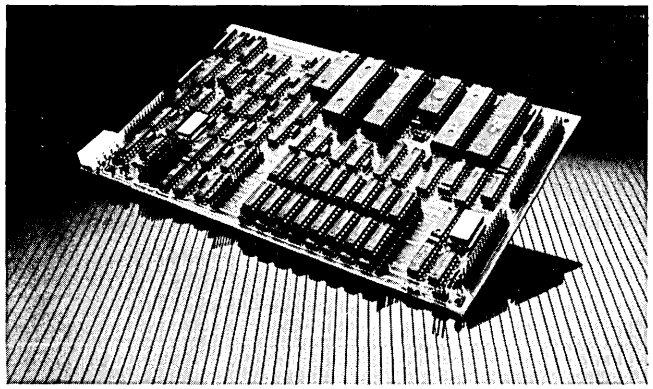
The Jontel Business System is a five journal accounting package based on a dual disk CP/M computer. Included with the seven disk package are mailing and inventory programs with 100+ pages of documentation on disk. 8 and 5 inch disk formats available. $69.95. Moonlight Computer, 707 Edge Hill Rd., New Bern NC 28560. Source code available for custom installations. Compiled CB80. (919) 638-6976.

CROSSWORD # 2 SOLUTION: Two winners at SOG IV (took 'em 24 hours) -- Sandy Brabandt and the McCutchen/Olds/Brittain team.





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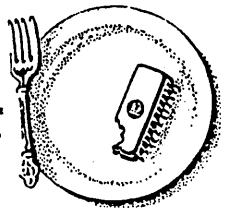


By Gary Entsminger

Future Tense Editor

SCSI

Rick Lehrbaum (VP of engineering at Ampro) was active at SOG IV spreading the gospel of SCSI (pronounced scuzzy).

SCSI, the Small Computer System Interface, acts as an expansion interface for such peripherals as hard disk drives.

SCSI is basically a renamed SASI (Shugart Associates Standard Interface) to which you can add a couple of additional handshaking signals. SCSI has been unanimously approved as an interface standard by the ANSC X3T9.2, and a book of specs is in the works. It's a welcome standard, and should open up the possibilities for networks, graphics, and co-processing.

For a copy of the ANSC X3T9.2 SCSI specifications, write to:

X3 Secretariat
Computer & Business Equip. Manufacturers Assoc.
311 First St., NW, Suite 500
Washington D.C.

Don't forget to send $20 and a self-addressed mailing label.

For more SCSI info contact —

Rick Lehrbaum
Ampro Computers, Inc.
P.O. Box 390427
Mountain View CA 94039

EGA — Graphic Standard

Speaking of standards, it looks like IBM's EGA will become the de facto for PC graphics.

Although EGA, a full-sized card for PCs, hasn't sold well (it's too expensive) many software vendors, including Digital Research and Microsoft, are announcing driver support, and several EGA-compatible clones will be competing with IBM by year's end. Currently, IBM's baby weighs in at a hefty $982 with 256K of memory, or $524 with a less useful 64K. (Gee, and we thought memory prices were coming down.)

Micro C Bulletin Board

More and more of you are using our bulletin board, and it looks like we've worked out the kinks. Thanks again for the support.

This month we're adding an area for MS-DOS public domain software. So check it out.

Keep calling: 503-382-7643.

Modula II At SOG IV

One of SOG IV's highlights for me was the first public showing of Borland International's CP/M Modula II compiler. It's still in Beta Test, but it works, supporting the Modula II specified by Niklaus Wirth in "Programming In Modula II," third corrected edition. It has three extensions — string assignment and comparison, Pascal-like I/O, and ADA-like exception handlers.

Mike Weisert, who's working on Modula Toolbox, envisions Modula II as a complement, not a replacement, for Turbo Pascal.

With its support libraries, Modula is better suited for large programs, and since Modula and Pascal are syntactically very similar, you can use Turbo Pascal to test ideas you're considering for a Modula library. So you can take advantage of Pascal development speed but later have modular organization.

If you can read Pascal, you can probably read Modula. For a comparison of Pascal and Modula II code see the sieves in Figure 1.

InOut in MODULE Sieve is another module, and WriteString, Writeln, and WriteCard are procedures in MODULE InOut.

Modula II's complete type checking across module boundaries, built-in low-level facilities, and improved syntax are its strengths, making Modula II a useful addition to Pascal.

Next issue, we'll look more closely at Modula II compilers.

ZCPR3, The Manual

I finally have a copy of Richard Conn's "ZCPR3, The Manual," and it should make my ZCPR3 travels more interesting.

For those of you out-of-the-know,

Figure 1 - Pascal and Modula II Sieves

```
PROGRAM Sieve;

CONST SIZE = 8190;

VAR I, PRIME, K, COUNT, ITER : INTEGER;
    FLAGS : ARRAY [0..SIZE] OF BOOLEAN;

BEGIN
  Writeln('START');
  FOR ITER := 1 TO 10 DO begin
    COUNT := 0;
    FOR I := 0 TO SIZE DO FLAGS[I] := TRUE;
    FOR I := 0 TO SIZE DO begin
      IF FLAGS[I] THEN begin
        PRIME := I + I + 3;
        K := I + PRIME;
        WHILE K <= SIZE DO begin
          FLAGS[K] := FALSE;
          K := K + PRIME;
        END;
        COUNT := COUNT + 1;
      END;
    END;
  END;
  Writeln(COUNT:4,' PRIMES');
END (*Sieve*).
```

```
MODULE Sieve;

FROM InOut IMPORT WriteString, WriteLn, WriteCard;

CONST SIZE = 8190;

VAR I, PRIME, K, COUNT, ITER : CARDINAL;
    FLAGS : ARRAY [0..SIZE] OF BOOLEAN;

BEGIN
  WriteString('START'); WriteLn;
  FOR ITER := 1 TO 10 DO
    COUNT := 0;
    FOR I := 0 TO SIZE DO FLAGS[I] := TRUE END;
    FOR I := 0 TO SIZE DO
      IF FLAGS[I] THEN
        PRIME := I + I + 3;
        K := I + PRIME;
        WHILE K <= SIZE DO
          FLAGS[K] := FALSE;
          INC(K,PRIME);
        END;
        INC(COUNT);
      END;
    END;
  END;
  WriteCard(COUNT,4); WriteString(' PRIMES'); WriteLn;
END Sieve.
```

Richard wrote ZCPR3 , a super CP/M Console Command Processor (CCP) replacement that adds shells, aliases, input/output redirection, named directories, password control, multiple and resident commands, and more to your faithful CP/M 2.2.

The manual, a whopping 350 pages, details ZCPR3's installation, toolset, and internal workings. If you want to get the low down on ZCPR3, "ZCPR3, The Manual" is essential. It's not light reading, however.

Costs $19.95 from:

New York Zoetrope
80 East 11th St.
New York NY 10003

If you're interested in this alternative operating system, check out Richard's article, "Inside ZCPR3," in this issue. (It's not light reading either.)

Pascal Runoff

We've already received 50 entries in the Pascal Runoff and mailed as many T-shirts. If no one you know has one, be the first — it's a really neat graphic of Pascal and Bug, two old favorites.

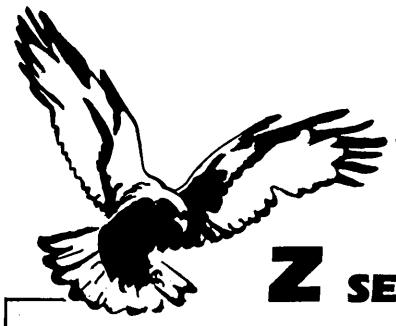
We're about to start judging, so get those dynamite programs to us. Deadline's November 1.

Public Domain MS-DOS

We've got something new and almost entirely different at Micro C this week — a public domain MS-DOS library for all PC compatibles. For a rundown of the gathering of our first disks, see "MS-DOS In The Public Domain" this issue.

Our MS-DOS disks are $12, about 300K each, and contain everything from essential utilities (like SWEEP and NULU) to games and bulletin boards. As usual, we're carefully screening programs and including as much source code as possible.

Also, we're gathering programs for the Kaypro 2000, and our first 2000 disks will be ready by December. For an indepth study of the 2000, see Dave's Kaypro Column.



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Improved RAM Disk Driver

Chuck Weingart (from Chicago) purchased a Microsphere RAM Disk at SOG IV and added some enhancements to the RAM Disk software.

Enhancements —

Memory test of the RAM Disk during formatting.

Warm boots on 84 boards no longer switch the RAM disk to E.

Version of the RAM Disk driver now available for the MAX 884 8' ROM.

Rewritten MOVECPM allows moves of fractions of 1K.

The RAM Disk driver now requires only 512 bytes.

You can get a copy of the improved RAM Disk driver from the MicroSphere-Bend Kaypro Users Bulletin Board (503-388-9944) between 5:30 PM and 8:30 AM Monday through Saturday or anytime Sundays. It's a 300/1200 baud Team Smart Modem.

Before you can download the RAM Disk files, you'll need to log on and wait for the SYSOP to validate you.

Alternatively, you can send MicroSphere $5.00 for a disk containing the driver. Be sure to tell them which Kaypro and RAM disk you have. The software for the PRO MAX 884 8' ROM is on a separate disk.

For more info — MicroSphere, Inc.
PO Box 1221
Bend, Oregon 97709
(503) 388-1194

And that's Tidbits.

■ ■ ■

Express— Text Editor

Review By Jack Rodenhi

1317 W. College Ave.
Lompoc CA 93436

If you're looking for an inexpensive, speedy text editor, then scroll through Express.

Public And Private Domain

Express comes in two versions: a fully functional text editor (version 1.0) and an enhanced version (2.0).

Version 1.0 is free. That's right, you can get Version 1.0 from Micro C (or from your local bulletin board) and you are free to pass it around to your friends, use it for a frisbee, or anything else you think is breezy. At $35 version 2 is almost free (but it's not public domain).

For text processing, Express resembles Vedit and WordStar, which means you can easily configure it for any terminal or Z80 computer, define the keyboard layout, and have full cursor and block control. Express also has word wrap and tab functions.

The fancy text formatting commands of WordStar are missing, but the Express disk contains ROFF4, a public domain formatting utility. So you should have at least most WordStar formatting capability.

Difference Between 1 and 2

The main difference between the two versions of Express is 1.0's lack of access to CP/M functions from within the editor. With 2.0 you can TYPE, COPY, ERASE, or RENAME files and get a DIRECTORY or LOG any disk or user area. These functions are really handy for correcting disk-full situations and reorganizing a disk without exiting the editor.

Better Than WordStar

But this is a programmer's editor, and it does some things better than WordStar.

Express comes up with the command menu on screen. After you use it for a while, you'll probably reconfigure it to bypass the command screen and come up in editor mode. If you're a Turbo programmer, you may want to execute Express from within Turbo.

You can edit any file in up to 32 user areas, and there's no limit on file size. If you select a non-existent file to edit, Express will ask if you want to create it. You aren't immediately thrown into a file you didn't want to create, so you don't have to go back out and restart the file selection.

Safety Features

The delete line command must be pressed twice to delete one line. For each additional line deletion, you only press once. So you're less prone to accidental deletion. You can also undelete a line, so it's not very likely that you are going to lose anything in this editor.

Express has some features that aren't available in WordStar. For example, words and lines can be erased in one place and unerased elsewhere (like in Perfect Writer). If you only have to move part of a line, it's easier than marking a block and moving it (as you have to do in the Turbo editor).

Macroing

Express has a macro-key facility. Any string (up to 10 characters) can be redefined to produce any other string (up to 256 characters).

You could define function keys as variable names or Pascal commands, for instance, and then save the definitions on disk. This will greatly reduce the work required to enter future programs.

Search And Replace

The search and replace routines in Express are very fast. 74 replacements of a 7 character string in a 20K file took only 34 seconds on my 4MHz Kaypro 10. The same job using the Turbo editor took about 52 seconds. To be fair though, Express doesn't show the replacements on the screen (Turbo does). So you might believe you had replaced all occurrences in a file and find out later you had replaced them only on the last page.

Special Feature

Perhaps Express's flashiest feature is its variable speed bidirectional autoscroll. You can vary the speed at which lines scroll up or down the screen (even while it's scrolling) by simply hitting any number between 1 and 9. Neat feature.

The manual for Version 1.0 comes on the disk (2.0 comes with printed manual). A short CHEATER.DOC file sums up most of Express's features.

Finally

This is user designed software. The programmers (Cecil and Laine Stump) are not part of a big impersonal corporation. I suspect this program will change more from reader feedback than other text editors. That being the case, I would like to start a wish list — an execute command for running other software from within Express, an alphabetized directory (the preceding wish would take care of this one), and a status line which displayed the current line and column number.

But I can't complain — for the price, either one is a super editor.

Express version 2.0 is available for $34.95 (incl. shipping and handling) from:

TCI
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Only 16 user areas	Copy, Rename, Erase not available
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Manual not included	File size limited to memory size

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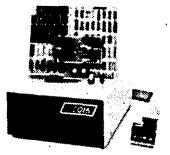

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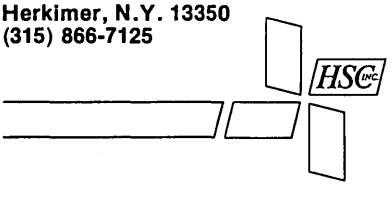

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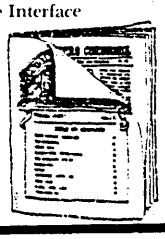

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By Gary Entsminger

Micro C Staff

Let's return to the wild wire and transistor world of your computer where electrical circuits make decisions.

But first — some background. (Lights, please.)

Boolean Algebra

About 1850, and long before the invention of digital electronics, George Boole, an English mathematician, invented a deductive system for writing complicated combinations of logical (or True/False) statements. His eighteenth century logic turned out to be very useful for representing decision-making logic gates in computers. (No, he couldn't have known.)

Basically, in Boolean we set up relationships based on the Truth or Falsehood of statements. Three of these Boolean equations are AND, OR, and NOT, and they're used for representation throughout your computer.

For example, if A and B are statements, then —

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If A AND B are TRUE, C is TRUE
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is an AND equation, and —

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If A OR B is TRUE, C is TRUE
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is an OR equation, and —

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If B is NOT TRUE, C is TRUE
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is a NOT equation (inversion).

A computer has two ways of dealing with bits (pieces) of data. It can AND, OR, or invert bits inside the processor (software), or it can use gates (hardware).

Imagine that A and B are input wires carrying high or low voltages. A high input (true) is normally between 3.5 and 5V. A low input (false) is normally between 0 and 1.5V. An input between 1.5 and 3.5V is usually undefined.

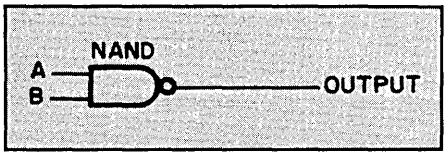
You know the old computer rhyme:
When it's up it's true,
And when it's down it's false,
And when it's neither up nor down,
It's neither true nor false.

We can construct three simple gates — AND, OR, and invertor — and build a network of them (some of these, some of those) to control some signals in your computer.

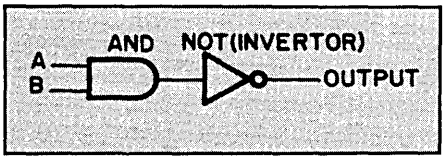
NAND

Some gates are easier to build, and some gates are obviously more useful. It happens that a combination of two of these simple gates, NOT and AND, can create a very useful (and particularly easy-to-build), gate — the NAND (Not-AND).

NAND's components, NOT and AND, are customarily symbolized —



NAND, the inverse of an AND, is customarily symbolized —



The bubble on the output end of the NAND gate is a shorthand way of saying that the output is inverted. In fact, anytime you see a bubble on a chip (either on an input or output) the designer is telling you that the signal is inverted as it goes through the bubble.

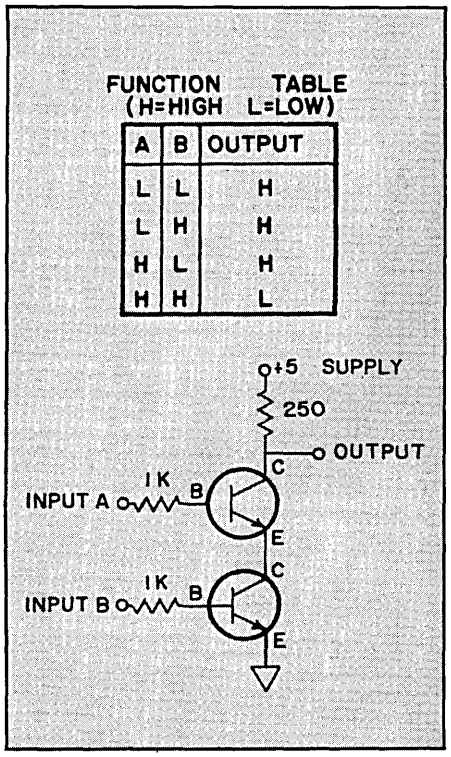
Figure 1 shows what happens to the output of a NAND gate when the inputs go high or low.

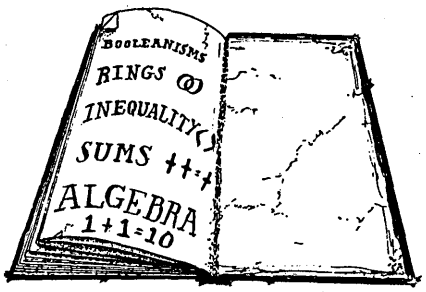
Either A or B (or both) have to be low for the output to be high. If A and B are both high, both transistors conduct. That is, they provide a direct connection between the collector (C) and the emitter (E), so the output point is connected to ground. If either or both transistors are turned off then the output point is disconnected from ground. Its only connected then to +5V through the 250 ohm resistor so it goes high.

You can see that our NAND gate resembles the inverting buffer from Issue #25; we've just added a second transistor.

Exit Stage Right

I hope I've sparked a little logical interest. If you want to know more, I suggest you check out the "Understanding Series" from Texas Instruments, available at Radio Shack for $3.95/volume. And of course, I recommend you stay tuned to Micro Cornucopia, where even the short-circuits are logical.





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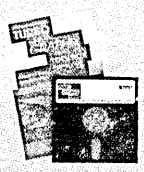

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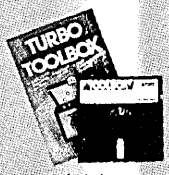

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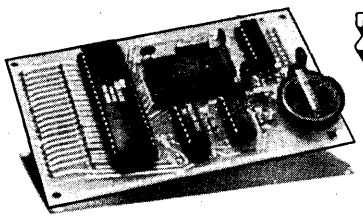

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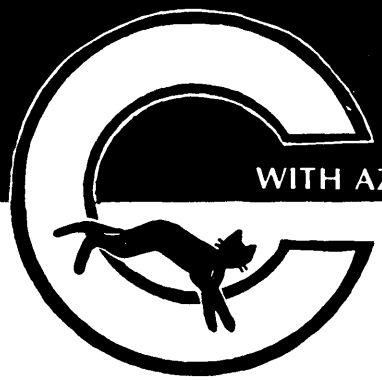

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