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MICRO CORNUCOPIA

JOURNAL OF THE BIG BOARD USERS

February 1983 No. 10

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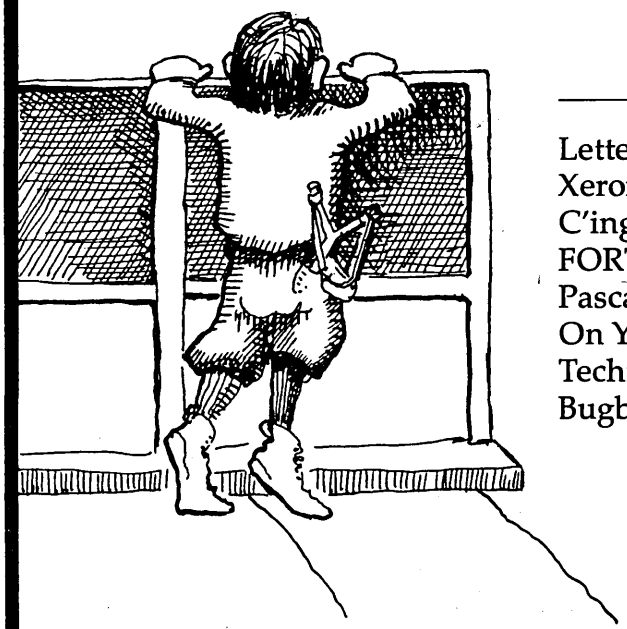

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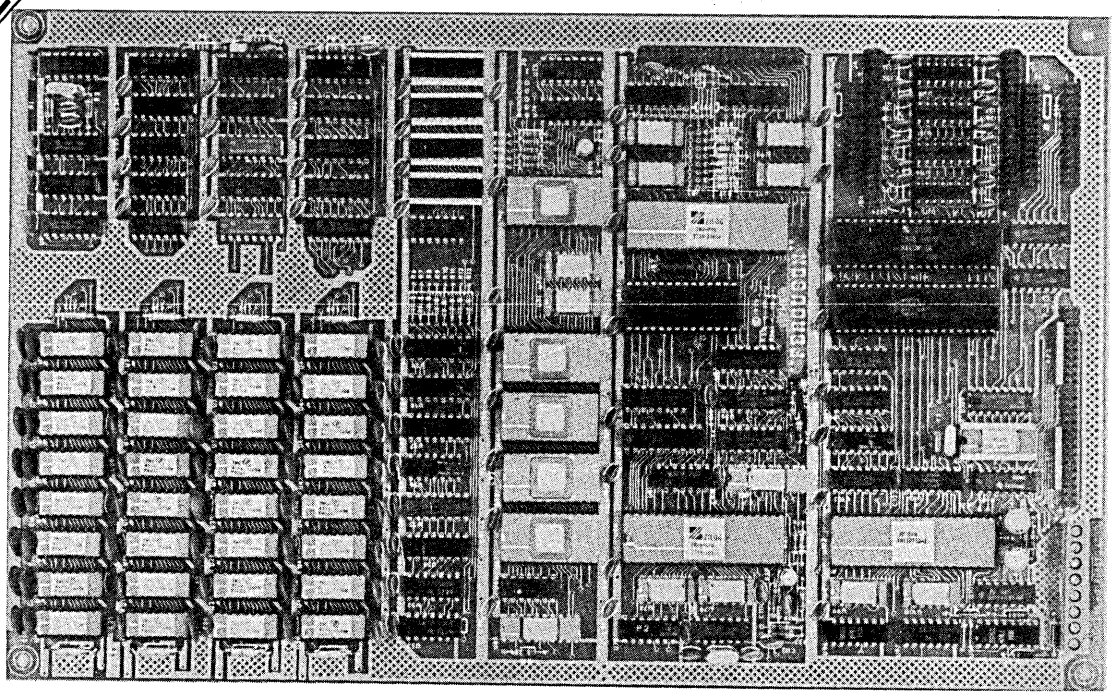

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MICRO CORNUCOPIA

February 1983 **The Single Board Systems Journal** **No. 10**

Big Plans

Getting Together

The Second Annual Semi-Official Get-Together (SOG) will be held Saturday July 30 and Sunday July 31 here in Bend.

This year we would like to have some talks on extending the BB I, BB II, the Xerox 820, and the KayPro along with some discussions on CP/M 3.0, the new 16-bit software, and other timely topics. So, if you'd like to present some of your ideas to other really interested and interesting folks please let us know.

We'd like to have more displays of equipment and accessories this year. Plus, we'd like you to bring your favorite public domain and personal software to swap, and your favorite commercial software to demonstrate. (Of course if you wanted to swap or show off some hardware, that'd be just fine too.)

Anyway, this will be a real honest to gosh professional workshop that anyone would be proud to write off their taxes. But, of course, you can't come to a place like Bend alone (it's just not fittin').

So if you wanted to bring the whole family and come a few days early to take in the Cascade wilderness area, or the high desert, or the regional observatory, or the lava cast forest, or any of a myriad of other interesting places and things, we wouldn't mind at all.

In fact Sandy and I would be glad to point you in all the right directions. Come and enjoy this part of the country with us. And, of course, if you come, you'll help make this year's event even bigger and better than last year's.

Hi-rez Dahoozits

It appears that a large number of people have been reading these editorials. Closely. Many phone calls have lately begun with: "I have a hi-rez dahoozit that I've been itching to interface with my drive latch. I have checked everywhere for the information but have come up with nothing. Can you help me?"

This need has certainly caught me by surprise. I had no idea that the hi-rez dahoozit was even available in most parts of the country. Of course lo-rez dahoozits have been around for quite a while but they show fingerprints so badly that it doesn't make sense to connect them to drive latches.

But then I haven't answered your question. You see I don't know, and though the calls have gotten more numerous and insistent, at least now the calls are coming during waking hours. Thank you.

If you want to research the problem yourself you might check the following sources: library (preferably small, out of the way), Shugart (that's not the only thing they don't know how to interface with their drives), or your congressman (he ought to at least have a form letter on the subject). If you find anything, definitely keep us posted. There are probably many ways to do something this important.

The 8088/Z80 Big Board

Software Publishers is coming out with a board that will plug into the BB I and the Xerox 820. Soon you will be able to run CP/M 3.0 software, using up to a megabyte of RAM, (controlled by the 8088) or run software written for the IBM-PC, all on your present system. In fact, I can't see anything preventing the same board from running on the KayPro. Nothing like staying current the easy way.

JRT Pascal

There has been a good deal of discussion lately about the bugs in JRT Pascal. Some reviewers feel it is still the best thing since free banana splits and others think it's not worth being drowned in chocolate syrup.

Meanwhile, through all the controversy, a lot of folks have been waiting and waiting and waiting for their copies.

(continued on page 33)

LETTERS

Dear Editor,

A friend of mine who has been putting my board together discovered that DRC sent a Z80A-DART in place of the Z80-SIO. Is there a difference between these chips?

Also, he noted that many components were labelled "composite video only." Will the board work properly in split video mode with these components installed?

Chris Carrar
75 Worth St
Saco, ME 04072

Editor's note:

The Z80-DART will work identically to the SIO if you are operating in an asynchronous environment. It is very unlikely that you will ever need to do any synchronous communication, so you will probably never know the difference. The DART costs about 2/3 as much as the SIO.

For separate video you must use a 74LS86 at U94 and you must leave out C142. The other composite video components can be in place.

If you decide to change over to composite video you can use a small trimmer capacitor in place of C142 to adjust the vertical vrs. horizontal character brightness. (But be sure to put a 74LS136 in U94 or it will look horrible.)

Dear Editor,

After reading a review of double density systems in Micro C, I decided to bring my system up in double density. Since I live close to Otto Hiller, I bought Otto's system, and made all the hardware changes to the Big Board to support 4 MHz and the new disk controller board. Everything went smoothly and when I was finished, I powered up and got the new sign-on. Then I got out issue #2 of Micro C to see how to jumper the 801s, and what DC power connections needed to be made.

When I hooked up the drives, however, all I got were error messages. I noticed that the heads loaded, but the stepper motors weren't doing a thing. Then I touched a stepper motor, and were they HOT! I quickly powered-down the system and checked out all my hardware changes but could see nothing wrong.

Then I made some calls. One person said to check the signal cable, (it was ok), another said to short the step pin of disk connector (J1 pin 36) to ground while the heads were loaded to see if the stepper motors worked (they didn't).

I took the Big Board and the add-on up to Otto to see if he could spot any errors. Everything checked out, and he used my system to control his drives. So I took my 801s to work to see if they were OK. Imagine my surprise when they both worked perfectly. Now I had a Big Board that could control Otto's drives, and two disk drives that could be controlled by another computer, but not by mine.

Since I was at a dead end, I got some hot chocolate and sat down with the Shugart manual to see if I could puzzle this out.

The manual said that the 5 and 24 volt return lines had to be connected together at the power supply. Mine weren't. I got out my soldering iron, put a jumper between the two returns and then powered up the system. When the message 'BIG BOARD CP/M' came up I knew my problems were over. The system runs fine and I'm very happy with Otto Hiller's double density.

My 801's are jumpered differently from Micro C issue #2, so here is what I did.

Drive A is on the end of the signal cable, so T2, C, DS1, T3, T4, T5, T6, T1, A, B, HL, Y, and 800 are jumpered. Drive B has T2, C, DS2, A, B, HL, Y, and 800 jumpered.

Mark Wiskochil
P.O. Box 583
Freeport, IL 61032

Editor's note:

The fact that you did all the hardware mods before starting the software changes was probably the key to the ease of incorporation of Otto's system.

Dear Editor,

Those who need a cabinet should take a look at the one from Colonial Data, 105 Sanford St, Hamden, Conn. 06514. For $135 you get room for two 8" floppies, the power supply, and the BB. They have already provided cutouts for two RS-232 connectors, a fuse holder, and a power cord. The whole thing fits together quite nicely.

Jim Totten
700 N Melborn
Dearborn, MI 48128

Dear Editor,

I have been a subscriber of your magazine from issue #1, and have enjoyed every one. I have recently received user disk #5 and found many of the programs very useful. I use the WASH.COM utility at work and have given copies to my friends and associates, but it was brought to my attention that this utility is also available from Micro Resources of Simi Valley, CA for $49.95. Is this really public domain?

Steven A. Morono
5004 Collett Rd
Shortsville, NY 14548

Editor's note:

This really neat file maintenance program was released to the public domain on September 20, 1981 by its author, Michael J. Karas of Micro Resources. It has been debugged and extended by the folks using it in the public domain. Feel free to continue using it and passing it around.

Dear Editor,

I am a recent subscriber to your magazine and I have found that it is a great place to get information I can't get anywhere else. So, to help others I would like to share my experiences.

First, a winner. I purchased a Qume DT-8 and found that I could not only jumper it to look like two single-sided drives (it is double-sided), but that it could be jumpered to access both sides of a standard single-sided disk. Also, it can step twice as fast as most single-sided drives.

Second, a loser. I am a member of the Software Tools User Group, which provides a number of programs written in Ratfor (which can be translated into Fortran). Thus I needed a Fortran compiler and I had a choice of two, SuperSoft and Microsoft. I picked SuperSoft.

I was generally happy, though the compiler seemed quite large and slow. However, after I subscribed to Micro C, I prepared two disks (26 programs and documentation) to submit to the Big Board User's Group (Micro C). However when I checked my license (and called SuperSoft) I found that I could not even give the COM files away unless I paid a $1000 per year fee and paid $10 per program royalty. The royalty charge for the 26 programs would have been more than the cost for each user to purchase the Fortran compiler! I found out later, that Microsoft's Fortran compiler requires no payment.

Third, a winner. Meanwhile, I looked

around for another programming language that I could use to develop software without paying royalties. I found Aztec CII and have been using it since May. I am very happy with it. It produces compact code and I have almost given up assembly language as a result.

Finally, the last winner is the new character ROM for my BB from Micro C.

Willis C. Gore
1302 Brook Meadow Drive
Towson, MD 21204

Editor's note:

Those of you who are familiar with the software tools (from the book by the same name) know the power of these tools for programmers, writers, etc. and know the significance of that kind of contribution. Tony Ozrelic is selling 9 such tools for $24.95, which is a still a real bargain considering what they do.

Also, Willis has just finished a spelling checker which is equal to the Word Plus in many ways (and in some ways, it's better). His is the first of a number of very heavyweight software packages that we will be marketing through the Micro Group. See the ad in this issue. (We're on our way!)

Dear Editor,

I am using an Amdek G300 with my BB II. It displays 7X9 characters just fine thanks to your comments on pg 19 of Issue #8.

I am having trouble figuring out which pin on the BB II handles the drive AC control. Is there one? Does anyone out there know?

I ordered SA801's for the system from Halted Specialties on Sept 30 ($225 each) but as of the first of November I still haven't received anything. Still waiting.

Dan Miller
1745 S Von Elm
Pocatello, ID 83201

Dear Editor,

Thanks a bunch for the extra copies of #8. It was quite a blast to see my name in print (for the first time). Everyone is very impressed when I tell them that I am a published author whose work has appeared in a renowned technical journal with international circulation!

T. Grady Griffin
1010 Rush Scottsville Rd
Rush, NY 14543

Editor's note:

What do you know, it just happened again!

Dear Editor,

There is some confusion about hooking a serial MX-80 printer. The description you gave with your PR program is incorrect. The hookup should be as follows:

JB5 for Port B
7-8 transmitted data
11-12 received data
15-16 request to send
19-20 clear to send
23-24 data terminal ready

Then from the BB (J3) to the Epson (EP), connect:
2—3 received data
4—4 request to send
5—5 clear to send
7—7 signal ground
20—20 data terminal ready

My printer occasionally types twice on the same line, what can I do to cure that?

Name and Address lost

Editor's note:

The problem is that the plain MX-80 has only an 80-character buffer. The serial print driver in issue #9 cures the problem you are having because it sets up the SIO for auto enable.

Dear Editor,

I am pleased to announce a new Big Board has been added to the World.

My BB came up Dec 29. I built it from a bare board and it runs 4MHz comfortably. It has two Tandon TM-800 thinlines and a Hayes Smartmodem. It even has a custom character set (thanks to issue #6).

Micro Cornucopia has been a big help. Keep a good mix of half hardware and half software. It's a pleasure to have a live BB so I can do something besides reading to it.

Will Johnson
5294 Pleasant Hill Rd
Pleasanton CA 94566

Editor's note:

That is the first birth announcement I've received although I'm sure a lot of us understand your feelings. However, you didn't give us the really important information. What does it weigh? Who does it look like? Who did you name it after? How is mom doing?) We know how you are doing but will mom ever see you now that your "BB" is here? (No apologies for the pun.)

(Letters continued on page 20)

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Putting a LST: in Your BIOS

By Richard H. Barnett

604 Robinson St.
West Lafayette, IN 47906

User Disk #4 is a great lifesaver. It contains ZCPR which allows you to be working on drive B while making all the drive A programs accessible. HOORAY!!! This feature alone is worth twice the price.

Another nifty feature of ZCPR is that it includes a built-in LIST command which will list a file to the CP/M LST: device. The only catch to this feature is that DRC ships the CP/M configured so that ALL the outputs go to the console device. In other words, an attempt to use PIP LST:=filename will result in the file being displayed on the CRT screen the same as if a TYPE filename were used. Likewise the CONTROL-P feature in CP/M will only result in double-printing to the console device (mmaakkeess yyoouu sseeee ddoouubbllee). It seemed to be necessary to enable the list device, but how to do it??

Investigation of the CBIOS listings supplied by DRC showed that the LST: device could be enabled by a change to the jump table in CBIOS. My application required that I use serial port B as the list device.

Further, to match my system standards (another computer, a terminal, a modem, and a printer all intercommunicate on a single serial bus), it would need to be set for 9600 baud, 7-bit word length, and no parity. A look at the ROM listings showed that the monitor initializes serial port B for 300 baud, 7 bits, and odd parity. Well they got one-third of it set right, so I guess the rest is up to me.

Doing It

The entire process I went through was long, frustrating, and bloody, but the results show that it can be done and that a similar scheme must be followed to make other changes to CBIOS. The balance of this article will be a list of the steps necessary to implement the LST: device in the BIOS. The comments will hopefully make it useful for other folks and other changes as well.

In short, enabling serial port B as the list device is done in three steps:

1. Changing the CBIOS.ASM jump table to use the serial port.

2. Adding to the CBIOS an initialization routine to set the serial port to the desired baud rate, etc.

3. Assembling the CBIOS and installing it into CP/M.

Changing the Jump Table.

The CBIOS jump table resides near the beginning of the CBIOS.ASM. As shipped, the list device jump vector is CONOUT, the console output device (i.e. the CRT in most cases). The jump table as changed is listed below. Note that the list device has been changed to SIOOUT.

See Figure 1 for the New CBOIS Jump Table

You will note that while the list device vector has been changed, the list device status vector has not. The reason for this is that in the initialization procedure which will be shown later, the AUTO mode is used so the status vector is not used.

Changing the jump table to SIOOUT is a start, but it is necessary to define SIOOUT or the assembler will burp when we try to assemble the CBIOS. In the segment of listing shown below is the code for SIOOUT. Notice that it loads the contents of register C into a then

Figure 1 - The New CBIOS Jump Table

```
;
        JP      BOOT        ;STANDARD JUMP TABLE TO
BVECTR: JP      WBOOT       ;THE SUBROUTINES OF CBIOS
SVECTR: JP      CONST
IVECTR: JP      CONIN
OVECTR: JP      CONOUT
        JP      SIOOUT      ;LIST DEVICE VECTOR
        JP      CONOUT      ;PUNCH DEVICE VECTOR
        JP      CONIN       ;READER DEVICE VECTOR
        JP      HOME
        JP      SELECT
        JP      SEEK
        JP      SETSEC
        JP      SETPTR
        JP      READ
        JP      WRITE
        JP      CONST       ;LIST DEVICE STATUS VECTOR
        JP      TRANS
```

Figure 2 - The SIOOUT Code

```
CONST:  JP      MONITR+6    ;MONITOR CONSOLE STATUS RTN.
SIOOUT: LD       A,C
        JP  MONITR+24

;
CONIN:  JP      MONITR+9    ;MONITOR CONSOLE INPUT RTN.
;
;
CONOUT: LD      A,C
        JP      MONITR+12   ;MONITOR CONSOLE OUTPUT RTN.
```

Figure 3 - Port B Initialization

```
;
BOOT:   XOR     A
        LD      (0003H),A       ;RESET IOBYTE TO ZEROS
        LD      HL,SIGNON
        CALL    PMSG            ;PRINT SIGNON MESSAGE
 ;Beginning of code to set up serial port B
        PUSH    AF              ;SAVE'M
        LD      A,0EH           ;LOAD 9600 BAUD CHAR
        OUT     (0CH),A         ;OUTPUT IT TO THE BAUD RATE GENERATOR
        LD     A,04H            ;POINT TO WR4
        OUT     (07H),A         ;SEND IT TO THE SERIAL PORT CONTROL
        LD      A,44H           ;16X,1STOP,NO INTERUPTS,NO PARITY
        OUT     (07H),A         ;SEND IT LIKEWISE
        LD       A,03H          ;POINT TO WR3
        OUT      (07H),A        ;AND AGAIN
        LD       A,61H          ;SET FOR AUTO CTS
        OUT     (07H),A         ;ONE LAST TIME
        POP     AF              ; RETRIEVE'M
; End of code to set up port B
       JR       GOCPM-$
;
```

Figure 4 - Custom Sign-On

```
SIGNON: DEFB    CR,LF
        DEFM    'R.H.Barnett custom CP/M version 2.2'
CRLF:   DEFB    CR,LF
        DEFB    '$'
;
```

jumps to a location MONITR+24. The purpose here is to get the character to be output into register A, then to jump to the serial port B output routine in the monitor. The SIOOUT code is shown inserted near CONOUT in the CBIOS listing only because it seemed like a nice place to put it. Anywhere will do as long as it's not in the middle of some other routine.

See Figure 2 for the SIOOUT Code

Custom Init

This completes the CBIOS.ASM modifications if you are happy with 300 baud, 7 bits, and odd parity. The following segment of code shows the necessary additional code to initialize the serial port B for 9600 baud, 7 bits, and no parity. The segment is shown inserted into the routine which prints the sign-on message onto the screen. I chose this spot to put it as a place which would be executed only once; namely at sign-on. The comments should let you change the routine if you wish.

See Figure 3 for Port B Initialization

If the comments make little sense, study the SIO specification sheet a bit. The WR3 and WR4 notations are write registers in the SIO. Note that the WR3 register is loaded with 61H. This sets up the AUTO CTS. In other words the SIO takes care of checking the CTS line and holds up printing until the printer is ready for more data. This is the routine referred to earlier which negates the need to use the list device status vector. The catch is, of course, that you must use the CTS protocol for printer control, not the XON/XOFF protocol.

This completes the changes necessary to enable serial port B as the LST: device. One other easy and ego-gratifying change is possible at this point. Namely the sign-on message can be changed to show your own sign-on message. Being somewhat of an egotist, mine signs on with "R.H.Barnett custom CP/M version 2.2." The segment of code containing the sign-on message is shown below. Change it as your conscience and ego permit.

See Figure 4 for Custom Sign-On

Creating CBIOS.HEX

The changes to the CBIOS.ASM are now complete. You now need to assemble the CBIOS.ASM and link it to create CBIOS.HEX. Then the whole affair must be installed into CP/M. Prior to assembly make sure that the CBIOS.ASM is originated at the correct location. As long as you are using DRC configured CP/M and DRC CBIOS, you should not have to worry about this. If you have questions, refer to 'Changing Your CBIOS' by James Simon in Micro C #8.

Automated Assembly

Since the project of assembling and installing the CBIOS is fairly complex and since finishing this project is likely to require several tries, I wrote a SUBMIT program to do the job. The program is listed below. Note that the comments are NOT part of the program, but were added when I wrote the article.

See Figure 5 for the SUBMIT file

There are a number of ways that you may wish to change the above procedure. One is to use drive A throughout (eliminate the two 'B:' lines, the 'ERA CBIOS.HEX' line, and the 'PIP. . .' line). Another is to leave CPM.COM on the disk (remove the 'ERA CPM.COM') so that the first 'SYSGEN' and the 'SAVE . . .' line are not required. This will cut down on the amount of time and disk activity involved with each run. It does, however, require that you have room on the disk to hold all the files.

Once you understand the steps involved in activating the LST: device, other changes to your CBIOS should be easy.

■ ■ ■

Figure 5 - The SUBMIT File

```
XSUB                    *so submit could input to each program
B:                      *assumes that the CBIOS.ASM is on drive B
ZASM CBIOS.ASM /SC      *ZASM is my z-80 assembler. You must
                         either have the assembler on drive B or be
                         using ZCPR. The /SC are assembler options.
B:                      *Reset to drive B since the assembler resets
                         to A:
LINKZ CBIOS /           *LINKZ is the z-80 linker. Makes a hex file
A:                      *Switch back to drive A for the CP/M install
ERA CBIOS.HEX           *Just in case one already exists
PIP A:=B:CBIOS.HEX      *Copy CBIOS.HEX onto drive A
ERA CPM.COM             *Just in case one is already present
SYSGEN                  *SYSGEN brings the CP/M into RAM. SYSGEN
                         asks 'source drive'. You must type 'A' in
                         order to bring in the CP/M from drive A.
SAVE 60 CPM.COM         *Writes the CP/M onto the disk as a file so
                         that DDT can work on it.
DDT CPM.COM             *runs DDT with CP/M as the file to be changed
ICBIOS.HEX              *Sets CBIOS.HEX as the file to be read in
R3780                   *Sets 3780H as the offset. Use 3580 if you
                         are not using a DRC configured CP/M.
GO                      *Get out of DDT
SYSGEN                  *Now when SYSGEN asks 'source drive' answer
                         with a <CR>. This lets SYSGEN know to use the
                         CP/M already in memory. When SYSGEN asks for
                         'destination drive', answer with 'A'. SYSGEN
                         then writes the new CP/M onto disk in drive A.
                         Answer the last SYSGEN question with a <CR>.
ERA CBIOS.HEX           *Do a little housekeeping.
ERA CPM.COM             *Likewise.
```

Serial Keyboard Interface

By Philip Plumbo

1128 Dayton Ave
St Paul, MN 55104

If you're tired of wrestling with six feet of 26-conductor keyboard ribbon cable (and tired of getting garbage characters because of the long parallel lines), here's an easy parallel to serial interface circuit that will let you use a standard telephone handset coilcord to link your keyboard to the BB and provide RS232 levels for more reliable operation as well.

I used TR1602B UARTs, since Digital Research Computers had them on sale, but you may substitute an AY-5-1012, COM 2502, or a TMS 6012. They are all pin-compatible.

The Transmitter

The keyboard UART is programmed (via pins 34-39) to transmit an 8-bit word with odd parity and 2 stop bits. The 8-bit word preserves the high-order bit for use with any special function keys.

The data transfer rate is set by the 555 clock circuit to 300 bits/second. The 555 runs at 4800 Hz, which is 16 times the data transfer rate. Be sure to use mylar or polycarbonate capacitors where indicated for clock frequency stability.

The transmitter UART, clock circuit and RS232 driver are mounted inside the keyboard case on a 22-pin Vectorboard edge card.

The Cable

Three of the four conductors in the cord carry supply current (+12V, −12V, and ground). The fourth line carries the serial data from the keyboard to the computer. I used a 7805 regulator for on-card +5V supply, although a 5V zener would be adequate.

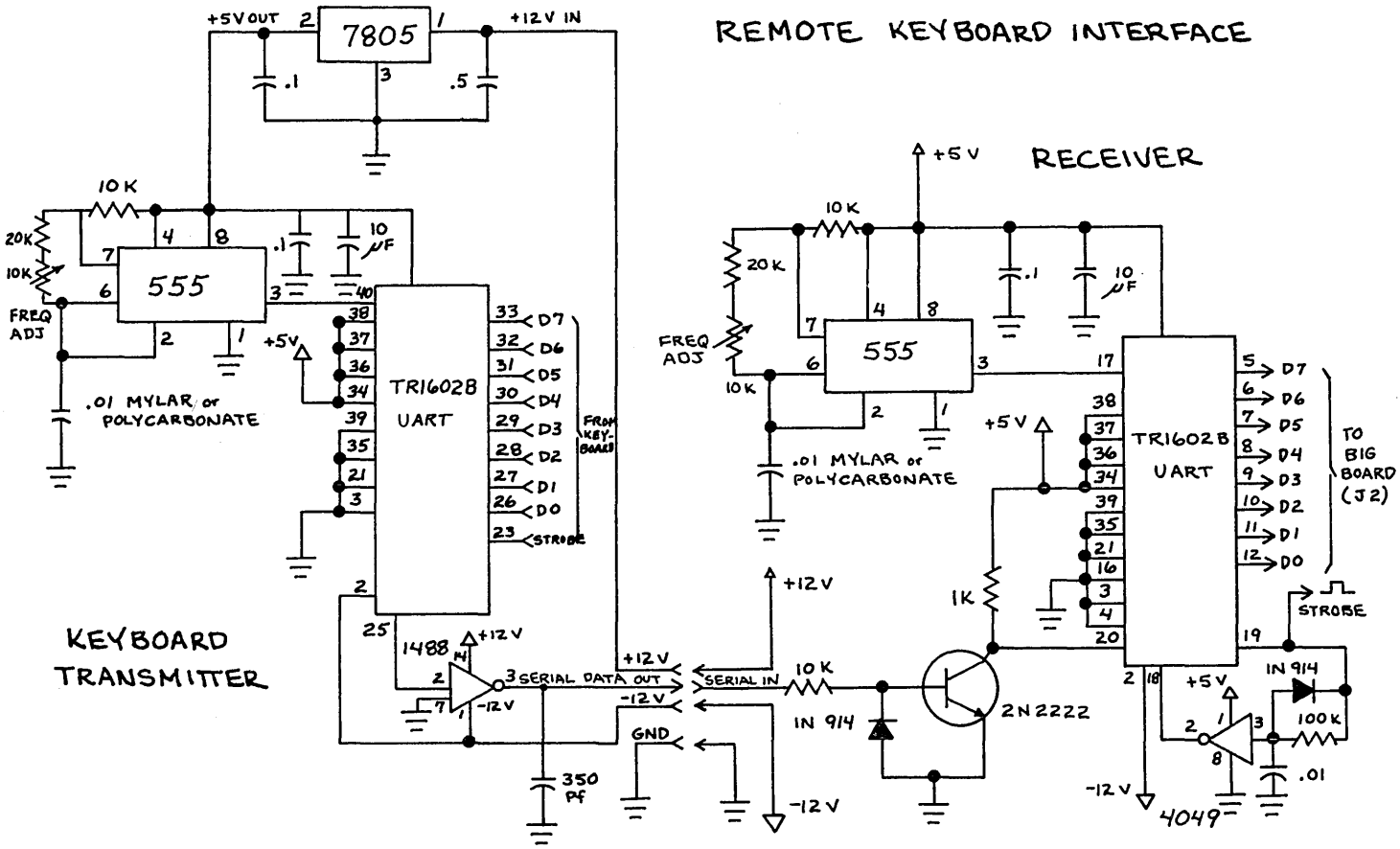
The Receiver

The receiver is also mounted on Vectorboard and is configured for the same 8-bit word, parity, and stop bits as the transmitter. The 4049 CMOS inverter and its RC network provide the delayed pulse to reset the strobe. I used a 2N2222 as an RS232-to-TTL converter but you could use a 1489 instead.

Both transmitter and receiver clocks should be set to approximately 4800 Hz. The frequency isn't critical except that both clocks must run at the same frequency. If you don't have a scope or frequency counter, connect a small speaker to the clock outputs and adjust them each to the same pitch. If you tune them both to the highest note on the piano you'll be close enough. (If you don't have a piano, call me and I'll whistle it for you.)

This remote keyboard interface works well, thanks to the magic of LSI. I especially like the added noise immunity of RS232 interface levels. This way a standard 25-ft telephone coil cord can be used without fear of losing data, although from that distance you would need binoculars to read the monitor.

■ ■ ■



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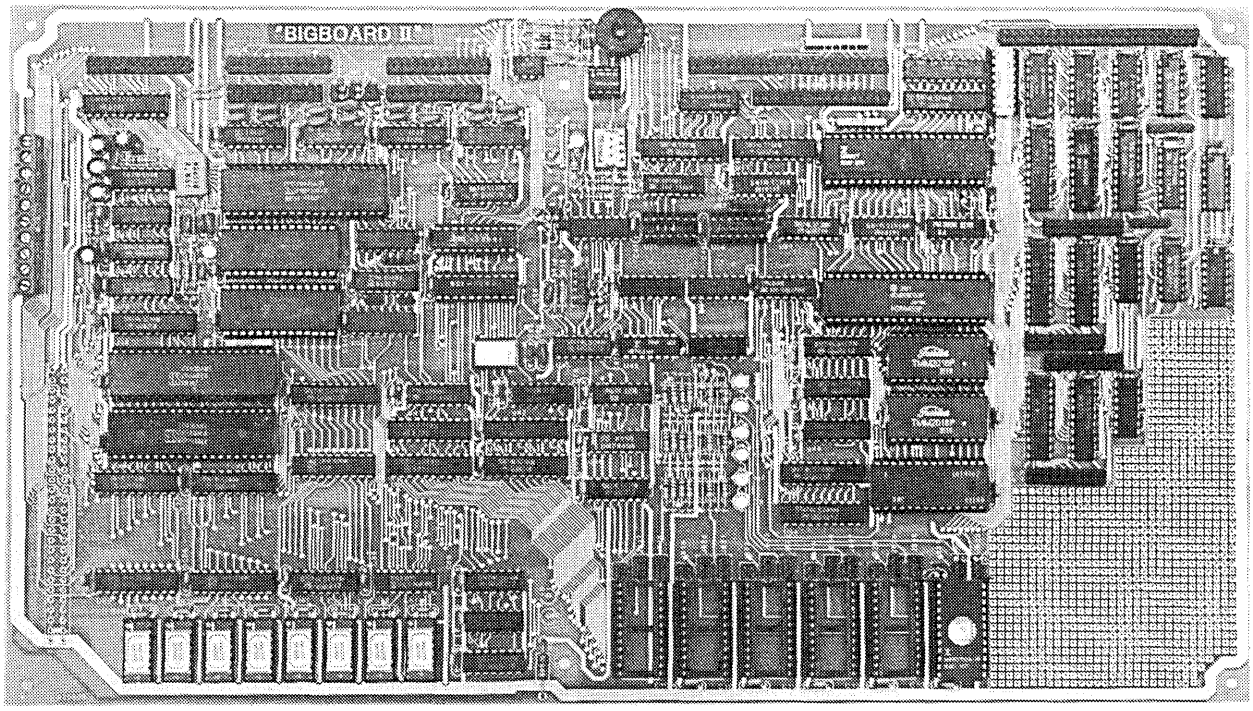
4 MHz Z80-A SINGLE BOARD COMPUTER WITH "SASI" HARD-DISK INTERFACE



$895 ASSEMBLED & TESTED* $695 FULL KIT* $245 PC BOARD WITH EPROM & PALS*

Jim Ferguson, the designer of the "Big Board" distributed by Digital Research Computers, has produced a stunning new computer that Cal-Tex Computers began shipping in June. 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, a full kit, or assembled and tested, it comes with a 250 nS 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, 1797, 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 processor overhead. When a hard-disk subsystem is added, the DMA chip makes impressive disk performance possible.

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**

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

---

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Xerox 820 Notes

Column by John P. Marlin, Jr

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Newton, Ma 02164
(617) 964-8041

This month we'll look at the Xerox 820 boards in greater detail than we did in issue #7. Specifically, we'll look at what's necessary to make one work, since you don't get much documentation. Figures 6 and 7 show the System PIO bit assignments and the port addressing.

Power Supply

The power supply used in many of the 820s is the ASTEC AA11760. It supplies +5V at 4.65A, −12V at 0.5A, +12V at 2.8A (also powers the 5¼" Disk Drive Cabinet P/N X-929), and +12V at 2.0A for the monitor.

Power connections to the 820 board are shown in Figure 1. If you are powering only the 820 board from +12V, the supply probably won't need to supply more than an amp. Additionally, there is a separate P/S connection to the drives so the +12V could be generated from part of the +24V for 8" drives.

The 5V feeds are tied together on the board, so if you are providing 5V through the 37-pin J1 connector, figure about half an amp each for 5" drives and about .8 amp each for 8." (So the 4.65A provided by the original supply might not handle the +5V for two 8" drives.)

There are some Micro Switch 74SW series keyboards on the surplus market at $35-55 each. These need 5V at 1.2A and −12V at 0.05A. A jumper could be added to the 820 to provide the −12V to the keyboard (ditto if +12V needed). See Figure 2 for spare pins available.

Monitor Connections

Connector J6 provides a DC interface to the monitor chassis. Any voltage could be tied to J5-7 from the power supply chassis to feed the monitor through J6-2. However, most Motorola monitors take 115VAC. Connector J7 handles the signal interface. Note that all signals are low-going TTL, and match most monitors (Ball TV-12, TV-120, etc.). Also, note that AmP pin numbers aren't the same as the Xerox designations! (Figure 2 uses AmP numbering conventions.)

Keyboards

Any keyboard having a low-going STROBE signal can be used, as the polar-

(Xerox 820 Notes continued on page 10)

FIGURE 1 - POWER/VIDEO CONNECTIONS

POWER SUPPLY (P5) Mates with AmP 1-480706-0

Pin	Voltage	Current	Destination
1	-12.0	0.5A	Logic (2 1488's)
2	+12.0	app 1.0A	Logic
3	+12.0	2.0A	5-1/4 Disk (no connect to pin 2)
4,5,6	DC GND		All Logic, all commoned
7	+12.0	2.0A	Monitor (P6). No other connection
8,9	+5.00	3.0A	Logic. Add'l for K/B and Disk.

MONITOR POWER (P6) Mates with AmP 1-480698-0

1	DC GND		Monitor Ground
2	+12.0	2.0A	Monitor Power (P5-7).

MONITOR VIDEO (P7) Mates with AmP 87865-7 (AmP pin numbers used)

8	VSYNC	Vertical Synch
9	HSYNC	Horizontal Synch
10	VIDEO	Video Data
3	VSYNC/RET	Ground for VSYNC
4	HSYNC/RET	Ground for HSYNC
5	VIDEO/RET	Ground for VIDEO

EARTH GROUND (E3) Mates with AmP 42660-2

E3	EARTH GROUND	Connect to Third Wire of Power Cord

FIGURE 2 - REAR APRON CONNECTORS
(Note all require continuity to connector shell for shielding)

PIN	SIGNAL NAME	DESTINATION (SOURCE)
DISK CABINET (J1) 37-pin "D" series connector.		
1	no connection	
2	8/*5	Jumper to GND for 5-14", open for 8"
3	no connection	
4	*INDEX	Index sensor (drive)
5	*DVSEL1	Drive select 1. (SYS PIO PA-0)
6	*DVSEL2	Drive select 2. (SYS PIO PA-1)
7	*DVSEL3	Side Select (SYS PIO PA-2)
8	*HDLD	Head Load (1771)
9	*STEPIN	Step Direction (1771)
10	*STEP	Step command (1771)
11	*WRT DATA	Write Data (1771)
12	*WRITE	Write Gate (1771)
13	*TRK00	Track 0 Sensed (drive)
14	*WRT PROTECT	Write Protect Notch Open (drive)
15	*RAW DATA	Read Data (drive)
16	*LOW CURRENT	TG43 (1771)
17	*READY	Drive Ready (drive) (faked from index for 5-1/4)
18	+12VDC	Power to drive (J5-3)
19	+5.0VDC	Power to drive (J5-8,9)
20-37	DC GROUND	Returns for twisted pairs or ribbon cable.
KEYBOARD (J2) 25-pin "D" series		
1	*KB0	Keyboard data (LSB)
2	*KB1	Keyboard data
3	*KB2	Keyboard data
4	*KB3	Keyboard data
5	*KB4	Keyboard data
6	*KB5	Keyboard data
7	*KB6	Keyboard data
8	*KB7	Keyboard data (MSB)
9	*KBSTB	Keyboard Strobe (note low-going)
10	n/c	
11	n/c	
12	n/c	
13	+5.0V	Keyboard Power
14-25	DC GROUND	Commoned for twisted pairs
PRINTER (J3) 25-pin "D" series from SIO-B		
1	CH GND	Don't believe it - DC GROUND
2	PRTR TXD	Data in from printer
3	PRTR RXD	Data out to printer
4	PRTR RTS	Request to send from printer (SIO CTS)
5	PRTR CTS	Clear to send to printer (SIO RTS)
6	PRTR DSR	Data set ready (4.7K from +12)
7	SIG GND	Common reference for EIA signals
8	PRTR DCD	Carrier Detect (from SIO DTR)
9-19	n/c	
20	PRTR DTR	Data Terminal Ready (SIO DCD)
21-25	n/c	
COMMUNICATIONS (J4) 25-pin "D" series from SIO-A (Jumper selectable on J9)		
1	CH GND	See note on J3-1
7	SIG GND	EIA Common
9-14	n/c	
16	n/c	
18-19	n/c	
21-25	n/c	
2-6	(Varies)	Jumper selectable to DTE or DCE configuration
8	(Varies)	Jumper for DCD or DTR
15	(TX CLK)	Transmit clock, either to or from device
17	(RX CLK)	Receive clock, either to or from device
20		

FIGURE 3. MEMTST CODE.

```
;       ARRIVE HERE WITH SP=START ADDRESS OF TEST AREA
;       WE WILL TEST UP THROUGH OFFFFH.
MEMTST:                         ;NOTE THAT MEMORY 2 BYTES BELOW
                                ;START ARE AFFECTED.
TESTLOOP:
        LD      HL,0AA55H       ;TEST WORD
        POP     BC              ;SAVE ORIGINAL DATA
        PUSH    HL              ;WRITE TEST WORD
        POP     DE              ;READ TEST WORD
        PUSH    BC              ;RESTORE ORIGINAL DATA
        POP     AF              ;RE-READ ORIGINAL DATA
        SUB     B               ;DID WE WRITE AND READ ORIG. DATA OK?
        JR      NZ,ERROR        ;NO, WE DIDN'T
        SBC     HL,DE           ;TEST WORD READ SAME AS WRITTEN?
        JR      NZ,ERROR        ;NO
        DEC     SP              ;SP NOW ONE HIGHER THAN AT ENTRANCE
        CCF
        ADC     HL,SP           ;MORE TO DO?
        JR      NZ,TESTLOOP     ;AND AROUND WE GO, AGAIN, IF NEEDED
EXIT:
        etc.....
;
ERROR:
        LD      HL,ERRMSG
        LD      DE,CRTMEM+036H
        LD      BC,LERRMSG
        LDIR
DELAY:  DEC     BC              ;HERE WE KILL TIME TO DISPLAY THE MESSAGE
        LD      A,B
        OR      C               ;WE ARE LOOPING 64K TIMES
        JR      NZ,DELAY
        JP      0               ;RE-EXECUTE THE PROM CODE.
;
ERRMSG: DEFB    'RAM ERROR'
LERRMSG EQU     $-ERRMSG
;
```

FIGURE 4. XEROX 820 MONITOR COMMANDS (All require <ret> to execute)

FUNCTION	SYNTAX	NOTES
Boot from A	A	Reads TK 0, SEC 1 into 0080 and jumps there.
Boot from B	B	Same. Names it A in Xerox CP/M.
Move (copy) data	CXXXX,YYYY,ZZZZ	XXXX=source start, YYYY=source end, ZZZZ=destination start.
Dump	D[XXXX][,YYYY]	Both operands optional.
Fill	FXXXX,YYYY,ZZ	All operands needed. Writes ZZ into XXXX through YYYY, verifying each byte, and displaying errors.
Goto	GXXXX	Actually a call, so RET comes back here.
Input from port	IXX	Input and display data. <ret> will read from next port, <-> (minus) will read from port below.
Read/write Memory	MXXXX	Display byte at XXXX. 2-digit hex data will be written there, <ret> will display next address, <-> will decrement display address.
Output to port	OXX,YY	Send YY to port XX. Nothing more.
Read disk sector	RX,YY,ZZ	X=drive (0 or 1), YY=track, ZZ=sector. Puts sector into 0080 and displays.
Typewriter	T	Sends keystrokes to Port B, no screen display. 1200 BPS, Odd Parity.
Verify	VXXXX,YYYY,ZZZZ	Same as Copy, but only compares. Xerox says this command is deleted, but code is still there.
Memory test	XYYYY,ZZZZ	YYYY=start address, ZZZZ=end. DON'T OVERWRITE MONITOR AT F000!

FIGURE 5. MONITOR ENTRY POINTS AT F000. (Addresses are for Rev. 1.0 PROMs)

```
F000  C32AF0      JP    INIT      ;CLEAR SCREEN, INITIALIZE PORTS, ETC.,
                                  ;AND DISPLAY INITIAL MESSAGE
F003  C3EDF0      JP    PROMPT    ;DISPLAY *, GET COMMAND
F006  C398F5      JP    CONST     ;JUST LIKE A BIOS
F009  C3A0F5      JP    CONIN     ;DITTO
F00C  C34BF6      JP    CONOUT    ;DITTO
F00F  C34BF6      JP    CRTOUT    ;SAME AS CONOUT IN THIS VERSION
F012  C32EF6      JP    SIOST     ;SAME AS CONST FOR SIO B.
F015  C336F6      JP    SIOIN     ;SAME AS CONIN FOR SIO B.
F018  C340F6      JP    SIOOUT    ;SAME AS CONOUT FOR SIO B.
F01B  C3DCF7      JP    SELECT    ;SELDSK
F01E  C312F8      JP    HOME
F021  C324F8      JP    SEEK      ;SET TRACK AND SEEK THERE
F024  C35FF8      JP    READ      ;READ SECTOR (C) INTO MEMORY (HL)
F027  C351F8      JP    WRITE     ;WRITE DATA (HL) TO SECTOR (C)
```

(Xerox 820 illustrations continued on page 10)

XEROX 820 CABLES

XEROX 820 cable harness assemblies for:

J5 - Power
J6 - Monitor Power
J7 - Monitor Signal
- Ground Connector

All cables have Xerox specified AmP connectors on one end. The other end is open.

Schematics of cables included

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Xerox 820 illustrations continued

FIGURE 6. SYSTEM PORT (01CH)

BIT	NAME	FUNCTION
7	BANK	Select alternate memory 0000-3FFF 0000-0FFF 2x2716 EPROM 3000-37FF CRTMEM
6	NCSET2	Selects upper half of 2716 character generator
5	n/c	Gets toggled on ASCII BEL character.
4	8/N5	Input from J1-2 (Disk). Hardware control of 1771.
3	KBDRDY	Set upon receipt of keystroke (KBDSTB)
2	DVCSEL3	Xerox uses for side select
1	DVCSEL2	Drive B select
0	DVCSEL1	Drive A select

FIGURE 7. PORT ADDRESSES

PORT	FUNCTION
00-03	SIO A Baud rate generator (write only)
04	SIO A Data
05	SIO B Data
06	SIO A Control
07	SIO B Control
08	GP PIO A Data
09	GP PIO A Control
0A	GP PIO B Data
0B	GP PIO B Control
0C-0F	SIO B Baud rate generator (write only)
10	1771 Command/Status
11	1771 Track
12	1771 Sector
13	1771 Data
14-17	CRT Scroll register (write only)
18	CTC 0
19	CTC 1
1A	CTC 2
1B	CTC 3
1C	SYSTEM PIO Data
1D	SYSTEM PIO Control
1E	Keyboard Data
1F	Keyboard Control

(Xerox 820 Notes continued)

ity of data is a don't-care (ain't software miraculous?). If your keyboard insists on high-if-true data leads, simply CMA the data in BIOS. However, if the keyboard has high-going STROBE, you must lift U-104 (74LS14) pin 12 and jumper U-104-12 to −13 to remove the invertor. As mentioned under POWER SUPPLY, you may add jumpers to supply +12V or −12V to the keyboard. Also, note that the 820 has no terminators on any keyboard signal, so if you need pullups (most DTL logic does), put them on the keyboard.

Smoke check

If you have gotten this far, you should be able to get the Xerox Monitor message on your CRT each time you press RESET (the button on the rear apron). It looks like this:

. . . XEROX 820 VER. 1.0 . . .
A—BOOT SYSTEM
T—TYPEWRITER

At this point, you have a Working Computer!

Monitor commands are shown in Figure 4. If you fat-finger the command the system will respond with 'what ?' and another asterisk. Separators in the command string may be either commas or spaces. This is probably a good time to do an extended (24 hours) test of memory. 'X0000,EFFF' will do this. DO NOT ATTEMPT TO TEST F000-FFFF as the monitor lives there in RAM, and is executing the test from there.

The monitor will write a sector using the 'R' command if a CALL located at F1A3 (Rev. 1.0 PROM) is changed from the READ (F85F) to the WRITE (F851). Verify these addresses from the Jump Table at F000 (Figure 5). Don't forget to 'unmodify' the CALL before loading (RESET button is fastest).

Disk Drives

The pinout on J1 allows ordinary mass-terminated ribbon cable to connect to 5¼" drives (i. e. the pins are in the right order). You have to provide a ground to pin 2 to tell the controller circuitry to divide the drive clock in two. For 8" drives, use twisted-pair. It works better.

Don't forget to remove the terminators from all but the last drive, and if your drives support it (Shugart, etc.) use the binary select option so you can access more than 2 drives.

Note that the ROM monitor adds 1 to the unit number, so no unit can be binary 0. Binary 1 is "A," and so on. Don't be afraid to modify the monitor PROM. I can think of many things they could have done better such as the silly 'T' typewriter option, which only works on Port B at 1200 BPS Odd Parity, ETX-ACK protocol.

Monitor

I have included, with this missive, a disassembly, without comments, of the 820 monitor. *(Editor's note: we haven't filled a disk with 820 software so we don't have an official 820 user disk but if you want the disassembly of the 820 monitor anyway, just send $15 and ask for the Xerox monitor disk.)*

Other Notes

We are trying to put an 820 board into an old Hazeltine 1400 terminal case, using the original keyboard, monitor, and power supply after bandsawing off the extraneous parts. More on that next month.

Figure 3 contains the memory test used in the 820-II. It should work as well on the BB or the 820.

■ ■ ■

C'ing Clearly

Column by Tony Ozrelic

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This column features a review of *The C Puzzle Book.* The review is by John Clements, a senior programming analyst for Seven Up Bottling Co. *(Ed. note: you like him, he likes you.)* He owns a BB and uses it in various hobbies including ham radio. He also owns an IBM PC (another single board computer).

Compiler News

But first, Manx has come out with a new version of Aztec C. This version has program overlays, a full implementation of C, I/O redirection, and source code compatibility with their Apple and IBM PC compilers.

If you have any compiler news (new releases, bugs, bug fixes, neat features, etc.) send them to me or Dave so we can run them in this column.

An LA Event

I've been kicking around the idea of having a Big Board and C and what-have-you meeting here in L.A. If you are interested, drop me a line so we can start planning.

The C Puzzle Book

The C language is rapidly growing in popularity. Its power and elegance lend it to a wide variety of applications. However, to a newcomer, C can appear quite strange and unreadable. It has a number of subtleties that can lead to hours of frustrating debugging.

The only definitive work so far available on C is *The C Programming Language* by Kernighan and Ritchie. This is a tutorial style text which means that it doesn't cover all of the topic and it means that material on a specific subject may be scattered throughout the book.

In *The C Puzzle Book,* Alan Feuer (who teaches courses in the C language at Bell Labs) has organized his class quizzes into a series of single-page puzzles with the questions on the front of the page and the answers on the back. These puzzles cover such material as operators, basic data types, files, control flow, pointers, arrays, structures, and the preprocessor. The puzzles, for the most part, are simple, but many require a fair amount of thought. Through them, he illustrates many of the common mistakes a beginner can make and displays both good and bad coding techniques. It is a thorough coverage of C.

Among the things I particularly liked is the way solutions are worked out step-by-step, complete with explanations. As you work out the puzzles you come across techniques that you would not have thought of. And after getting answers wrong repeatedly on some very "simple" examples, you will learn the proper way to code.

The book was designed as a workbook for the Kernighan and Ritchie book, but it can be used by itself. It should be required reading for the beginner and should become the second classic work on the C language. I suspect that many software houses will begin offering it with their compilers. One thing is sure, when you can work the puzzles, you will know C and you will have saved countless hours of debugging. ■ ■ ■

File COPY Program written for BDS C *By James Simon*

```
/* This is a program to move a file  to another file.
   it is faster than PIP and it is smaller than pip.
*/
#include "a:bdscio.h"
#define BUFSECTS 128
int fd1,fd2 ;
char buffer[BUFSECTS * SECSIZ] ;

main(argc,argv)
int argc ;
char **argv ;
{
        int oksects ;

        fd1 = open(argv[1],0) ;
        fd2 = creat(argv[2]) ;

        while (oksects = read(fd1,buffer, BUFSECTS)){
                if(oksects ==ERROR)
                        perror("Error reading: %s\n",argv[1]) ;
                if(write(fd2,buffer,oksects)!=oksects)
                        perror("Error; probably out of disk space\n") ;
        }
        close(fd1) ;
        if(close(fd2) == ERROR)
                perror("Error closing %s\n",argv[2]) ;
        printf("copy complete\n") ;
}

perror(format,arg)
{
        printf(format,arg) ;
        fabort(fd2) ;
        exit() ;
}
```

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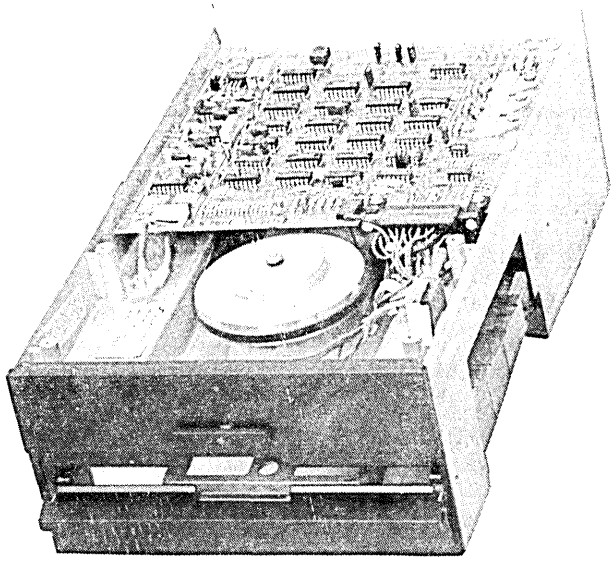

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The Disk Inspector

Review by David Thompson

This has been a very pleasant review. I expected The Disk Inspector to be a simple rehash of DU-77 or DUMPX, with perhaps different command names, but it is much better than that.

It is better, primarily because it takes a lot of the effort out of directly editing disk files. Yes, I mean disk files, not just sectors and directories.

Its display is very much like DUMPX with the hexadecimal characters on the left and the equivalent ASCII characters on the right. However, you can edit the characters in either field!

In the modify mode you can move a cursor all over the sector, changing hex values in the hex field or changing ASCII characters in the ASCII field (or both).

As you make changes in either field, the equivalent character in the other field also changes. In other words, if you changed a "G" to an "H" in the ASCII field, the "47" in the hex field would change to a "48." Whoopee! No more looking up the ASCII codes. This is almost as easy as full screen editing!

Inspect also lets you specify block numbers (the hex numbers displayed in the directory with the filename). Thus if a file resides on blocks 3E and 3F you can simply specify you want to read block 3E and behold you will be looking at the first sector of the file (at least if you are in single density).

Inspect is supposed to work properly with any single or double density disk but I found that it was off by one sector when looking at blocks on a double density disk created by the Software Publishers board. The sector following the first sector it showed me was the first sector of the file.

Meanwhile, you are looking at two sectors at a time on the screen and you can select them independently. So, the upper sector on the screen could be from disk A and the lower could be from disk C and you could independently scroll each through its own disk (or through the same disk).

The commands include:

RU— read sector onto upper half of screen
RL— read sector onto lower half of screen
NU— read next sector (upper)
NL— read next sector (lower)
MU— modify (edit) upper
ML— modify (edit) lower
WU— write upper sector back to the disk
WL— write lower sector back to the disk
H — help
— plus many more

A carriage-return simply repeats the previous command, so stepping through a disk is very easy.

CP/M Auto Load

I was a little surprised to see in the manual that I could use the Inspector to automatically run a file upon boot up. So, following the instructions, I tried it.

First I located the sector with the Digital Research copyright notice (the Inspector manual notes that it is usually the second sector of track 0). Byte 7 (you start counting with byte 0) of that sector should be 00, followed by a bunch of 20's (spaces).

Change byte 7 to the number of bytes in the following command and then change the following 20's to the command.

For example, I wanted it to run PR.COM (to set up the serial printer port) so I changed byte 7 to 02 (a two-byte command will follow), and then entered "P" and "R" in the following two bytes. I changed the byte following the "R" to 00 to tell CP/M that the command was ended.

Using The Inspector, I entered the 02 in the hex field and then entered the "P" and "R" in the ASCII field. Then I jumped back to the hex field to enter the final 00. It was very very easy.

Unfortunately when I booted up, the PR.COM program started running itself over and over. It turned out that when the program did a jump 00 to return, CP/M simply ran the program again. So I booted up on another disk and used The Disk Inspector to locate and change the return in the PR.COM file from JP 00 to JP 03 and everything worked fine. If the boot file is not present on the disk, you will get the filename and a question mark displayed on the screen but the system will run fine anyway.

Conclusion

Everything they say about the Disk Inspector is true, you can really do all those things on the disk.

The manual does a very good job explaining what is going on between the directory and the files but the Inspector does so many of those infernal block calculations for you (plus figuring the proper next sector) that it is easy to locate and step through a file or program looking for specific bytes.

Plus, The Inspector was so well designed that after a few minutes you are pretty much through referring to the manual or the help displays. The things you do often are easy, the commands available are constantly displayed, and the help command gives instant instructions.

So it is obvious that The Inspector was designed with both the occasional user and the heavy user in mind. And I found the handles on this package worn comfortably smooth.

The offset problem on the double density disks could well have been a simple implementation difference between Graham Campbell, the creator of the Disk Inspector, and Russell Smith, the creator of the double density package.

The Disk Inspector
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■ ■ ■

HELP!!!HELP!!!HELP!!!
HELP!!!HELP!!!
HELP!!!

If you were the kind person who sent in the super article on the BB II, please get in touch right away. I have lost your name and address. The article included information on configuring WordStar & lots of other BB II goodies. It was written using WordStar and you noted that you were using two Shugart 850 drives.

THE ABSENT-MINDED EDITOR

BB II EPROM Program Extended

By D.H. Durland

663 Georgia Ave
Palo Alto, CA 94306

A number of people have asked if my 2732 BB II PROM burning program could cover 2716's. Yes, with a little work.

First some background. If jumpered properly, BB II will reliably read both 2732's and 2716's. It is well set up to program 2732 and program 2716's. So what is the problem?

Ron Saso noted (much to my embarrassment) that: (1) When reading a 2716, pin 21 (programming voltage pin) must remain at +5V. This is not the case with a 2732. (2) The 2716 has a positive programming pulse, the 2732's is negative. This means we can't reliably use the chip selects to do the pulsing since we can't guarantee that any one will stay low during address changes. This is OK on the 2732 since we keep all the lines high by disabling the chip select decoder.

You can make sure that pin 21 remains at +5V during a read by cutting the trace between the appropriate U-44 output (determined by the socket you will be using) and the 2N2907 collector. Thus this line will be either +5V or VPP (the programming voltage). If you used sockets you can simply lift the correct pin on U-44.

Now we have to find a way to pulse the program line (ROM pin 18). We can't use the chip selects and we can't use PGM because we need a qualified line to gate the chip onto the bus during read and this will have to come from SMEMRD/.

I propose that we tie pin 18 of our selected socket to U42 pin 7, the y-1 output. Tie pin 20 to the chip select (U-55). We can disable the chip select by making DECODE/ high during programming. Tie U42 pin 6 to U41 pin 6. U41 pin 6 will be pulsed during programming and the pulse will be passed through when the B side of U42 is active. Tie U42 pin 5 to U42 pin 14 to pick up SMEMRD/. Thus pin 18 of our chosen socket will be our qualified CE/ during read. *(Editor's note: Whew!)*

First get user's disk #9 or enter the source from issue #9. Then make the following changes.

(1) Change the ROMSIZ equate from 4096 to 2048.

(2) Locate the line "here is the actual burn." (Page 5 following CKADUP:) Change "LD B,3" to "LD B,4." (We are going to initialize one additional output line.)

(3) Locate BRNTBL: Add "DEFB 2 ; set U41 Q2 low" before the line "DEFB 8"

(4) Locate the line "LD A,1" (four lines above CNTMS:) Change this to "LD A,0AH ; programming pulse high"

(5) Locate the line "LD A,9" (two lines above BURN9:) Change this to "LD A,2 ; programming pulse low again"

Make the following jumpering changes: Pin 21 of the chosen socket (one of the chosen few) goes to VPP. Pin 18 of the chosen goes to U42 pin 7. Pin 20 goes to the proper chip select pin.

That should do it. You now have something which will reliably program 2716's. Yes, many times you can get away with pulling pin 21 to ground, and the chip select may usually stay quiet during address changes, but you can't count on it. With these changes you can forget about marginality. ■ ■ ■

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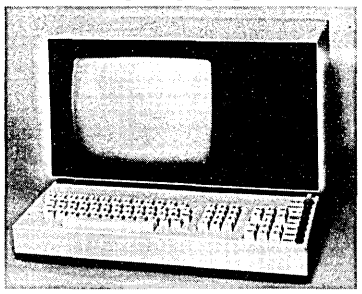

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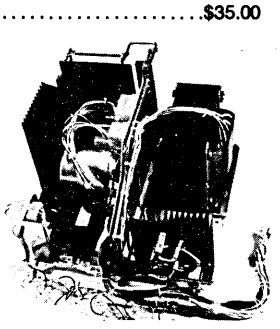

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The Winchester and the BB II

Story by Robert S. Broughton

Box 5191
Beaverton, Oregon 97006

My Cal-Tex Big Board II has this extra 50-pin connector for a SASI interface. How tempting it would be to actually have a winchester disk drive hooked to it!

Well, even though the double density operation of the 8-inch flexible disk drives is flawless, and though each disk read grabs 9 logical sectors . . ., the thought of having five megabytes online did turn my head.

So there the SASI connector sat.

Meanwhile, a co-worker, Lynn Cochran, splurged (blew his hardware budget for the year!) and took up Xebec on their $999 offer for a Tandon 5 megabyte winchester disk and an S1410 controller card.

After 6 weeks, Lynn's disk package came in. Oh, oh, there was only a 90-day guarantee. This meant that Lynn would have to really rush to make up an interface card between his S100 bus computer and the Xebec combo before the warranty ran out. *(Ed. note: wasn't a bad idea since nearly half the Xebec combos are reportedly dead on arrival. But we're getting ahead of ourselves.)*

I pointed out to Lynn that there was this unused SASI connector on my up-and-running Cal-Tex Big Board II. Also, I noted that the CP/M that I received for the BB II was already configured for two 8" flexible disk drives and the Xebec controller. Heh, heh, heh.

Anyway, I wound up with Lynn's Tandon 600 winchester drive and Xebec S1410 winchester disk controller card.

My assignment was to plug the Tandon and Xebec into a power supply, plug a cable between the Tandon drive and the Xebec controller, and plug the Xebec SASI interface cable into the SASI connector on the Big Board II.

Simple enough, right? Even though I had to make the cables myself, this couldn't be too difficult, could it? What could go wrong? Ah, dear reader, let me count the ways.

The Project

Making the cables wasn't too hard. The two ribbon cables between the Tandon disk drive and the Xebec controller are 20 and 34 conductor with header and edge connector respectively for the Tandon end, and headers on the Xebec end. The interconnection between the Xebec controller and the Big Board II is a 50-conductor ribbon cable with headers on both ends.

The power supply is a Power One model CP323a that seems to run a little warm. This power supply gives 12 volts at 4 amps and 5 volts at 2 amps. The 12 volts drives the motor of the disk drive and needs to be able to handle 6 amps for ten seconds as the disk comes up to speed. The motor needs 2 amps continuously after this initial surge.

After cabling it up, I applied power to the whole system and gave the "format drive" command to the Xebec controller. Nothing happened. The drive appeared dead, since the front-panel activity light did not flash in response to commands given to the Xebec controller.

Visions of buying Lynn another disk drive flashed through my head. Did I hook up the 12V power supply backwards? Was the motor reversed? I could imagine the inside of the sealed disk drive clouded with brown, the disk head grinding the aluminum disk and magnetic material to a pulp. Oh, my.

Next, I tried a "controller diagnostic" command to the Xebec controller. It's supposed to check itself and report back its opinion of its health. Quick as a wink, it said that it was ok. I also gave the controller a "drive diagnostic" command. The controller reported back that the disk drive was healthy. Yeah? What about the disk activity light?

I wrote some simple assembler programs to format the disk and test the bits on the SASI interface connector. The bits all looked OK on a scope but nothing happened.

Things got so bad, I finally put Lynn's home phone number in the debug program using db statements to tell the drive "miniwini phone home!"

After hearing of my troubles getting this system to work, Lynn (who now was getting a little nervous himself) wrote an assembler language program to debug the SASI interface.

He did a complete diagnostic program. I'm talking heavy duty. He brought it over and we debugged and debugged.

After a while we knew more than we wanted to about the SASI interface handshaking and protocol, but the thing still didn't work. I pulled the power to the winchester and asked Lynn to look it over for bad cables and other visible things.

Lynn found it by inspection. The problem was a 7405 IC, mis-inserted into the Tandon circuit board by an automatic board-stuffing machine. One of the pins didn't go through the hole in the board and was bent up. When it was in the Tandon factory it no doubt made contact with the solder pad filling the pin's hole but probably became non-contacting during shipping. Resoldering the pin cured the problem.

Of course, it had to work at the Tandon factory or they wouldn't have shipped it, would they?

We gave the controller the format drive command and the disk activity light worked! Hurray! After 30 seconds or so, the SASI interface busy line dropped, and we read some sectors at the beginning of the disk. Cheers went up as the terminal screen filled with hex 6C's, the default Xebec formatting character. We wrote 25K or so of hex E5's starting at the beginning of the disk to make a CP/M directory area (CP/M thinks that is an empty directory) and used PIP to copy some files over to the winchester disk.

I didn't have to replace the disk for Lynn, and we made the system run in the warranty period.

Performance

Now for a review of performance issues: The Big Board II runs at 4MHz, with all major peripherals operated from a DMA controller. It runs lickety-split even without the winchester disk and controller. The flexible disk performance is super.

As supplied from Cal-Tex, the CP/M bios supports double density for the flexible disks with physical to logical sector deblocking. Each physical read of the flexible disk pulls off 9 CP/M sectors while using double density. For sequential file reads and program loads, only one large physical sector need be read, then the eight other logical sectors with-

(continued next page)

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(The Winchester and the BB II continued)

in this physical sector are just read out of RAM.

The winchester runs about 30 percent faster than the flexible drives for short files. For long files it is much faster. Here the difference in rotation speed between the flexible disk and the winchester, 360 rpm vs 3600, makes the winchester really shine. The Xebec controller for the winchester is set up for 256 byte sectors. Instead of double density flexible disk storage of 674K each, the winchester has 4.84 megabytes.

Directories

As supplied from Cal-Tex the CP/M BIOS for the winchester disk provides 256 CP/M directory entries. This is not enough in my opinion. With small files, it is possible to fill the directory before you ever begin to fill the disk. 512 directory entries would be a fair balance.

With the winchester drive on the BB II, I have discovered the concept of "Peripheral Imbalance." Files can now be 512K—larger than my printer can print over a weekend.

Also, my system utilities are now inadequate. The text editor that I use (am using to prepare this, in fact) lets me edit files that are 20K or so in size because it has to hold it all in RAM. I have an assembler file for a document processor that's 110K, with an associated listing file that's 264K in size. Ouch!

To deal with this situation, I wrote some utilities in C to split up large files into a bunch of smaller ones (like UNIX' split command). Plus, I wrote a program to wade through the listing file reporting error lines. These are lines that start with an alphabetic character (E for example).

Conclusion

All in all, the BB II is very good. So good, in fact, that by 10:30 Monday morning, I have the Monday morning blues. My system at home is faster than the company's DEC PDP 11/44.

■ ■ ■

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FORTHwords

Column by Arne A. Henden

7415 Leahy Road
New Carrollton, MD 20784
(301) 552-1295

I am still waiting for my preliminary copy of the FORTH-83 Standard, so will delay my discussion until next issue. However, I think you will find sufficient material in this edition of the column to tide you over.

Vendors

Timin Engineering has released their dual-tasking FORTH. This version provides the ability to run two tasks concurrently, without requiring a real-time clock for scheduling. My guess is that Timin has modified NEXT to swap tasks every time the address interpreter is called. In any case, the dual-tasking feature is nice to have. You need a Z-80, 32K RAM and CP/M or CDOS to run Timin Dual Tasking FORTH, along with $285 with which you are willing to part. Timin Engineering Company, 6044 Erlanger Street, San Diego CA 92122.

Multi-tasking has finally made it big. Four other producers of concurrent FORTHs are: Unified Software Systems, for Z-80 stand-alone, $150; Creative Solutions, Inc., for the HP 9826/36 (68000-based systems); FORTH, Inc, for the IBM PC (8088-based), $300; and A-FORTH, by Shaw Labs, Ltd. for 8080-based CP/M systems, $395. FORTH, Inc.'s offering is interesting as it is their first 'inexpensive' FORTH. Competition must be getting tough!

New Products

Peopleware Systems, Inc. (Minneapolis, MN) has introduced their P-FORTH card, a single-board 6801-based STD bus card. The Fig-FORTH firmware package includes an editor, assembler and monitor.

Controlex Corp. (Van Nuys, CA) is using FORTH to control their CS105 Intelligent Controller. The CS105 is a multi-module system that supports the STD, IEEE-488 and CAMAC busses, utilizing an 8085A processor. The Fig-FORTH firmware package includes a decompiler, line- and screen-oriented editors, and an assembler.

The Panasonic RL-H 1800 hand-held computer now has a FORTH programming module available to replace the BASIC module if you so desire.

Cosima Corporation (Salem, OR) has introduced the C1000 data acquisition and control computer. It incorporates RS-232, current loop and IEEE-488 protocols, with 16 A/D and D/A 12-bit channels and 32 I/O lines. The firmware uses Stackworks FORTH on a Z-80 processor.

The new Rockwell AIM-5 computer is guiding a specialized robot in cleaning navigational gyroscope components for the Navy. Of course, FORTH is the controlling language.

Finally, word comes from England that a new single-board computer called the Jupiter Ace has been released, which comes with FORTH firmware and costs $180.

Z800

Zilog has finally introduced their first member of the Z800 family—the Z8108. This chip is designed to replace the Z80, having a superset of the instruction set. New features include memory management, additional addressing modes, and hardware multiply/divide. It looks very much like the 8088.

The Z8108 should be an excellent FORTH chip. It has many 16-bit features, such as PUSH and POP from memory, and array indexing. It should be possible to mate a Z8108 to the Big Board with a minimum of effort. For more information, see the October 14, 1982 issue of *Electronic Design*, page 163.

```
SCR # 1
  0 ( Random number generator ala Knuth)   ( 1/4/83 AAH)
  1 55 ()DIM RNUM      ( 55-element random array)
  2 24 CONSTANT JINDEX   ( one of the 2 array indices)
  3 54 CONSTANT KINDEX   ( one of the 2 array indices)
  4 (  *** fill the array with picked set of init values ***  )
  5 (      this set from Rand Corp tables                     )
  6 << 41138 39569 19997 16299 39568 55428 26649 25031
  7    57529 56344 36394 60498 55321 24386 50714 30919
  8    8520 4235 45139 18101 25213 7011 2801 54404 765
  9    32576 6061 13523 42106 6977 13693 516 18989 59855
 10    58260 22250 19808 47484 39934 1923 58217 118 13995
 11    35059 39538 35805 12039 52819 43290 22022 35823
 12    12784 26950 55066 38377 0 RNUM >>
 13 -->
 14
 15

SCR # 2
  0 ( Random number generator ala Knuth)   ( 1/4/83 AAH)
  1
  2 : RAND  ( --- n ...leaves 16-bit random number)
  3    JINDEX RNUM @ KINDEX RNUM @ + DUP JINDEX RNUM !
  4    JINDEX 1- DUP 0= IF DROP 54 THEN ' JINDEX !
  5    KINDEX 1- DUP 0= IF DROP 54 THEN ' KINDEX ! ;
  6
  7 : SEED   ( --- ...pseudorandom initialization routine)
  8    CR ." Wait a few seconds, then enter any key:"
  9    BEGIN  RAND DROP ?TERMINAL UNTIL KEY DROP ;
 10
 11 : 2/U  0 2 U/MOD SWAP DROP ;
 12
 13 ;S
 14
 15

SCR # 3
  0 ( The game of REVERSE ...M Burton FD III/5)
  1 0 VARIABLE MOVES  ( Number of reverses so far)
  2 : Y/N  ( --- t/f ...look for Y or y from keyboard)
  3     PAD 80 EXPECT PAD C@ CR CR 95 AND 89 = ;
  4 : INSTRUCT  ( game instructions)
  5    CR CR 18 SPACES ." The Game of REVERSE"
  6    CR CR ." Would you like instructions? " Y/N
  7    IF  ." The object of the game is to arrange a random list"
  8      CR ." of nine numbers into ascending numerical order in"
  9      CR ." as few moves as possible by reversing a subset of"
 10      CR ." the list.  For example, given the random list:" CR
 11      CR ."       5 2 4 8 7 3 9 1 6 " CR
 12      CR ." reversing a subset of 4 would yield the list:" CR
 13      CR ."       8 4 2 5 7 3 9 1 6 " CR
 14      CR ." To quit the game, simply reverse 0."  CR CR
 15    THEN  SEED ;      -->
```

Random Number Generators

"Random" numbers have numerous applications, including sampling, simulation (Monte Carlo techniques), numerical analysis, generating test data, decision making, and games.

The primary requirements for a routine that generates series of random numbers are that the routine is fast, and that the series is as random as possible. This latter requirement is important, as most methods tend to get into a rut and start repeating.

Von Neumann's "middle-square" method, suggested in 1946, is an example of a generator that has a short period. His idea was to take the square of the previous random number and extract the middle digits. One of the problems with this technique is that if zero ever appears as an element of the sequence, it will continually perpetuate itself.

Therefore, all methods repeat themselves, and the objective is to make the cycle as long as possible. The most popular method is the Linear Congruential Method (LCM), which uses four initial values: the modulus, the multiplier, the increment, and a starting value. The next element of the series is formed by multiplying the current element by the multiplier, adding the increment, and then taking the number modulo the modulus. Many Ph.D. theses have been devoted to the best choice of the four initial values! An example of an LCM generator is:

```
VARIABLE SEED
: RND ( n1 --- n2)
SEED @ 259 * 3 + 32767 AND
                    DUP SEED ! 32767 */ ;
```

Here 259 is the multiplier, 3 is the increment, and the stack value divided by 32767 is the modulus.

Note, however, that a multiply and divide are used for every determination of a random number. There are other methods for random number generation, and the listing describes one of these, called an Additive Number Method (ANM). This method is usually faster than the LCM because it only uses additions, with overflows on 16-bit adds taking the place of the modulus function. The initial subscript pairs actually determine the length of the period; the pair 24 and 55 yield the longest period. The 55-element table was initialized by selecting values from the Rand Corporation Tables (1955).

The advantage of the ANM is its speed: 10000 values takes 22 seconds on the Big Board, while 10000 values with the LCM takes 61 seconds. The disadvantage of the ANM is that it takes more storage (228 bytes vs. 51 bytes). For more information about random number generation, see Knuth, Seminumerical Methods, volume 2 of the *Art of Computer Programming Series,* Addison-Wesley 1981.

The Game of Reverse

M. Burton described a simple game in FORTH Dimensions, vol. III/5, page 152, that I thought would be an ideal example of the use of the random number generator. The object of REVERSE is to arrange a list of single-digit numbers (1 through 9) in ascending numerical order from left to right. The input during the game is the number of elements of the list to reverse. For example, if you reply '4' to the question, 'Reverse how many?', the first 4 elements of the list will be reversed and the last 5 will remain the same.

To leave a game that is in progress, simply reverse zero numbers. You need to discover the trick to 'win' in as few moves as possible. Good luck hunting!

■ ■ ■

```
SCR # 4
  0 ( The Game of REVERSE -- 2)
  1 10 ()DIM RANLIST  ( the list of numbers)
  2 : RANINIT  ( initialize the random list)
  3     10 1 DO I DUP RANLIST ! LOOP ;
  4 : .RAN  ( print array)
  5     ." The list is now..."
  6     CR 6 SPACES 10 1 DO I RANLIST @ 3 .R LOOP ;
  7 : CHECK  ( --- t/f  ...check ranlist for ascending order)
  8     1 10 1 DO I DUP RANLIST @ + AND LOOP ;
  9 : GETIN  ( --- n ...get amount to reverse)
 10     BEGIN CR ." Reverse how many? " GETNUM
 11      DUP 0< OVER 9 > OR DUP IF CR
 12     ." Only 0 through 9 is allowed. " THEN 0= UNTIL ;
 13 -->
 14
 15

SCR # 5
  0 ( The game of REVERSE -- 3)
  1 : SCRAMBLE  ( mix up the array values)
  2     1 9 DO RAND 2/U 32767 I / / 1+  ( calculate K)
  3           I RANLIST @               ( get ith value)
  4           OVER RANLIST @            ( get kth value)
  5           I RANLIST !               ( store kth in ith)
  6           SWAP RANLIST !  -1        ( store ith in kth)
  7         +LOOP  ;
  8 : SUBREV  ( n --- ...reverse subset of RANLIST)
  9     DUP 2/ 1+ 1 DO DUP I - 1+   ( loop 1 to [n/2]+1, calc index)
 10                   DUP RANLIST @ SWAP  ( get [n-I+1]th)
 11                   I RANLIST @ SWAP RANLIST !  ( ith to [n-I+1)
 12                   I RANLIST !         ( [n-I+1]th to ith)
 13                LOOP DROP ;
 14 -->
 15

SCR # 6
  0 ( The Game of Reverse -- 4)
  1 : REVERSE  ( play the game)
  2     INSTRUCT RANINIT
  3     BEGIN
  4        SCRAMBLE 0 MOVES !
  5         BEGIN
  6           .RAN GETIN DUP 0=
  7             IF 1 ELSE
  8              SUBREV 1 MOVES +! CHECK
  9             THEN
 10         UNTIL
 11        .RAN  CR ." You made " MOVES @ . ." reversals." CR
 12        CR ." Care to play again? "  Y/N 0=
 13     UNTIL
 14     CR ." Thanks for playing REVERSE... " CR CR ;
 15 ;S
```

LETTERS

Dear Editor,

After subscribing for a year, I had to write to tell you how wonderful Micro C is. I have used many of the routines you have printed and have just recently finished building the EPROM programmer.

When I got my Microline printer I was naturally excited and thought it would be simple to connect up. Boy was I wrong! I was able to initialize the SIO and I made sure I wasn't sending it characters when its buffer was full, but I couldn't get the (&%$%#$) CTS to respond to the busy signal from the printer. I tried everything.

After a long time, I tried resetting the external status interrupt even though I wasn't using interrupts. It was the only thing that had even a little relationship with the problem I was having. I couldn't believe it when that made it work. Since then I haven't had a single problem. I think that programming the SIO is a very educational experience.

As for me, (perhaps you've already guessed) I'm only 15. I've been interested in computers for about four years and have had a Big Board for over a year.

Paolo Sechi
373 Riverside Drive
Princeton, NJ 08540

Editor's note:

Thank you for the letter, Paolo. You are participating in one of the most exciting hobbies or professions there is, and you are doing it at a level that makes me feel very humble (which is probably good for me). I was 15 when I received my general class ham ticket, and no doubt your feelings about computers are the same as mine were about transmitters and receivers. Only the technology has changed.

Dear Editor,

I would like to offer a reference for Jay Papillon. After reading his ad in the last issue, I sent him my BB to assemble. Within two weeks I had my completed board and it came up on the first try. Jay did an excellent soldering and debugging job. He is the next best thing to buying a turn-key system.

Jerry Olsen
RT #5 Box 38
Rupert Idaho 83350

Dear Editor,

Recently I have become afflicted with a rather bizarre quirk you may be able to help explain.

Issue #8 arrived in the middle of a pile of mags, bills, and other really important stuff. I got home from work, grabbed a cup of coffee, the mail, and headed for the swamp (workshop). While sifting through the pile I came to Micro C and tossed the rest aside. The next day I discovered that I had passed up reading *Electronics, Electronics News,* and the new *Time.*

When issue #9 came, the same thing happened. I passed up the really quality material to read Micro C, cover to cover.

My question is this: What has gone wrong with my priorities? Is it that Micro C is really more interesting? I don't know. I'll do some more research and let you know.

Sorry I missed all the fun at the Get-Together last summer. I had an Air National Guard meeting and couldn't make it. If there is going to be another Get Together in Bend this summer I will probably make it—REGARDLESS!

Al Gillis
1020 SW Hillcroft
Portland OR 97225

Editor's note:

The minute I received your letter, I placed a collect call to the state mental health asylum (and farm). I had never before encountered such an advanced case of fractured reality (the worst kind). I was sure there must be some way to get you off the street (and out of the swamp) for your own safety. Unfortunately the state asylum no longer accepts collect calls.

Perhaps there is a psychiatrist among our readers, who can give this condition a serious sounding name. It may be your only hope.

As for the Get Together, yes there will be another one this summer. See the editorial for more details.

Dear Editor,

I recently discovered several bugs in the checks program which you are distributing on user disk #5. Please publish the following corrections to the program which current users can make using ZSID or DDT. The new version is fully compatible with any data files the user may have already created.

If you have the old version you should not use the Tally command. This command does all sorts of evil because an uninitialized pointer causes it to overwrite portions of the program.

A second bug caused the Tally command to malfunction when starting the month with a negative balance and a third caused an error in saving the check data if it crosses a page boundary. The following fix cures all these.

TO FIX THE OLD REVISION 4/3/82

Do the following:

1) **Save a back up copy of the checks program in case of a typo error.**
2) **Using ZSID or DDT, load the checks program in memory.**
3) **Using the S (SET) command, make the following modifications which change the revision date of the program.**

```
S 192F
192F 34 31
1930 2F
1931 33 32
1932 2F
1933 38
1934 32 33
1935 0D .
```

4) **Now using the A (ASSEMBLE) command, make the following program modifications**

```
A1D63
1D63 CALL 246E
1D66 .

A14EC
14EC CALL 248E
14EF .
.PA
A1B42
1B42 CALL 2475
1B45 .

A1D0A
1D0A LD A,(1E6F)
1D0D OR A
1D0E JR NZ,1D1F
1D10 LD A,30
1D12 LD (HL),A
1D13 LD A,01
1D15 LD (1E6F),A
1D18 NOP
1D19 NOP
1D1A NOP
1D1B NOP
1D1C NOP
1D1D NOP
1D1E NOP
1D1F .

A246E
246E LD DE,1E4F
2471 CALL 0FF1
2474 RET
2475 CALL 1DF5
2478 CALL 111C
247B LD A,(1E09)
247E LD (1E2D),A
2481 LD A,(1E0A)
2484 LD (1E2E),A
2487 LD A,(1E0B)
248A LD (1E2F),A
248D RET
248E LD HL,(1E75)
2491 RET
2492 .
```

Now that the corrections have been made, do a ctrl-C to get back to CP/M. Immediately enter the following to save the modified program.

SAVE 36 CHECKS.COM

Now when you run the modified program it should sign-on as revision 1/2/83. Make a thorough checkout of all the commands to be sure that everything is right. It's best to keep a backup copy of all your check data in case you discover another bug.

Just a few words of general interest. There is quite a big group of Big Board users locally and all are using my new ROM set which replaces PFM. The disk error reporting is now done out of the ROM which frees up space in the BIOS for the IOBYTE expansion. The ROMs also delay disk select until actual file read or write, which reduces disk clatter. The ROMs also do disk formatting, verification, block moves and compares, and provide a clock routine.

Ralph Sherman
15 Hydaway Drive
Forest, VA 24551

Editor's note:

Thanks a lot, Ralph for the update. We updated the Checks program on the user's disk around January 15. Those who received their disks after that should have the latest version. And by the way, the ROMs sound great!

Dear Editor,

On bringing up the big-board.

I chose to buy the bare board and assemble the parts, as I felt that I could save money that way. I was able to find all of the parts from BYTE ads, except for the baud rate generator, (which I ordered from Digital Research), and the terminal strip, (which I omitted, soldering the power lines directly to the board).

I assembled the board and powered up without chips in place only to find that there was no −5V at pin 1 of the 4116 RAM chips. If the RAM had been installed, they would have been destroyed. My friend Ken Mitchum, a hardware hacker, was able to locate a manufacturing defect on the board which shorted the −5V line to ground. Fortunately, nothing cooked, and cutting away the offending piece of metal resulted in −5V where it should have been.

Unfortunately, after inserting the ICs and powering up, the screen remained blank. After about one hour of checking, Ken found a spot where solder had gotten through the solder mask, effectively bringing the write-select pin on all the RAMs to +12V. I was lucky again, in that no damage was done, and on power-up got into the monitor.

The next problem was the wavy screen, just as others had reported, which was fixed by getting a new crystal from Digital Research. I considered myself lucky to get up and running with only two hardware errors, and no IC infant mortality.

Gordon Banks, M.D.
1360 Scaife Hall
University of Pittsburgh
Pittsburgh, PA 15261

Dear Editor,

You asked about inexpensive drives from reputable sources. Well, here goes. I got my 8" CDCs brand new for $175. They are the 220V 50Hz type but they come with a new spindle for 60Hz and a transformer to change 110V to 220V. (All included in the $175.)

I have done an interface for my CDCs that is simpler than yours in issue #8. I will be sending it along shortly. With the interface they work perfectly with the BB. There is also a mod you can do to reduce the 1.6-amp stepper motor holding current to .3 amp.

You can get the drives from John Meshna Co., PO Box 62, East Lynn, MA, 01904. Their number is 617-595-2275 (talk to Doug Meshna). It's just Doug and his wife, I believe, and they give super service.

Jack Rutherford
214 Rolling Rd
Burlington, NC 27215

Dear Editor,

I bought a BB and a Hazeltine terminal from D&W Associates (one of your advertisers). Is there anyone out there who has figured out how to get the keyboard to produce the 14 standard control codes such as LF, FF, BS?

Also, I will have an article for Micro C in the near future.

Don Chin
Dynamic Research Corp
3312 SW 14th St
Fort Lauderdale, Fl 33312

Dear Editor,

I was very excited to read about the BBII. We currently use three Xerox 820 systems to train people on WordStar, SuperCalc and other CP/M-based programs. Since we try to keep the prices we charge for our courses to a minimum we are continually looking for a way to get more computer power for less money.

Along that line I have been considering hooking up several BB-Is to a BB II running a hard disk. The BB-Is could be running the new romable CP/M and the BB-II could be running MP/M and use parallel ports for communication. The BB-Is would not have drives of their own.

If anyone is interested in developing this type of system, please get in touch with me right away. I know several outfits here in Cambridge alone which might be interested also.

Finally, a note about drive lubrication. Most manuals say not to lubricate the stepper motor lead screw. However, we had continuous trouble with Xerox 820 drive squeal. We had the units replaced but the new ones did the same thing. However, once the Xerox technician LIGHTLY lubricated the lead screws with a small amount of WD-40, the squeal disappeared and we have not had problems with our drives since.

Edwin Meyer
Micro Workshop of Cambridge
PO Box 70
Cambridge, MA 02139

Editor's note:

OK, for all you avid readers of "On Your Own," here's a project that has very substantial commercial application (and could very well be your meal ticket out). The market for this kind of system is mind-boggling because the BB and Xerox and KayPro could suddenly take on the big multi-terminal systems and win, in terms of price, flexibility and, in many ways, power. There are any number of dealers and users (even here in Bend) who would be delighted to find such a system.

Also, WD-40 works pretty well on auto hood latches.

Dear Editor,

The PROM programmer came just in the nick of time to save me a lot of $$$. I've been using Arne's UniFORTH for a machine control development system. It has worked out fantastically. It appears to me that he has done a first class job.

Steve Chaikin
709 Linda Vista
Ann Arbor, MI 48103

Dear Editor,

Thanks for disk #5. You were 100 per cent right about Pacman. Now I have to do my programming (playing?) in the late hours. Also, the catalog program is really fantastic!

Tibor Devenyi
12 Nesbitt St
Nepean, Ont. Canada K2H 8C6

■ ■ ■

Pascal Procedures

Column by John P. Jones

6245 Columbia Ave.
St. Louis, MO 63139

This is the first in a series of columns on PASCAL. PASCAL is a general purpose, high level, structured programming language originally defined by Kathleen Jensen and Niklaus Wirth as a teaching tool. It has evolved into a family of generally source compatible languages which provide powerful tools for software development.

Types

There are two major types of PASCAL compiler. One type has as its output an intermediate code (often called P-code) which is designed to run on a theoretical computer, the P-machine. The P-code interpreter is written in the computer's native code and is the only machine-specific portion of the system. In theory, both source and P-code are directly transportable between different computers. The UCSD PASCAL system is the only complete implementation of this type. The problem with the UCSD system is that it is just that, a system—it includes the disk operating system, editors, assemblers, etc. It is NOT CP/M compatible so none of the large body of CP/M compatible software will run under the UCSD system.

Fortunately, there are conceptually similar implementations of PASCAL for the CP/M environment. Sorcim's PASCAL/M and JRT Systems' JRT PASCAL are both of this type. Neither of these compilers generate UCSD compatible P-code but both require a run-time interpreter for execution.

The other major type of compiler ultimately generates native machine code. PASCAL/MT+ from Digital Research and Ithaca Intersystems' PASCAL-Z are examples of this type. Both require additional processing beyond the compile since neither generates pure object. The resultant machine code will generally provide faster execution than an interpreted P-code and often will be more compact at run-time since no memory is required for the interpreter.

Coming Up

In this series we hope to serve three functions. First, we will provide a forum for questions, comments and the like about PASCAL and PASCAL-related publications. Contributions are invited for this section.

Second, we will review books, compilers and software as they are submitted by their publishers. Again, contributions will be gratefully accepted.

Finally, over the course of several articles, we will be providing an introduction to the PASCAL language. By the time we are finished we will have looked at all of the basic features of PASCAL and hopefully have given you enough basics to make you comfortable with the language.

A Common Version

For specific programming examples we will be using JRT PASCAL. Despite its current bugs it is definitely the best buy I have found in a complete PASCAL. I have been told that JRT Systems is working on a new version of their package for release in early 1983. Version 3.0 will have more extensions and I would assume that all of the known bugs in V 2.x will be fixed. Where JRT syntax or implementation differs from the "standard" we will point out those differences so that the examples can be tested and experimented with whichever compiler you have.

A Look at Pascal

In the remainder of this installment we will look at the overall structure of a PASCAL program.

Listing 1 illustrates this basic structure. PASCAL programs, procedures

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and functions all are structured in the same way. Each starts with a declaration which includes the name and in parentheses, the parameter list. Labels, constants, user defined data types and variables are then declared in that order. Any included procedures or functions are then defined. Finally comes the body of the program delimited by a BEGIN . . . END construct. For a program only, the END statement is followed by a period.

If you are familiar with another language, you should note the following:

First, ALL variables used must be declared before they can be used. Variables declared within a procedure will be local and are not available outside the procedure.

Second, PASCAL derives much of its power from the fact you can define your own data types in addition to the standard types available. Sets, subranges and records are all examples of this. The example program shows two such definitions. Type NUMERIC is defined as a CHAR in the range of '0' to '9'. Though not used in DEMO, it could be used to test the validity of input data.

Records allow access to related data as a unit. They can be used like any other variable, assigned, written, read, etc. (We will look at variant records later.) Individual variables within a record are accessed by a name of the form RECORDNAME.VARIABLENAME. In the example, WHERE-TO-GO.MESSAGE would be a valid name. On the other hand, inside the scope of a WITH construct, components of a record can be referred to by the component name only.

GOTOXY is a procedure which has general utility, so much so that many PASCALs have it incorporated as a built-in procedure. It is very useful for screen oriented input/output. As written it will run on any ADM3A compatible terminal.

It is impossible to discuss all of the features of PASCAL in a single article. In future articles we will look at simple and structured data types, input/output (console & file), looping, procedures & functions, execution control and dynamic variables. For JRT we will also look at external procedures and functions.

For now, experiment with DEMO. First compile and run the program and then start making changes to see how they affect execution. What happens when you use the bottom line (row = 23) for input? What mods are needed if you take out the WITH construct? How could you use the row and column inputs to terminate the program? Enjoy.

■ ■ ■

```
program demo(input,output);

     label     10;

     const
          clrscreen = 26;      {^Z = clear screen character}
          escape    = 1bh;     {use $1b for MT+, decimal 27 for M}
          clrtoeol  = 24;

     type
          numeric = '0'..'9'; {definition of subrange data type}

          input_record = record    {structured data type}
               row : integer;
               column : integer;
               message : string[20]; {most PASCALs have this extended type}
          end;

     var
          where_to_go : input_record;
          i  : integer;


     procedure gotoxy(y,x : integer);   {parameters passed by value so
                                         can only be modified locally}

          begin
               y := y mod 24;   {be sure stay on screen}
               x := x mod 80;
               write(chr(escape), '=', chr(y+32), chr(x+32));
          end;

{ for PASCALs without a built-in UPCASE function this procedure
  will convert all lower case chars in a string to upper.
  This procedure replaces lower case chars in the input string
  so cannot be used in this program in the same way JRT's built-in
  upcase can without setting up a scratch variable for the
  comparisons.

procedure upcase(var str : string);     (* parm passed by address,
                                        can be globally modified *)
        var i : integer;

        begin
          for i := 1 to length(str) do
                if (str[i] >= 'a') and (str[i] <= 'z')
                    then str[i] := chr(ord(str[i]) - 32);
        end;}

begin     {program demo}

     i := 0;
     write(chr(clrscreen));   (* clear display *)

     with where_to_go do      {lets use shorthand references}
          repeat
               gotoxy(0,0);  {use top line for input}
               write(chr(clrtoeol)); {erase potential previous input}
               write('Enter row and column : ');
               read(row,column);
               gotoxy(0,40);
               write('Enter message : ');
               readln(message);
               if upcase(message) <> 'END' then (* upcase is JRT specific *)
                    begin
                    gotoxy(row,column);
                    write(message);
                    i := i+1;
                    end;           {if upcase...}

          until (upcase(message) = 'END') or (i >= 25);  {terminus of 'repeat'}

      end;           {end of 'with' construct}

end.           {of program demo}
```

JRT Fix

If you have version 2.1 of JRT Pascal you may have noticed that multiplying a real number by 0.0 doesn't give 0 as a result. To correct the problem enter the following (using DDT).

```
DDT EXEC.COM
S563C
563C ED EB
563D 53 .
G0
SAVE 90 EXEC.COM
```

The Electric Blackboard

Review by Donald Alan Retzlaff

1113 Hillcrest
Denton, Texas 76201

I can say without reservation that The Electric Blackboard by Santa Cruz Software Services is the easiest and most versatile full screen text editing system I've ever used.

Jerry Brevier started with a standard definition of text editing when he designed The Electric Blackboard. There are no commands that perform text formatting (justification, pagination, tables of contents, bibliographies, or footnotes). All the commands (such as insertion, deletion, and movement of text) are strictly for text editing.

Documentation

The manual is large yet well organized. It is designed to be read in detail or quickly scanned if you have a question.

Each page is divided in half. The left side of each page consists of blocked questions that are typical of the questions that one asks about the material. An arrow points from the box to the point in the detailed text on the right that answers the question.

I read the entire manual before I started using the software and found that the ideas flowed easily and the descriptions were extremely clear. There were also many illustrated examples.

The manual contains a configuration section, a learning guide, and a command summary. The package also contains a quick reference guide.

Features of the Editor

You can start entering text immediately after entering the editor. The arrow keys work as you would expect. (Editor's note: Don doesn't specify what characters his arrow keys generate or whether the command characters are customizable.) If your keyboard does not contain these keys, you can use a control character sequence instead.

You use escape character sequences for most of the rest of the commands. For instance, if you want to insert a character, simply position the cursor to the right place and press ESC I C. Now anything you type will be inserted. To go back into "replace character" mode, type ESC R C.

The characters used to define a mode are obvious. ESC I C is used for Insert Character, ESC I L for Insert Line, ESC S F for Save File, and so on. This has a distinct advantage over using random control characters (like Wordstar) because it is easier to remember.

You can quickly move through the text by repositioning the text window by combining the ESCape key and one of the arrow keys. Plus, there is a "Find" command that will position the cursor to a specific sequence of characters. And you can do a "Find Previous" and "Find Next." You can use "Append" and "Break" commands to paste together or break lines.

Multiple Windows

One of the most powerful features of the Electric Blackboard is the ability to break the video screen into more than one text window. By using commands similar to those already described, you can define additional text windows (horizontal or vertical). You can load those windows with portions of text from your present file or from other files.

You can mark and copy text from one window to another which makes my job as a programmer and an author much easier. Again the commands are easy to remember escape sequences.

Picture Cursor

When the Electric Blackboard begins execution, you have a "Text-cursor." This cursor moves left to right as characters are typed. However, this type of cursor is a little awkward for creating illustrations.

The "Picture-cursor" moves left-to-right, right-to-left, up, or down.

When this cursor is ">", it moves left to right as you type, (just like a normal cursor). When it is a "v", the cursor moves down a line when each character is typed and so on. Of course, "<" means you enter characters backwards!

This makes complicated diagrams a dream to design and draw. I'm willing to tackle diagrams I would have avoided in the past simply because they were too tedious.

Remembering Keystrokes

The Electric Blackboard can also remember keystrokes and even store them on the disk. This makes it worthwhile to design specialized diagrams (decision boxes for flowcharting, for example) because they can be reproduced in any number of documents.

To use this feature, simply type the "Execute File" command and the keystrokes will be executed.

Conclusion

The addition of The Electric Blackboard to my library has made program development and text production much easier.

Its commands are so obvious that someone can learn to use the basic set of functions in one sitting (a definite advantage).

What and Where

The package includes the Electric Blackboard 32K command file, an assembly language configuration program, and several sample data files. Specify that you use a Big Board with onboard monitor and you will receive an already-configured version. (There is also a version for the BB II.)

Santa Cruz Software Services has been very helpful. I had to reconfigure my version of The Electric Blackboard for the double density board sold by Software Publishers. I've had no problems since then.

To purchase, contact:
Jerry Brevier
Santa Cruz Software Services
1711 Quail Hollow Road
Ben Lomond, CA 95005
(408) 438-2360 **$199.00**

Editor's note:

This editor is easy to learn because of the careful mnemonic selection of commands. However, as you get more experienced with a package, you find that learning ease is only a part of a package's ease of use.

Some editors (the Small C text editor for instance) have multiple modes, data entry, command, edit, and so on. With these you usually move the cursor to the proper place and then use a single keystroke to select the proper mode.

Other editors, (WordStar and Vedit for instance) have only a couple of modes and you usually enter control-key sequences as commands.

(continued next page)

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(The Electric Blackboard continued)

Wordstar's commands do not make much sense but its abbreviated list of commands at the top of the screen (the list changes as you enter a different mode) make Wordstar especially friendly for the beginner. Later, after the beginner becomes experienced with WordStar, he can deselect the menu.

Vedit lets you choose the escape-key or control-key sequence for each command, which is a real advantage if you are familiar with another editor, but not much help for a beginner.

Studies have shown that word processing productivity is limited primarily by the number of motions the user has to make. Thus, for an experienced user, a single keystroke or control-character is faster and easier than a two or three keystroke escape sequence. However, for someone who doesn't use the software often, the ease with which he can recall or locate the commands becomes important to his productivity. In this case, menuing or good mnemonic design of the command language is quite significant (as Don indicated).

■ ■ ■

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The KayPro

Column by David Thompson

This will be an introduction to the KayPro for those of you who are not familiar with this solid little computer. It turns out that Non Linear Systems is not releasing very much information about the system (like schematics) yet, so even its own dealers would like an introduction.

Differences

In many ways this is a Big Board. The processor clock circuit is the same, as is the processor and much of the RAM select. However, the RAM chips are the 64K devices and the video circuit has been changed slightly.

In the video circuit, the hardware scroll circuit has been removed along with the composite video output. The output is standard separate TTL level signals.

In part, even the board layout is the same but because of the 64K chips, the board is substantially smaller.

Size

The whole system, however, is not as small as it could be. The cabinet is simple bent aluminum and there is a lot of empty space inside. But that way, it is a lot easier to work on than the somewhat smaller Osborne, and it includes a 9" CRT which displays a full 80 by 24.

Power Supplies

They have used several different power supplies during the initial production. All have been small switchers producing +5V, +12V, and −12V. Some have not provided very good regulation (the video image shrinks noticeably during disk accesses). Some of the early power supplies appeared to be quite sensitive to spikes on the power line. I notice that there is a MOV (metal oxide varister) on mine so it appears that they are aware of that problem.

All the power supplies have been jumperable for both 110V and 220VAC.

Disk Drives

The drives are 5" and they are the most likely source of trouble. Experience seems to indicate that if you are going to have trouble with a drive it will probably be the B drive. (At least on the older models with the vertical drives.) The newer models have the two horizontal drives, stacked one atop the other. The A drive is on top.

I've heard from dealers that the new arrangement has created some additional heat problems and it has made it more difficult to remove the drives. Mine are vertical and have worked fine. One possible cure might be to cut some air slots in the shield that wraps around the drives, but the shield is probably to protect the drives from the electrostatic field around the CRT. If so, I'd be VERY leery of slots, air or no air.

If you are checking out a new system, try copying files back and forth between the two drives to see if either drive starts generating CRC errors. Let them run for a while so things will have a chance to warm up.

I also understand that for a while, NLS was using SMC 1793's and data separators (I have that brand in mine). They apparently found that many of the SMC chips were dead on arrival and that the ones which worked initially have given trouble in the field. So far mine have worked faithfully but I'm crossing my fingers. If I wind up with drive problems I'll replace the disk controller and data separator first.

The single-sided 5" disks each hold 191K so there is enough room on each disk to get some work done. The system can read (but not write I understand) single density 5" Xerox 820 disks so there is some compatibility with other systems. There may be some other systems that use the KayPro's disk format but I don't know what they are. Anyone for a standard double density format for 5"?

Heat

Like the Osborne, the KayPro has no fan. So there can also be heat buildup around the processor board. However, unlike the Osborne, the KayPro has enough room inside and enough air holes that convection can remove a good share of the heat.

You still have to be careful about heat inside the system and you may find that a system which gets strange after an hour or two will work fine if you remove the cover. A small whisper fan mounted inside the top cover would do wonders for any heat problem, but replacing the Z80, the SIO, PIOs, 1793, and the ROMs with better parts (higher speed) would also eliminate 99% of the problems related to heat.

EMR

The electro magnetic radiation from the KayPro is quite noticeable, especially around the keyboard. In fact, there is a sticker on the unit which says specifically that it hasn't been tested for FCC radiation standards. I'm sure it wouldn't pass. You can do a rough test on any system by holding an AM or FM pocket radio next to the equipment. As you move the radio around the cabinet and the keyboard you will hear a raspy buzz if there is any leakage. On some systems you can't even get the radio close and still pick up a local radio station. Fortunately, the KayPro is not that bad.

The cabinet area is pretty clean but around the cables and the keyboard there is a lot of interference.

Odds and Ends

The keyboard has a standard Selectric-like layout with a keypad. It connects to the system via a 4-wire telephone cable. The keyboard outputs serial data which is input on serial port B. Serial port A is initialized as an 8 bits/char, 300-baud port for modem or printer. There is a configuration routine which comes with the system that lets you change the baud rate and lets you select whether the LST: device is the serial port or their standard Centronics parallel port.

The next time you are in your favorite local computer store, take a look at the small BB that has already captured nearly 10% of the portable computer market.

■ ■ ■

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3-New Crowe.com file with larger symbol table.
4-New CBIOS for CP/M 1.4 and 2.2 (& boot).
5-Disk mapper with source.

USER'S DISK #5
This disk is a potpourri of significant software collected from the far reaches of the globe by world-renowned software hunters.
Including:
1-CAT is a directory cataloging package. It keeps track of which disk contains which software. It sets up a file and lets you list the directories of all your disks, or display all the disks that contain a particular file, or all the disks that contain .TXT (or whatever) files, plus much more. You've got to try it to believe it! Contributed by Don Bell from a Pascal-Z user disk.
2-MODEM7A.COM & MODEM7B.COM: Already configured for BB ports A and B by Gary Kaufman.
3-PACMAN: Gordon Banks and Gary Kaufman both sent me PACMAN.C, and .COM. This really works like the commercial game. (Caution, don't even whisper a word about this to kids over 3 or you'll have to stand in line to use you BB.)
4-FAST: This little screamer from Gordon doubles the speed of any program that accesses the disk a lot (like ASM, MAC etc.).
5-NOLOCK: NOP's out the shift lock feature on the BB so you can send nulls to other systems without casing your own (from Gordon again).
6-VERIFY: Brett Berg sent in this one. It checks a disk and tries to restore bad sectors. It reports any sectors it is trying to restore. It leaves the data intact (or even more intact) on the disk. Brett says this is better than the $100 commercial routines.
7-SQ-USQ squeeze and unsqueeze files.

USER'S DISK #6
This disk contains one of the more significant new contributions to the public domain. The runtime package for 8080 has 51 functions to handle all those details that take so long to write.
Including:
1-RUNPAC: This is the run-time utility package written by Dennis Baker for his 8080 assembly language programs. Even though it occupies only 1,951 bytes in memory, this utility package handles 51 functions including: 4-byte addition, subtraction, multiplication, and division; string evaluation; number formatting; opening a file; closing a file; getting a record; keyboard input; chaining and running a .COM file; finding a string in a group; and converting days to date.
It handles up to 8 channels of disk I/O, each having a 512 byte buffer and a file control block in high memory. Runpac uses signed integer binary arithmetic with provisions for decimal I/O. This gives maximum numeric range for 4-byte variables. This package should handle any business or other application that does not absolutely require floating point. Includes source which assembles under ASM.
2-REZ: This is the Z80 version of the famous disassembler RESOURCE. Originally from the CPMug, it disassembles 8080 and Z80 object files. It was contributed by Gary Kaufman.

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This is standard FIG FORTH in three 2716's. FIG FORTH is standalone FORTH so you don't use CP/M at all. If you have disks, FIG FORTH handles the disk I/O. If not, you can still enjoy a most fascinating language. A simple FORTH line editor and a decompiler are available on disk.

FORTH editor & decompiler disk.....	$15.00	$20.00
TINY BASIC IN ROM.....	$35.00	$40.00
(in fast ROMs)		

This two-ROM set takes control of the system just like FORTH does, handling its own I/O, loading Basic programs and object code routines on and off the disk or out of the third ROM. This little Basic is great for controller and utility applications.

VISA & MASTERCARD ACCEPTED

	US,CAN,MEX	Other Foreign
Your Fortune in the Microcomputer Business.....	$26.45	$36.45

This is the best, most complete collection of "working for yourself" information I've found (and I've heard nothing but good comments from those who have received it). This two-volume set is a perfect for those blustery fall evenings when you snuggle up in front of the fire and dream of great riches.

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From Micro Cornucopia

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This is the disk for folks who are building Jim Monesmith's ROM programmer. Two versions of programmer software plus a disk file CRC checker. Also contains a sophisticated disk utility (DU77) and source for a substantially updated fast copy routine, plus more.
Including:
1-Unmodified ROM programmer.
2-ROM programmer with CRC.
3-Disk file CRC checker.
4-Source of new fast copy.
5-Utility isolates bad disk sectors.
6-Reset bit 7 (unWordstar a file).
7-Print fancy page headings.

USER'S DISK #7
This disk is for those of you who aren't satisfied with the PFM monitor, aren't able to communicate with a mainframe system, or aren't able to keep a checkbook balanced.
Including:
1-CHNGPFM: If you've wanted to revise the PFM monitor but haven't had the time or don't know how, then this contribution from Willis Gore is for you. This new monitor implements the real time clock, changes the shift lock to a caps lock, lets you access the ROM/video RAM bank directly, and changes the track table so the board works better with double-sided drives. He included a routine that lets you overlay the monitor from the disk. He has also included the source of the PFM monitor translated into TDL 8080/Z80 mnemonics.
2-TERM: Willis also sent three terminal routines (each less than 1K of object code). The terminal routines let you set up the Big Board as a simple terminal, as a file receiver, or as a file sender. Programs send command string to other system to initiate transfer making it easy to interface with large computers.
3-CHECKS: Ralph Sherman really did a professional job on this check balancing package. If your mate has been nagging you to do something practical with your BB then send us a check for this one.
4-Disk Utilities, copy to memory, from memory, and dump.

VISA & MASTERCARD ACCEPTED

FREE Your choice of a user's disk or the deluxe character ROM free if you send an article or software and a ROM or extra disk.

	US,CAN,MEX	Other Foreign
Small-C+	$24.00	$29.00

This is a simple, extended version of Small-C. For more information see issue #7, page 6. The documentation is on the disk.

Screen Editor in Small C	$39.00	$44.00

A simple but full-function screen text editor plus a text formatter, all written in Small C by Edward Ream. This package includes the editor and formatter .COM files setup for the Big Board, Small C itself, and source code for all. With the documentation this is over 400K on a flippy disk. Edward is selling this package for $50, you can buy it from us for $39 (and Ed gets a royalty). Where else can you get an editor, a formatter, a C compiler, and source for all, for under $40?

USER'S DISK #4
Like all the rest of the user disks, this disk is full even though it contains only two packages. The documentation on the disk includes step-by-step instructions for incorporating these into your CP/M.
Including:
1-CBIOS: This is a custom BIOS contributed by Robert Edison for those folks who have Tandon Drives. It also supports a parallel printer and looks like it was written for the Crowe Assembler.
2-ZCPR: This replacement for the CCP really makes CP/M a lot nicer. For instance, if you try to run a program that is not on the present drive it automatically looks on drive A for the program. I'm absolutely addicted to this feature because it means that every .COM file on A (my system drive) is effectively on every other disk in the system. Think about that! Plus, the TYPE, LIST, ERA, and SAVE commands have all been substantially improved. This CPMug winner was setup for the BB by Gordon Banks and Gary Kaufman.
3-ZCPRBLOC: run it and it tells you the base of your CCP. Nice!

USER'S DISK #8
The specials here include: a super-powerful modem program, a beautiful text formatter (very much like Unix's run off), and custom I/O for BDS C all contributed by Gordon Banks. Rex Buddenberg provided the the block letter printer.
Including:
1-YAM: This modem program is far superior to modem7, but uses a compatible protocol. YAM includes almost every option imaginable. It turns the Big Board into a paging intelligent terminal, complete with printer interface.
YAM provides an optional CRC and enhanced error recovery and transfer abort logic. It handles batch transmission of files, baud rates to 9600, directory listing, disk changes, transfer time calculations, and much more.
2-BDSCIO: Custom BB I/O for BDS C. (both .h and .c)
3-ROFF: Powerful text formatter, plus Sample formatted text.
4-SIGNS: Prints large block letters on screen or printer.

USER'S DISK #9
This should be another very popular disk. One thing notable is that it includes the first software donated for the BB II.
Including:
1-CBIOS: This is an update of Mark Stieglitz's super CBIOS on user disk #2. Gary Kaufman added a serial print driver so you can assemble it for either serial or parallel (and choose your baud rate besides).
2-KEYBOARD TRANSLATOR: This will translate keyboard characters one-to-one or one-to-many. In fact a single keystroke can start execution of a user-written function. Two functions are already installed: both display the contents of the processor registers immediately before the key was struck—the first then returns to the program, the second does a warm boot. Ken Stephenson uses this for his debugging.
3-ADVENTURE: This is the latest, greatest, most cussed adventure ever devised by mortals. This is the 550-point version donated by Lynn Cochran from SIG/M volume 11. And I'll tell you, the cave is GREATLY EXPANDED and the creatures are much smarter. (At least smarter than I am, so far.)
4-EPROM PROGRAMMER: This is 2732 programmer software for the BB II. It checks the ROM to verify that it can be programmed. And it only programs the bytes that are to be changed.

TWO WAYS TO ENHANCE YOUR BIGBOARD'S CAPABILITIES:

#1 DUAL DENSITY

HARDWARE

- A daughter board that plugs into the 1771 socket. With this board the system employs automatic density select.
- You can run 5¼" drives by following the simple steps outlined in the manual. A 50-34 pin disk drive adapter board is included with 5¼" orders.

SOFTWARE

- Choose 2.5 MHz or 4 MHz software, for 5¼" or 8" drives. Also select software for single or for double-sided drives.
- 8" users have up to 674k bytes of user storage per disk (per side). 5¼" users have up to 185k bytes of user storage per disk (per side).
- Dual Density software includes:

- DDINIT. COM: a double density disk initialization and verification program. Options:
  - 8 formats.
  - Format an entire disk or just system tracks.
  - Selection of sector skew.
  - Option to verify.
  - Choice of drive to be used.
  - Has a default which chooses the format that gives the most disk space.
- DDSYSGEN. COM: a double density sysgen program with three options:
  1) Read double density system tracks into memory.
  2) Write double density system tracks from memory to a double density disk.
  3) Generate a double density system disk complete with printer driver. This process uses your single density CP/M disk, the SWP distribution disk, and a blank disk. Five serial printer drivers and a parallel driver are included, and there is an option to install a user-written driver. All drivers can be modified.
- DDCOPY. COM: a double density copy program that copies all files from a source disk to a destination disk.

- Being a dual density system, the computer automatically distinguishes between single and double density disks. Densities may be mixed.

~~$199.95~~ SPECIAL OFFER: $149.95

#2 CO-POWER-88+

HARDWARE

- A powerful 16-bit 8088 coprocessor.
- Available in three RAM sizes: 64k, 128k and 256k.
- Consists of two main boards, the Z80 adapter board and the main processor board. The Z80 adapter board plugs into the Bigboard Z80 socket. A ribbon cable connects the Z80 adapter board to the main processor board. The main processor board holds 128k of RAM. An additional 128k RAM is available using an add-on RAM card.

SOFTWARE

- Runs CP/M-86 or MSDOS. CP/M-86 is compatible with CP/M 2.2. Its command files have .CMD as the extent, making it possible for CP/M-86 and CP/M 2.2 files to co-exist on the same disk (CP/M 2.2 command files have .COM as the extent). MSDOS is the operating system of the IBM-PC. IBM-PC MSDOS programs are compatible with the CO-POWER-88 MSDOS.
- Simple commands move the user between the Z80|CP/M2.2 system and the 8088|CP/M-86, MSDOS system.
- The RAM of CO-POWER-88 can be used as a "memory" ("M") disk drive for CP/M 2.2. Programs can be compiled in M, then saved to disk, decreasing job time by avoiding disk access time.

PRICING:

*64k CO-POWER-88	$ 699.95
*128k CO-POWER-88	799.95
256k CO-POWER-88	1049.95
256k CO-POWER-88 with CP/M-86	1250.00
CP/M-86 for CO-POWER-88	250.00
MSDOS for CO-POWER-88	—CALL—

*Add-on RAM cards are available. Call.

+CO-POWER-88 is available for nearly all Z80 or 8080 computers using CP/M 2.2.

CP/M and CP/M-86 are trademarks of Digital Research, Inc. MSDOS is a trademark of Microsoft. IBM-PC is a trademark of IBM. Z-80 is a trademark of Zilog.

SOFTWARE PUBLISHERS, INC.
2500 E. Randol Mill Rd., Suite 125 Arlington, TX 76011 (817) 469-1181

On Your Own

By David Thompson

Before you read what follows, I want to warn you that you will find it unsettling, outlandish, and irritating. If you are at all prone to self-pity, do not read beyond this point.

Since you're still with us, let's set up the scenario.

You've decided to break out on your own and do make a small connection (as discussed in the last issue). You know what you have to offer in terms of hardware and/or software expertise. You know where you want to set up your business. (You do know, deep down, where you want to live and work don't you? You just don't think you can make a living there.) Well, maybe you can and maybe you can't.

The following is based on some observations I've made over the last few months here in Bend. These observations should give you some methods for deciding whether your dream move is workable.

Jobs

First of all, demand for computer expertise is popping up all over in Bend. That has really been surprising since the local TV repairman is cutting firewood for a living and small retailers are folding right and left. However, computer classes at the local community college are filled during pre-registration, and the local businesses are lining up to buy micro and mini packages from Portland firms even though it means waiting months to get a system and it means that training and assistance are almost nonexistent.

So, the college is looking for instructors. Private and business people are looking for evening classes and weekend seminars on such topics as home and small business applications on CP/M, using a micro for word processing, keeping records on a computer, the kinds of systems to purchase for specific applications, where computers will be going in the next 12 months, and on and on.

These people are still being told by the biggies that you either buy a word processor (for $20,000) or a computer but you can't get both on one machine. I mean these salesmen are either still back in computer pre-history or they've been badly Wanged in the head. But the local businesses are looking at the market more critically now so they are not being so badly fooled by the salesmen. However, they still need really good information from independent sources.

Businesses here want someone to put together a complete package of software and hardware and then support them as their needs change. They need to get into the computer age because they see their labor costs rising while revenues are barely remaining constant. And they are seeing their competitors getting computers.

So there are some real needs out here in the smaller communities and those needs appear to be at least as great if not greater than in the large cities. Chances are, if you are experienced with both hardware and software, and if you are comfortable dealing with the public, then you should be able to create your own computer business in just about any small to medium size community in the U.S.

Now that the pep talk is over, how about some practical tips?

Mom

Be careful about moving back home. Someone just did one of these big studies showing that engineers suffer asthma and other allergies in inverse proportion to the distance between themselves and their mothers. The greater the distance, the lower the occurrence. (And she wanted you to go to engineering school, didn't she.) Of course, now you're going to have to start hiding Micro C in the bottom of your socks-drawer so your mom won't find it—but I had to warn you.

Scouting trip

If you have a pretty clear idea of where you'd like to live (and you're not there yet) then you need to do some scouting. God did not make all paradises equal.

It is best to go and talk to some local paradisians, including some who are already doing what you plan to do. Be sure to also contact those folks who will provide the services you will depend on. For us that meant the computer department of the local community college, the local typesetters & printers and the good-old-boys at the post office.

During your conversations (called hunkering here in the outlands) you might find out if there are any businesses that might need the services or products you plan to offer or might be interested in knowing you are in town. Then go talk to them. You might even have half a dozen projects lined up before you make the final decision to move.

In Bend, the people who have any computer expertise at all are so swamped between work and moonlighting that they were tickled to hear that we were moving into the community. These folks could provide me enough consulting projects to keep me going for years. (I discovered this while trying to find someone to help me with a project!)

Scouting Sisters

At first, we were thinking about moving to Sisters (population 800), 20 miles from Bend. But the Sisters newspaper had to have its printing and typesetting done in Bend so it looked like we to would have spent a lot of time and energy running into Bend for services.

Plus, we couldn't find housing in Sisters that would hold both us and the magazine. Plus, we found that the intellectual community was centered around the college in Bend.

What's ironic is that we wouldn't have even considered moving if we hadn't been doing Micro C. But it appears that there is plenty of work in many of these smaller communities, it just takes a little hunkering with the right folks to find out if your ideal spot will work out.

About Bend

We are just a few miles from the best downhill and cross country skiing in the Northwest and remind me next summer to tell you about the fishing, camping, hiking, the wilderness areas, how the communities are small pockets surrounded by high desert on one side and forested mountains on the other.

Now, if you're still willing to put up with all the hassles of the large city just because someone lets you go to work at 8:30 and leave at 5:00, then you deserve to feel sorry for yourself.

P.S.

I know, that's a cheap shot. I enjoyed many of the projects I was working on at Tektronix, and I really enjoyed the folks I was working with. So, it was quite a while before I was ready to leave.

I was gaining the experience (and nestegg) I needed to move on to what I'm doing now. You have to assess your own interests, needs, and abilities very carefully—even try some things on your own, to see if this is what you want to do.

The main point I'm trying to make is that the big companies and the big cities are not the only (or even necessarily the best) places to ply your trade. The computer era is here and you have become the journeyman of the era.

■ ■ ■

TECHNICAL TIPS

4 MHz Modification

An easy and reliable method of converting your Big Board system to run at 4MHz involves the following steps.

1. Remove U96 from its socket.
2. Remove U97 from its socket.
3. Obtain a 74LS14 Schmitt trigger buffer.
4. Bend up pins 1, 5, 9, 11, and 13 on the 74LS14.
5. Solder a piece of wire from U97 pin 4 to U96 pin 3.
6. Install the 74LS290 back at U97 and the 74LS14 at U96.

This modification inverts and buffers the clock signal and changes the duty cycle so that the signal is low 60% of the time and high 40% of the time. This allows more time for memory access and enables use of slower memory devices. My board was shipped with 300nS TI4116-30 RAMs that worked fine at 4MHz the first time the system was powered up.

Tom Dilger
5804B Nassau Drive
Austin, TX 78723

Improving the Video Display

Thought you might be interested in improving the video display with minimum effort. This mod makes the characters farther apart and makes the whole display wider on the screen (particularly important on some monitors).

First, isolate U24 pin 3 from +5V and then connect it to ground. This increases the character width from 7 to 8 dots so there is more space between characters.

Next, isolate U11 pin 3 from +5V and connect it to U10 pin 12. This changes the character count of each line from 128 to 97 (so there is less wasted space).

Change the video crystal to 12.2 MHz (exactly 60 Hz). Mine was 12.272726 (60.36 Hz) but the monitor is still stable. This slows down the dot clock rate, widening the characters.

Also change R5 from 39K ohms to 330 ohms. This change centers the display by reducing the time between the display of the 80th character and the next horizontal sync pulse. Some people may need to vary R5 and C69 to achieve a stable display.

These changes resulted in a more professional-looking display comparable with many systems. Also, the character font might be improved by isolating U75 pin 3 and connecting it to U74 pin 10. Then connect U74 pin 11 to U73 pin 15. This change would make each character 6 dots wide instead of 5.

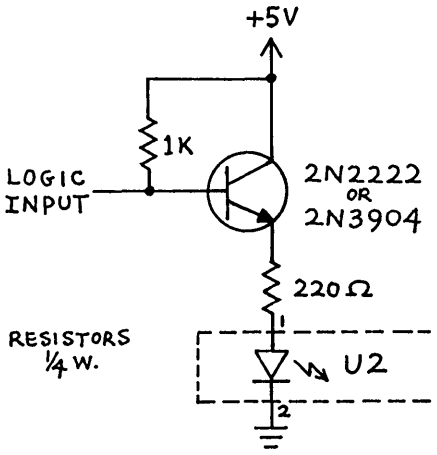
Keith Jack
11045 Roselle St., Ste. B
San Diego, CA 92121

Yet Another Drive Motor Control

The triac motor control circuit presented in issue #8 (bottom of page 19) loads the signal line tremendously. I modified the circuit as shown below and reduced the drive required to a few milliamps. Also, this modified circuit is driven toward ground by the TTL gate TB1 pin 7 rather than high. That is much easier for the gate.

The transistor type is not critical; most general purpose NPNs should work. The remainder of the circuit is unchanged.

Jim Skinner
20435 SW Alexander
Aloha, OR 97006



Eight Drives

This simple modification sets up the BB hardware to select a total of 8 disk drives, either single or double density. It might also allow the BB to run a five-platter disk such as the Phoenix from Data General.

Jumper the following:

U109 pin 5 to J1 pin 8
U109 pin 6 to J1 pin 10
U109 pin 7 to J1 pin 12
U109 pin 9 to j1 pin 14

Now modify the software by by changing PFM location F6B3 from 04 to 08, and change location F7C6 from BB to FF.

At the disk drives, the select lines will be: line 8 for DVSEL4, line 10 for DVSEL5, line 12 for DVSEL6, and line 14 for DVSEL7.

Dave Burgess SRA USAF
Box 5921
APO NY 09012

WANT ADS

The following folks are reaching you for only 20 cents per word. If you would like to reach the same audience, send your words and 20 cents for each to Micro Cornucopia.

9600 Baud Serial Keyboards, 113 keys, 8048 controller. Cursor keys, numeric keypad, plus 33 function keys. 5 interface lines, DTR, DSR, Ground, +5V, and DATA. Only $20.00 + $3.00 per Keyboard for shipping.
Don Duncan
1305 Lowry Ave. NE
Minneapolis, MN 55418
612-789-2190

Wanted—Diagrams for Adds MRD-980 (Cherry) and SOL (Keytronics RevB) keyboards.
Frank LeVine
123 Sequoia Way
Santa Ana, CA 92703

TUITION SALE—Big Board, assembled, factory certified. Includes all options, socketed, CP/M, manual. $550.00
Harold Choate
666 O'Farrell # 36
San Francisco, CA 94109
415-776-6745

Jim said he shipped 25,000 copies between introduction and January 1 of this year. (Let's see $29.95 times 25,000 is . . .) I've heard reports that he received a huge batch of bad disks from the outfit which was copying disks for him. Needless to say, that set deliveries back a lot.

He has sent out a list of bug fixes to clean up the more obvious problems in version 2.1, including to famous "A times 0.0 = A". See "JRT Fix" in this issue for more information.

Version 2.2 is a cleaned and extended version of 2.1 and version 3.0 reportedly has some additional extensions.

However version 3.0 will not be ready until mid-February at best, even though their ads give the very strong impression that it is already available. This means that all those folks who have already ordered their version 3.0 are either going to get version 2.2 or are going to wait. Either way, Jim is not going to win any popularity contests.

I'm still rooting for Jim. I think his head is in the right place. After all, he is pioneering a new way of selling software and in the process, showing the rest of us the pitfalls.

Pascal Column

John Jones is back with us, this time, doing a Pascal column. He is using JRT Pascal so there is no reason that those of you just getting interested in Pascal can't borrow a copy from a friend (it's OK, you know). I think you'll enjoy Pascal as long as you don't try to sell it for $29.95 per copy.

Siemens Drives

The standard rumor is that Siemens is dumping all those FDD100-8 drives on the surplus market because they are getting out of the drive market. The word from Darren Hiebert, however, is that Siemens got a batch of short-lived drive motors and didn't discover the problem until after the drives had been built. So they dumped the drives on the surplus market (at a loss) instead of selling them to their regular customers. Darren said he would be sending more details shortly.

Networking and Ham Radio

Computer networks are, I believe, the real communication future. There are the standards like The Source, some smaller national ones like EIES plus the local bulletin boards.

$29.95 SpellSys

Are you signing your name with an X because spelling doesn't come easily?

Then you need SpellSys!

With this full-feature package, you can write prose with the pros. SpellSys features a 42,000 word dictionary and all the bells and whistles of those expensive checkers—including rhyming, crossword search, letter unscrambling, etc.

SpellSys is made up of a group of individual programs which you can use together or separately. With SpellSys you can setup and maintain your own custom dictionary (in addition to the main dictionary). These are real dictionaries, not hash tables, so you edit or remove words from your own dictionary at will.

IT'S EASY TO USE!
Just enter "SPELLSYS", select which disks you'll use, and file you're checking. Then SpellSys takes over. Everything is self-prompting—so sit back and relax.

Word Review Operations
C . . show Context in file
L . . Lookup word in dictionary
M . . Misspelled (correct file to.....)
D . . put in user Dictionary
I . . Ignore
N . . Next word
P . . Previous word
E . . Exit review
? . . (or any other key) displays menu

ORDER AT NO RISK!
Check out the manual and if you don't agree that SpellSys is a super bargain, just return the package with the disk unopened within 30 days and we'll refund your money. Plus, if you want to give a copy of SpellSys to a friend, that's fine, so long as it's not for resale.

SpellSys $29.95 ppd. in US & Can
Other Foreign add $5.00
Requires 32K CP/M
Available in 8" SS SD or KayPro 5" DD
SpellSys was written by Willis Gore

micragraup

P.O. Box 65 - Bend, OR 97709
MC (503) 382-8048 Visa

The real power of networking is, I believe, in the ability to exchange ideas easily with people who have a particular expertise or insight on your subject. That way communities can be defined by interests and needs rather than by physical boundaries.

One of the primary impediments to open and free participation in this kind of forum is the expense of phone connect time (again adding the physical element). If there were a way for many folks to communicate freely and for free, this thing would mushroom.

Well, hang on to your hats (and your mushrooms). The best free communication medium has for years been amateur (ham) radio. We have voice, Morse, teletype, ASCII, slow-scan TV, and fast-scan TV to name a few. However, the ham population is dwindling, and the primary reason is the Morse code requirement for licensing.

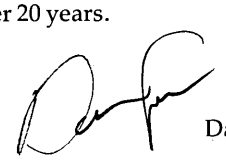
That requirement will probably disappear in the next 6 months for a new class of license. That class of license will hopefully allow ASCII communication on the higher bands. If so, here we go. (You will still be tested on radio theory, radio practices, and radio law but those have not been as big a stumbling block.)

Hams are already interconnecting repeaters all over the country and they plan to provide packet-switching communications at baud rates that will mean almost instantaneous data communications throughout the U.S.

With that kind of free communications network, folks in the smallest burgs (including Bend) will be able to communicate with others with dependability equal to (if not better) than the commercial phone line. The primary restriction is that amateur radio absolutely cannot be used for commercial purposes and it's not private.

Now, just to display my ignorance of present regulations, I wonder if the hams are using the standard tones from a 300-baud telephone modem for their 110-baud ASCII communications. I also wonder if anyone has put together a simple interface between a transceiver and a Big Board for Morse or TTY or ASCII.

If you have, please let me know. There may well be a lot of new hams among the Micro C'ers shortly—and I might even dust off the old S-line pair and once again get actively involved in the medium that has held my fascination for over 20 years.

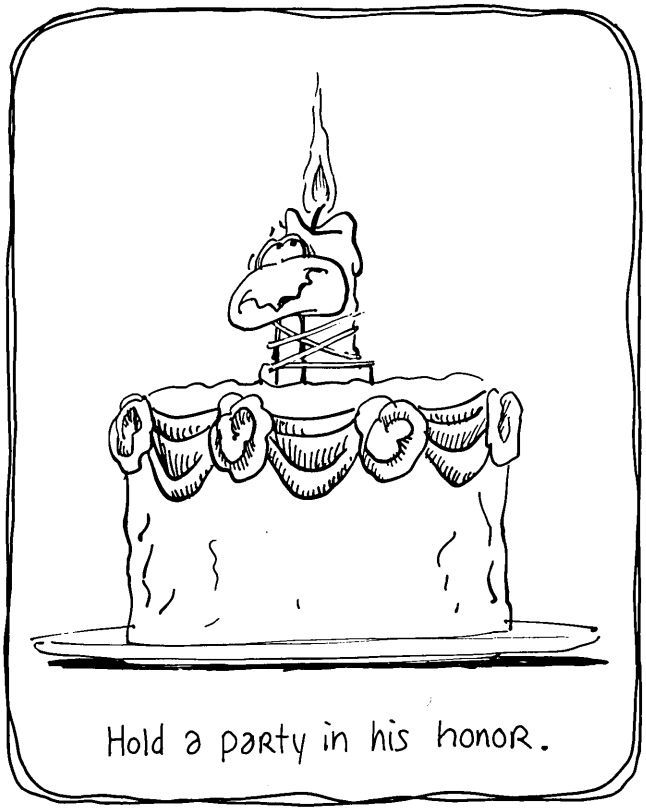


David Thompson
K7OMT

THE CONTINUING ADVENTURES OF Bugsbury

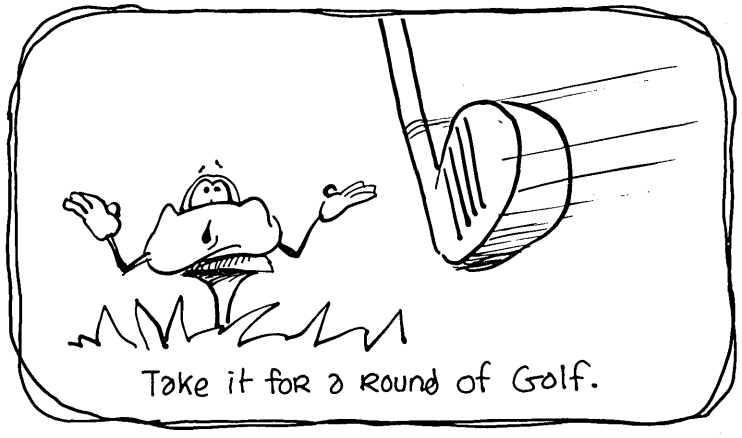
by Gary Whitley

A DAY OF FUN WITH YOUR SOFTWARE BUG...



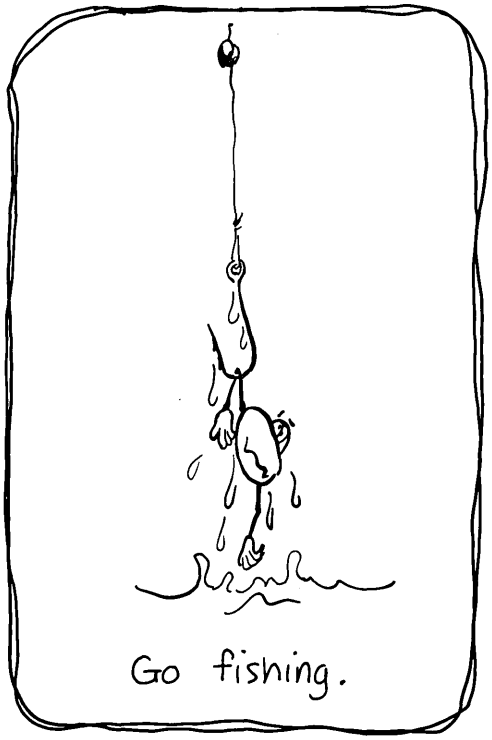
Hold a party in his honor.

Do some target practice.

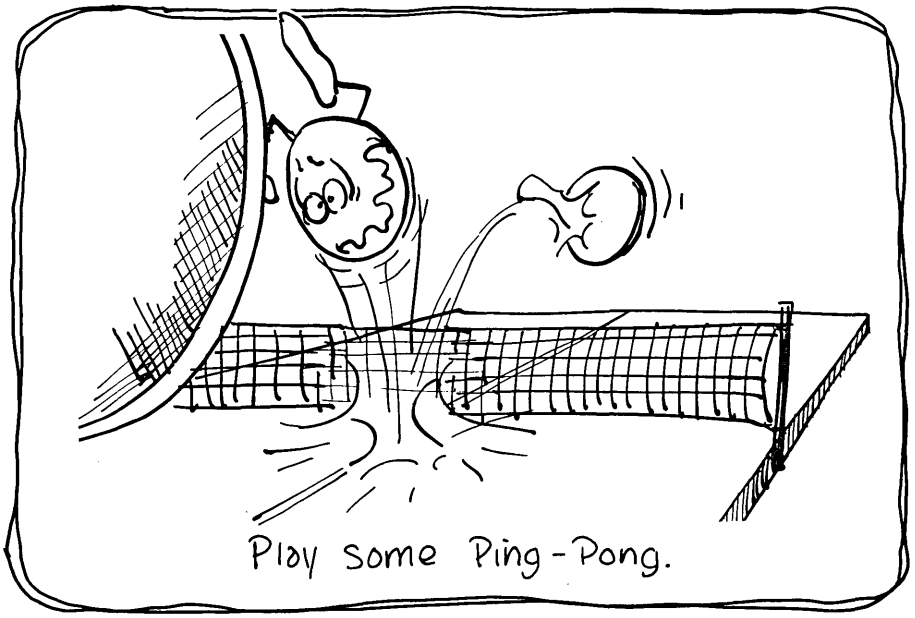


Take it for a round of Golf.

Copyright © 1983



Go fishing.



Play some Ping-Pong.

ORDER FORM

Micro C works because it is a central information exchange for the doers in this crazy industry. So we encourage you to share your trials and tribulations. That way we can invent new wheels rather than redoing the old ones over and over.

What kind of exciting adventure (misadventure) are you working on?

_____

_____

_____

_____

_____

_____

What kinds of information do you need right now?

_____

_____

_____

_____

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_____

_____

Quantity	Description	Price Each			Total
		U.S.	Can & Mex	Other Foreign	
	USER'S DISKS—8" SSSD, CP/M #'s	$15	$15	$20	
	BACK ISSUES #'s	$3	$3	$5	
	SUBSCRIPTION (1 year—6 issues) ☐ New ☐ Renewal	☐ $16 (Bulk) ☐ $20 (1st Class)	☐ $20 (Air Mail)	☐ $26 (Air Mail)	
	OTHER ITEMS:				

Prices include media, package, 1st Class postage (Air Mail for Other Foreign)

☐ Check or money order enclosed
(US funds only, payable on a US bank)

Make checks payable to:
MICRO CORNUCOPIA

TOTAL ENCLOSED

Card No. _____ - _____ - _____ - _____ **Exp.** _____ _____
☐ Visa ☐ MasterCard Signature

NAME _____ **PHONE (?)** _____

ADDRESS _____

CITY _____ **STATE** _____ **ZIP** _____

MICRO CORNUCOPIA • P.O. Box 223 • Bend, Oregon • 97709
(503) 382-8048

BIG BOARD USERS DISKS

USER'S DISK #1
1-Two fast disk copiers.
2-A Z80 assembler.
3-Two disk formatters.
4-Othello.
5-A serial print routine.
6-Modem software.

USER'S DISK #2
1-Two single-disk copy programs, both with source.
2-The source of the Crowe Assembler.
3-New Crowe.com file with larger symbol table.
4-New CBIOS for CP/M 1.4 and 2.2 (& boot).
5-Disk mapper with source.

USER'S DISK #3
1-ROM programmer software.
2-Disk file CRC checker.
3-Source of new fast copy.
4-Utility isolates bad disk sectors.
5-Reset bit 7 (unWordstar a file).
6-Print fancy page headings.

USER'S DISK #4
1-CBIOS, custom bios for Tandon Drives.
2-ZCPR, dynamite CCP that's absolutely addicting.
3-ZCPRBLOC, it tells you the base of your CCP. Nice!

USER'S DISK #5
1-CAT, disk cataloging routines.
2-MODEM7A-MODEM7B, Modem7 for ports A and B
3-PACMAN, play the most popular arcade game at home.
4-FAST, buffers the disk to speed up assemblies, etc.
5-NOLOCK, get rid of PFM upper/lower case switch.
6-VERIFY, cleanup and verify a flaky disk.

USERS DISK #6
1-RUNPAC, source and hex for 8080 runtime.
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