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We’re In

(All In!!)

Moving is no trivial matter unless, of course, you live out of a burlap sack (a bum wrap). But we moved over 10 tons of “necessities” and now have shifted from dump mode (toss it, sell it, or at last resort keep it) to search mode (if we kept it, which box did we put it in).

I’ve seen those glowing reports about the computer cottage industry. You know, those articles and TV features produced by the NY City jet set describing some mystical group of freaks who don’t commute to work every morning—they just live where they want; be it a beach town, a rural farm community, or (like us) in a skiing community nestled against the Cascade Range.

We’ll see what it is really like, and in the meantime we’ll see if we can’t encourage others to join us. (You maybe?)

There’s no work here to speak of (the guy who cuts, delivers, and stacks firewood for $45 per cord is a TV technician when there are TVs to repair), but if you can bring your business with you as we did, then a small community like Bend appears ideal.

The local community college offers very good two-year computer hardware and software programs. That means that there is a pool of technically trained people—both instructors and students. Plus there is an unusually large community of artists, musicians, and other creative sorts who live here because of the quality of life.

I’ll keep you all posted on how this grand experiment is working but I may be a little biased by all the friendliness and trust the local people have shown us. (This is the first post office I’ve visited that accepts out-of-town checks from strangers without asking for any ID.)

Prices of New Products

After you’re involved in computers for a while you get pretty good at predicting what things are going to sell for, and I pride myself with being as astute as the next guy. However I’ve been delightfully surprised lately.

First, the hard disk interface that Andy Bakkers put together for the Big Board I is definitely one of those surprises. It connects up and works with so little muss and fuss that it is easy to forget you are adding an incredible amount of memory to your system. With five megabytes on drive A, the big board is ready to take its place with heavyweight business systems. When you look at $240 for the interface (with software!) and $995 for both the drive and the controller, how can you go wrong.

See the “On Your Own” column in this issue for some thoughts about doing your own trip based on the Big Board (I or II) and 5 or 10 megabytes.

The second delightful surprise has been the power supply sold by BG Micro of Dallas. I did some snooping around on the circuit board after it arrived and I must say, the quality is first class. Everything their ad says is true.

Billy Gage (owner) didn’t mention who manufactured the supply but I noticed a small metal tag which read “mfg. by Teletype Corp.”

Two of us got these supplies along with the 24V mod kits. We are changing the +12 to +24 and then using the 12V mod from issue #1 (page 4) to reduce a little of the +24 to +12. You can use a 7812 3-terminal regulator in place of the LM317.

We had only two problems with the supplies. First, Billy threw in a couple of special 110V connectors for the supplies (a nice surprise) but he sent male pins for the connectors rather than the female pins that we needed, so we just soldered in the AC cord. Second, the heat sensor on the master oscillator had opened during shipping and we spent several hours with volt meters locating the problem. When we found the cause, all we had to do is push the little reset button on the sensor and everything worked fine.

(continued on page 26)
Dear Editor,

I am interested in adding graphics to my system. Thomas Hameenaho (issue #7, page 2) said that only half the character generator chip is being used. Could the other half be used for simple graphic characters? If you were to offer this in an EPROM with instructions I would be your first customer. This would become the graphics standard so that us users could swap graphics programs.

The only problem I see is switching back and forth between alpha and graphics.

John Appleton
702-101-14th Avenue SE
Calgary, Alberta, Canada T2G 1C6

Editor's note:

A number of readers are working on solutions to the graphics problem. Some are building daughter boards, others are trying to find ways to modify the original circuit with a minimum of effort and destruction. The classier the display, the more trouble it is to do. More information about that is coming.

Dot graphics are obviously the most demanding. Simple, connected block graphics (similar to the TRS-80) are much easier. In fact, some folks are working on adding a 6845 circuit. The disconnection means that you can’t paste simple characters together to make graphic displays.

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Dot graphics are obviously the most demanding. Simple, connected block graphics (similar to the TRS-80) are much easier. In fact, some folks are working on adding a 6845 and 8002A (block graphics) to the Big Board I so that both it and the BB II would run the same graphics software.

Dear Editor,

Thanks for sending Tiny Basic so quickly. I ended up not using it in the prototype of the gizmo I was working on but intend to use it on the next version (if they order any more).

Now, about adding additional memory to the BB—I have only done a paper design so far (I have to get the paying projects done first) but here are some details.

1. Change the high 16K of RAM to 5V only parts.

2. Use the WR/NOP signal path through the 74157 as the mux for the two bank select bits.

3. Replace the lower 48K of RAM with 64K chips.

4. Use the “bell” and “spare” PIO bits to handle selection of the proper 48K bank.

5. Add an additional SIO/DART chip and baud rate generator.

6. Add a DMA chip for the floppy interface so that a 2.5 MHz system can run double density and so that interrupts don’t have to be turned off during disk reads.

7. Bring up a 4-user MP/M bios for the whole mess.

I'm also working on the first segment of “Karl's Korner” on how to stuff a BB along with a schematic for a Z80 stunt box that will single-step the BB, display registers, RAM, and trap on I/O or memory address match.

Karl-Wilhelm Wacker
100 Rockaway Street
Islip Terrace, NY 11752
516-581-2932

Dear Editor,

The KayPro II portable microcomputer manufactured by Non-Linear Systems is based on the Big Board. They made a few changes to the board. They used 4164 RAMs, the keyboard outputs serial data to port B of the SIO, and they changed the 1771 to a 1791 for double density (5’’). The board has space for the CTC timer and for all four EPROMs but there is a socket for monitor ROM only.

The KayPro documentation shows that the memory map is identical to the BB. Very interesting.

The SCBIOS on User’s Disk #2 brought life to my parallel printer! I use the Daisy Wheel II made by Ricoh and sold by Radio Shack. However, for this printer, the jumper instructions from Micro C #7 (page 2) aren’t quite right. For the Ricoh, don’t jumper pins 1-2 on J3.

Jack Phillips
Suite 222, Park-Cherry Bldg
114 East Park
Olathe, Kansas 66061

Dear Editor,

I got a call this weekend about my Tandon BIOS on user disk #4. It looks like I forgot to mention that the CTC must be jumpeder for the disk drive auto time-out. This is described in the Big Board addenda, but I’ll repeat it here.

Jumper pin 3 to pin 4 and pin 7 to pin 8 (on JB2).

Bob Edison
Kronos Inc
355 Western Ave
Boston, MA 02135

(continued on page 14)
The new Ferguson computer has two 240-A CTCs. One is used to clock data into and out of the 270-A SIO/0, while the other is for systems and applications use.

- **PROM Programming Circuitry**
  The new Cal-Tex SBC has circuitry for programming 2716s, 2732's or pin-compatible EEPROMs.

- **CP/M**
  CP/M uses Russell Smith's superb Monitor.

**“BIG BOARD II”**

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

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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 EPROM 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 2732A's, 2K 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 8032 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 860 Kbits per second with minimal processor overhead. When a hard disk subsystem is added, the DMA chip makes impressive disk performance possible.

**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 runs a fifty-conductor ribbon cable from a header on the board to a jetbus 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/0 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 270-A SIO/0, while the other is for systems and applications use.

- **PROM Programming Circuitry**
  The new Cal-Tex SBC has circuitry for programming 2716s, 2732's or pin-compatible EEPROMs.

**CP/M**
CP/M uses Russell Smith's superb Monitor.

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BB II EPROM PROGRAM LISTING

; TITLE PROGRAMMER, 2732
; This routine reads a CP/M .COM file of maximum size 4k bytes
; and burns it in a 2732 installed in U80 of BIGBOARD II. The
; 2732 is 1st checked against the code to be burned in to be sure
; no '0' levels are to be programmed to '1'. Note that the 2732
; need not be blank. To achieve maximum speed, only those locations
; needing to be programmed actually receive the 50 ms programming pulse. Following programming, the 2732 is verified,
; and any errors reported. The program can possibly be modified
; to burn other PROMs, but the reader should proceed with caution.
; Programming requirements vary considerably.
; jumpering for U-80 is as follows:
; pin 18 to REC5
; pin 20 to /OE/VPP5
; pin 21 to RA11
; D. H. DURLAND
; 663 Georgia Ave.
; Palo Alto, CA 94306
; (415)493-4984
; edit 11-1-82 to remove reference to 2716's
; edit 10-21-82 to include jumper information
; the program is intended to be assembled using MACRO-80
; Instructions for use:
; Your code should be stored in a CP/M .COM file.
; To program, for example, EXAMPROG.COM
; Turn on your programming power supply.
; Insert the PROM to be programmed in U-80
; Boot up CP/M to access PROGRAM.COM and EXAMPROG.COM
; (the usual drive access rules apply)
; Type: ;<x:)PROGRAM<y:)EXAMPROG.COM<CR>(the .COM is optional)
; The rest is automatic
;
FALSE EQU 0
TRUE EQU OFFH
BOOT EQU 0
PCB EQU 5CH
DDOS EQU 5
CR EQU 0DH
LF EQU OAH
R2 EQU 7FH
SY1 EQU OCBH
PROG EQU OCH
CTCB3 EQU O8BH
SRCMEM EQU 9000H ; park source here
STACK EQU SRCMEM
ROMSIZ EQU 4096 ; size of a 2732
MAXREC EQU ROMSIZ/128

The following is a listing of the EPROM program for those of you
who want to program 2732s on your Big
Board II. As you can see from the pro-
gram heading it was written to be as-
sembled by MicroSoft's M80. The two
special features of this software are that
it programs only the bytes which
need to be changed.

Dec
LD HL A,MAXREC ; least significant byte
CP (HL)
JP C,TOOBIG ; MAXREC records maximum

; fill with FF 1st
LD HL,SRCMEM
LD DE,SRCMEM+1
LD (HL),OFFH
LD BC,ROMSIZ
LDIR ; do it

RDLP:
LD HL,128
ADD HL,DE
EX DE,HL
PUSH DE
LD C,26
CALL BDOS ; read sequential

LD C,20
LD DE,PCB
CALL BDOS ; read a record
POP DE
recover DMA ADDR
OR A
JR Z,RDLP ; if not past end of file
CP 1 ; end of file?
JP NZ,BNHRD ; anything else is an error

now we move the next section to 8000 and jump to it,
; as we are going to bank switch in the PROMS and can't operate
; from CP/M
PRAM EQU 8000H ; where some of this will run
ROMLOC EQU 5000H
ROMCPY EQU 0A000H ; PROM copied here
ENDCK EQU HIGH (SRCMEM+ROMSIZ)

; Org 100H
ASEG

; PROGRM: LD SP,STACK ; Underneath code to be burned
; 1st check to be sure a name has been entered.
; LD HL,FCB+1 ; 1 past drive
LD A,(HL)
CP ~,~ ; is there a letter?
JP Z,BUMFIL
; if not, go report no file

; now check for no type spec or .COM
; LD DE,65H ; 1st type in FCB
LD HL,COMTBL
LD BC,3

; COMO:
LD A,(DE) ; get type
CP ~,~ ; space OK
JP (HL) ; ck letter
JP NZ,BUMFIL ; insist on space or correct letter

; COM1:
LD A,(DE) ; move a letter
 JP PE,COMO ; until COM moved in
 JR OPNFIL ; go open it

; COMTBL:
DEFM 'COM'

; OPNFIL:
LD C,15 ; open file
LD DE,FCB
CALL BDOS
OR A ; set flags
JP M,BUMFIL ; if can't find it

LD C,35 ; compute file size
LD DE,FCB
CALL BDOS
LD HL,R2 ; point to high virtual size byte
LD A,(HL)
DEC HL
OR (HL) ; middle byte
JP NZ,TOOBIG ; both high bytes must be 0

; CKADUP: INC HL
INC DE
LD A,H
CP ENDCK ; 1 past end
JR C,CKADUP ; if no bits where up

; LD A,FALSE
LD (BITSO),A ; flag for message at end
JP ROMOUT ; go back to CP/M

; at this point we know that the PROM is at least theoretically
; programmable. Copy it into ROMCPY for reference.
LD HL,ROMLOC
LD DE,ROMCPY
LD BC,ROMSIZ
LD DIR

; here is the actual burn
; LD B,3
LD C,PROG
LD HL,BRNTBL ; table of output words
CALL OTIR

; LD HL,SRCHEM ; source code
LD DE,ROMLOC
LD BC,ROMCPY
LD BRNTBL
JR BURNLP ; and do it (continued on next page)
BB II EPROM PROGRAM LISTING (continued)

BRNBL:
DEFB 8 ; to disable PROM outs, enable U-57 outs
DEFB 9 ; to disable PROM /CS lines
DEFB 0CH ; to turn on program voltage

; BURNLP:
LD A,(BC) ; PROM copy
CP (HL) ; same as source?
JR Z,BURN9 ; skip burn if so (save time)
LD A,(HL) ; get source
LD (DE),A ; latch it to PROM for burn
LD A,1
OUT (PROG),A ; /DECODE low thus /CS low
PUSH BC ; save copy address
LD B,50 ; millisecond count

CNTMS:
IN A,(CTCB3) ; get current count
LD C,A ; it becomes reference

MSCHR:
IN A,(CTCB3) ; change?
CP C ; until a change
JR Z,MSCHR

DJNZ CNTMS ; do 50x 1 millisecc
POP BC ; retrieve copy address
LD A,9
OUT (PROG),A ; /DECODE high thus /CS high

; BURN9:
; can get here if PROM=source
; (see BURNLP+2)

INC HL
INC DE
INC BC
LD A,H
CP ENDCK ; 1 past end
JR C,BURNLP ; for 4K bytes

; PROM is now burned. Time to verify it.
LD B,3
LD C,PROG ; table to go back to normal
OTIR ; go back
JR VERIF1 ; and verify

NRMTBL:
DEFB 4 ; to turn off program voltage
DEFB 1 ; to enable chip set decoder
DEFB 0 ; to turn off out buff and enable PROM

; Report receives DE pointing to the bad PROM byte and HL pointing
; to the source byte. HL is a relative address.

REPORT:
PUSH DE
PUSH HL
CALL MOVE4 ; move address into message
LD A,(DE) ; get bad PROM byte
LD DE,ERRMS4 ; move bad PROM byte to message
CALL MOVE2 ; move bad PROM byte to message
LD A,(HL) ; get source byte
LD DE,ERRMS6 ; move to message
CALL MOVE2
LD DE,ERRMS1
CALL PMSG
POP HL
POP DE
LD A,FALSE
LD (ROMOK),A ; if we get here at all, we have a problem
RET

; MOVE4 converts the address to ASCII and moves it to the message area

MOVE4:
PUSH DE
LD DE,ERRMS2
LD A,H
RES 7,A ; modulo 4k
CALL MOVE2 ; move H to message area
LD A,L
CALL MOVE2 ; and L
POP DE
RET

; MOVE2 converts a HEX byte to two ASCII characters and moves
; them into the message area

MOVE2:
PUSH AF
RRA
RRA
RRA
RRA
CALL MOVNIB ; get high nibble into low
POP AF ; and move it
MOVNIB:
AND OFH ; only low part of interest
ADD A,90H
DAA
ADC A,40H
DAA
LD (DE),A ; convert to ASCII
INC DE ; put it in the message area
RET
VERIFI: ; this area contains abort routines and messages

; 1st we copy the burned PROM into ROMCPY
LD HL,ROMLOC ; PROM
LD DE,ROMCPY ; copy destination
LD BC,ROMSIZ ; byte count
LDIR ; move it

; Now switch out the PROMS and go back to CP/M for verification.
ROMOUT: DI
LD A,8
OUT (SYS1),A ; switch out the PROMS
EI
JP VERIFY ; go do the verification
BINEND EQU $ ;
BITOK: DEFS 1 ; goes false on 0 to 1 transition request
ROMOK: DEFS 1 ; goes false on bad verify
.DEPHASE

VERIFY: LD A,(BITOK)
OR A
JP Z,BITNG ; go report no try
LD DE,CRLF ; else do the verification
CALL PMSG ; put crlf
LD A,TRUE
LD (ROMOK),A ; assume ok
LD HL,SRCMEM ; source start
LD DE,ROMCPY ; PROM copy

VLP: LD A,(DE) ; get a PROM byte
CP (HL) ; match?
INC HL ; if not
INC DE
LD A,H
CP ENDC ; 1 past end
JR C,VLP ; catch all bytes
LD A,(ROMOK)
OR A
JP Z,FINIS ; if not ok, no reporting to be done
LD DE,VERMSG ; else report success, and quit
CALL PMSG
JP FINIS

; BUMFIL:
LD DE,FILMSG
CALL PMSG
JP FINIS

; this area contains abort routines and messages
BITNG:
LD DE,BITMSG
CALL PMSG
JP FINIS

BITMSG:
DEFS 4 ; will hold address
DEFS 4 ; will hold bad PROM byte
DEFS 2 ; will hold source byte

; ERMVS1: DEFS 4 ; will hold address
ERMVS2: DEFS 4 ; will hold bad PROM byte
ERMVS3: DEFS 2 ; will hold source byte

; VERMSG:
DEFS 3 ; should=
DEFS 2

; VERMSG:
DEFS 4 ; PROM verifies OK',CR,LF,'$'

; END
Not all Big Boards work when first powered up, so the purpose of this article is to help those who don’t get that sometimes elusive “system monitor 3.3.”

Background
First, a little information about the PFM monitor. At power-up, the processor starts executing code from location 0000H in the ROM bank. The first 16 instructions in the ROM move the rest of the monitor to high memory starting at F000H. Following the move, control is transferred to F000H.

If PFM is copied correctly, if the RAM at F000H is good, and if there are no other basic problems in this part of the system, then PFM will start its tasks. PFM does a number of things before it can accept an input and sign on. It deselects the ROM bank, clears the video RAM, initializes the system PIO, SIO, CTC, and 1771. Next it checks to see if you have an SIO and if so, it starts polling both the SIO and the PIO to see which receives a carriage return character first.

You can watch this polling process by checking the chip enables of the PIO and SIO to see if the processor is alternating selecting one and then the other. If the monitor finds that an SIO is not installed, then it goes ahead and signs on and waits for characters from the SIO.

Let’s go down the list of the most common problems and see what usually works.

Is It a Dead Processor?
The first thing you need to check on a bad board is whether the processor is running. Check the M1 line (is pin 27 wiggling up and down?) to see if the processor is fetching opcodes. If it is not running, then either it is not receiving a good clock signal (pin 6) or it is being held in a constant reset (pin 26 stays low).

If you find either of these problems, recheck all the related components to make sure they are in their proper places and not interchanged with others or installed in a feed-through hole. R43 is the most often misplaced component in this part of the board and people often interchange Q1 and Q2. Q2 helps make the rise time of the clock short enough to meet Z80 specs. It must be a 2N2907.

Alternating Character Display
If the processor is running you will find that the on-board video is a very powerful debugging tool. A repeating pattern of boxes and colons is called a stack crash. It usually means that the processor is running but it is not able to execute PFM. Usually this is caused by a bent pin on a RAM chip (this is hard to find so look carefully) or it happens when someone substitutes 74LS157s for the 74157s in U58 and U59. The LS parts won’t work here.

Other common mistakes include unsoldered or badly soldered pins, switched parts, or defective RAM (especially the top 16K). You only need RAM chips U1 through U8 installed in order for PFM to sign on. Also, the Z80 is the only 40-pin chip that has to be installed in order to get the magic prompt.

Other Visible Problems
If you are getting more than one prompt or the screen hasn’t been completely cleared at sign on, then the trouble most likely is in the 74LS157 area. Again, look for bent pins or switched parts. If you move parts and the trouble changes, that should give you a clue.

If the characters on the screen slowly swim back and forth, check the video crystal. The documentation calls for 14.31818 MHz but the proper crystal is 13.9776 MHz. This provides a true 60 Hz vertical sync rate. If the new crystal causes the characters to tear, then replace C24 with a 10 pf capacitor or reduce R2 to 470 ohms.

If the dots on your screen jitter, then you probably have some noise leaking into the video. Add some bypass capacitors to the +5 V line near the video section. (Editor’s note: try some 50 mfd 10V tantalums between the +5 V line and ground.) Also, swapping or changing U38 and U51 will sometimes clean up the problem.

If the first half of each video character is missing then you may have mis-installed the 1.5K resistor at R21. It is easy to mistake a feedthru for the component pad on this part.

Keyboard
If your keyboard is not hooked up properly (bit 7 is not grounded or driven low) the BB will answer all or some of the commands with “what.” Also, a defective 74LS14 (U112 or U114) can lead to a bad case of “what.”

Disk Drives
If you have two drives jumpered as drive 0 (LEDs turn on together) then you may destroy the system tracks (0 and 1) on your disk.

SIO
A lot of people don’t realize that there is a difference between an SIO/0 and an SIO/1 or 2. By the way, a DART will work just as well as an SIO as long as you do not plan any synchronous communications. (And who wants to do synchronous work anyway?)

Other Thoughts
If your −12 V supply fails while a disk is loaded, the 1771 will write garbage on the track where the head is, destroying both the data and the formatting. If your −5 V supply goes positive, your 4116 RAMs may be damaged. So, you should double-check your power supplies if problems occur.

Although our customers are some of the best computer whizzes around, 9 out of 10 boards we get back for repair have at least one IC pin bent under or out, or have bad solder joints.

The memory test is not infallible. We have seen cases where bad memory chips have passed the test. If your programs act weird and your power supplies and software are OK, then suspect the RAM. Swap rows of memory around to see if the problem changes.

Finally
About 19 out of 20 BBs work on the first try. I hope the above hints will help with the other 1 out of 20.
Relocating Your CP/M

By Pseud O. Nym

In Micro C #2, Dave notes that in the CP/M distributed with the Big Board, the BIOS starts at E800, while most 60K versions start at EA00. You can modify the BIAS definition and reassemble this BIOS to accommodate this BIOS. Many of you with the BB version may, like myself, want to return to the standard CP/M EA00 BIOS to recover the wasted space and be compatible with the majority of 60K CP/M systems. (I had to laugh at the note about maintaining consistency—we would have been consistent if we’d stayed with the CP/M standard.)

MOVCPM contains a relocatable copy of CP/M, a BOOT, and a BIOS. Whenever you run MOVCPM, it modifies all of these. If your MOVCPM includes a BOOT and BIOS suitable for your hardware, fine. Otherwise you have to overlay the relocated system with suitable programs. However, MOVCPM only allows relocation in steps of 1k bytes—so you can set up the BIOS at EA00, E400, DA00, etc.

The version of MOVCPM distributed with the Big Board has been modified to deposit the code 512 bytes lower than the standard version. Thus, MOVCPM 60 gives you a 59.5K system! You can duplicate this feat or defeat it by adding a patch to your MOVCPM program.

This patch modifies MOVCPM’s size calculation. When execution reaches location 016FH, the HL registers contain the specified system size (e.g. F000H for a 60K system). If you add anything to or subtract anything from HL at this point, the resulting system will be larger or smaller.

Voila! To make the BB MOVCPM work like the standard version all we have to do is add 200H to HL here.

This is how I patched MOVCPM.

DDT MOVCPM.COM
L16F check that 16F is JP A15
A16F
JMP 2A00 jump to patch.
. (don’t forget this period)
A2A00 assemble code at 2A00H
PUSH B save BC
LXI B,200 to convert E800 to EA00
or LXI B,FEOO to subtract
200H
DAD H,B add BC to HL
POP B restore BC
JMP 1A5 where it was heading
. G0 “go zero”
SAVE 42 MOVCPMX.COM

I should note that I have only tested this for converting the BB MOVCPM to standard. Also, your MOVCPM may not be the same length as mine. I put the patch at 2A00 because DDT reported that as NEXT when I loaded MOVCPM.

After this, you can follow the CP/M documentation for “Second Level System Generation.” (See page 6 of the CP/M Alteration Guide.) Note that when using the BB MOVCPM you must add 200 to the read offset for the BIOS. This makes the offset 3780.

Editor’s note:
This is one of those really significant pieces of information which gives us all a chance to org at EA00. You can reassemble your present BIOS (use the SD Systems assembler on the original source) or go ahead and install an updated BIOS such as the one from user disk #2 or #9.

Also, the author asked not to be identified so I gave him the best pseudonym I could think of. Sorry if I was too obvious.

---

CATCH US AT THE FAIRE

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Micro Cornucopia, Number 9, December 1982
Xerox 820 Notes

Column by John P. Marlin, Jr

As promised, I’m back again, and the Xerox 820-II (R) board has been disected, also as promised. What a difference! I scarcely know where to begin. I’ll refer to the old board as 820, and the new one as 820-II.

It looks like Xerox has gotten serious about the microcomputer market. They have done a lot of the “Personal Computer” stuff but this one is definitely a Business Machine.

Appearances

The 820-II has the same old 4 connectors and reset button across the back edge, and same good RFI-EMI attention, but now, all of a sudden, there are a couple of edge connectors on the mother board, and one of them has a PCB in it! Also, fewer ICs, and more space between them. Removing the disk controller made a lot of space on the mother board.

There are two different boards available for the controller slot, a floppy controller, and a hard disk controller.

The other slot is an expansion connector, nearly one-for-one with the controller slot, but obviously intended for memory, or like that.

The hard disk board is only a SASI in most cases. Bit 7 is the only one with the double density kit for 820, but obviously intended for memory.

The Controller

The controller is a 1797 which allows double-sided double-density floppy drives, with side checking on address headers. However, the chip is limited to 256-byte sectors.

John MacFarland, of Software Publishers, tells me he has one running 1K sectors with a 1793. He is using essentially the same double density software he supplies with the double density kit for the Big Board. The rest of the floppy controller is pretty much the same as the old 820, with the addition of a write precompensation circuit (a double density necessity).

The Kernel

CPU: 4.0 MHz Z80-A with 8.0 and 16.0 MHz clocks available on the board. As with the old version, nothing significant here.

CTC, SIO, and PIOs are the same as on the 820.

MEMORY: Now we see some differences. For instance, Bank Select (bit-7) turns off everything up through BFFFFH. The second edge connector (memory expansion) has *MEM4 and *MEM5 signals which are decodes of the second and third 16K segments when the second memory bank is selected. CP/M 3.0, anyone? Additionally, the expansion slot has *RFSH, and all the other normal bus signals almost like STD-BUS. A pity they didn’t use the STD-BUS pinout.

There are the usual 4 2716 sockets, but the upper two have jumpers to feed the WR (write) signal to pin 21 for 6116-type RAM. Currently, 3 sockets are occupied by ROMs. All 4 sockets run with wait states.

CRT RAM: is a 2016 2Kx8 chip running with a wait state.

The ROMWAIT (ROM wait) can also be accessed from both the Disk Controller slot and the Expansion slot, as needed.

Lots of new I/O ports defined. SYNC/ASYNC select, SGL/DBL density, CHARGEN1/CHARGEN2, set DIM video, and (at last!) SET/RESET ALARM. Yes, Virginia, there really is a beeper!

SLight changes to the System PIB definitions. Bit 5, not needed for the bell, now senses double-sided floppy drives.

Monitor

Here there is a real difference! On reset, the following happens:
1. SP, HL, and last word of stack are stored beginning at FFEO.
2. The Copyright disclaimer is executed. You heard me, they actually execute the copyright characters. And, since they have eliminated the spaces in the text (you know, those troublesome JR NZ’s) the result is a bunch of harmless LD’s. Saves 2 bytes not to JR around it! This, it turns out, is the beginning of some of the tightest code ever written by mortals!
3. Clear and initialize the CRT;
4. Non-destructive test of RAM from F000-FFFF;
5. Checksum test on 3 of the 4 ROMs;
6. Initialize FF00-FFFF data (the old LDIR loop);
7. Initialize the I/O ports (ditto OTIR);
8. Initialize CPU. Mode 2, FFXX vectors;
9. Move the F000-FFFF image into place;
10. Checksum test on fourth ROM. Fail says jump to entry in HIMEM;
11. Test for 55AA just below checksum in fourth ROM. Fail says jump;
12. Load HL with Command Address Table;
13. Load DE with DSKMAP;
14. Load BC with HIMEM entry address;
15. Call ROM4;
16. Jump to HIMEM entry address (FC55).

ROM or RAM errors detected move appropriate message to CRTMEM directly, time out, and re-jump to 0000.

After all this, the SIO is initialized. (Even Parity with DTR and RTS set on both channels.) Channel A is set for 300 BPS, B at 1200. The PIO is initialized for a Centronics interface.

High Memory

HIMEM entry. After we finally get here, we still have bits 6 and 7 of the System PIO as outputs, and all others are inputs, for the moment. Bit 0 is held low by the SASI I/F, so we start moving storage addresses and driver addresses around. Bit 4 is held low by 5 1/4" drives, so we move some DPE’s and modify DPH’s. Finally, we display the startup message and wait for keystrokes.

Oops! new message! “H Host Terminal” Yes, we can look like an ADM3A. Better yet, from the KBD we can do local copy for those pesky IBM systems, or, still better yet, remote echo to look like a CPU to some remote dumb terminal. Innovation! As each line scrolls off the top of the screen, it is written to RAM in 80 byte chunks, starting at 0100H, just like in CRTMEM. No CR’s, no LF’s, just an image of CRTMEM. Holds about 700 lines. Do one of those, then boot CP/M and SAVE 220 FILENAME.EXT and you got it!

(continued on page 12)
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The Disk is the Media

By David Thompson

Researching this article was a real learning experience for me. It was particularly enjoyable both because I’m interested in the subject and because I got a chance to chat with some very interesting people. I found that the magnetic media market has its own language, its own pecking order, its own hype, its own secrets, and its own technical gurus.

My technical sources include Tektronix, Colin Thompson of BASF, Marilyn Gilman of Memorex, and Dale Isaacs of Dysan.

Background

There are two ways of putting recording material on a disk. The oldest and most common way is called knife coating and everyone but Maxell appears to be using this method. The method Maxell now uses is called roto gravure, and is a very similar to the precision printing technique of the same name.

The roto gravure technique is new to disk manufacturing and though it provides the best control over emulsion thickness, Maxell hasn’t figured out how to produce a smooth, non-abrasive surface. (They are working on it night and day.) It turns out that the thinner the coating, the higher the data density because the magnetic information written onto the disk surface cannot fan out as far when the coating is very thin. And this new coating method makes it possible for Maxell to make their coatings thinner because they are so consistent.

Meanwhile, they are having a problem with abrasion. The tiny particles of iron oxide that store the information are quite abrasive, so it’s important to make the disk surface as smooth as possible and impregnated with lubricant. It’s also important that any particles kicked loose by the head be picked up immediately by the fabric envelope liner because these particles can damage the head and damage the disks that follow.

Media life

I asked Colin Thompson, the BASF technical rep, about differences between brands in terms of media life. He said that all the manufacturers have advanced to the point where the media would last practically forever if users would handle the disks properly. Bending, dust, and fingerprints are now the primary determinants of disk life. (You should see how folks ship disks to me. Shame! Shame! You must keep them in their envelopes and mail them in real boxes.)

Occasionally a manufacturer will go off on a tangent. An example of this is Verbatim’s attempt to use aluminum oxide (doesn’t sound very magnetic does it?) in place of iron oxide. Those disks haunted Verbatim for a long time. In fact, I had some and they were so bad that I still don’t trust Verbatim (though from what I’ve found out, I really shouldn’t distrust them now).

During the time when Verbatim was having its problems I bought a number of BASFs. I had absolutely no problems with them. However, this spring I had mentioned last month, the 820 board supports 5/4” floppies. Rondure has schematics for the 820 at $5.00 apiece, although I don’t know if the prints are available separately. If not, I have prints for the same price.

Coming Up

Next issue I will talk about the slick non-destructive RAM test used in the 820-II, as well as the improved CRT handler and the new monitor entry points. See you then . . .

About the last column:

I made an error on last issue’s info. It’s the RIGHT ARROW, not the DOWN ARROW, which sends °C. Sorry.

Editor’s note:

John caught an error I added while editing his last column. He pointed out that 5” drives do not do their own data separation, as there is no line on the interface for FDCLK. The 8” separator is used just as on the BB, and the internal separator of the 1771 is used for 5” just like Radio Shack did, to their eternal embarrassment.

(820 Notes continued)

However, we type “LAret>” and more happens in HIMEM. Overlays! The first letter brings in an overlay from ROM into the aforementioned HIMEM EMTRY address and is executed there. Sooner or later we get a very sheepish, one-line greeting from CP/M. We’re up!

DIR brings back strange files. CONFIGUR.COM. WHATSA.COM. BACKUP.COM. A bunch of funny others. What are they?

CONFIGUR allows a disk image or a memory image to be patched in many wonderful ways. I/OBYTE, 7/8-bit KBD, floppy step rate, auto-restart filenames, video attributes, hard-disk partitions. Several tables are stored in HIMEM to make CONFIGUR work, including addresses of “ANDA,7F” (reset keyboard bit 7) instructions and such.

By the way, we don’t call F000-jumps for SETDMA, SETSEC, SETTRK, SELDSK, READ, and WRITE from BIOS. Now we request “Execute Physical Device Driver”, specifying a 9-byte table in HL. That’s all. The table has logical drive, sector, track, DMA, and command. HIMEM code equates logical drive to physical drive, finds the appropriate driver, and does it. Almost magic.

CONST, CONIN, CONOUT are replaced with logical CONST, etc. which, in turn, is steered with the contents of I/OBYTE. Same for LIST.

In addition to all these magical entries, all the old ones are still where we expect them, so 820 BIOS runs on 820-II hardware. Single density, only, of course. Code’s all there to fake them.

Back to the 820.

Seems as though the surplus 820 boards became available after I wrote the last column, but before it got printed, so you have the word on the Rondure (Dallas) offerings at $435.00. Even at $399.00 for the BB kit, if you add the SIO and CTC options, as well as the pre-soldered socket option, the 820 board is cheaper, and, has been tested as a running system. Hard to beat!

It should fit into nearly any old CRT case in place of the old logic (especially the single-board designs) and use the old keyboard and CRT monitor assembly, as well as the power supply. Also, as
problems with two batches in a row. I had a marginal drive but the BASFs were the only disks that it threw up on.

According to Colin Thompson the BASF technical rep, the disks produced in 1981 (the last character of the ID # on the back is a 1) had problems. I checked, and all my flakey disks ended in "1." He says they have done a major re-engineering for 1982 (the number ends in "2") and they have not had any of the new ones returned.

**Drive problems**

Colin also mentioned that many of the complaints that disk manufacturers are now seeing are a result of drive problems. He noted that the drive manufacturers are not taking the time to align the drives as precisely as they used to (because of the volume of drive orders) and that OEMs and dealers are not set up to do it.

**Similarities**

All manufacturers start out with essentially the same raw materials. They all use the same type of mylar base and use nearly identical materials to formulate the coating.

First the manufacturers mix the raw materials into a slurry (the recipe is precisely dictated by an ANSI standard) and then they coat the mylar base with the slurry. They wind up with large rolls of coated material from which they cut the disks. The disks are polished and then tested. It is only during the testing process that disks are separated into single or double sided and single or double density.

**Differences**

The differences between brands appear primarily to be differences in the lubricant, the polishing, the testing, and in the envelopes.

All of the manufacturers have full time labs to keep on top of changes in the quality of the product. The manufacturers are: Athana, BASF, CDC, Dysan, IBM, Maxell, Memorex, Nashua, Scotch, Verbatim, and Wabash. All other brands use material made by one or more of these folks. (And even the above folks fill out their own product lines by purchasing finished and unfinished product from other manufacturers.)

Dysan, for instance, buys coated rolls (called tape) of raw 8" material from Scotch because they haven't perfected the coating process for this size. However, they have perfected the burnishing and it's only been recently that other manufacturers have figured out how to match Dysan's high quality finish. Meanwhile Dysan is trying to increase its production substantially. It'll be interesting to see whether they can maintain their high quality during the expansion.

**Vague Conclusion**

So the question still comes down to whose disks are best and whose are the best deal for the money. Dysans are premium disks but you definitely pay for that quality. Maxell is trying to compete with Dysan in the quality market but they are going to have to get their finishing worked out and they aren't cheap. Maxells probably will never be cheap because their marketing agents cut off supplies to anyone caught discounting too much.

Beyond that, it's up for grabs, and various brands of disks have done well or poorly depending more on the phase of the moon (or so it appears) than on brand name. Slight changes in one of the raw materials or in one of the manufacturing processes can have a significant effect on the quality of the product.

Most manufacturers strive to keep the number of defective disks down to one percent. (This is the percentage of disks that customers return, which is not necessarily a good indication of the actual percentage which are bad.) Between two and four percent of my Scotch disks are bad. Colin has said that he hasn't seen any returns of the 1982 BASF disks (the last digit of the number on the back is a 2). They had lots of returns of their earlier product.

It sounds to me as if most of the disk manufacturers have gotten their trips together. If so, there are some real bargains available in the disk market. I've started testing a batch of the new BASFs and haven't had any problems so far. If you want to try some of their latest disks, look for the boxes with "qualimetric" stickers on them. ("Qualimetric" must be another word for 1982.)
A lot has happened in the FORTH world over the last couple of months and we may have passed a new milestone. This month's column includes information from two new contributors, Philip Plumbo and Ward Harold. We welcome user contributions, especially when they are of this quality!

Dr. Dobb's Journal
In case you haven't been following the computer magazines closely, each magazine tends to have a monthly theme. The first issue devoted to FORTH was the August 1980 issue of BYTE. This single issue probably doubled the number of FORTH users!

Since then, Dr. Dobb's Journal (DDJ) has had two FORTH issues, first in September 1981, and again in September 1982. This latest FORTH spectacular is one of the best mix of applications I have seen.

They have included Joe Barnhart's binary, relocating, linking FORTH loader (mentioned in the last column); a complete floating point package, in both high-level and assembler; an H-19 screen editor; a Z-8000 FORTH; and a programming style article. Almost as good as the articles are the numerous ads. I suggest ordering a copy before DDJ runs out.

Correction
In the last column there was a typo in Hampton's screen. For TERMINAL the 2BCD should have been 2BC3.

The FIG National Convention—by Philip Plumbo
The FORTH Interest Group presented its fourth annual National Convention on Saturday, October 9, in San Jose, California. The turnout was impressive (over 500 people), as was this year's expanded schedule of seminars. For the first time in FIG's history, the number of lectures exceeded the time available, and so lectures ran in parallel throughout the day. (Unfortunately, they were all top-notch, making it difficult to choose which to attend).

The Standards Committee gave an update on its work of the past year, reporting that the task of defining FORTH-83 was proceeding smoothly and without the squabbling that marred past efforts.

Other seminar topics included energy control applications, a multi-tasking FORTH system, debugging and development tools, and the latest video games (from Atari of course).

Charles Moore and Elizabeth Rather chaired a seminar on the use of FORTH in digital image processing.

Other panels discussed the use of FORTH in industrial and process control, business applications, computation, video mixers and television commercial production, university engineering courses, and data transmission via amateur radio packet switching networks.

The commercial display area was a busy spot, and the vendors were out in force with their latest FORTH language systems and various development tools. FORTH, Inc. demonstrated its poly-FORTH II for the IBM-PC, a multi-tasking FORTH that includes hardware floating-point support for the 8087 numeric processor, and on-line system documentation.

Their floating-point implementation uses a separate floating-point stack, and their floating-point words operate only on that stack. Their demonstration included a set of matrix multiplications which appeared to run almost instantly.

If you've ever done any matrix algebra...
with your micro, you know how impressive that is.

Creative Solutions, Inc. showed a FORTH for the Hewlett Packard 68000-based computers. Their demonstration included various animations, high-resolution graphics routines, music-synthesis, and a FORTH interpreter all running simultaneously. You could shift from one task to another with a few simple commands.

C. H. Ting displayed a Chinese-character generator/symbol processor capable of creating and manipulating any ideogram interactively.

The friendly people of Mountain View Press were there with a long table stacked high with the latest FORTH publications. The 1982 Proceedings of the Rochester FORTH conference (on data-base and process-control applications), Haydon's All About FORTH, The FORTH Encyclopedia by Derick and Baker, and Huang's And So FORTH attracted lots of stand-up readers to the MVP booth.

Mr. Kogge, a senior engineer in advanced system architecture for IBM and adjunct professor at SUNY-Binghamton, gave the keynote address titled "On Removing the Magic from FORTH." Mr. Kogge cautioned the FORTH community that "If we wish to avoid being confined to the dustbins of technology we must make a conscious effort to de-mystify what we have." He urged the audience to spread the FORTH word widely, especially in "recognized" literature, reminding us that FORTH is virtually unknown in industry and academia. Those few people that have heard of FORTH often know it only as a "write-only language" or "a variant of assembler."

A High-Level Interrupt Handler—

by Ward Harold

The March/April FORTH Dimensions (vol. 4, no. 2) published an interrupt handler designed to allow the use of high-level FORTH words. When the interrupt occurs, the machine state is saved, the high-level word's code field address is loaded into the interpreter pointer, the word is executed, and the machine state is restored.

Ward Harold of E. R. Squibb & Sons, Inc. has modified the Fig version to work with UNIFORTH. Ward's version is presented here as an excellent example of well-documented FORTH. He has used CTC 0 and 1 as a one-second interrupt counter for an example of the handler. Several Macros (POP.REG, SAVE.REG and their parent versions) are used to clean up the source code. If you still have any questions then read the original FORTH Dimension article or check with one of us.

A high-level interrupt handler buys you transportability and ease of coding. You lose speed because all registers have to be saved and restored, and a high-level word executed. For slow interrupts (spaced more than 0.01 second apart), the high-level handler will work fine.

Next Month

The FORTH-83 preliminary standard is just about ready to be released, and the next column will include a summary of the changes. Plus, we'll cover new commercial versions of FORTH and examples of FORTH in OEM instrumentation.

Future subjects include a label maker, Epswriter (using your MX-80 as a typewriter), and hard disk interface. Best holiday wishes to all!

Micro Cornucopia, Number 9, December 1982
Serial Print Driver

By David Thompson

The following is the much-requested general purpose serial printer driver for the BB I. It was written for the Crowe Assembler. Use your text editor to move the semi-colons around and change the baud rate and BIOS bytes to set it up for your system.

Then assemble it and you are on your way. Those of you writing software for others might look at the heading. This is the kind of information that I like to get with a new piece of source.

Editor's note:
OK Phil, we were late with issue #8 (and we'll be late again with this issue). But since you're so well versed, I feel I have to reply. Though there is no rhyme nor reason for it.

There once was a journal so witty, that it didn't belong in the city, so it packed up its kit, moved even the wit, but it's still late, which is surely a pity.

(Letters continued)

Dear Editor,

Oh Where, Oh Where has my Micro C gone?

Oh Where, Oh Where can it be?

If it's ready, dear Dave, will you send it along?

Or has Oregon dropped into the Sea?

Phil Plumbo
1128 Dayton
St Paul MN 55104

 Portugese Encounts

   ORG 100H
   (UNCOMMENT THE PORT YOU WANT AND COMMENT OUT THE OTHER WITH ";")

   **** PORT A ADDRESSES **********
   DATA EQU 04H ; PORT A DATA ADDRESS
   STATUS EQU 05H ; PORT A STATUS ADDRESS
   BAUDGN EQU 06H ; ADDRESS OF PORT A BAUD RATE GEN.

   **** PORT B ADDRESSES **********
   ;DATA EQU 05H ; PORT B DATA ADDRESS
   ;STATUS EQU 07H ; PORT B STATUS ADDRESS
   ;BAUDON EQU 08H ; ADDRESS OF PORT B BAUD RATE GEN.

   **** EDIT THE FOLLOWING TWO EQUATES FOR YOUR OWN SYSTEM ****
   ; also edit the SIO INITIALIZATION TABLE to
   ; select the proper bits/char and parity
   ;
   ; BAUD EQU 0EH
   ; 05H = 300 BAUD
   ; 06H = 600 BAUD
   ; 07H = 1200 BAUD
   ; 0AH = 2400 BAUD
   ; 0CH = 4800 BAUD
   ; 0EH = 9600 BAUD
   ; 0FH = 19200 BAUD
   ; JMPTABL EQU 0E80CH ; USE E80C WITH DRC CONFIGURED CP/M
   ; USE E80C IF YOU USED DRC BIOS WITH YOUR OWN COPY OF CP/M
   ; WORKPLA EQU 0EF20H ; THIS IS WHERE THE PRINT ROUTINE
   ; AND THE A REGISTER PATCH
   ; WILL RESIDE (ABOVE PFM)
   ; BOOT EQU 0 ; RETURN TO CP/M
   ; ROY EQU 10H ; IS THE SIO READY FOR ANOTHER CHAR?
   ; INITCNT EQU 09H ; LENGTH OF INITIALIZATION TABLE
   ;
   ; **** INITIALIZE THE PORT *************
   ; INIT LD A,BAUD
   ; OUT (BAUDON),A
   ;
   ; INITA LD B,INITBYT
   ; OUT (INITBYT),B
   ;
   ; INITS LD B,INITCNT
   ; OUT (INITCNT),B
   ;
   ; DEC C
   ; JR NZ,INITB

Micro Cornucopia, Number 9, December 1982
Talking Serially

By David Thompson

If you need to make two computers communicate with each other via RS-232, then chances are the following tactics should make them talk.

You need two male RS-232 connectors and some cable with 7 or more conductors.

- **pin**
  - 1 ground ———— 1 ground
  - 2 Xmit data ———— 3 Receive data
  - 3 Receive data ———— 2 Xmit data
  - 4 Request to send ———— 5 Clear to send
  - 5 Clear to send ———— 4 Request to send
  - 7 Signal ground ———— 7 Signal ground
  - 8 Data Carrier ———— 8 Data Carrier
- **Detect**
  - Detect

You will need to pull pin 8 high so both ends know that the interface is active. The easy way to do this is to jumper pin 6 (data set ready, DSR) to pin 8 on the Big Board end. You’ll notice on both the BB I and II that DSR is tied high through a resistor.

Both systems must think they are terminals (DTE). Each is expecting to see a modem (DCE) on the other end. This is why lines 2-3, and 4-5 are swapped between the two connectors.

On the BB I, jumper pins 7-8, 11-12, 15-16, 19-20, 23-24, 27-28 on either JB4 for channel A or JB5 for channel B.

On the new BB II, jumper pins 3-4, 7-8, 11-12, 15-16, 19-20, 23-24 on JB1 for channel A or JB3 for channel B.

Now Modem7, YAM, or even PIP can transfer data either way.

---

Micro Cornucopia, Number 9, December 1982
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Pascal/Z

Review by Rex Buddenberg
1910 Ash St
North Bend, OR 97759

I chose Pascal/Z a couple years ago to run on my system. This article explains some of my reasons for choosing Pascal as a language, and Pascal/Z as the compiler.

I was not able to compare different compilers and had essentially only the sales literature and some reviews to work on. The things that attracted me to that particular compiler was that it was a native code compiler; that is, finished programs run quickly. Compilation time is fairly slow partly because it runs directly from CP/M. (By way of reference, JRT Pascal requires a run time executive.)

Pascal/Z was also reputed to be a "fast" compiler; that means is that finished programs run quickly. Compilation time is fairly slow partly because it accesses the disk a lot.

Why Pascal

Why did I choose a Pascal compiler? My original system is a North Star (my Big Board has only been up and running a couple months now) and it came with a fairly decent BASIC interpreter.

However programs became very cumbersome once they got a little complex. All variables were global and the limitation on variable names didn't help me keep track of what each variable did.

Pascal seemed to offer the modularity that I felt I needed in programs—build one segment to access the file, say; then use the same code any number of times in any number of programs.

Pascal also offered several logical devices that BASIC didn't such as WHILE-DO and REPEAT-UNTIL constructs. I also felt that the structured approach required by Pascal was what I needed to keep discipline in my programs. It all sounds good, doesn't it? Has Pascal been the answer to my needs? Well . . . partially.

Which Pascal?

I had been watching Pascal ever since UCSD released a version that was supposed to run on 8080 micros. I tried tinkering with UCSD Pascal and gave up the operating system as a bad job—between North Star I/O routines and my Hazeltine terminal, the screen editor just wouldn't work. Then UCSD rewrote the licensing agreements and the price went up. Time to scout the competition.

Pascal/Z looked good, but at a price. The code executes quickly, but the compiler takes a while to get from source to finished .COM program. The biggest asset that I discovered as my programming progressed was the package's ability to compile modules separately.

Separate Compilation

Separate compilation is a feature of the implementation, not the language. First a main module must be prepared. That module must contain all global variable declarations and the main program block. Each procedure and function called by the main program must either be in the main module or must be declared as an external. Externals can then be put into up to 15 CPM files.

A print routine, for instance, can be quickly modified and relinked without recompiling the whole program.

Problems

The compiler, assembler, and linker generate numerous files among them gobbling up disk space in a hurry (very much unlike the old BASIC interpreter) and makes compilations slow.

You can alter a few lines of code in a BASIC program and check the result immediately; not so with Pascal.

It is a compiler rather than an interpreter. That means that translating the code to machine language so you can try it will take longer even though the resulting code will run faster. Second, you must be prepared for a bit more tinkering before you get something to run—a couple of long nights are usually on order.

As a result, there is less impulsive changing and more planning to Pascal programming than BASIC.

Most Pascals designed for 8-bit machines limit the maximum integer to 32,767 which is sometimes a problem for accounting software.

Another pitfall is input and output processing. Pascal was defined when magnetic tape was the basic means of mass storage, so only sequential file access is defined in the standard. However, everyone writing software wants random access and all Pascal compilers support it. All differently. This greatly limits program portability.

Pascal/Z doesn't recognize the CP/M end of file character so you have to make sure you write a dummy EOF into your program.

(continued on next page)

BUYING A BIG BOARD? READ THIS FIRST!

Let me put it together for you. I am experienced at electronics assembly and am set up to produce finished and tested Big Boards you can be proud of. If yours arrives with any defective parts, I'll test it and find the problem. Negotiating for spares is between you and Digital Research.

Normal assembly time is about two weeks. Total charge is $100 or $60 if you have already bought the kit with the sockets installed. Include $5 extra for return postage. Idaho residents add $3 sales tax. I also repair botched Big Boards for a price to be determined upon inspection.

Send your kit (or have Digital Research send it) to:

Jay Papillon
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Moscow, Idaho 83843

If you have any questions or wish references as to the quality of my work, call (208) 885-7093 weekdays; evenings call (208) 883-0847.

ASK ABOUT PRICES FOR COMPLETE SYSTEMS
LETTERS

Dear Editor,

Enclosed is all the "complete" documentation on the ROMAC Sculltek single board computer. They have a full page ad in each Computer Shopper.

It is a straightforward Z80 64K system and in January 1982 it seemed to me like a better deal than the Big Board. ROMAC sells a terminal board (supposedly emulates the Z19), PROM programmer, speech board, and controller board. I bought both the computer and terminal boards.

However, I am now disappointed by the lack of documentation, the refusal of the manufacturer to answer my letters, and misleading advertising. The manufacturer did not mention that the firmware (code in ROM) was only available on disk (that part that was available at all). Also, the buyer has to have another CP/M machine to bring up the system or has to shell out another $99 for a "starter kit." I plan to dig through the code and find enough info to make a memory map so I can program a memory-mapping ROM.

Victor

Editor's note:

Victor is still trying to get Sculltek's attention so he can complete his system and he did not ask that I publicize his plight. But I felt that this information was important enough to other computer builders that I have taken the liberty of running this letter without his full name and address. The Sculltek manual is hardly worth the paper it was xeroxed on. If it were the scribbled notes from the designer's notebook, then they had a very amateur designer. Tektronix expects its engineers to maintain substantially better documentation on the first pass at a new design. The best of luck, Victor.

Dear Editor,

I built the EPROM programmer in issue #6 for 2716s and 2732s. I found that some 2716s need to have pin 21 tied to +5V to work reliably during read and verify. To do this I changed SW2 to a double-pole-double-throw switch. One side is used just as it was in the original schematic to switch program voltage for the 2732. The other side is wired to switch pin 21 of the 2716 between the programming voltage and +5V.

Dennis Juve
2935 6th St
Marion, Iowa 53202

Dear Editor,

Your recommendation for removing rosin from printed circuit boards is greatly appreciated. I have recently come upon several problems in boards built by novices, and the problems were caused by rosin residues. We have high humidity and salty air, so rosin contamination can result in anything from occasional glitches to complete failure.

I use alcohol like you do but I use a cheap paint brush along with plastic foam containers (from supermarkets) to catch the drippings.

Be careful about breathing alcohol fumes. Though they are not as toxic as some solvents, they are both dangerous to health and a fire hazard. Good ventilation is a must.

I have Shugart 901 drives all over the place. I got them all "as is" and have repaired them as I've needed them. I run them at the 6ms step rate with no problems. They are very reliable and the only errors I've experienced are the CP/M comments when I forget to reboot.

Just received JRT Pascal— isn't it beautiful! Also have C80. Now if I can just become ever so slightly adept . . . . what fun.

Jim Buckler
325 Rita Boulevard
Melbourne Beach, FL 32951

Dear Editor,

You made some goofs editing my article on the MFE drives (See the MFE Interface article in issue #8). In the third paragraph, "location 215" should be "location Z15" and the −15V should read −12V.

The fourth paragraph should indicate that the drives with only a single LED will read only double-sided disks (you edited it to indicate they would read only single-sided). This means that the user has to punch the standard double-sided index holes on all disk envelopes. See below.

Also, I forgot to include the double-sided option jumpering for the drives. These alterations are not well described in the MFE manuals. To set up drive 0 as sides A and C; cut HS1, jumper HS2 and DS1, and solder a wire from AS2 to DS3 (the pins next to the numbers). To set up drive 1 as sides B and D; jumper HS2, DS2, and AS4. DS5 stands for disk select, A5 stands for alternate select.

Rick Gerson
Ontario Cancer Institute
500 Sherbourne St
Toronto, Ontario, Canada M4X 1K9

Dear Editor,

I have JRT Pascal— isn't it beautiful! Also have C80. Now if I can just become ever so slightly adept . . . . what fun.

Jim Buckler
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‡Characters are blocks: 2 wide by 3 high in an 8 x 10 dot matrix, for a
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§Similar to TRS-80 commands. *Switch not included.

Dear Editor,

I have a model 771 George Risk Industries keyboard. Not all the keys respond as I would expect, some not at all. Also, I would like to protect my system from voltage surges. Any ideas?

Finally, I would like to send you some articles. Is WordStar OK? Do you send back the disk? How do I pack it?

Keith Von Borstel
4811 Slodusty Rd
Garden Valley, CA 95633

Editor’s note:

I don’t know anything about your keyboard but if you put a 100 ohm resistor and an LED in series—then hook the combination between each keyboard output pin and ground you will see what the output is for each key (for all the keys that are encoded). Then you can write a translate routine for the BB to change the output to what you want.

Get a MOV (metal oxide varistor) from GE for surge protection. They look like disk ceramic capacitors but they knock line spikes down to almost nothing. The larger MOVs handle bigger spikes.

WordStar is just fine. I have a little routine that takes the garbage out of WordStar files (from user disk #3). I send the disk back if you ask for it, (and I put your choice of user disk on it besides). Most folks send an extra disk upon which I put the free user disk so that I can keep the original submission in my files (much appreciated). But either way is fine.

Put the disk in a small box (thick enough that it won’t fold). Then write on it “MAGNETIC DISK DO NOT FOLD.” Even then the post office manages to fold about 10 percent of them. However, the small, thin-cardboard “disk mailers” get folded over half the time. Anyone who says postpersons are lazy has never seen what they can do to a package.

Dear Editor,

I am in the U.S. Air Force and am stationed in Germany. On February 12 I ordered a Big Board from DRC, some hardware from Jade, and a subscription to Micro C from you (by the way, Micro C is probably the best users group newsletter I’ve ever had the pleasure to subscribe to).

By March 15, I had received my Micro C and a letter from Jade saying that the $1200 I had sent was insufficient.

On May 1, I called Jade (cost 5 cents per second) only to have them tell me that I didn’t exist. $1200 is a lot of money to misplace.

On May 15, I received my keyboard and video modulator from Jade but still no drives (and I was planning to use the power supply from the drives to power the BB).

On June 1, I called Jade and they told me that the drives had been shipped 2 weeks before by first class mail. That meant that they should have already arrived.

On June 15, I called Jade again. The customer rep was very courteous (after putting me on hold for $20) and told me I didn’t exist. He told me he would look into my problem and drop me a letter if he found out something.

Finally, a note to frighten the stout hearted souls who are still following along. If Jade ships my drives in one box (rather than in two as I asked) the weight will be 8 lbs. over the air mail maximum. Does the phrase “a slow boat to China” mean anything to you?

Anyway, if I ever get my BB up and running I promise to write and tell everyone how my system turned out.

SRA David B Burgess
Box 5921
APO NY 09012
Just a few beginning notes. It appears that the Code Works is shipping version 2.0 of their Q/C C compiler. It comes with an all-new 138-page manual which is even better than the original, and the compiler has been improved too. For instance, in conjunction with Microsoft’s M80 assembler, it generates smaller programs since the linker can select only those routines needed from the runtime library. See the New Products section for more information.

For those of you looking for reading material on C, I recommend (of course) The C Programming Language by Kernighan & Ritchie, and The C Puzzle Book by Feuer. The first book is the definitive reference for the language, the latter explores different ways to write C programs. We’ll have a review of it shortly. Both of these can be ordered from Opamp Books here in L.A. Their number is 213-464-4322. They ship quickly and take Visa and MC.

Filters

A filter, in the programming sense, does pretty much the same thing it does in hardware: it accepts or rejects certain things (in this case certain information).

Suppose, for instance, that you want to display all the control characters in a text file on your printer. To do this you would want to convert all the characters whose ASCII values are less than a space or greater than a tilde to some visible combination of characters that the printer could print. That program might look like:

```c
main()
{
    char c;

    while((c=getchar()) != EOF) {
        if(c < ' ')
            putchar(' ');
        else if(c > ' ')
            putchar(c);
        else
            puts(line);
    }
}
```

You will need to define EOF and this depends on the character your compiler generates when it detects end of file. It also needs a name so let’s call it CONV.C and after compilation we can run it like:

```
A>conv <text.dat >lst:
```

Text.dat gets searched, character by character, for characters outside the normal printing range. If it finds a line feed, for instance, it would be converted to the printable characters ~J. A character with the value 129 would be converted to a "A. By simply changing the tests in the WHILE loop, we can filter out and convert stuff till we run out of ideas. For instance, you could convert WordStar files to straight text, uppercase to lowercase, formfeeds to linefeeds, tabs to spaces, assembly listings to assembler source, 8080 opcodes to Z80 opcodes, and so on.

Of course, the conversion of 8080 to Z80 would be a little more involved but the overall structure would be the same:

```c
char line[80];
while(gets(line) != EOF) {
    if(is8080(line)) {
        convz80(line);
        puts(line);
    } else puts(line);
}
```

---

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Nov. 15, 1982
Bringing Up WordStar

By Gordon Banks, M.D.

Probably the most popular word processing program for CP/M is WordStar. It is easy to use, has extensive "help" menus, and allows the document to be edited and formatted using the same program. It is not as powerful as MINCE (a CP/M version of the powerful editor EMACS, which currently only runs on mainframes), but it suffices for most needs and is easier to use for documents. The WordStar installation program contains prompts to allow installation with just about any hardware.

While in a few moments you can bring WordStar up on the Big Board if you have the CP/M LST: device installed, the ideal companion for WordStar is a proportional spacing printer such as the Diablo. Since the standard CP/M LST: device has output, but no input, it is better to install the printer using built-in port drivers which reside in WordStar, and use the ETX/ACK communications protocol. This allows the most efficient use of the relatively small (256 byte) buffer of most daisy-wheel printers.

First run the install program and select ADM3a from the menu. From the printer menu, select your printer, in my case, the Diablo 1620. From the protocol menu, I chose the ETX/ACK protocol, as this is implemented on the Diablo.

I selected port drivers from the next menu. The Big Board ports are, of course, direct i/o (not memory-mapped). WordStar then asks if you want the install program to try to find your ports or accept them from you. The port configuration of the Big Board is such that WordStar cannot find your ports properly, so you must specify them. The port addresses for SIO port A (B) are:

output 04 (05)
output status 06 (07)
ready bit 04 (04)
mask 04 (04)
input 04 (05)
input status 06 (07)
ready bit 01 (01)
mask 01 (01)

The installation program will ask for these bytes (in hex) in order given here and they should be entered as given for your port. You will then be asked if your installation is complete. The answer should be no, as there are a few more very useful patches that you can make. When you answer this question no (N) you are asked to give the locations you wish to change. Refer to your WordStar documentation for the exact locations, as the locations I give here refer to version 3.0 and your version may differ.

First, WordStar has an initialization area into which you can patch a routine to initialize your serial port. If you do not do this inside WordStar, it will be necessary to run a separate program to do this prior to running WordStar. At the location INISUB: (2A4 in version 3) patch a jump to the large blank area MORPAT: at 2E0, (code: C3 E0 02). Then at MORPAT: patch in the initialization routine (actually, it may be easier to do this using DDT after you have finished installing WordStar):

2E0 MVI A,07 ;1200 baud character
2E2 OUT 0C ;send to baud rate generator
2E4 MVI A,04 ;select sio register #4
2E6 OUT 07 ;sio chan B control port
2E8 MVI A,44 ;16 x clock, 1 stop bit, no parity
2EA OUT 07
2EC MVI A,03 ;select register #3
2EE OUT 07
2F0 MVI A,C1 ;8 bits transmit character
2F2 OUT 07
2F4 MVI A,05 ;select register #5
2F6 OUT 07
2F8 MVI A,EA ;8 bits receive character
2FA OUT 07
2FC RET

If you want another baud rate, don't forget to change the 07h in location 2E1 to the appropriate character (see the BB documentation).

The Big-Board has one feature that the ADM3a does not that will speed up WordStar: clear-to-end-of-line. Patch this character ('X=18H') into location 2E6, after putting a 1 into 2E0D to indicate only one character is necessary for this function.

WordStar has several built-in delays following cursor positioning and other functions. This allows slow terminals to keep up without losing characters. I found them to be unnecessary with my Big Board so I set them to zero. They are located at DELCUS: (2AE) and DELMIS: (2AF). There are other delays at DEL1: to DEL5: which control the waiting for various menus that you may wish to alter to suit your own taste.

1360 Scaife Hall
University of Pittsburgh
Pittsburgh, PA 15261

Micro Cornucopia, Number 9, December 1982
A Cheap RAM Disk For the BB I

By Tony Ozrelic

Faced with ever lengthening compile time and an insatiable need for speed (my BB already runs at 5MHz), I’ve designed a 256K RAM board plus the software to make it appear to be a single density drive.

I’ve seen assembly time for 11K of source reduced from 30 seconds to 7 seconds and compilation time for a 18K C source has been reduced from 5 minutes 20 seconds to 3 minutes 26 seconds.

Generally I’ve noticed that programs that access the disk a lot show the most improvement (which would include editors like Mince and Wordstar).

How It Works

The RAM disk (which I call Dynadisk), is connected to the BB via the user PIO at J5. After booting up CP/M, you execute DYNA.COM which patches the disk I/O calls (in the monitor), initializes the PIO, and relocates itself to F800, just above the PFM monitor.

The program (all 200 bytes of it) monitors the disk I/O calls looking for references to drive D. Accesses to drive D are translated into accesses to the RAM board.

Additional Software

SWAP.COM swaps drive A and drive D so Dynadisk becomes drive A and the real disk drive "A" becomes drive D.

DCOPY.COM will copy all of real drive A to drive D (Dynadisk). It takes about 45 seconds to copy 241K. And, of course, you can reverse the process and copy the Dynadisk onto a real disk in 45 seconds. (Editor’s note: are you single-drive folks listening?)

DFORMAT.COM formats the Dynadisk to look like the disk format.

Theory of Operation

In the block diagram, Dynadisk's main section is 256K bytes of memory. The next section contains the address registers which appear to CP/M as track and sector registers. For the sake of efficiency, I set it up as 8 tracks, with 256 sectors per track. Each sector contains 128 bytes. This means that the Dynadisk contains 8*256*128 or 262,144 bytes (two to the 18th power). I use software mapping to make my RAM disk look like the real thing.

Transfers are initiated by selecting a track (0-7) and sending that byte to the track register, then selecting a sector (0-255) and sending that byte to the sector register (the status of PB0 indicates which register is being primed).

Then you drive PB1 low to turn off refresh and initiate the 128-byte transfer. Each time a byte is transferred, the byte-count/refresh register is incremented. Immediately after the 128 bytes have been transferred, PB1 is brought high to turn on refresh again and Dyna waits for the next data transfer.

I have a detailed theory of operation along with complete schematics, parts list, and software listings, but the whole package would more than fill a whole issue of Micro C. So, I will provide all the above plus a disk of software for $25. By January I hope to have a PC board available for an additional $40.

At that time I plan to have a complete kit available for $375. The complete package will include the board, software, parts, sockets, cables, and documentation; everything you need to put it together. Be sure to write or call to verify availability before ordering the bare board or complete kit.

Editor's note: I'm sure you all know the prices of the commercial RAM disks, so my main worry is that Tony will be overwhelmed by orders. Such a problem.
Character ROM
To quickly display the graphic characters in the character ROM (all but one) use PFM to change memory location F348 (hex) from 20 to 00. Then type ‘_’ (control-underline) followed by ‘A thru ‘Z. This will display 26 of the 32 funny characters available. Five of the remaining six are available by typing ‘_’ followed by ‘[,’ ‘], ‘{,’ ‘}, and ‘~’ respectively. The funny character corresponding to cntl-@ is not displayable using this shortcut. A way to see all the funny characters is to change CSRCHR location FF76 to 00, 01, 02...1F.
This way you can change the cursor from ‘_’ to the corresponding funny character. (By the way, I assume by now that this is common knowledge, but if you prefer a blinking cursor, simply put DF in location FF76.)
Note that in order to find where an ASCII character is formed in the ROM, just take its hex value, multiply by 80h, then add 400h. The next 8 addresses will contain the dot matrix of the character. Only bits 0-4 are significant and the 8th address corresponds to descendents on lowercase letters. For example, the letter “A” corresponds to ASCII 41H so its dot matrix is located in the ROM at addresses 0608H—060FH.

Don Britain
4200 Spruce Street, Apt. 208
Philadelphia, PA 19104
215-386-2684

The Z80 Can’t Wait
The BB I Z80 has its wait (pin 24) and bus request (pin 25) tied directly to +5V. This is all right until you add something that needs to use either of these pins (like some hard disk controllers). So, if you need them, simply separate them by cutting the board run between them and then tie each to +5V through a 1K resistor.

Now they work just like they did but you can also connect an open collector TTL device and use them as Zilog intended.

Hampton Miller
PO Box 516
Carpinteria, CA 93013

New Products

Q/C Version 2.0
Just after the reviews of C hit the street, Jim Colvin finished a substantial revision of his Q/C compiler.
He has added: unsigned integers, initialize, #ifdef/#ifndef, and #if/else/endif. If you want to keep your “C at a Glance” table (issue 7, page 7) up to date, check off the above. Also, Q/C only supports single dimension arrays, so you might want to correct the table while you are at it.

More improvements:
—Constant expressions are evaluated at compile time
—Optional verbose mode prints name of function as it is compiled
—Improved error handling (better type checking and recovery)
—Peephole code optimization
—Larger, fancier manual (145 pages)
—Undeclared arguments default to integer
—Static externals (when used with M80)
—Expanded library (including sprintf, fprintf, ungetc, getkey)
—I/O redirection is now optional
—Printf is now standard
—Binary I/O
The price of version 2.0 is $95 but those of you who have an older version of Q/C can upgrade for a paltry $20.
The Code Works
Box 550
Goleta CA 93116
805-683-1585

256K STD bus RAM
The Little Big Board
Pulsar Electronics sent me a blurb on their new memory board designed to plug into the STD bus. It contains 256 by 9 dynamic RAM with 175 ns access time and 300 ns cycle time. It was designed specifically as a memory extension for their Little Big Board. Board size is 4.5 by 6.5 inches.
The Little Big Board is a 4MHz Z80 system with 64K of RAM, 2 RS-232 serial ports, double density floppy controller, battery backed up real time clock, and 2K of PROM all stuffed together on a 4.5 by 8 inch STD bus card. CP/M 2.2 is available along with MP/M if you have their RAM memory board.
The price of the memory board is $750, assembled and tested. They didn’t send a price for the little BB.
Pulsar Electronics
323 Bell Street
Pascoe Vale South 3044
Victoria, Australia

Note: I usually don’t run information about a product just because I get a news release. The primary reason is that I’ve never seen a piece of promotional material list any of the cons, they are all pro; and I have yet to find a product that didn’t have some weaknesses (and strengths) that were completely missed by the promoters. However, I occasionally get something that looks interesting enough to pass along.

Micro Cornucopia, Number 9, December 1982 25
We noticed that the 5V output was 5.07V (on my newly calibrated Fluke) but when we jumpered the remote 5V sense terminal to the 5V output terminal the output came down solidly to 5.00V and stayed there. Period.

It was very apparent by the time we’d finished our digging that when Teletype builds a power supply it really builds a power supply. This switcher is super duty all the way through. It even has 3 LEDs, one tied to each output voltage. If one of the voltages is not present, its LED isn’t lit.

I/O, I/O, It’s Off to Work We Go

I have been hearing some really outlandish things about what happens to a system when you add a bunch of RAM and tell the system that the new addition is a disk. (Thus proving you can fool landish things about what happens to a I/O, LEDs, one tied to each output voltage. I/O isn’t a dirty word.

I’ve heard of 7-hour compiles finishing in 20 minutes, and short compiles reduced to the time it takes to type the command line and hit the carriage return. I’ve even heard that Mince and Word Star get so fast and so quiet (disk accesses are somewhat quieter when it’s a RAM disk) that users think they are running single-user on a DEC 11-70.

So what. Who’s got a RAM disk for the Big Board? Well, Semidisk says it is working on a Big Board version. Semidisk’s 512-byte board which lists for $1995 would plug into the Z80 socket.

Plus, Tony Ozrelic is running his own 256K version designed to interface with the BB via the parallel port. Check out the article describing it this issue.

New Phone number

Despite strong suggestions to the contrary (e.g., “How do you get any time to yourself?” or “Have you considered psychiatric help for your compulsion to answer the phone?”), we will continue to list our phone number in the magazine. The only people who threaten that policy are those East Coasters who forget that 7:30 am their time is 4:30 am here. Since it’s not unusual for me to work until 1 or 2 in the morning, I’m not in much of a mood to help someone interface a new hi-rez dahoozit to a drive latch when I’ve had only a couple hours sleep.

In fact, at that time in the morning I’m usually lucky to find the phone at all, much less find it before it wakes up the whole family. So here it is: 503-382-8048. (And try to call between 1 pm and 6 pm Pacific time; that way I have evenings to get something done.)

Software Wanted

Jennifer, our 8-year-old, would very much like to learn to touch-type so she can help Sandy and I with Micro C and also so she can use the text editor on her school work. I remember what I went through in typing class so I’m looking for something better, such as a well-thought-out typing training program (preferably public domain).

In fact, I would guess that many of you have little people who would love to learn typing and programming and so forth on your BB. So, keep your eyes peeled for anything appropriate to short sorts. Maybe we’ll put together user disk #1/2.

Disks

This issue contains the disk article that I didn’t have room to run in issue #8. Sandy read through the article and decided she didn’t like it because it didn’t come to very many good solid conclusions about which brands of disks you should buy and which you should avoid.

Outside of the obvious winner—Dysan—and the obvious losers—Maxell, Wabash, and possibly 3M—what you purchase is pretty much up to you. Variations from one batch to the next appear to make it nearly impossible to rank the rest of the brands (how’s that for a conclusion).

Overall, it appears that disks are getting better, especially in terms of media life. After all, Elephant is guaranteeing that its disks will never forget and they are simply rebranding Wabash product, the shortest-lived brand on the market. I’m trying to find a good source of disks other than the 3Ms I’m now using (too many errors). Hopefully I can tie down some BASFs.

A Narrow View of Drives

Shugart has just announced half-wide 8" drives, the single-sided 810 and the double-sided 860. They feature fast-
In the first two installments of this column we discussed some of the business of working for others. However, many consultants are simply high-paid, short-term employees.

I started out working for others in this mode but with Micro C I'm definitely doing my own business. I like this much better.

You've no doubt been wondering what kind of business you could start that would generate some very real income and get you totally away from employeethood. Of course, your mother can tell you that the possibilities in this field are endless (and she probably has). The problem is that you haven't connected with the endless possibility that will work for you.

So let's see if we can't connect you with something workable.

Great Big Connections

There are BIG connections that you can make by writing a new compiler, interpreter, screen editor, data base language, spread sheet handler, etc. However, this is such a visible and competitive field that you need something special to crack it now.

That doesn't mean you can't do it, but it helps a lot to have a combination of right-place/right-time, and a little genius. This also requires a tie-in with a good marketing outfit or a lot of time, moxy, and money to get it off the ground by yourself.

The marketplace is changing very rapidly, which is both a disadvantage and an advantage. Change can be a disadvantage because the market could well disappear while you are writing the code (or the life of your product could be very short). Change can be a great advantage if you predict the market correctly and have the right product ready at the right time. Then your only financial problems will be with the IRS.

For instance, if you guessed correctly that the 68000 processor was going to be the next big winner (IBM is reportedly working on another system that may completely replace their PC), and you guessed correctly which operating system they would use, you'd be someone we'd all admit knowing. However, IBM insiders already have this information and are already preparing to take advantage of it.

IBM is selling 10,000 PC's a month so it doesn't take advanced math to figure out what some folks are making off IBM compatible software and hardware.

Medium Size Connections

There are smaller connections that include selling hardware or software by mail order. Billy Gage (BG Micro) is probably not lying awake nights wondering where the next dollar is coming from. He knows because he is offering a lot of products, good service and some very good prices.

ICI is doing quite well selling software. Their overhead is low enough that they can make good money on margins that would strangle larger outfits.

This area has its own special set of problems (like waiting weeks or months for the software packages to ship to anxious purchasers). We'll discuss some of the problems of mail order at a future date.

Tiny Connections

The smallest connections can actually be the most worthwhile and dependable. These are the one-to-one connections between you and the end user.

For instance, the end user might need a way to handle his mailing list and keep his books.

Even large software houses are now specializing in custom systems for small businesses. These outfits will combine a Z80 or 8086 based hard disk system with a custom data base handler and rake in $50,000 to $500,000 for the package.

Then they put the user on a contract for hardware and software maintenance. The contract usually covers service on the hardware and guarantees that the user will pay $50 per hour for any software modifications. It turns out that software maintenance usually winds up costing the user several times as much as the initial package price over the life of the system. Even if the software is absolutely perfect when delivered, changing user needs usually dictate continuing updates so this is usually a long-term relationship (and income).

The Big Boards (both I and II) now have the hard disk interfaces that are necessary for handling large data bases (or large compiles or large anything else that used to mean large, expensive computers). So you now have inside access to one of the best bargains in computing power in the industry.

If you use a Big Board you can build a spare system, complete with drives, for what you would charge for a 6-month service contract. If your client's system goes down, just swap. Then you can repair the defective system at your leisure or have someone else work on it.

Meanwhile, as business grows and you get busy writing data base handlers or whatever, you are going to need other folks who will put together anything from assembled and tested boards to complete hard disk systems. (Do you hardware types smell a market?)

Finally, if you keep ownership of the software, then it's very possible you will find a larger market (medium size connection) among people in the same business. So you advertise in Micro C or wherever to sell your software to other computer folks interested in selling complete packages (with your software) in their area.

And, of course, it doesn't take very many $20,000+ systems (or $500 a month service contracts) to keep bacon on the table (and eggs and frozen waffles . . .).

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.

BIG BOARD I -- Used 6 months. Assembled by Bill Siegmund. Includes Software Publishers dual density.

$500 with documentation

Harry Siegmund
808-536-4624

Micro Cornucopia, Number 9, December 1982
Especially For The Big Board

USER'S DISK #1
Over 200K of software especially for the Big Board.
Including:
1-Two fast disk copiers.
2-The manual for Small C+.
3-A Z80 assembler.
4-Two disk formatters.
5-Other.
6-A serial print routine.
7-Modem software.

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.
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 BB.
7-SQ-USQ: squeeze and unsqueeze files.

USER'S DISK #2
Especially for folks with single-drive systems and those who want to try their hand at extending an assembler. Also a new BIOS with parallel printer interface. Returns to default drive on reboot, stifles head banging, supports CP/M 2.2 and 1.4. Step by step instructions for the simple incorporation into your CP/M.
Including:
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 BIOS for CP/M 1.4 and 2.2 (& boot).
5-Disk mapper with source.

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-RUNPA: 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.

All Users Disks ..................$15.00 each (US,Can,Mex) .................$20.00 each (other foreign)
All The Users Disks Contain Documentation On Disk In .DOC Files.

OTHER GOODIES

FORTH IN ROM ............................................$65.00 $70.00
in fast ROM ...........................................$80.00 $85.00
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 ROM ............................................$45.00 $50.00
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.

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.

MORE ROMS
Fast monitor ROMs for speed freaks and our famous ‘better than Texas’ character ROM (V2.3) for screen freaks.
Fast Monitor ROM ....................................$25.00 $30.00
Version 2.3 Char ROM ..............................$25.00 $30.00
• Send Big Board number with ROM orders.
• Monitor & char. ROMs $5.00 each if you send a fast ROM and a stamped, self-addressed return envelope.

MICRO CORNUCOPIA • P.O. Box 223 • Bend, Oregon • 97709

VISA & MASTERCARD ACCEPTED
USER'S DISK #3
This is the disk for folks who are building Jim Monesmith's ROM programmer. Two versions of programmer software plus a disk drive 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.

NEW!

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 floppy 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 Edisson 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 CP/Mug 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 #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 8080/280 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.

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 Stiegitz'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.
A daughter board that plugs into the 1771 socket. With this board the system employs automatic density select.

Software Publishers' Dual Density gives you several choices:
- You can have either 2.5Mhz or 4Mhz Dual Density.
- You can run single or double-sided drives.
- You can run 5½" drives on the Bigboard by following a few simple steps outlined in the SWP manual. A 50-34 pin disk drive adapter board comes free with 5½" Dual Density.

8" Dual Density users have up to 674k bytes of user storage per disk. 5½" users have up to 185k bytes per disk.

Dual Density software includes:
- DDINIT: a double density initialization and verification program.
  DDINIT options:
  - 8 formats.
  - Format an entire disk or just system tracks.
  - Selection of sector skew.
  - Choice of whether or not to verify formatting.
  - Choice of which drive to be used.
  - Has a default which will choose the largest format (9 by 1024 for 8"; 5 by 1024 for 5½").

- DDSYSGEN: a double density sysgen program with three options:
  1) Reads double density system tracks into memory.
  2) Writes double density system tracks from memory onto a double density disk.
  3) Generates a double density system disk complete with a printer driver using your single density CP/M, our distribution disk and a blank disk. Five serial drivers and a parallel driver are included, or there is a user-written driver option. Drivers can be modified.

- DDCOPY: a double density copy program. Copies all files from a source disk to a destination disk. Both disks (and the disk DDCOPY is run from) must be the same density and the same format.

Software Publishers Dual Density comes with a thorough instruction manual.

$199.95
SUBSCRIPTION FORM

(It's OK to brag!)

☐ I own a __________________ computer.

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Are you willing to be a resource in the areas where your expertise is 4 or 5?

- love to ☐
- probably ☐
- maybe ☐
- no ☐

What are your hardware/software needs now?

______________________________

In the near future?

______________________________

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

______________________________

If you get the idea that this document is as interested in enlisting your aid and ideas as it is in getting a subscription, you're right. Lots of people are willing to subscribe, lots of people have ideas - and we'd like to encourage lots of people (especially you) to take an hour or two and put ideas and needs and accomplishments down on paper or disk. Then we can pass them along to others and that's what this journal is all about.

Send me six issues (1 yr.) of MICRO CORNUCOPIA. I understand that I can cancel at any time and receive a refund for the balance of the subscription. (Issue #1 was published in August 1981.)

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NAME ______________________ PHONE (?) ______________________

ADDRESS ______________________

CITY ______________________ STATE _________ ZIP _________

☐ Renewal MICRO CORNUCOPIA • P.O. Box 223 • Bend, Oregon • 97709
ORDER FORM

User's Disks .................. $15.00 each (US,Can,Mex) .................. $20.00 each (Other Foreign)

All the Users Disks contain documentation on disk in .DOC files.

USER'S DISK #1
1-Two disk formaters. 2-A Z80 assembler. 3-Two disk formaters. 4-Obello. 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-Dis 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-ZCFR, dynamite CCP that's absolutely dictating. 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.

USER'S DISK #6
1-RUNPAC, source and hex for 8080 runtime. 2-PRINTPRN, routine to print Crowe listings. 3-REZ, 8080/280 disassembler

USER'S DISK #7
1-CHINGPFM, all those PFM mods you wanted to do. 2-TIME, data and time accessible by operator and program. 3-Disk utilities, copy to memory, from memory, and dump. 4-TERM, 3 terminal routines with source. 5-CHECKS, complete checkbook package (+ example file)

USER'S DISK #8
1-BDSCLIO, custom BB I/O for BDS C. (both .h and .c) 2-ROFF, powerful text formatter, plus sample formatted text. 3-YAM, Yet Another Modem program in .COM and source form. 4-SIGNS, prints large block letters on screen or printer.

MORE ROMS
Fast monitor ROMs for speed freaks and our famous 'better than Texas' character ROM for screen freaks. Fast Monitor ROM ...... $25.00 $30.00 Version 2.3 Char ROM ...... $25.00 $30.00

- Send Big Board number with monitor ROM orders.
- Monitor & char. ROMs $5.00 each if you send a fast ROM and a stamped, self-addressed return envelope.

BACK ISSUES
$3.00 each (US,Can,Mex) $5.00 each (Other Foreign)

Because of the demand from new subscribers (bless their hearts) we are keeping back issues in print. The following is a list of some of the special articles in each issue.

ISSUE #1 (8/81)
Power Supply Parallel Print RAM Protection Drive Motor Cont. Video Wiggle Shugart Jumpers
1/2 PFM.PRN 1/2 PFM.PRN

ISSUE #3 (10/81)
Configuring Modem 7 More 4 MHz Mods Safer Formatter Modsens, Lynx & SiOs Reverse Video Cursor Undoing CPM ERASE

ISSUE #5 (6/82)
Word Processing EPROM Programmer Two Great Spells Customize Your Chars Scribble, a Formatter Terminal in FORTH

ISSUE #7 (8/82)
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12'' Green Ball Brothers monitor with enclosure measuring 19'' x 16.5'' x 14''. Room inside to mount a Ferguson single board computer or small SS-50/S-100 system. (Power supply available, see below.) Requires +15 volts DC @ 1.5 amps, noncomposite (separate sync) input. A sync separator schematic is available. It is also possible to mount a single 8'' disk drive or two of the new slim line 8'' disk drives in this enclosure. All units are used, and have been 100% tested.

Shipping weight 35# ............ $65.00

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Shipping weight 8# ................... $35.00

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