April 1983

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Souping Up the BB I</td>
<td>4</td>
</tr>
<tr>
<td>Detailed View of the BB II</td>
<td>6</td>
</tr>
<tr>
<td>Dyna, A Very Fast Disk</td>
<td>10</td>
</tr>
<tr>
<td>Easier Reverse Video Cursor</td>
<td>11</td>
</tr>
<tr>
<td>Data Base Handlers</td>
<td>14</td>
</tr>
<tr>
<td>Epson MX-80</td>
<td>19</td>
</tr>
<tr>
<td>PlannerCalc</td>
<td>25</td>
</tr>
</tbody>
</table>

REGULAR FEATURES

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letters</td>
<td>2</td>
</tr>
<tr>
<td>C'ing Clearly</td>
<td>12</td>
</tr>
<tr>
<td>FORTHwords</td>
<td>18</td>
</tr>
<tr>
<td>Pascal Procedures</td>
<td>22</td>
</tr>
<tr>
<td>KayPro</td>
<td>24</td>
</tr>
<tr>
<td>On Your Own</td>
<td>31</td>
</tr>
<tr>
<td>Technical Tips</td>
<td>33</td>
</tr>
<tr>
<td>Bugsbury</td>
<td>34</td>
</tr>
</tbody>
</table>
THE ORIGINAL BIG BOARD
OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC

SINGLE BOARD COMPUTER KIT!
Z-80 CPU! 64K RAM!

(Do not confuse with any of our flattering imitators)

THE BIG BOARD PROJECT: With thousands sold worldwide and over two years of field experience, the Big Board may just be one of the most reliable single board computers available today. This is the same design that was licensed by Xerox Corp. as the basis for their 820 computer.

The Big Board gives you the right mix of most needed computing features all on one board. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM
Uses industry standard 4115 RAM's. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU
Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERRUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)
Full 2 channels using the Z80 SID and the SMC S116 Baud Rate Generator. FULL RS232 For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2.1mt.
Price for all parts and connectors: $39.95

BASIC I/O
Consists of separate parallel port (280 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

BLANK PC BOARD — $119
The blank Big Board PC board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

PFM 3.3 2K SYSTEM MONITOR
The real power of the Big Board lies in its PFM 3.3 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search PFM occupies one of the four 2716 EPROM locations provided. Z-80 is a Trademark of Zilog.

$319.00
(64K KIT
BASIC I/O)

SIZE: 8'1/2 x 13'1/2 IN.
SAME AS AN 8 IN DRIVE.
REQUIRES: +5V @ 3 AMPS
+ 12V @ 5 AMPS.

WANT MORE INFO?
Full Documentation and Schematics — 25.

NEW!

TERMS: Shipments will be made approximately 3 to 6 weeks after we receive your order. VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a $75 deposit. Balance UPS COD. Add $4.00 shipping.

USA AND CANADA ONLY

*TRADEMARK OF DIGITAL RESEARCH. NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE ORIGINATORS OF CPM SOFTWARE

**1 TO 4 PIECE DOMESTIC USA PRICE.

Digital Research Computers
(OF TEXAS)
P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538
Fairely Flagged!

The Computer Faire

It's hard to be both a participant and an observer but here I am trying to tell you about the West Coast Computer Faire after Sandy and I observed it from the confines of one small booth.

Of course it seems crazy in Bend sometimes with the phone ringing, stacks of mail to be answered, user disks to put together, and a magazine to produce; but the Faire really puts things in perspective.

First of all, San Francisco streets are a good place to find out if you have any insecurities. The two and a half blocks between the show and our hotel were a sort of no man's land of empty shops, porno flics, and panhandlers. The parking lot attendant suggested that we not leave our green Honda (Kermit) in the lot overnight because it would be broken into.

Smashing, I thought—where do we keep the car, in the hotel room? Hello, room service? Please send up supper for Sandy and I, plus a quart of your best orange juice. The Honda was not molested.)

Second, manning a booth means a lot of hours of talking. Actually, the first day we shouted in an attempt to be heard over the din, the second and third days our voices were in no shape to shout.

So it was a crazy time, two weeks getting ready, one day of travel, one day of setup, three days of Faire, one more day getting back to Bend, and then back into the thick of things trying to get caught up.

It was worth going. We were able to put together a lot of names and voices and faces. Also we found out that a lot of people are aware of the Big Board and have considered getting one but didn't know about Micro C. There was also a LOT of interest in the KayPro.

Most of the KayPro folks were not interested in hardware or software details, they were just users. But those interested in the nits and grits were delighted to see the kind of information they could get in Micro C.

We put up a little sign announcing the Saturday meeting of the Big Board Users. We got a larger room than we had last year but we filled it (had more folks than the TRS-80 color users and we were a much more colorful group). I did a rough count and it looked like better than 100. Over 90 percent had at least one Big Board I, 20 percent had Big Board IIs, 5 percent had KayPros, and 2 percent had Xerox's. I know this doesn't add up, but I'm sure you realize that you don't have to be into sports to give more than 100 percent.

The presentation was very impromptu (unorganized) and I spent good a portion of the time sucking on a lemon (to save what was left of my voice).

There were a lot of questions: “What is the history of the BB I, the Xerox, the KayPro, and the BB II?” “What is Bend like?” “Who are you (meaning me)?” “Tell us more about the BB II.” “What is the story about the RAM disk?” “Are they ever going to finish the documentation for the BB II?”

Fortunately Bill Siegmund was there to field the BB II questions. I still don’t know, however, if or when Cal-Tex is going to finish the manual. I’m going to give you as much BB II information as I can through Micro C but it would be really super if they would come up with documentation appropriate to such a powerful system.

Tony Ozric was there to handle the questions about the new RAM (Dyna) disk, so I turned the podium over to him and I went back to sucking on my lemon. He had just installed Dyna on my BB so at the end of the meeting we all adjourned back to the booth to watch my BB play VAX (VAX simili?).

I don’t know how many orders he got at the Faire, but he sure had a mob of folks following him about. See my very (continued on page 26)
Dear Editor,

My BB is running 4MHz. I had problems with the EPROM and with the 74LS04 in clock generator circuits (video & system). I replaced them with 7404.

The second problem I had with floppy drive SA901. It was an error in the index circuit. I found the error in four hours without an electric scheme.

Now I am building a box from wood for the BB and floppy drive.

In December I received JRT PASCAL! It is very good.

In software I made simple assembly programs for copying programs using a single drive, and made a calculator in Pascal. In future I shall make screen editor in JRT Pascal.

At the end I must write: 1. BB is the best. 2. Micro Cornucopia is very good. 3. I am happy.

I hope that you understood all. My English is not well.

Martin Mali, Dipl. Ing.
Borovnica Blok-7
61353 Borovnica Yugoslavia

Editor's note:

Don't apologize for your English, Martin. It is very well indeed. And definitely keep Micro C in mind when you have your text editor running. It sounds most interesting.

Dear Editor,

Here's the promised update on Siemens drives. I talked with a sales rep from a distributor and was told that Siemens had installed faulty DC stepper motors in several thousand of their FDD 100-8 (8" SD/DD) disk drives before they found out the motors had a short life span.

Instead of replacing the motors, they decided to call it a loss and dump the drives on the surplus market instead of trying to pass them off on their regular OEM customers. Not to worry though, the life span of the motors is probably sufficient for most anyone's purposes, since 'short life' refers to 'industrial' standards (I don't think I could get a couple of thousand hours of operating time out of a stepper motor even if I played Adventure 24 hours a day!).

There is some truth to the rumor that Siemens is getting out of the drive market. I was told that Siemens had sold their drive operation to a place called International Storage Technology (or something like that). No one seems to know yet whether or not it will change names, but the drives will go on. (Until the stepper motors quit.)

Two more notes that may be of interest:

First, anyone interested in the Dvorak keyboard layout can find an article in the history and a picture of the layout in the June 1980 issue of Phi Kappa Delta, pp. 671-3. I have set up my keyboard this way and I have to agree, it is quick to learn and easy to use.

Second, if you have had difficulty locating a solid state relay for the time-out on the disk drive AC motors (Micro C, Sept. '81, p5), then write or call

ITT Components
3201 S. Standard
Santa Ana, CA 92707
(714) 751-3900

for a distributor in your area. The price is about $8.50 each.

Darren Hiebert
1188 Masselin Ave.
Los Angeles, CA 90019

Dear Editor

I can implement double density but I need help with the software. If anyone is willing to do the software, I would be willing to share the hardware design in an article.

I am also working on a disk interface with DMA, 256K RAM conversion for CP/M plus. NEC 7220 interface and an NEC 7261 hard disk controller interface (1984).

I would also be more than happy to contribute to the Pascal column.

Robert C Hughes
265 Wroe Ave
Dayton, OH 45406

Editor's note:

Anyone wanting to contribute to the Pascal column should get in contact with John Jones. John is a really neat person who's worth contacting even if you are just interested in Pascal.

Your other offers, Rob, are very exciting. They are great projects!! See this issue for Trevor Marshall's versions of these same things.

Dear Editor,

Horrors! Murphy has struck. The article I wrote on putting a LST: in your BIOS (issue #10 page 4) has a problem. It appears that SYSGEN ignores inputs from a SUBMIT program so that the .SUB file I included with the article does not work.

The easy fix is to remove the XSUB from the SUBMIT. You will have to do more input during the BIOS incorporation because you have to enter data from the keyboard rather than having it passed by SUBMIT. Otherwise the process is the same.

I hope no one was unduly inconvenienced.

Richard Barnett
604 Robinson St
West Lafayette, IN 47906

Editor's note:

Someone should try the original .SUB file under SUPERSUB. That might work better than SUBMIT.[Anyway, thanks for the update and thanks again for the super article.]

Dear Editor,

Keep up the good work. Don't let anyone try to make you into a Byte etc. I am renewing even though I am building an S100 board. You have so much really helpful information including a lot of hardware articles that I can't get elsewhere.

C. Senger
11309 Markab Dr
San Diego CA 92126

Dear Editor,

I am looking for a Double Density modification using the Western Digital 2795 (all-in-one disk controller chip) and a new BIOS.

Mark Hedin
320 Prospect Ave #9
Redondo Beach, CA 90277

Dear Editor,

I would like to know if anyone has a daughter board that will handle 5" and 8" SD and DD drives at the same time.

Dan R Farris
6101 Alvis Circle, SW
Albuquerque, NM 87105

Editor's note:

So would a lot of people. I get requests for this kind of drive interface almost daily.

(Anyone listening?)
Dear Editor,

I’d like to become a Big Board contact for Central Europe. I’m stationed at the Ramstein Air Force Base. People can call me at 0631-54908 just about any time.

Also, UNIVAC just got the contract for the new phase IV computers for the Air Force. This means that Burroughs will probably be dumping a lot of older equipment on the surplus market. Along this line, is anyone familiar with a Burroughs RLP, and has anyone interfaced it to anything but a Burroughs? I’d like to get mine going.

David Burgess
Box 5921
Ramstein AB
APO NY, NY 09012

---

Dear Editor,

Instead of cutting board runs when making modifications to the BB you can often bend the IC pins out of the sockets and then solder jumpers to the pins. This type of change is much easier to undo than cuts on the board.

David Strauss
247 Greendale Ave
Needham, MA 02914

---

Dear Editor,

I have not had many disk problems in the last four years. But recently, the system crashed while booting and it destroyed the directory. Ward Christianen’s disk editor helped me recover some of the text files but I lost the rest. Very discouraging.

I’d like to see a utility that would copy the directory to another place on the disk (a reserved area?) to another disk. Then, if the utility could access the disk using the special file as a directory we’d be all set.

Rex Buddenberg
1910 Ash St
North Bend, OR 97459

---

Dear Editor,

In a recent issue you asked us to let you know if we had experience with dBase II. I have been using it for a year now and find it excellent. I am about to take delivery of my first run-time packages ($50 per copy) so that I can start to resell the results of my labors.

I have been looking at updating to the BB II or the Insight Enterprises board (issue #8). I need to transfer data from 8" to 5" but find the drives cannot yet be mixed on the BB II.

I spoke to Bill Siegmund but he was about to depart with all his equipment to escape the rising California floodwaters. It’s ironic that we, meanwhile, are experiencing the worst drought in our history.

I issue #6, Andrew Beck mentioned he was trying to bring up Turbodos on the Big Board. Do you know if he has had any success? Also, is there any way to run CP/M 3 on the BB II?

And may I once again reiterate my satisfaction with the quality of your publication. You have no idea what a breath of fresh air it brings to the technological desert we live in Down Under.

Jim Reid
82 Parriwi Rd.
Mosman 2088 Australia

Editor’s note:
Bill Siegmund’s back now, and pretty much dried out. I am working on reviews of a number of the data base handlers so I really appreciate your comments about dBase II. Good data base application generators can be invaluable to the programmer and to the end user but most of them are quite expensive, too expensive for casual purchase.

Please, anyone using dBase II, Selector, Quick-n-easy, Software Associates database system, dBase Window, etc. please fill out a page with: the name of the package, the retail price, where it’s available, short description (database language or screen generator), main strengths, main weaknesses, how it compares with any other packages you’ve tried, and your general impressions. When you send me your page, specify which user disk you want in return. Try to get your comments in to us by the middle of June. (Also read the database overview in this issue.)

Dear Editor,

While using the PFM monitor DUMP command, I noticed a bug. The ASCII dump resets bit 7 of the hex byte so a C3H displays as a ‘C’ just like a 43H.

Walking through the monitor I found the RES 7,A at F23CH. Just NOP out the two-byte instruction and the dump works.

This helped eliminate attendant confusion (confused attendants?) during the birth of yet another BB I (with the prodigious name of ACME). There goes my favorite Saturday morning cartoon.

Thanks for all the assistance your fine magazine and readers have provided.

Jordan Freedman
93 Vine Street
Newton, MA 02167

(Letters continued on page 20)
Souping Up the BB I

By Trevor Marshall

Editor's note: The following are some of the hardware mods that Trevor has done to his BB I. Steve Hope helped develop the video mods which, I understand, include longer descenders for lower case. The files refered to in this article are available on weekends on Trevor's RCPM. You'll get a chance to meet him and possibly see a version of his system if you come to the Semi-Official Get Together (SOG).

Reliable 5MHz Operation
First, you will need to replace the monitor EPROM with a 2716-1. The 2716-1s distributed by DR work fine. I used the one they supplied for the character generator, which works OK with any 'Garden variety' EPROM. Program your fast PFM monitor before attempting the following steps.

The RAM array is refreshed by 128 RAS only cycles. The delay needed to clock in the column data is provided by U76.

To operate at 5MHz we must cut the tracks to pins 4 and 5 of U76 and move the CAS line to pin 4 and the MUXC to pin 3. The Z80 clock can then be changed from U96 pin 4 to pin 5.

The clock line for the Z80 chips has to be damped since it is resonant and the ringing causes problems. Two 33-ohm resistors are needed, one in series with the collector lead of Q3, which must be changed to an MPS3640, and one in series with pin 8 of U77, which must be changed to a 74S04. A 3K resistor must be soldered between pins 3 and 7 of U77 to yield a more symmetrical 20MHz waveform.

The track to pin 8 of U77 is cut on the top of the board between U77 and U79. The 33-ohm resistor is soldered between U77 pin 8 and the plated through hole adjacent to pin 16 of U80.

More Details
Cut trace between pin 4 of U96 and pin 9 of U78 on bottom of board. Link pin 5 of U96 to pin 9 of U78.
Cut trace between pin 5 of U76 and plated through hole adjacent to pin 3 of U65. Link this plated through hole to pin 4 of U76. Cut trace between pin 4 of U76 and plated through hole adjacent to pin 8 of U52. Link this hole to pin 3 of U76.

Lower Case Modifications
You will need a new character EPROM, see file DISPPROM.BB (on the above bulletin board) for a hex image for your prom programmer.
1. Remove link between pins 14 to 3 of U11.
2. Cut trace to pin 4 of U11 below board.
3. Link pin 3 of U11 to plated through hole adjacent to pin 9 of U21 (below board).
4. Cut the track from pin 12 of U111 to pin 11 of U9.
5. Cut trace to pin 11 of U9 below board.
6. Link pin 5 of U25 to pin 9 of U60.
7. Link pin 8 of U22 to pin 19 of U73.
8. Cut trace on bottom of board from pin 19 of U73. It comes through a plated through hole adjacent to pin 4 of U73.
9. Cut trace to pin 11 of U9 between U9 and U10 on top of board.
10. Cut trace to pin 12 of U10 between U10 and U11.
11. Cut trace to pin 5 of U25. It emerges between pins 6 and 7 of U23 and disappears between pin 8 and 9 of U22 on top of the board.

Double Density Floppy Controller
1. Cut trace from pin 12 of U111 on top of the board before it goes to the plated through hole. The software has been rewritten so that the PBRSY handshake is not required.
2. Cut trace from U102 pin 37 to U102 pin 22. Link U102 pin 37 to U111 pin 12. This is the Double Density control line.
3. Link U111 pin 9 to U112 pin 13. Link U112 pin 12 to pin 14 of J1 (the floppy disk drive header). This connects the Side Select circuitry of the YEDATA drives.
4. Cut the track from U102 pin 27 on the top of the board between U102 and U104 pin 6. Link U102 pin 27 to U101 pin 3. This is the RAW DATA line, which must bypass the on-board circuitry when using the double density controller. When changing back to the 1771 this is the only line which must be repaired. Pin 37 may be left as modified.

Memory Bank Select Circuit
Note: Bank 1 video RAM and ROM circuitry left intact
5. Cut track from U112 pin 1 on top of board before the plated through hole. Connect U112 pin 1 to U111 pin 13. The drive power signal is now derived directly from the drive select enable line. (leaving pin 8 free for the CACHE memory bank select).

Adding Extra Banks of 64K RAM

1. We need to disconnect the select lines to U53. First isolate U53 pin 10 and U53 pin 4 by cutting the tracks from them between U53 and U54. Then cut the tracks from U53 pin 13 and U53 pin 1 between U53 and U54.

2. The multiplexer to drive A7 of the 64K RAMs must be freed. It is currently used as a buffer. Cut track between pins 10 and 11 of U59 underneath the board and from pin 10 of U59 between U59 and U58 on top of board. Cut track from pin 9 of U59 next to R13. Now link the 33-ohm resistor that was connected to pin U59 pin 9 to the plated through hole just below pin U56 pin 8. (This hole used to lead to U59 pin 10. (A buffer is not required.)

3. The 64K RAM chips only require a +5 volt supply. All the supplies must be re-routed, and the old +5 volt supply lines now become A7. Remove C1-C8. Cut the tracks from each of C78-C85 to pin 9 of each column of the RAM array. Link pin 9 of each column to the next (8 links or a daisy chain). Connect U59 pin 9 to U46 pin 9 with a 33-ohm resistor (underneath the board). Connect A15 and A14 to the multiplexer by linking U59 pin 10 to U55 pin 1 and U59 pin 11 to U55 pin 2.

4. The +12 and -5 supplies to the RAM array must be cut. The 8 tracks to the rows of the RAM array that carry them must be cut. To be sure that you have not missed any, it is wise to short pins 1 and 8 of U1, U13 and U26 and to place a 5V MOS protection diode type MPT5E (or 5.6V, 5-watt zener if an MPT5E is not available) between pins 16 and 8 of any one of the RAMs.

5. The new +5 volt supply can conveniently be connected by soldering an RF choke (6-hole type) between pin 8 of U39 and the +5 rail adjacent to U53.

6. Extra BANK SELECT gating must now be provided. An extra 74LS10 is added to the board between U8 and U9 to provide the additional functions, however if two extra banks of 48K are desired then U10 pins 2, 1, 13 must be freed for use by the bank select circuitry. Pin 2 passes under IC towards U11. Cut it between the two ICs. The pin 12 track should already have been cut. Cut tracks to pins 1 and 13 on the underside of the board. The 74LS10 alone can handle the cache memory.

Bank Select

BANK 0, the main memory bank is enabled whenever any of the 4 outputs of U55 are active (low) and all of BANKS 1, 2 and 3 are not active.

BANK 1, the disk CACHE memory, is enabled when pin 8 of U111 is active (LOW). At power-on PA6 floats (HI) and BANK 1 is thus disabled.

BANK 2, the spare memory, is enabled by sacrificing the BELL (on PA4). It is enabled if the appropriate jumpers are installed and PA4 is LOW. Don’t jumper these if you are using the bell! You also need to modify the operating system. (Editor’s note: Here’s where CP/M vrs 3 comes in.)

The file BBSYSTEM.ZQ0 is the BIOS I use for CP/M and the monitor ROM. The file BBDRIVER.ZQ0 is the CACHE buffer BIOS I developed for INFOSOFT IOS v2.34.

Critical ICs

U75 should be 74151
U77 must be 74504 SHOTTKY TTL
U76 should be 74164
U59 and U58 must be 74157
U112 should be 7414
U109 should be 7445

All Z80 chips should be Z80B types, although only Z80A CTC, SIO and PIO are currently available. These A parts seem to work well, as does standard 250 nsec memory.
The following is a detailed look at setting up the BB II. First, we'll discuss the video section followed by BIOS incorporating, disk drive interfacing, WordStar, and more.

### The Video Section

The Big Board II uses the Motorola 6845 Video Timing Controller along with a Standard Micro Systems 8002-003 Video Display Attributes Controller. The 6845 sets up the screen refresh and sync timing. It also handles the scroll and cursor positioning. A light pen can be connected to the designated input on the 6845. This input is located on the edge of the board in the power block.

The 8002 handles the character and graphics generation. It also creates the cursor and the various attributes that have been mask-programmed into it. The two chips provide a very advanced graphics generation. RAM starting at address 6000H, character RAM starting at address 0000H, character RAM starting at address 6000H, and attribute RAM starting at address 7000H.

If you insert hex codes from 00H to FFFH into the video RAM using the Modify memory command in the monitor, the screen will display all of the characters of the 8002. Dumping the video attribute memory with the Dump command, will show 03H in all attribute positions, which is the default attribute of standard ASCII.

The easiest way to change the attributes of the screen is to return to bank 1 (main memory) and do the following:

- Boot up CP/M, and type ESC 'G' attrib. The table below lists the attribute, in ASCII, that will be assigned with the attribute chosen. For example, ESC 'G' will produce underlined ASCII for every letter typed. The attribute byte will remain in effect until terminated (even across lines), and must be reset by typing ESC 'G0'.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
</tr>
<tr>
<td>1</td>
<td>Underlined</td>
</tr>
<tr>
<td>2</td>
<td>Blinking</td>
</tr>
<tr>
<td>3</td>
<td>Underlined, Blinking</td>
</tr>
<tr>
<td>4</td>
<td>Rev</td>
</tr>
<tr>
<td>5</td>
<td>Rev, Underlined</td>
</tr>
<tr>
<td>6</td>
<td>Rev, Blinking</td>
</tr>
<tr>
<td>7</td>
<td>Rev, Blinking, Under</td>
</tr>
<tr>
<td>8</td>
<td>Normal Graph</td>
</tr>
<tr>
<td>9</td>
<td>Underlined Graph</td>
</tr>
<tr>
<td>A</td>
<td>Blinking Graph</td>
</tr>
<tr>
<td>B</td>
<td>Under, Blinking, Graph</td>
</tr>
<tr>
<td>C</td>
<td>Rev, Graphics</td>
</tr>
<tr>
<td>D</td>
<td>Rev, Underlined, Graph</td>
</tr>
<tr>
<td>E</td>
<td>Rev, Blinking, Graph</td>
</tr>
<tr>
<td>F</td>
<td>Rev, Blink, Under, Graph</td>
</tr>
</tbody>
</table>

Another way of thinking of this is to consider the least significant four bits of the attribute byte (see Figure 1).

### ASCII Character Function

- **0 Normal**
- **1 Underlined**
- **2 Blinking**
- **3 Underlined, Blinking**
- **4 Rev**
- **5 Rev, Underlined**
- **6 Rev, Blinking**
- **7 Rev, Blinking, Under**
- **8 Normal Graph**
- **9 Underlined Graph**
- **A Blinking Graph**
- **B Under, Blinking, Graph**
- **C Rev, Graphics**
- **D Rev, Underlined, Graph**
- **E Rev, Blinking, Graph**
- **F Rev, Blink, Under, Graph**

### Setting up the Display

You have a number of options when setting up the Big Board II display. First, the 8002-003A part requires a 16MHz crystal. Switch number 4 should be set to the off position, and both jumpers on JB13 must be installed. This sets the scan row counter for twelve rows and full descenders.

There is one problem with using this mode, the monitor must be able to handle an 18.7kHZ horizontal scan rate. (Editor's note: with the new video setup routine available from Cal-Tex, most garden variety, 15.750 KHZ monitors will work, displaying descenders and all. This routine, however, will not necessarily provide perfectly centered etc. display for all monitors without some futzing on the centering, or the width. See below.)

### The 8002B

You can select the 8002B attributes controller instead of the 8002A. The difference between the two parts is the 8002B does not have descenders and it requires an 11 MHz crystal instead of 16 MHz.

The 8002B still has full graphics and attribute options. To set the Big Board II up for the 8002B, switch number four should be in the 'on' position and both jumpers on JB13 must be removed.

### The 6845

One of the most powerful features of the new BB II is the programmable CRT controller, the Motorola 6845. It is easy to wonder, when setting up the new computer, how we ever got along without being able to easily change the characteristics of the CRT.

Trouble is, though, that with all that power and flexibility comes a very broad range of values that do not work with a given monitor. The following will hopefully be a help in setting up the most critical values so you can get your monitor running.

The horizontal timing registers are R0, R1, R2, and R3. They are, respectively, the Horizontal Total Register, the Horizontal Displayed Register, the Horizon­tal Sync Position Register, and the Sync Width Register.

These registers work together to set the horizontal timing in four areas: characters displayed, front porch, sync width, and back porch (see Figure 2).

---

(continued on page 8)
"BIG BOARD II"
4 MHz Z80-A SINGLE BOARD COMPUTER WITH "SASI" HARD-DISK INTERFACE

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

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

- **64K Dynamic RAM + 4K Static CRT RAM + 24K E(E)PROM or Static RAM**
  "Big Board II" has three memory banks. The first memory bank has eight 16K DRAMs that provide 60K of user space and 4K of monitor space. The second memory bank has two 2Kx8 SRAMs for the memory-mapped CRT display and space for six 2732As. 2Kx8 static RAMs, or pin-compatible EEPROMs. The third memory bank is for RAM or ROM added to the board via the STD bus. Whether bought as a bare board, a full kit, or assembled and tested, it comes with a 250 nS 2732 EPROM containing Russell Smith's superb Monitor.

- **Multiple-Density Controller for SS/DS Floppy Disks**
  The new Cal-Tex single-board computer has a multiple-density disk controller. It can use 1793, 1797, or 8877 controller chips since it generates the side signal with TTL pins. The board has two connectors for disk signals, one with 34 pins for 5.25" drives, the other with 59 pins for 8" drives.

- **Vastly Improved CRT Display**
  The new Ferguson SBC uses a 64x64 CRT controller and SMC 6002 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 transfers at 500 Kbytes per second and bit serial transfers via the Z80-A SIO at 880 Kbits per second with minimal processor overhead. When a hard disk subsystem is added, the DMA chip makes impressive disk performance possible.

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

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

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

- **64K Dynamic RAM + 4K Static CRT RAM + 24K E(E)PROM or Static RAM**
  "Big Board II" has three memory banks. The first memory bank has eight 16K DRAMs that provide 60K of user space and 4K of monitor space. The second memory bank has two 2Kx8 SRAMs for the memory-mapped CRT display and space for six 2732As. 2Kx8 static RAMs, or pin-compatible EEPROMs. The third memory bank is for RAM or ROM added to the board via the STD bus. Whether bought as a bare board, a full kit, or assembled and tested, it comes with a 250 nS 2732 EPROM containing Russell Smith's superb Monitor.

- **Multiple-Density Controller for SS/DS Floppy Disks**
  The new Cal-Tex single-board computer has a multiple-density disk controller. It can use 1793, 1797, or 8877 controller chips since it generates the side signal with TTL pins. The board has two connectors for disk signals, one with 34 pins for 5.25" drives, the other with 59 pins for 8" drives.

- **Vastly Improved CRT Display**
  The new Ferguson SBC uses a 64x64 CRT controller and SMC 6002 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 transfers at 500 Kbytes per second and bit serial transfers via the Z80-A SIO at 880 Kbits per second with minimal processor overhead. When a hard disk subsystem is added, the DMA chip makes impressive disk performance possible.

**SINGLE QUANTITY PRICE, ATTRACTIVE DISCOUNTS FOR DEALERS AND OEMS.**

**CP/M IS A REGISTERED TRADEMARK OF DIGITAL RESEARCH.**

TERMS: Orders paid for with a cashier’s check or bank card will be shipped within three working days. Orders paid for with a personal check will be shipped within three weeks. Add $5 for packing & shipping.
The horizontal display is set by R1 and determines how many characters will be displayed on the line. This is set to 80 in the ROM.

The next area, defined by R2, is the front porch or Sync Delay. This sets the time between the last character and the start of the sync pulse. The front porch default value is 71.

The next value, the Horizontal sync pulse width, is the low order four bits of R3 (the upper four bits are used for the vertical sync width in the 6845). The default value is 8.

Finally, the back porch or scan delay is defined by R0 (in conjunction with the other registers). From the timing diagram above, you can see that given the Horizontal total and the first three elements, the 6845 can deduce the scan delay.

Note that all the timing values above are the values actually encountered in the ROM for the 7x9 character set and are defined in character times, not ‘real’ time. The final timing is determined by the clock frequency (16 MHz).

Suggested Changes

Now for some practical help in configuring your monitor.

We used monitors initially set up for 15,750 Hz horizontal sweep. Needless to say this was not compatible with the 16,800 Hz required by the BB II.

The first thing to do is slowly increase R0 (horizontal total). By tuning the horizontal sweep rate, on the CRT monitor, we could keep up with the slowly changing timing. Each increase in R0 made the characters slightly smaller (more characters in the same scan time, right?) until we had 80 characters displayed on the screen.

Problem: as R0 is increased, the front porch (R2) needs to be adjusted to keep the display on the screen. Increasing R2 moves the display to the left, decreasing R2 moves it to the right. These are the only changes we needed to make. You may find that the sync width needs to be adjusted as well.

Do not alter R1 (horizontal display). To do so will require changes to other areas in the BB II monitor ROM since PFM is counting on displaying 80 characters per line.

Several different monitors were adjusted using this technique. After a little fine tuning of the hardware and software, the BB II makes a very impressive display.

One final note on using PFM to alter the register values. Once the display has started scrolling, the system ignores changes to the registers, so an occasional CTRLZ (clear screen) is necessary.

DC is the port used to tell the 6845 what register you will be working with, then use port DD to actually put the value there. Figure 3 shows the commands which worked for our monitors.

Installing Disk Drives

We used two Shugart 850 Double Density Double Sided disk drives. They work very well with the standard software timing that the Big Board II uses. See Figure 4 for jumper configuration.

More Drive Details

Five-inch drives do not supply a drive ready signal, so the ready line on the disk controller must be tied to five volts. This is done at JB4 by inserting a jumper from the center pin to the pin facing the drive connector.

To jumper the board for the ready line that is supplied by most eight-inch drives, install a jumper from the center pin to the pin farthest from the drive connectors.

Next comes the option that enables the write precompensation. Single density drives will have this option disabled and double density will have it enabled. To select precompensation, install a jumper from the center pin of JB38 to the pin farthest away from the disk drive connectors.

You can have write precompensation on all tracks or just after track forty-two. Five-inch double density will have write precompensation on all tracks, while most eight-inch drives only need it on the inner tracks. Eight-inch drives run fine with it enabled for all tracks, but it is not necessary and there is a possibility of incompatibility with other systems.

Last comes the clock selection for the drives. Five-inch drives have a lower data transfer rate than the eight-inch drives, so the clock to the disk controller chip must be halved. On JB35 jumper the center pin to the pin nearest the CTC for eight-inch drives, and away from the CTC for the fives.

BB II Double Density

The Big Board II can be brought up with the same software that the Big Board I used, but it will only be single density.
Once you have decided which CBIOS you'll use, refer to the BIOS.DOC and MELDING.DOC files on the CBIOS disk.

Using SID or DDT, load the CP/M file that you have produced via MOVCPM. Move the CP/M out of the way by typing M0980,1FF7,4000. This will move CP/M so the lower part of memory can be cleared. Fill lower memory with M0980,lF7F,4000. This clears lower memory with a value that will not affect the operation of the Z80.

Next prepare to read the selected CBIOS. For example, for DS60E8.HEX, type IDS60E8.HEX. Now read the file into memory from disk using the read command and the offset specified in the MELDING.DOC file.

In the case of DS60E8.HEX the command would be R2200. This will read the CBIOS into memory at A00H and the one-sector loader at 900H with the signon message at 980H. This is a little different from the BB I and other CP/M computers, but is needed for the version of Sygern supplied.

There are several cold boot routines that are loaded into areas of memory that are overwritten after boot. There is no need for these routines to be in the permanent BIOS as they are only used during cold boot. Also there is not room in the BIOS to store these routines.

Now move CP/M back down to 1600H by typing M4000,55FF,1600. CP/M and the CBIOS are now ready to be saved and copied onto the system tracks of the newly formatted disk. SYSGEN8 is provided on the CBIOS disk to generate and copy the system.

With the new system on the newly formatted disk, the Big Board II is now fully operational. The copy routines that were previously used on the Big Board I cannot be used on the Big Board II, but PIP can be used in the global format. For example, the command PIP A:=B:*.* would copy the entire contents of disk B to disk A. All CP/M 2.2 compatible programs and utilities that use the BDOS seem to work fine. Of special interest are SWEEP, FIX, and DU.

Connecting a Keyboard
The keyboard controller for the Big Board II is the same as the Big Board I. The connection diagram is shown below. The Big Board II does not have to be jumpered for the strobe polarity. It senses the strobe polarity on the first keypress and stores the level information in memory. This is very nice when bringing up the board for the first time. Connect a test jumper to pin 17 of the keyboard connector. Ground the free end of the test jumper and the monitor will display the monitor startup message. So a keyboard is not necessary to test the board.

Patching WordStar
Almost immediately after we got the Big Board II running we just had to patch WordStar! The Big Board I does not sup-port some of the special features that are available with WordStar, but the Big Board II does.

We quickly got out appendix E of the WordStar Manual and began plotting massive changes. The first thing we noticed was the section on cursor positioning. Since the Televideo 920 uses the same cursor positioning commands as the Big Boards we ran INSTALL.COM with the TVI920 set for the terminal. The 920 uses the special functions of WordStar but not in the same way as the Big Board.

See Figure 6 for patch points to optimize WordStar.

With these changes in place Word Star will run faster and look great. All of the menu information is printed in reverse video with section titles in normal video.

When a block is labeled for a block operation the text within the bounds of the block is changed to reverse video to make formatting easy. If you don't like reverse video, you can select any of the other attributes and substitute the appropriate value in the last byte of each patch.

![Figure 5 - Port Addresses](image)

**PORT NUMBER FUNCTION**

<table>
<thead>
<tr>
<th>PORT NUMBER</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>SIO Data Port A</td>
</tr>
<tr>
<td>81</td>
<td>SIO Control/Status Port A</td>
</tr>
<tr>
<td>82</td>
<td>SIO Data Port B</td>
</tr>
<tr>
<td>83</td>
<td>SIO Control/Status Port B</td>
</tr>
<tr>
<td>84</td>
<td>CTC Channel 0 - Keyboard Strobe</td>
</tr>
<tr>
<td>85</td>
<td>CTC Channel 1 - Index Pulse Count</td>
</tr>
<tr>
<td>86</td>
<td>CTC Channel 2 - SIO Sync Interrupt</td>
</tr>
<tr>
<td>87</td>
<td>CTC Channel 3 - VSYNC Interrupt</td>
</tr>
<tr>
<td>88</td>
<td>CTC Channel 0 - SIO A Baud Rate</td>
</tr>
<tr>
<td>89</td>
<td>CTC Channel 1 - SIO B Baud Rate</td>
</tr>
<tr>
<td>8A</td>
<td>CTC Channel 2 - 1 Millisecond Timer</td>
</tr>
<tr>
<td>8B</td>
<td>CTC Channel 3 - Clock Interrupt</td>
</tr>
<tr>
<td>90</td>
<td>Memory Control - Program</td>
</tr>
<tr>
<td>91</td>
<td>Sense Inputs - Index, Kbat, SW4</td>
</tr>
<tr>
<td>92</td>
<td>Misc System Control Bits - U14 Latch</td>
</tr>
<tr>
<td>93</td>
<td>Drive Select/DMA Mux</td>
</tr>
<tr>
<td>94</td>
<td>Keyboard Inputs</td>
</tr>
<tr>
<td>95</td>
<td>Select Disk Controller</td>
</tr>
<tr>
<td>96</td>
<td>Select General Purpose Parallel Ports</td>
</tr>
<tr>
<td>97</td>
<td>Select 6845 Crt Controller register</td>
</tr>
<tr>
<td>98</td>
<td>Use selected 6845 register</td>
</tr>
</tbody>
</table>

**CTC BAUD RATE DIVISOR**

**DIVISOR BAUD RATE**

<table>
<thead>
<tr>
<th>DIVISOR</th>
<th>BAUD RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>128</td>
<td>300 BPS</td>
</tr>
<tr>
<td>64</td>
<td>600 BPS</td>
</tr>
<tr>
<td>32</td>
<td>1200 BPS</td>
</tr>
<tr>
<td>16</td>
<td>2400 BPS</td>
</tr>
<tr>
<td>8</td>
<td>4800 BPS</td>
</tr>
<tr>
<td>4</td>
<td>9600 BPS</td>
</tr>
<tr>
<td>2</td>
<td>19200 BPS</td>
</tr>
</tbody>
</table>

* Divisor is in Decimal. Convert to hex and output to port 88 for SIO port A and port 89 for SIO port B.

---

*Figure 3 - 6845 Video Patch*

<table>
<thead>
<tr>
<th>PORT</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODC,0</td>
<td>Tell the 6845 we want R0</td>
</tr>
<tr>
<td>ODD,6F</td>
<td>111 characters per line</td>
</tr>
<tr>
<td>(the 80 you see plus another 31)</td>
<td></td>
</tr>
<tr>
<td>ODC,2</td>
<td>Now we want R2</td>
</tr>
<tr>
<td>ODD,59</td>
<td>Position the display on screen</td>
</tr>
</tbody>
</table>

*Figure 6 - Wordstar Customization*

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERAEOL 01,18</td>
<td>Erase to end of line</td>
</tr>
<tr>
<td>LINDDE 02,1B,52</td>
<td>Delete line</td>
</tr>
<tr>
<td>LINSN 02,16,45</td>
<td>Insert line</td>
</tr>
<tr>
<td>IVON 03,18,47,3A</td>
<td>Inverse video on</td>
</tr>
<tr>
<td>IYOFF 03,18,47,30</td>
<td>Inverse video off</td>
</tr>
<tr>
<td>TRMINI 01,1A</td>
<td>Terminal initialize</td>
</tr>
<tr>
<td>TRMUNI 01,1A</td>
<td>Terminal un-initialized</td>
</tr>
</tbody>
</table>

---

Micro Cornucopia, Number 11, April 1983
The disk I'm using to hold this text during editing is not a disk at all. It is a memory board with 256K of 4164s. The difference between this and a regular disk is incredible. Absolutely incredible.

History
First I have to warn you that I am a little biased. Tony Ozrelic (the sole owner, employee, and dishwasher for LA software) called me one evening and mentioned that he was trying to figure out what would sell to the Big Board folks. He is a hardware engineer who has been trying to make it on his own writing and selling software tools (really neat tools but that is another story). The tool has been trying to make it on his own fortunately I didn't get a chance to cruise Computer Faire and I got my first glimpse of what

Then I signed up for board #1.

Tony brought board #1 up to the Computer Faire and I got my first glimpse of what I/O had been doing to me all this time (and I mean TIME). A number of other Big Board owners also got a first-hand chance the other drives, so it's much faster to

Since you can't see what my Dyna does first-hand (unless you come to the Get Together—which is not a bad idea) I'll try to give you an idea what it does.

How Fast Is It?
First of all, once you have loaded Dyna (it takes 38 seconds to transfer the entire contents of a disk into Dyna), you are surprised by the silence—the drive motors don't so much as twitch, and normal CP/M activities become instantaneous.

Run your fancy directory program such as “DIRR” and the files are displayed almost before you hit the carriage return. You can get into and out of your text editor so quickly and easily that editing multiple files with a single-file editor is often easier than using a fancy multiple-file editor with standard disks.

Large assemblies become trivial. If there's an error in the source, it's no great loss. I can correct a 46K source file with my text editor and then do a complete reassembly in just over a minute. It took over four times as long to do the same thing on disk.

The editor times (above) are the best example of how responsive the system gets. I have a good stopwatch, but a significant share of the .8 seconds is simply reaction time. Many other CP/M processes are so quick they appear instantaneous. I'd like to see the IBM PC (or the IBM anything) take on my little Z80 now!!

Ease of Use
Dyna is very easy to use. You just boot up on drive A, and then enter "DD" which formats Dyna, copies the entire contents of drive A into Dyna, and then does a swap (Dyna becomes drive A and the disk becomes drive D). You also get small (1K) programs that do each of these functions individually.

Dyna has not generated any BDOS errors. You know, "drive not ready," or "bad sector." If your CP/M contains ZCPR as mine does, Dyna is perfect as drive A. All of the .COM files on Dyna are automatically available on the other drives, so it's much faster to NOT have the .COM files on drives B-D because the programs load so much more quickly from Dyna.

PIP transfers between Dyna and a disk are twice as fast as the same transfer between two disks.

More Details
I had to give up double density on this BB to run Dyna, although I don't see why you couldn't use Software Publishers' dual-density package along with Dyna. You see, Software Publishers' dual density board can run the original single-density BB bios just fine so you can run Dyna. When running double density, however, you wouldn't have access to the RAM disk.

If you have four drives on your system already, the D drive will be disabled when you enter Dyna. However you don't have to junk your D drive. You can go ahead and use it just as you used to without entering Dyna. Once you are in to Dyna you can get out by hitting the reset button and rebooting then you can use the real drive again.

Resetting and rebooting, however don't affect the contents of Dyna. So, you really can have five 241K storage devices. Just enter "DYNA" and the RAM disk is back with all its data intact.

So far, Dyna has hung on to its data no matter what I've done to the system. I purposely ran the system for a whole day with the fan off (the cabinet got very warm) but Dyna didn't lose a single bit. The only thing you have to remember is to copy Dyna to a real disk before powering down.

Documentation
Tony did his usual very thorough and well-written manual. It is not fancy, just dot-matrix output, but it is very laid out so it is easy to find the information. A lot of typeset manuals with color covers should be this nice to use.

A Quick Conclusion
I love it. I suppose I shouldn't have even tried it, because in just a few days I've become very aware of the penalty that flexible disks exact. Now I expect things to happen instantly.

Using the RAM disk has been a sort of quantum leap, very much like moving from cassette tape to disk. Now it is frustrating to go back and use a system which has only floppies. Very frustrating.

---

**Sample times in seconds on 4MHz BB with single density disks.**

<table>
<thead>
<tr>
<th>Disk</th>
<th>Dyna</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>182.0</td>
<td>40.0</td>
<td>MB assembly of 46K source, yielding 108K PRN file</td>
</tr>
<tr>
<td>120.0</td>
<td>16.0</td>
<td>CRC of 39 files (194K)</td>
</tr>
<tr>
<td>27.3</td>
<td>1.8</td>
<td>Create second copy of 22K file using PIP</td>
</tr>
<tr>
<td>346.0</td>
<td>2.4</td>
<td>VERIFY all &quot;sectors&quot; on disk and Dyna</td>
</tr>
<tr>
<td>14.1</td>
<td>0.8</td>
<td>Load 11K text editor and 22K text file</td>
</tr>
<tr>
<td>14.5</td>
<td>0.8</td>
<td>Exit 11K text editor and create new 22K text file</td>
</tr>
</tbody>
</table>
Easier Reverse Video Cursor

By John J. Phillips

For some time now I have had a reverse video blinking cursor. I want to share it because it is quite simple—requiring no trace cuts and only a few jumpers.

First, remove U25 and bend out pins 2 and 3 and reinstall (we are bending out the pins to that they don’t go back into the sockets). On the underside of the board, jumper U25 pin 4 to U25 pin 1. Install a second jumper connecting U37 pin 11 to U74 pin 11.

Next remove U75 and bend out pin 6. Now prepare to piggy-back a 74LS158 on top of U75. Setup the 74LS158 by bending pin 11 to pin 3 and reinsert (we are bending out the sockets). On the underside of the board, jumper U25 pin 4 to U25 pin 1. Install a second jumper connecting U37 pin 11 to U74 pin 11.

Now prepare to piggy-back a 74LS158 on top of U75. Setup the 74LS158 by bending pin 11 to pin 3 and reinsert (we are bending out the sockets). On the underside of the board, jumper U25 pin 4 to U25 pin 1. Install a second jumper connecting U37 pin 11 to U74 pin 11.

Just add a simple single-pole, double-pole switch-select blinking and non-blinking just add a simple single-pole, double-pole switch to this line.)

This gives you blinking reverse video controlled by bit 7. If you don’t want the blink, move the jumper attached to U37 pin 11 to U74 pin 12. (Ed. note: if you want to switch-select blinking and non-blinking just add a simple single-pole, double-pole switch to this line.)

PFM does not set bit 7 if the cursor is located on a blank space (20H). In a space position, it displays an underline character instead. If you would rather have the space displayed in reverse video you can use the memory utility in PFM to alter the monitor.

Overbeek Enterprises is committed to providing quality software at low prices. We intend to make a handsome profit by having thousands of satisfied customers.

Menu-Plus
A fast, convenient menu package for CP/M systems

Are your users finding it painful to cope with CP/M?

You’ve probably heard about the glories of menu driven systems. This powerful package developed by Capacity Inc. makes the ease of menu driven systems affordable to any CP/M user. Menu-Plus allows rapid, easy configuration of simple or hierarchical menus. You can hide the complexities of CP/M and allow single keystroke invocation of your programs. It’s a user’s dream. Both beginners and experienced operators will find Menu-Plus a significant enhancement. You do not have to be a programmer to install or tailor Menu-Plus on your system. In just a few minutes, you can easily create whatever new menus you desire with a text editor. Our competitors offer products in the $75-150 range. We certainly invite comparison of this product with any comparable system in terms of features or user friendliness. In terms of price there is no comparison.

Micro-WYL
A powerful Z80 CP/M editor

Tired of trying to use ED under CP/M? This is the editor developed by Realworld Software, Inc. and reviewed in Infoworld (11/15/82). Here are just a few unsolicited quotes from our customers:

"Micro-WYL is undoubtedly the hottest bargain on the market."

"Thank you, thank you, thank you."

"This editor is perfect for writing in nearly any programming language. [I]...

find myself looking for excuses to use Micro-WYL, and certainly have no hesitation in recommending it to anyone whose requirements match the capabilities of this inventive piece of software."

— From a review in Infoworld (11/15/82)

Now you can have the convenience of WYLBUR on your micro. CP/M is a registered trademark of Digital Research, Inc.

Disk Inspector
A full screen editor for disks that runs on Z80 CP/M systems

Have you ever been unable to read a file due to a bad sector? Have you ever erased the wrong file? Disk Inspector acts as a full-screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are screen editor for diskettes. You can simply watch as sectors are

Micro Cornucopia, Number 11, April 1983

11
Pointers

"A pointer is a variable that contains the address of another variable." Software Tools, P89.

For the novice, pointers may be mysterious and not too useful. To the assembly language programmer, pointers are old hat. In most micros, the largest register is 16 bits, and operating on items larger than 16 bits usually means passing the address of the item, rather than the item itself, to a subroutine. In C, a string bly language programmer, pointers are

"char *answer;"

for the address of the beginning of the string. The declaration for a pointer to a string

"char *answer;"

is a pointer to an integer

"int *answer;"

for the address of another variable." 

The transfer (*to++ = *from), and in incrementing. This compiles to a few short lines of code.

The unary (works with one item) operator * takes the contents of answer to be an address and fetches the contents of that address. Its opposite, the unary &, fetches the address of a variable.

```
char query[20];
char *answer;

gets(query);
answer=&query;
if (*answer == 'Y') return;
```

These lines of code fetch a string of characters from the console (gets (query);) and to a return if the first character is a "Y".

We could have said—if(query [0] == 'Y')—or even—if(*query == 'Y'). "Query[0]" and "*answer" yield the same character.

Using the statement "query[1]" is called indexing while "*(answer+1)" is called using a pointer. Either way works, but indexing requires more computer operations. See figure 1 for a copy routine in pointer and indexed versions.

In the pointer version the addresses passed to the function are used directly, in the comparison [while(*from++)], the transfer (*to++ = *from), and in incrementing. This compiles to a few short lines of code.

```
char to[],from[];

for(i=0;from[i];i++) to[i]=from[i];
to[i]=from[i];
```

The index example requires an extra variable i, plus the overhead of index address calculation for both the testing and transfer.

I compiled both versions of the copy program. Aztec C generates 36 instructions (pointer) and 88 instructions (indexed). Q/C generates 23 instructions (pointer) and 72 instructions (indexed). Q/C creates fewer instructions because it does calls to its runtime library for fetches and compares, Aztec generates inline code.

C Compiler Wish List

I wish all compilers would come with a trace option like the one in Q/C. A program compiled in trace mode spits out the name on entering and exiting a function.

I also wish that Aztec would provide a Z80 runtime library with the Z80 version of the compiler. You have to create it yourself using a giant SUBMIT file. It compiles and links a zillion little routines so there is no way to get the library together using two single-density drives. This irks me. I pay $45.00 a year for updates and they can't even send one extra disk along with the proper library on it.

---

**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
871 N. Eisenhower
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
The computers of tomorrow will have multiple windows. Yours can have them today. The Electric Blackboard™ multi-window text editor allows you to divide the screen of your CRT into any combination of horizontal and vertical windows.

Cut, paste, compare, draw charts, review, scroll and edit your favorite 4, 5, or even 10 files simultaneously. Create your own commands for your own applications. Increase your productivity. Whether scientist or novice, it takes only minutes to get started. Let our multiple windows unleash the extraordinary power and flexibility of your micro for only $198.00 (manual alone: $30.00)

SANTA CRUZ
SOFTWARE SERVICES
1711 Quail Hollow Road
Ben Lomond, CA 95005
(408) 438-2360

The Electric Blackboard has become my sole program editor under C/PM. The advantages of a windowing editor are well known to us hard-core computer folk in theory, but I couldn’t really imagine just how much it would increase my productivity until I actually used it.

David Ramsey

The Electric Blackboard requires:
Z-80® processor
48 K CP/M™ or CDO®
CRT with cursor addressing

The Electric Blackboard is configured for over 30 terminals and most Z-80 systems including Apple II (with SOFTCARD®), Osborne I, IBM-PC (with Baby Blue Card), Radio Shack and Televideo.

Distribution Media: Diskettes (8"SSSD format & most 5½ formats.)

The Electric Blackboard documentation includes a step-by-step learning guide, command summary, quick reference card and customization notes. The configuration package includes user customizable source code.

In addition to checks and money orders, we accept VISA and MASTERCARD.

*Trademarks of Zilog, Digital Research, Cromemco, Xedex and Microsoft.
Data Base Handlers

By Rex Buddenberg

The following is a view of file managers in general, and some of the things you may want to consider when you check out a package.

There are a number of general purpose Data Base Management Systems available today. The market is similar to the word processing market a couple years ago, with new entries showing up daily. Most are known as file managers rather than data base managers (a data base is made up of a number of files) because most of these handle only one file at a time.

Data Compatibility

Most of us have some sort of file system already—either under a file manager for which you are looking for an improvement or under a BASIC or Pascal program.

Most of us are not really interested in retyping that data—it was tedious enough the first time. Similarly, the file manager that we buy today will probably not be the one we use a couple years from now. (Just like the Big Board I retyped that data—it was tedious enough the first time. Similarly, the file manager that we buy today will probably not be the one we use a couple years from now. (Editor's note: Give it to 'em, Rex.) In data base sense, that means make a new file (remember backups?) and select all records where "expiration date" is before, after, smaller, or larger than xx/xx/xx. Not terribly difficult to conceptualize, or to implement. But again, the standardization bug-a-boo. Christmas may come on any of the following dates: 25 Dec 1982 (militarerepea, note the rational ascending).

December 25, 1982 (conventional, but not convenient for programmers). 25/12/82 (French) 12/25/82 (Yankee) 82/12/25 (computerese, often without the /)

Note the descending order on this last one making it easy to sort on the field. This is a military standard as well.

360 (Julian date, also computerese)

The Julian date is not accurate on leap years. (And you thought the Biblical scholars had a problem reckoning the coming.)

Any of the above conventions will work fine if the file manager is programmed to handle them. Most systems have a 'date' field that implements one of these. Some simply punt and expect you to fill in an alphanumeric string. That will work OK if there is some edit checking so the '/'s get in the right place and so on.

In writing this kind of stuff from scratch, I find it best to treat day, month and year as three separate fields with separate edit checking on each. That allows the '25 Dec 1982' form, which happens to be my personal favorite (compact, ascending order, no month/date ambiguity).

The things you need to check for in a date field are:

a. A format you can live with.

b. Storage as a string (see the zip code discussion above.)

c. Edit checking that rejects attempted inputs of the 13th month or the 43rd day. The sophisticated edits know about February and leap year, but unless you compound interest daily, that probably is not necessary.

My recommendation is that you find a file manager that stores all data as strings. This gets you several benefits:

a. Files can be TYPEd right from the operating system.

b. A text editor or DDTEd can be used to do emergency surgery.

c. If you bomb a disc, like I recently did, you can use Ward Christensen's Disc Utility, or the PFM monitor, to find and read the data for which the directory is missing.

Lesson 2—Reconfiguration

This problem has plagued anyone who has ever worked with a file manager.

After Dave gets all his programming done and all of us subscribers entered, he thinks, 'Wouldn't it be a good idea if I knew who had ordered which user discs.' He wants another field, folks.

That means updating the original program (first piece of frustration), writing a transfer utility (what a waste, you will only use it once), and transliterating all that data into a new file (ulcer time). This is the major reason why corporate exec...
Lesson 3—Transferrability

In another few months you will have worn out your big board and will want the data on a system based on Steve Ciarcia’s 8088 single board computer. How to get the data from one system to another?

There are several ways to skin this cat, most of them with some hangups. Look for a section in the manual that may be titled ‘Foreign Files’.

Some systems can handle straight text files from disk. Look also for the ability to route output to disk as well as the printer. This will allow you to turn your data file into another pre-formatted data file ready for the new system. Look for a file manager that will take input data from (1) the keyboard (they all do), (2) a modem port, (3) a disc file (by far the most important for our mobility discussion).

My prototype system lacked some of the above features, but I was able to get around most of them. An example: I had a file system that I had labored mightily to write in Pascal. The records were stored as a 'file of records' which was a text file, but sans carriage returns and line feeds. The data system that I wanted to transfer the file to needed straight text files plus a leader character. Additionally, the file needed a header record that contained the record length and file size. I transferred the file into the correct format, added the header record with DDT and copied into a properly formatted file and presto. It cost me a Sunday afternoon, but that was a lot quicker than rewriting the program or reentering the data. Plus, now I know how.

 Loose Ends

Data mobility is one aspect of a file manager or database system that is important. Several other subjects also should be understood both by users and programmers. Some issues:

a. Different data types. I have discussed the method of storage with a recommendation for pure string representation. But to the user, data needs to be presented as alphanumeric, numeric, date, and tabular to name just a few.

b. Edit checks. Each data type must be able to have restrictions added so that patently illegal data is rejected. Edit checks cannot idiot-proof a data file, but it can reject the dumb errors.

c. Physical data storage. Will the file fit in RAM, or on disc? This opens up a whole Pandora’s box—can we afford the volatility of RAM storage of a data file in order to gain speed? Or should we accept a speed loss to put the file on disc? Can a Z80 with 64K RAM with a disc drive or two with say a meg of storage manage a respectable database at all? If I get the demand (hint, write me or the editor . . .), maybe I’ll try this subject as the next article.
WHAT'S NEW?
The thirteenth letter of the Greek alphabet is NU;
The SCULL-TEK H19MK101 TERMINAL LOGIC BOARD is NEW!

S-100 OR STAND-ALONE MODELS

A 4 MHZ MICRO-PROCESSOR BASED CONTROL SYSTEM USING
STATE OF THE ART COMPONENTS

This board measures 5¾” x 10” and uses less than 1 amp of 5 volts and around 30 milliamps
of +/- 12 volts

- 4 MHZ Z 80 based system
- Supports up to 8 KB's of program storage
- Allows display of 24 lines of 80 characters
- Flicker free display of reverse video data
- 25th line setup programming
- EIA RS-232-C compatible terminal interface
- Programmable baud rate operation to 19.2 Kbaud
- Supports HEATH H19 and DEC VT52 escape sequences
- Escape sequences include full cursor movement and editing functions
- Display memory supported by access arbitration circuitry preventing video noise on screen when
memory is accessed
- Reverse video attribute and special alternate character mode available on a per character basis
- Standard character generator provides 33 graphic HEATH SYSTEM H19 compatible symbols
- Bit 8 of incoming ASCII characters may be used to cause the character to address an alternate user
defined character generator
- Zilog SIO/DART serial device allows async communication or may be reprogrammed to communi-
cate in bit or byte sync modes
- Display signals: Composite video (1.5 volt P-P negative sync); Separate sync and video outputs
(polarities selectable and widths programmable)

KEYBOARD INTERFACE:
- Standard RS 232 serial communication
- Only 4 wires connect keyboard for communication
- Programmable keys reduce many multiple key WORSTAR* functions to a single key stroke
- Allows detachable keyboard

S-100 BOARD with assembly and operating instructions, firmware on 2732 EPROM $79.00
S-100 BOARD and TERMINAL PARTS KIT $184.00
STAND-ALONE BARE BOARD, assembly and operating instructions, firmware on 2732 EPROM $84.00
STAND-ALONE BOARD and TERMINAL PARTS with manual $179.00
STAND-ALONE POWER SUPPLY and TRANSFORMER $15.00

ROMAC COMPUTER EQUIPMENT
240 W. Market St. Box 589
Somonauk, Illinois 60552
815-498-2111

$2.00 Shipping
Registered Trademark: *Digital Research
WHY BUY ROMAC'S SCULL-TEK COMPUTER?

It's as Fast or FASTER
It's more EXPANDABLE
It COSTS LESS

THAN MOST OTHER SINGLE BOARD COMPUTERS

COMPLETE BOARD AND DISK DIAGNOSTICS ARE INCLUDED IN MONITOR

- 4 programmable timers
- Memory mapping provides 64K for CP/M*
- Full 4 or 5 MHz Z-80 MICRO-PROCESSOR with 64K dynamic RAM
- Complete (6K) BIOS/monitor-boots, runs CP/M*, version 2.2
- 50 pin expansion connector, (2) eight bit I/O ports and sense switch for expandability
- Floppy disk controller operates both 8" and mini floppy drives at the same time, including the new megabyte 96TPI double sided disk drives.

BOARD, ASSEMBLY INSTRUCTIONS and BIOS $99.00
BOARD and COMPLETE PARTS KIT, 4MHZ $349.00
BOARD and COMPLETE PARTS KIT, 5 MHZ $375.00
COMBINATION SPECIAL: CP/M 2.2 WITH THE CP/M PRIMER by Stephen Murtha, SCULL-TEK COMPUTER BOARD AND COMPLETE PARTS KIT $449.00

SCULL-TEK EPROM PROGRAMMER BOARD, assembly instructions with utility programs on floppy disk $49.00
SCULL-TEK CENTRONIC PRINTER INTERFACE BOARD and assembly instructions $20.00
SCULL-TEK CENTRONIC PRINTER INTERFACE with COMPLETE BOARD PARTS KIT, $25.00

DISK MOTOR CONTROL BOARD and assembly instructions $15.00

ROMAC COMPUTER EQUIPMENT
240 W. Market St. Box 589
Somonauk, Illinois 60552
815-498-2111

$2.00 Shipping

Registered Trademark : *Digital Research
Last column we discussed a simple random number generator, and applied it to a game. This time around we’ll cover MX-80 programming, and in the next issue we will apply the program to a typing task. But first, a few words about the latest happenings in the FORTH world.

Vendors

I recently received a copy of the Idaho ROM FORTH User's Manual. Ingerson and Buvel of the Physics Department at the University of Idaho have developed a replacement for the PFM monitor that is a really nifty use of FORTH. The PFM jump table is retained, but many new monitor features have been added, such as disk copy, CP/M system copy, track read/write, RAM verify, standard 16- and 32-bit arithmetic, and FORTH defining functions. The IFORTH compiled code is available on disk from Univ. Idaho. It can be run from disk or burned into EPROMs for permanent installation in the Big Board.

Editor's note: User disk #18 contains the complete IFORTH package as well as fig-FORTH and every other scrap of FORTH related material I could find. The FORTH disk is not full but then no one seems to write anything very large in FORTH (very frustrating). The disk is available for $15.00 from Micro C.

Hampton Miller is working on an interface between IFORTH and the Dyna Disk and should have his results available shortly. Tom Ingerson, Ray Buvel, and Jay Papillon worked on IFORTH. Jay will burn IFORTH into ROM for you if you send him $2716s and $35.00. Contact him at, 871 N Eisenhouwer, Moscow Id 83843, 208-883-0847 (evenings).

New Products

Triangle Digital Systems (London) uses FORTH on their TDS9000 SBC. This $180 board is an all CMOS Eurocard design, utilizing a 6301 microprocessor. The software includes a full screen editor.

You already know about the BASIC-on-a-chip microprocessors such as the Z8. Several manufacturers are now starting to ship samples of their FORTH-based chips. Three that have already been announced are the Rockwell RF611-12 (a 6502 with FORTH mask-programmed into 3K bytes), the RCA 1804N (2K byte), and the TI TMS7000.

The holdup to date has been the limited on-chip PROM space (usually 2-3K bytes). The manufacturers listed above have circumvented this limitation by placing key run-time routines in the mask-PROM, with an outboard ROM to provide I/O and user functions. I've also heard that a single-chip FORTH microprocessor with FORTH as its instruction set (an object-oriented processor like the iAPX-432) is soon to be announced. Stay tuned!

Interrupt Handling

The December column (issue #9) described a high-level interrupt handling routine. There were some vendor-specific parameters that were not adequately mentioned.

NEXT-LINK is the address of NEXT in UNIFORTH. 'NEXT-LINK 1+ ' bypasses one of the initialization instructions needed for UNIFORTH; most FORTH systems can replace this with NEXT-LINK. PCI is the same as the fig-FORTH P! (since UNIFORTH is available for 16-bit systems, it has PCI and P! functions for 8- and 16-bit port store respectively).

The word INTERRUPT-SERVICE loads register HL with the interrupt routine CFA. Fig-FORTH uses BC for the Interpreter Pointer instead of HL. If you are not using the Z80-specific registers, then you won't need to save all of the registers upon interrupt. UNIFORTH uses almost every available register, which is why all of them are saved and restored by the high-level interrupt handler.

Using the MX-80

The MX-80 is perhaps the best dollar value in printers today, and the recently introduced FX-80 will extend Epson's domination of the low-end printer market. Screens 1 through 3 show how you can set most of the parameters for the MX-80 from FORTH.

This menu-driven program is designed around the basic MX-80, and should be usable with minor changes if you have GrafTrax installed. As you can see, user-friendly interfaces are not difficult in FORTH. These routines assume

```
SCR # 1
0 ( *** EPSON SETUP UTILITY *** )
1: +PREMIT ( n --- ...add 128 then emit to printer )
2 128 + PREMIT ;
3 : RESET ( reset printer ) 24 +PREMIT ;
4 : TAB ( horizontal tab ) 09 +PREMIT ;
5 : COMPRESS:ON ( turn on compressed mode ) 15 +PREMIT ;
6 : COMPRESS:OFF ( turn it off ) 18 +PREMIT ;
7 : DISTRIE:ON ( double strike mode ) 27 PREMIT 71 PREMIT ;
8 : DISTRIE:OFF ( turn it off ) 27 PREMIT 72 PREMIT ;
9 : EMPHASIZE:ON ( emphasize mode ) 27 PREMIT 69 PREMIT ;
10 : EMPHASIZE:OFF ( turn it off ) 27 PREMIT 70 PREMIT ;
11 : VSPACE ( --- ...set vertical spacing )
12 : 27 PREMIT 65 PREMIT CR
13 : " Enter spacing in 1/72 inch intervals (12=single): 
14 : GETNUM +PREMIT 27 PREMIT 50 PREMIT ;
15 -->
```

```
SCR # 2
0 ( *** EPSON SETUP UTILITY -- 2 *** )
1 : FORMLENGTH ( --- ...set form length )
2 : 27 PREMIT 67 PREMIT CR
3 : " Enter form length (default=66): " GETNUM
4 : PRECIS @ 0< IF 66 THEN PREMIT ;
5 : HTABS ( --- ...set horizontal tabs )
6 : 27 PREMIT 68 PREMIT BEGIN CR
7 : " Enter tab, <cr> ends: " GETNUM PRECIS @ 0>=
8 : WHILE +PREMIT REPEAT 0 +PREMIT ;
9 : VTABS ( --- ...set vertical tabs )
10 : 27 PREMIT 66 PREMIT BEGIN CR
11 : " Enter tab, <cr> ends: " GETNUM PRECIS @ 0>=
12 : WHILE +PREMIT REPEAT 0 +PREMIT ;
13 -->
14
15
```
that you have: a PREMIT function that passes characters to your printer in the same manner as EMI7 works with the console; a GETNUM routine similar to one described in an earlier column; and a multi-branch CASE statement.

The UNIFORTH CASE statement actually works better with random choices; the Eaker CASE (used by Laboratory Microsystems and described in FORTH Dimensions) would be a better choice for this kind of menu. PRECIS is a conversion flag and is used here only to test if a number was entered. You can replace it with an explicit number entry and check instead of a carriage return.

Next column

I've read several new FORTH books (Introduction to FORTH, Discover FORTH, and Programming in FORTH), and will review their good and bad points. (Hint: Starting FORTH is still the best FORTH text). The monthly application will show how to make your printer function as a typewriter with a memory. Until then, good luck and FORTHwords!

*** ***

Model: MX-80
Manufacturer: Epson America, Inc.
3415 Kashiwa Street
Torrance, CA 90505
List Price: MX-80 $995 MX-80 F/T $695

When I bought my Big Board 18 months ago, I intended to use it largely for word processing. So I scoured the magazines to find an inexpensive printer that had the basic requirements: speed, lowercase descenders, sheet feed, graphics and low price. Six months earlier, Centronics had the market locked up and didn't meet the criteria. But Epson appeared and rapidly became the leading marketer of printers because they did fit the bill.

Strengths

Epson has made a real workhorse of a printer. Mine has been in constant use over the past year with no hint of failure. I suggest you only buy the printer with the Graftrax option (G). Not only do you get dot-addressable graphics, but in addition Epson includes italic print, sub- and super-scripts, and many more printer commands.

One of the highlights of the MX-80 is its manual. For once, a Japanese firm had the foresight to contract with an American consulting company to write its English-language manual. David Lien (Compusoft, Inc., San Diego) has written an excellent manual that covers all of the commands without assuming that you are an Epson service representative. It is 200, 8½ × 11", spiral bound, pages in length, and reminds me of "Starting FORTH" when reading it. Brodie and Lien write like they are brothers.

The MX-80 will print at 5, 8, 5, 10 and 17 cpi in standard, italic (G) and sub/super-script (G) modes. Each mode is supported in single, double and quadruple strike. Graphics (G) resolution is 80 dots/in, with very good registration. To enter the graphics mode, the user issues the graphics command plus the number of horizontal dots to print. The printer then accepts that many bytes of data before switching back to character mode. Each byte controls 8 wires of the print head, meaning that you print 8 lines of horizontal dots at once. If you don't purchase the Graftrax (G) option, 64 block graphic characters are available.

Weaknesses

On the negative side, the Epson is noticeably slower than is the competition, with an advertised speed of 80 cpi but an actual throughput more like 40 cps. The typestyle is not typewriter quality; instead, it is quite plain and square. To me, this is the largest negative factor for the MX-80. The IDS and NEC printers are much prettier. The basic MX-80 does not take single sheet paper. The form feed action is very slow. The dip switches to change printer configuration are deep inside the printer and require considerable dismantling to set. On the other hand, the printer ribbon is exceptionally easy to change, and the print head is user-replaceable.

Conclusion

I really like the printer and know many friends that feel the same way. Check it out first, and then compare with the competitors to make your final decision.

*** ***
Dear Editor,

The article on interfacing CDC drives in issue #8 was a useful guide, however, there appears to be an error on diagram 3. HDLD1 and HDLDO (head load) are on pin 26 instead of pin 36 (as indicated in the diagram).

My converted television set did not like the composite video output from the BB. The screen had vertical bars and bad ghosts. The following cured the problem.

Wesley Ebisuaki
550 Memorial Dr 16E
Cambridge MA

Dear Editor,

Folks looking for a 9" hi-res Motorola monitor which accepts composite video should check with Acme Electronics, 224 Washington Ave. N., Minneapolis, MN 55401 612-338-4794. They have no cabinet and require 12V at .8 amp but they are new and only $59.00 plus $5.00 shipping.

Tom Mason
2402 Audubon Rd
Akron, OH 44320

Dear Editor,

I'm working on a high resolution graphics add-on board for the BB I. It has its own processor and connects via the parallel ports. If anyone else is working on graphics hardware or software, please get in contact with me.

Robert A. Van Winkle
11497 Sandpiper Way
Penn Valley, CA 95946

Dear Editor,

Now that CP/M 3.0 is just around the corner, I'm wondering which brave souls are going to write a BB I or II BIOS for it. In the banked mode, the operating system requires 96K of RAM minimum but can talk to a good deal more.

I'm presently looking at an application that would be immeasurably speeded up by the additional RAM space since the space can be used as disk data buffers.

I'd appreciate hearing from anyone working on this or planning to go this direction.

Jim Totten
700 N Melborn
Dearborn, MICH 48128
313-561-6794 after 6pm EST

Dear Editor,

I was faithfully following Jim Simon's "Chang­ing your BIOS" instructions in issue #8 page 17—including step 11 which is a DDT read command with offset (R3780).

When E8BIOS.HEX executes, it also offsets by 3780. The cure is to enter only the "R". The E8BIOS works beautifully with my Diablo 1640.

Dear Editor,

DRC is now selling the BB kit for only $319 and the bareboard for $119!!! I still remember when the kit was $699. DRC is also offering a BB software package for $149—the software comes from CDL. By the way—why does DRC take so long to fill its orders? I've ordered three S-100 memory boards, as well as the bare Big Board, from them and nothing has reached me in less than 6 weeks. (And the S-100 boards were shipped Priority Mail! I would have gotten the boards quicker by stage coach if only DRC had shipped them the day they received my order.)

Boy am I pleased with the Big Board, though. It was up and running in no time, and has been running reliably ever since. I like DRC's products but their service stinks.

Here are my experiences on disks. I use IBM diskettes almost exclusively. Yes, they're expensive, but if you ask me they're worth it. They cost $47.50/box in quantities of 1 or 2, $40.00/box for 3 or 4, and $37.50/box for 5 or more boxes at the IBM Product Center downtown (Philadelphia). I recently converted 5 Verbatim disks to flippies and 2 of the 5 had bad sectors on the back side (though I had no problems with the front sides).

I bought some Jade disks, and though I haven't had any bad-sector problems, they make so much noise when they're in the drive that I keep thinking there's a war going on behind the little red drive light. I now use the Jade disks only for backup and mailing.

Speaking of Jade, as with SRA David B Burgess (see the letters in Micro C #9), I too had a bad experience with them. After sending me a faulty VERSAFLOPPY II double-density disk controller board (that was supposed to be assembled and TESTED) they informed me that the in­warranty repairs would take 2-4 weeks. Well, after they received my board, they sat on it until the warranty period expired, then sent it to SD Systems for re­pairs.

I am a cement plant accountant and am working on replacing my pad and calculator with a computer. Now I can get down to the business of learning how to use word processing, spreadsheets and CP/M. Also hope to add double density and a RAM disk in the near future.

John Allen N0JA
144 Yagi Lane RR #1
Bowling Green, MO 63334

Dear Editor,

Here are my experiences on disks. I use IBM diskettes almost exclusively. Yes, they're expensive, but if you ask me they're worth it. They cost $47.50/box in quantities of 1 or 2, $40.00/box for 3 or 4, and $37.50/box for 5 or more boxes at the IBM Product Center downtown (Philadelphia). I recently converted 5 Verbatim disks to flippies and 2 of the 5 had bad sectors on the back side (though I had no problems with the front sides).

I bought some Jade disks, and though I haven't had any bad-sector problems, they make so much noise when they're in the drive that I keep thinking there's a war going on behind the little red drive light. I now use the Jade disks only for backup and mailing.

Speaking of Jade, as with SRA David B Burgess (see the letters in Micro C #9), I too had a bad experience with them. After sending me a faulty VERSAFLOPPY II double-density disk controller board (that was supposed to be assembled and TESTED) they informed me that the in­warranty repairs would take 2-4 weeks. Well, after they received my board, they sat on it until the warranty period expired, then sent it to SD Systems for re­pairs.

Micro Cornucopia, Number 11, April 1983
ELHIINATES
INCLUDED ONLY $8.80

No, I don't mean to make this disappear, but once they're
it's still quite powerful, and for writing
zy. Yes, I know those HELP screens can

Techniques for Improved Programming

Instructions, and a theory of operation absolutely free. They also promised to send
me a service manual for the supply when
they received them. That's what I call a
great deal. My power supply worked the
first time I plugged it in, and like yours,
it's as solid as the rock of Gibraltar.

I ordered Aztec C II for the special Mi­

cro C subscriber price of $149 about a
month ago. I've been in love ever since.
Boy is it great to have a complete
UNIX 7 C to program in.

I do almost all my editing with VEDIT,
though I only have their mini version
(Mini-Vedit 3.31 to be exact). It doesn't
have the fancy features like word-wrap
or all the text buffers (only 1, not 10), but
it's still quite powerful, and for writing programs its almost unbeatable. I also
have Wordstar, but those HELP screens
and all the disk-banging drives me crazy.
Yes, I know those HELP screens can
be made to disappear, but once they're
gone I have no idea what any control key
does. VEDIT is simple and fast. $49 for
the mini version is a steal.

A neat book is Mastering CP/M by Alan
Miller (of 8080/820 Assembly Language: Techniques for Improved Programming
fame). It's put out by Sybex, copyright
1983. (How'd they manage that? I
bought the book the week after Thanksg­

ing.) This book is really a huge macro
library containing routines for just about
anything you'd ever want to do in as-
sembly language in the CP/M environment.

Don Brittain
4200 Spruce St. Apt. 208
Philadelphia, PA 19104

[Image of Keyboards Enclosure]

LOW COST DISK CONTROLLER
- LESS THAN $10 COMPLETE -

SAVE WEAR AND TEAR ON YOUR DISK DRIVES
AND FLOPPIES WITH THE MODEL 3801 ALL
SOLID STATE RELAY. SMALL ENOUGH TO FIT
EASILY INSIDE YOUR DISK DRIVE. THE 3801
CAN BE INSTALLED IN MINUTES. YOUR DISK
BOARD WILL THEN TURN YOUR DRIVES ON AND
OFF AUTOMATICALLY AS THEY ARE NEEDED.

- FEATURES -
  * SMALL SIZE - 1.75 X 1.40 X
  0.35
  * FAST INSTALLATION - DIAGRAM
  INCLUDED
  * ZERO CROSSING - ELIMINATES
  ALL SWITCHING NOISE
  * TRIAC OUTPUT - NO MECHANICAL
  PARTS
  * DFET FILTER - INCLUDED
  * LOW COST - ONLY $8.00 EACH
  * 1 YEAR WARRANTY
  * 30 DAY MONEY BACK GUARANTEE

PHENIX
COMPANY OF CALIFORNIA
1833 SOUTH MINDEE STREET
SANTA ANA, CALIFORNIA 92701
(714) 547-4316

CALIF. RES. ADD 6% SALES TAX
ADD $1.00 POSTAGE & HANDLING

XEROX 820 CABLES

XEROX 820 cable harness assemblies for:

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

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

Schematics of cables included

$20.00 per set
ppd. U.S.

FULL SET
XEROX 820 SCHEMATICS
$5.00

NUF Computer Co., Inc.
99 Pennsylvania Ave.
Nexton, MA 02164
(617) 964-8041

VISA & MASTERCARD
ACCEPTED

Micro Cornucopia, Number 11, April 1983
Pascal Procedures

Column by John P. Jones

I had planned to give a preliminary report on JRT PASCAL Version 3.0 by this time but as is the case with most software products, the release date was postponed. I hope to have a full report by next issue.

Before we continue with our look at the language I have a few comments on PASCAL textbooks. The last time I was at a major bookstore, I must have found at least twelve volumes which dealt with PASCAL and PASCAL programming. Many dealt with specific versions of the language but most were designed to teach 'standard' PASCAL. Someone wanting to learn the language has the problem of trying to decide which one or two texts will be best to purchase.

Without going into detail, I would recommend the following: For those without much experience in any programming language, Introduction to PASCAL by Rodnay Zaks, Sybex 1981. The text is designed as a tutorial in the language and even the beginner should have no trouble with it.

For those wanting to learn PASCAL as a second language, Programming in PASCAL by Peter Grogono, Addison-Wesley 1980 is a better choice. The explanations and examples in this text are on a more technical level, more suited to the experienced programmer.

Finally, as a reference to the language, The PASCAL Handbook by Jaques Tiberghien, Sybex 1981. All of the above should be used along with whatever documentation you got with your PASCAL compiler. Unfortunately, all of the implementations of PASCAL deviate from the standard and one another enough that there cannot be a truly general text or reference.

Data Types

One of the strengths of PASCAL is its variety of data types.

The pre-defined simple data types are INTEGER, REAL, CHAR and BOOLEAN. Integers are 16-bit signed numbers in the range (-32767 ... 32767). When written as constants, no decimal point is allowed (0, 3, -24, +769). Real, or floating point numbers are implementation dependent in their range and precision. Precision can be from as few as 6 to as many as 14 digits. When written, the value MUST have at least one digit preceding the required decimal point (0.1, 13.809E+12, -6.4).

Boolean variables are the objects of relational expressions and can take on the values TRUE or FALSE. Type CHAR is used for 8-bit characters such as 'B', 'I', '(', '6'.

Some PASCALs have extensions providing additional simple data types. For example BYTE is an 8-bit integer in PASCAL/MT and LONG INTEGER is a 32-bit value in PASCAL/M.

The above simple data types are fixed in their properties. The other data types available have some of their properties defined by the programmer.

Scalars

A scalar or enumerated type is defined by a list of all the possible values for that type.

TYPE day = (mon, tue, wed, thu, fri, sat, sun);

The enumerated values become ordinal constants of that type, the first value being ordinal 0. Thus ORD(thu) = 3.

The values cannot be written directly; you must use the ORD function. Scalars can be used for array indices, loop control, CASE switches and the like.

Subrange types are defined by two constants.

TYPE small integer = 1..10;

The associated scalar type is that of the constants in the declaration and any operations valid for that type will be valid for the subrange.

SETS

A SET is a collection of objects of the same type.

TYPE week = SET of day;

weekday = SET of [mon..fri];

Set variables can be assigned, compared and otherwise manipulated using conventional set algebra. The symbols +, -, *, >=, <= and IN are used for union, difference, intersection, contains, is contained by, and inclusion respectively.

ARRAYs and RECORDs

ARRAYs and RECORDs are the structured data types of PASCAL.

An ARRAY is a collection of data elements, all of the same type, accessed by an index (subscript).

VAR

name : ARRAY[1..20] of char;

screen : ARRAY[0..79] of char;

matrix : ARRAY[1..10, 1..10] of INTEGER;

daily pay : ARRAY[week] of REAL;

A multiply-dimensioned array is in effect, an array of arrays. Array elements do not have to be simple types.

A RECORD is a grouping of related data elements (fields) which can be manipulated as a unit. The component data items are accessed by name and can be of different types. Variant records in which a portion of the record can have different components will be considered in a future article.

TYPE entry = RECORD

date : integer;

name : array [1..20] of char;

ssno : array [1..8] of char;

salary : real;

end;

Most PASCALs have an additional pre-defined data type, STRING. The type declaration for STRING would look like this:

TYPE STRING = RECORD

current_length : 0..max;

value : array [1..max] of char;

end;

Default max is usually 80 characters, and absolute max is usually 255. (JRT PASCAL allows strings up to 65,535 characters since the dynamic length is stored as a 16 bit value)

VAR

name limited to 30 chars*;

VAR name : STRING [30];

VAR name : STRING [80];

Strings can be read, written, compared and handled much like other data. Individual characters or sub-strings can be manipulated by subscripting into the char array and most compilers will have a set of pre-defined procedures and functions to simplify string handling.

In many applications, the size of the database to be handled will be unknown or variable. With most other languages, the software will have to be written to allow for the maximum possible number of data items. For instance, a BASIC program for analyzing a year's checkbook entries might have the statement:

nnDIM C3(12,100)
Eprom Programming Software
for the Big Board II

features are:
- Program, Verify, Load, and check for Erased 2716, 2732, 2732A, 2764 EPROMS
- 16 k byte memory buffer allows you to work with up to 8-2716 EPROMS at the same time
- Upload and Download Intel Hex Files with the memory buffer
- Edit the data in the memory buffer
- Define your own addresses for the memory buffer so you never calculate where your data is in the memory buffer
- Complete screen error messages

Software is delivered on a standard 8 inch SS SD floppy disk. User must use the video output from Big Board II or an equivalent terminal. Please notify us if you are using a different terminal.

Biegun & Associates
Winnipeg, Canada

which would allow for 100 checks for each of the 12 months. If more than 100 checks are entered for any month, the program will likely bomb. On the other hand, if fewer than 100 checks were written in any month or if the analysis is for less than a full year, the extra storage is wasted. PASCAL provides a method for the dynamic creation of variables at execution time. Dynamic variables are accessed through a pointer variable, bound to a particular data type. The statements:

```
TYPE word_ptr = 'word;
    word = record
       spelling : string[15];
       sound : string[12];
       before,
       after : word_ptr;
end;
VAR base, current : word_ptr;
```

Define the type word_ptr to be a pointer to a dynamic variable of type word. Type word is a record, two fields of which are pointers to additional variables of type word. (PASCAL allows pointers to be defined before their target types have been specified to allow for just this kind of recursive definition.) The variables associated with 'base' and 'current' do not actually exist until created by the built-in procedure NEW(.). The statement:  

```
NEW(base);
```

will create a variable of type word, and base will then point to that variable. The expression, baseCTRL, means 'the variable pointed to by base' and is used to access the newly created variable.

```
base^.spelling := 'hello';
```

Because pointers can point to records, and fields of records can be pointers, all kinds of linked list structures (rings, trees, queues) can be built at execution time. The example above could be used to build a binary tree of dictionary entries for a text-to-speech conversion program. The pre-defined value, NIL, is recognized by the compiler for null pointers, i.e. pointers that don't point to anything. Finally, the procedure DISPOSE(), releases the storage allocated to a dynamic variable. As for all variables in PASCAL, values are meaningless until they are assigned. To start a dictionary as above: (*create the variable*)

```
NEW(base);
(*then assign its values*)
base^.spelling := 'hello';
base^.sound := '*-bzQ#';
base^.before := nil;
base^.after := nil;
```

This newly created node has no branches.

```
NEW (current);
base^.before := current
```

would add a branch to the tree.

Be careful when you begin using dynamic variables,

```
NEW (current);
NEW (current);
```

will create two new variables of type word, but one will be inaccessible.

Much of what we've covered in this installment may take a while to sink in (it did for me). The best way to learn a language is to actually write programs. At the start, you'll make a lot of mistakes, and the results may not be what was intended but after a while you'll find that success becomes more frequent.

Get a text, and/or a book of PASCAL application programs and use them to expand on what's been presented here.

Next time, we'll look at loop and control structures.

---

Micro Cornucopia, Number 11, April 1983
The first impression you get when you look at small systems like the KayPro is that all systems should have the small drives. I mean, 8" seems large and clumsy compared with the little disks and drives.

However, after fighting a flaky drive or disk for a few hours you learn that with the smaller drives you need to back up your work about every hour (or sooner) and to back up the backups.

The KayPro may have been more prone to drive problems than some. The drives are Tandons, certainly not a name to be taken lightly, but it appears that Tandon isn’t taking as much care manufacturing and aligning these drives as they do with their 8". I’ve had a number of dealers comment (not favorably) about the Tandon 100s. Anyone who has experience realigning the little units should get in touch with me as soon as possible. There are a lot of people desperately waiting for such info. On the other hand there are many things blamed on drives that may not be drive related, and in fact, the following fix for "drive" errors doesn’t involve the drive at all.

Drive Fix
The clock to the 1793 was slow (with respect to the processor) by about 40 nanoseconds, and that made setup and hold times critical. It turns out that with a little heat, the times got too critical. So the mod:
Remove U87 (74LS390). Cut pin 9 (or bend out), also bend out pin 1. Jumper pin 1 to pin 6. Jumper pin 12 to pin 15. Put the 74LS390 back into the socket, making sure that pin 9 and pin 1 are not making contact with anything. (If you bent out pin 9, make sure that it is not touching the resistor lead next to the socket.) Be sure that you don’t get any solder down on the parts of the pins that go back into the socket.
This mod is now being done at the KayPro factory so you might take a close look around U87 for signs of jumpering. If there isn’t any and you are getting drive errors, then this mod is probably just what the system ordered.

New ROMs
We are selling new character and monitor ROMs for the KayPro. The monitor provides both a non-blinking cursor and 5 retries on a disk read error. The new character ROM contains our new BB character set plus the Non-Linear Greek set (or blanks in place of the special characters).

Reading other 5" disk formats
A software package called UniForm sets up the KayPro to read, write, and format disks for:
- Osborne 1, SD and DD
- Superbrain
- NEC 8001A
- Xerox 820, SD and DD
- TRS-80 MOD 1 SD
- Morrow Micro Decision
- Heath with Magnolia, DD
UniForm contains two programs. One lets you format a disk in drive B to any of the above formats, the other lets you read or write any of the formats. You can run the programs on these other disk formats and you can PIP programs between these disks and the KayPro format disk in drive A.
The UniForm programs are completely menu driven so you don’t need to refer to the manual. The user interface is well done.

Weaknesses
Drive A is always in KayPro format and you may only transfer files from the KayPro format to the other formats using PIP which is quite slow.
It would be much nicer to be able to select a special format for both drives, and if the format were the same, be able to do a fast track by track copy between the two drives.
It also would be nice if the program smartened up the BIOS enough so the system could automatically figure out a new disk format and access the data with no operator intervention (just like Software Publishers dual density package).
Anyway, there is a super demand for this kind of software and I’m sure a number of folks will follow along with new packages. Meanwhile, at $39.95 UniForm is certainly worth getting.
UniForm
Micro Solutions
125 S. Fourth St
DeKalb, IL 60115

8" Drives for the KayPro
A couple of folks are working on an 8" drive interface for the KayPro II, and we’ve had numerous requests from users and dealers for information that they might use to help them make this mod.
Well, there is nothing so far, but things should be coming. There are a couple of options.
First, you could do away with the 5" drives altogether. Just modify the CBIOS for 8" and the drive cable for 8" compatibility and pick off 2MHz for the controller.
Second, you could add one or two 8" drives as drives C and D. This would take some additional table space for sector decoding, etc., but would be the most versatile.
Since the KayPro has a 1793 on board, you could make your 8" double density (670K per 5S disk) but you’d have to speed up the KayPro to 4MHz to transfer data fast enough. (Unless you could figure out how Russell Smith did it at 2.5 MHz on the BB.)
Anyway, considering the calls we get about this, the demand here is pretty gigantic too.

---

WINCHESTER DISK DRIVE LIQUIDATION

Cash-pressed OEM is liquidating its inventory of new Shugart SA1002 8" 5.33 megabyte Winchester hard disk drives. These are sold un-used, as is, in original shipping boxes. $380 each plus $12 shipping. New Western Digital controller card for this drive, $350 each. Call LIQUIDATORS @ 803-877-9828 or send check to 105 S. Main St., Greer SC 29651.

Micro Cornucopia, Number 11, April 1983
Review by
Kenneth R. Schurr Jr.

When Comshare Target Software reduced the price of their program "PlannerCalc" to $50.00, they declared that "the calc price war has just ended." If you need to make financial spreadsheets, then this program is for you. If you want to do expense accounting or budgeting, then it's not, but more about that later.

What it does
PlannerCalc, (hereinafter referred to as PC), allows you to develop, view and manipulate financial models from a gridsheet or 'matrix' screen approach. You can enter commands by line or column, using a large variety of arithmetic conditions, functions and operations. Any formulae or values used in calculations are seen and changed easily.

First some terms. A gridsheet is composed of a number of vertical blocks (columns) and horizontal blocks (rows). A cell is a single matrix position. It is the intersection of a column and a line. The locator is a movable block used to highlight the cell on the screen to which a command or value is being placed. There is a command line at the bottom of the screen where you tell PC what to do.

Capabilities
The program is very powerful; you can have up to 128 columns and 512 lines in one matrix. It's easy to communicate with; you talk to it in simple English statements, like:

COLUMN 1 FALL'82
COLUMN 2 WINTER'82
COLUMN 3 SPRING'83
COLUMN 4 SUMMER'83
COLUMN 5 TOTAL = COLUMN 1 THRU COLUMN 4
LINE 1 UNIT'SALES = 100, 200, 300, 350
LINE 2 UNIT'SALES = 4, 5, 6, 7
LINE 3 REVENUE = UNIT'SALES * UNIT'PRICE

You can make up to 128 columns and 512 lines in one matrix. You can view or edit any column, line or cell (whether or not it has a value). The left hand and right hand margins are visible. If you are adding, subtracting, multiplying or dividing, any cell can be used as an "input," instead of an amount in each cell. You can store this model and use copies of it to make additional models. The problem is that you have to use their editing feature to replace the "inputs" with amounts. Editing is awkward. First you have to hit the "D" key 5 times to delete the word "input," then hit the "I" key to insert the amount. This is really a drag.

Also, there is no way to take the results from one model and use them in another model. I wanted to use it for my expense accounting, but I can't get the ending balance from this week's model to be the beginning balance for next week's.

In summary, PlannerCalc is a great tool for doing spreadsheets. They have a more advanced model, called "MASTERPLANNER" that overcomes the limitations I've mentioned above, but that costs $325.00!

Editor's note: PlannerCalc is being upgraded (according to Comshare) and the new version will sell for about $100.00. The $50 version will no longer be available. They sold something like 10,000 copies in the first month that it was available (for $50 per copy.) So, if anyone wants write a new super deluxe $50 spreadsheet program, here's your chance.

CP/M 2.2 License and disk for Scull-Tek Big Board
Reconfiguration of above for Ferguson Big Board or Xerox 820
CP/M manuals
C-DIFF file compare utility for CP/M
CP/M Public Domain Software Collections
Wabash 8 inch SSSD diskettes
CP/M 2.2 License and disk for Scull-Tek Big Board
Reconfiguration of above for Ferguson Big Board or Xerox 820
CP/M manuals
C-DIFF file compare utility for CP/M
CP/M Public Domain Software Collections
Wabash 8 inch SSSD diskettes
Add $2.00 each to copy CP/MUG, RCPM or SIGM disks onto new disks. Specify which disk numbers you want. There are over 200 disks full of public domain software available in these three collections. The best way to find out what is available is to order a box of 10 disks plus $2.00 for copying and specify that you want the catalogs and abstracts, which will fill all ten, then after you read the abstracts order the disks you have picked out. Quantity discounts and custom CP/M configurations available. Send $1 for catalog which describes the above and other items in more detail.

Micro Cornucopia, Number 11, April 1983
Canned Lightning For Your Big Board!

If you're hot for speed and have a standard BB with a parallel interface, flash on this: Anything CP/M does with a regular disk drive it can do 35 - 300% faster with dynaDisk.

dynaDisk is a 256k RAM board that runs on 5 volts and plugs into your parallel interface (JS). It comes with auto-patching software which makes it look like an 8" single density disk drive to CP/M. See December '82 issue of MC for more details.

dynaDisk comes in four flavors:
1. HOMEMAKE: manual & software (on 8” single density disk) $35.00
2. PARTIAL KIT: above plus PC board $95.00
3. ASSEMBLED & TESTED: we put it together for you, burn it in for 48 hrs. & test it $495.00

Send check or money order today to: L.A. Software

EDITORIAL (continued)

biased review in this issue for more information about Dyna.

P.S. On Sunday, a number of BBers stopped back by the booth to say they had enjoyed the meeting (and to take another peek at the Dyna disk). Jim Simon presented me with a large (and delicious) grapefruit (more voice medicine). Anyway, to all those of you who were there, thank you for coming. It was a pleasure meeting you.

And, lest I forget, Jim Tyson was there distributing JRT Pascal version 3. I understand that sales were so brisk, he ran out of some disk formats on Saturday. So, it's coming, it's coming.

CP/M 3 and 256K of RAM

There is a lot of interest in the new version of CP/M especially because of the added speed you get with disk buffering etc. To take full advantage of version 3 you need more RAM and the BB I is ideally suited to expansion to 256K.

In this issue there is an article by Trevor Marshall covering his design for 256K and double density, among other interesting things. Trevor is using a BB I with a 160-Mbyte streaming tape as a bulletin board.

In issue #12 we will have a follow-up article by Art Boehm, covering (very thoroughly) how he came up with 4 banks of 64K chips.

Cheap Drives

Unfortunately, by the time Micro C #10 hit the streets, BG Micro had sold all its 801s and by the time my comments about their power supply made it into print they had sold out of those. However, for those of you who can use the slightly larger (not the standard R version) Shugart 801, there is still a real steal on the market.

Cascade Electronics of Randolph MN, 55065, is selling Shugart 800s for $99.00. These are like the full-blown 801s with the standard interface and all the standard jumpers. They run single and double density. The difference is that they have the older TTL style boards (service men prefer these boards) so they require -12V or -5V. Mine came jumpered for -12V. (Jumper "L" if you have -5V.)

I bought two and checked them out with the scope and the alignment disk. They were both right on and in beautiful condition. They are better drives than the new ones I bought for $400 each.

So if you can use the larger drives and don't mind the fact that they were pulled out of new, unsold commercial computers, and checked out on a BB before shipping, then this is definitely the way to go.

RS-232-C Test Board

After I took a shot at ROMAC for their documentation on the ScullTek computer, I didn't expect to hear from them. As you will see in this issue's ads, I've heard from them. They say that they have greatly improved the manual on that board (I have to take their word for it because I haven't seen it yet). They are also selling two other products: a terminal board that sounds neat (there are some very nice programs written to run on the Heath terminal), and a really zingy little serial test board.

I ordered the RS-232-C line check board complete with parts. It takes about 10 minutes to build and at $25.00, it costs less than 1/4 as much as any other units I've found. Plus, it's really handy. Probably half of the serial printer problems are a result of electrical connections.

If you insert pins into the extra holes provided on the board and cut the traces between the male and female sockets, you can make this little unit into a real RS-232 breakout box. This way you can try out any conceivable interface arrangement very quickly. Then you can build a custom cable knowing it will work.

CPMug

For those of you interested in contacting the CP/M Users Group, the address is: 1651 Third Ave, New York, NY 10028. The price of each CPMug volume is now $13 for 8" and $18 for Northstar and Apple 5".

David Thompson
Editor & Publisher
We are already getting calls from folks all over the U.S. who are planning to come to the second annual Semi-Official Get Together here in Bend, Oregon, July 30 and 31.

The standard questions are: "What's the weather like in July?" "Where's the nearest airport?" and "Do you have a Holiday Inn?" Well, the following should give you some idea, and if you'll call or write, we'll send out some more details (in four-color).

Weather

Summer days are usually 85 to 95 and very dry (not muggy). We are at about 4000 feet elevation between the high Cascades and the high desert so it doesn't get sweaty, sticky, hot. (In fact, 90 feels about the same as 80 does in the valley.)

The night time lows range between 35 and 45 with occasional frosts. So, bring a sweater you can put over your warm weather clothes.

If you plan to do some backpacking into the Three Sisters Wilderness (twenty-five minutes drive from the house), bring warm clothing and warm sleeping bags.

Transportation

The nearest commercial airport is Redmond, just 13 miles from here. It used to take us 40 minutes to get to the Portland Airport from our house in Portland. It takes us 20 minutes to get to the Redmond Airport.

Republic Airlines flies into Redmond. There is also a daily shuttle van between Bend and Portland International Airport. It gets to the Portland airport at 9 a.m. and leaves Portland for the return trip at 4 p.m. ($23 each way).

Hertz and National rent cars at the Redmond airport and there is an inexpensive limo service that takes you anywhere you want to go in Bend.

Lodging

Bend has a plethora of places to stay, ranging from the plush resorts (complete with river running, horseback riding, tennis, fishing etc. $38-$60 per night), to plain (but nice) motel rooms for $15.95.

A couple of miles outside of town is a state campground which has full facilities for tenting and trailering, including solar-heated showers and trout fishing. It is only $8.00 per night.

Plus, we have a large yard (for all in tents and purposes).

Goodies

Already there are some indications of the kinds of things we'll be doing here. Trevor Marshall is hoping to bring a system along. It will be a Big Board with 4 banks of 64K dynamic RAM and 160 MBytes of streaming tape, divided up into 8 MByte pseudo disk. (And it's not that much slower than a floppy.) He's already using such a system for a bulletin board.

A very famous person may have a whole new system to show. I can't say anything more than that—even though I know none of you would breathe a word of it if I told you.

Hopefully someone will bring an operating copy of CP/M 3 along with some copies of the CBIOS. (You could be a very well-loved person.)

I should have a graphics display running on either the BB or the KayPro that you can play with. And, of course, Dyna will be here. Tony Ozrellic (LA software) and his wife are planning to come so you might just take home your own Dyna disk.

You folks with hardware and software for trade or sale should definitely bring along some goodies.

Activities

There are a number of really fine short trips you can make from here. Local guides will be glad to take you out sailing, kayaking, river running, fishing, backpacking, bicycling, you name it. The Bend area is internationally known as one of the most beautiful and varied recreation areas in the Northwest, so plan to stay a few extra days and enjoy.

$29.95

SpellSys

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

Then you need SpellSys!

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

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

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

Word Review Operations

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

ORDER AT NO RISK!

Check out the manual and if you don't agree that SpellSys is a super bargain, just return the package with the disk unopened within 30 days and we'll refund your money.

SPELSSYS $29.95 ppd. in US & Canada
Other Foreign add $5.00
Requires 32K CP/M*
Formats: 8" 8 SS DD or 5" SS DD for KayPro, Xerox, Osborne, Morrow, Superbrain.

*CP/M is a trademark of Digital Research

P.O. Box 65 Bend, OR 97709
MC (503) 382-8048 Visa
Especially For The Big Board

USERS DISK #1
1-Two fast disk copiers
2-The manual for Small C+
3-Crowe Z80 Assembler
4-Two disk formaters
5-Modem7
6-Othello
7-Serial print routine-Port B

USERS DISK #2
1-Two single disk drive copy programs, both with source
2-Crowe Z80 Assembler source
3-New Crowe.COM file, debugged version
4-New CB IOS with parallel print driver & other extensions for CP/M 1.4 & 2.2
5-Disk mapper with source

USERS DISK #3
1-EPROM burning software for BB I
2-Reset bit 7 (unWordStar a file)
3-Disk file CRC checker
4-New fast copy program & source
5-DU77, disk inspector/editor
6-FINDBAD, isolates bad disk sectors
7-Print fancy page headings

USERS DISK #4
1-CB IOS, custom bios for Tandon drives
2-ZCPR, dynamite CCP checks drive A for missing .COM files; improved commands
3-ZCPRBLOC, identifies CCP location

USERS DISK #5
1-CAT, disk cataloging routines
2-Modem7 for Port A
3-Modem7 for Port B
4-PACMAN, the arcade game
5-FAST, buffers the disk to speed up assemblies
6-NOLOCK, removes BB I shift lock
7-VERIFY, cleanup & verify a flaky disk
8-DUMPX, enhanced for BB I
9-UNLOAD, create .HEX file from .COM file

USERS DISK #6
1-REZ, 8080/Z80 disassembler, TDL mnemonics
2-PRINTPRN, prints Crowe listings
3-RUNPAC, run-time utility package for 8080 assembly language programs.
Has 51 functions. Includes source which assembles under ASM.

USERS DISK #7
1-CHNGPFM, PFM monitor mods
2-TERM, terminal routines let you set up BB as simple terminal, as a file receiver, or as a file sender.
3-Checkbook balancing package
4-Disk Utilities - copy to memory, from memory, and dump.

USERS DISK #8
1-BDSCIO, custom BDSC I/O for BB I (both .h and .c)
2-YAM, Yet Another Modem program in source & .COM form. Turns BB into paging intelligent terminal, complete with printer interface, baud rates to 9600.
3-ROFF, text formatter
4-SIGNS, prints large block letters

USERS DISK #9
1-ADVENTURE, expanded 550 pt version
2-Keyboard translation program
3-CB IOS, serial & parallel printer interface
4-EPROM programming package for BB II, for 2732s only

USERS DISK #10 - Lots of Disk Utilities
1-REBOOT, sets up the CP/M auto load
2-SWEEP, directory/file transfer routine
3-A, Lets BB I recognize a double sided drive as one drive with 494K of usable space
4-FIX, super disk utility, does everything, much easier to use than DU77
5-Compare files routine
6-UNERA, retrieve erased files
7-FIND, check all drives on system for a file
8-MENU, menu program for CP/M
9-NEWCAT, enhanced disk catalog program
10-Single drive copy program that does track by track copies rather than file by file
11-Extended CRC checker, creates file & checks file
12-Super disk formatter program for BB I

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

Screen Editor in Small C .............. $39.00 $44.00
A simple but full-function screen text editor plus a text formatter, all written in Small C by Edward Ream. This package includes the editor and formatter .COM files setup for the Big Board, Small C itself, and source code for all. With the documentation this is over 400K on a flippy disk. Edward is selling this package for $50, you can buy it from us for $39 (and Ed gets a royalty). Where else can you get an editor, a formatter, a C compiler, and source for all, for under $40?

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.

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 ---
From Micro Cornucopia

GENERAL UTILITIES, BB I

1-ZZSOURCE, disassembles to real Zilog mnemonics
2-EX14, superset of submit or supersub
3-MOVPATCH, lets you move MOVECPM on other copies of CP/M
4-XMON, 3K expanded BB I monitor, use in ROM or as overlay
5-CURSOR, prompts you for cursor char you want
6-UMPARE, very fancy RAM test
7-ZSIDFIX, display improvement for ZSID
8-PIPPAT, modify PIP so you can reset system from within PIP
9-&, Lets you use the BB as a calculator, including HEX
10-SORT, sort package written in C80.

USERS DISK #13 - General Utilities, BB I

USERS DISK #14 - BB II Software

1-PRO32, latest 2732 reader & programmer
2-SMODEM2, lets BB II talk to Hayes Smartmodem
3-GRAPHDEMO, demonstrates BB II graphics
4-ATTRETEST, demonstrates BB II graphics
5-NIT66, initializes port B for 300 or 1200 baud
6-MENU, displays menu of .COM files, enter number to run file
7-SETCLK, sets realtime clock built into BB II
8-PRINT2, modified print which accesses BB II clock
9-BOX, draws a thin line box on screen determined by HL and BC
10-AIENS, space invaders arcade game
11-LISTSET, printer interface, auto-enables RTS, ignores DCD.

USERS DISK #15 - Word Processing

1-EDIT, very fancy line editor which almost looks identical to EX (Unix). Includes help menu, programmable key, and full manual on disk
2-TED, simple minded line editor, easy to learn & use. Very fast.
3-TTYPE, typing training program written in BASIC
4-TINYPLAN, very simple-minded spreadsheet. Whets your appetite for a fancy one.
5-C80 Text Utilities
6-CHOP, cuts off file after N bytes
7-ENTAB, replaces spaces with tabs where possible
8-MS, double or triple spaces a file to output
9-RTW, removes trailing spaces from file
10-TRUNC, truncates each line to specified length
11-WRAP, wraps at column 80, plus pretty pretty printing, page #5...

REMEMBER
FREE Users Disks in exchange for submitted software or articles.

USERS DISK #16 - BB I Modem Software

1-RCPM27, list of U.S. bulletin boards
2-SMODEM, interfaces BB I with Hayes Smartmodem
3-PLINK66, easy to use with non-CP/M host, for port A
4-BBPAT, menu selection of BAUD rate, bits/char, parity, & stop bits
5-MODEM7+, Modem7 plus BBPAT, lets you talk from any port A

ANNOUNCING

NINE

!!! NEW !!!

USERS DISKS

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.

BACK ISSUES

$3.00 each
ISSUE NO. 3 (12/81)
4 MHz Mods
Configuring Modem 7
Safer Formatter
Reverse Video Cursor
FORTHwords begins 16 pages

ISSUE NO. 4 (2/82)
Keyboard Translation
More 4 MHz Mods
Modems, Lync, and SIOs
Undoing CP/M ERASE
Keyboard Encoder
20 pages

ISSUE NO. 2 (10/81)
Parallel Print Driver
Drive Motor Control
Shugart Jumpers
Program Storage Above PFM
1/2 PFM.PRN
16 pages

ISSUE NO. 5 (4/82)
Word Processing
Two Great Spells
Two Text Editors
Double Density Review
Scribble, a Formatter
20 pages

ISSUE NO. 6 (6/82)
BB I EPROM Programmer
Customize Your Chars
Double Density Update
Self-Loading ROM
Terminal in FORTH
24 pages

ISSUE NO. 7 (8/82)
6 Reviews of C
Adding 6K of RAM
Viewing 50 Hz
On Your Own begins
24 pages

ISSUE NO. 8 (10/82)
Drive Maintenance
Interfacing Drives
Installing a New BIOS
Flippity Floppies
C’ing Clearly begins
Xerox 820 begins
28 pages

ISSUE NO. 9 (12/82)
BB II EPROM Program
Relocating Your CP/M
Serial Print Driver
Big Board 1 Fixes
Bringing Up WordStar
Cheap RAM Disk
32 pages

ISSUE NO. 10 (2/83)
Saving a Flaky Disk
Hocking Wini to BB II
The Disk Inspector
JRT Fix
Serial Keyboard Interface
Pascal Procedures begins
36 pages

ISSUE NO. 11 (4/83)
BB I Expansions
BB II Details
Dyna, RAM Disk Review
Easier Reverse Video Cursor
PlannerCalc Review
KayPro Column begins
36 pages

MICRO CORNUCOPIA • P.O. Box 223 • Bend, Oregon • 97709
TWO WAYS TO ENHANCE YOUR BIGBOARD’S CAPABILITIES:

#1 DUAL DENSITY

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

**SOFTWARE**
- Choose 2.5 MHz or 4 MHz software, for 5¼” or 8” drives. Also select software for single or for double-sided drives.
- 8” users have up to 674k bytes of user storage per disk (per side). 5¼” users have up to 185k bytes of user storage per disk (per side).
- Dual Density software includes:
  - DDINIT. COM: a double density disk initialization and verification program. Options:
    - 8 formats.
    - Format an entire disk or just system tracks.
    - Selection of sector skew.
    - Option to verify.
    - Choice of drive to be used.
    - Has a default which chooses the format that gives the most disk space.
  - DDSYSGEN. COM: a double density sysgen program with three options:
    1) Read double density system tracks into memory.
    2) Write double density system tracks from memory to a double density disk.
    3) Generate a double density system disk complete with printer driver. This process uses your single density CP/M disk, the SWP distribution disk, and a blank disk. Five serial printer drivers and a parallel driver are included, and there is an option to install a user-written driver. All drivers can be modified.
  - DDCOPY. COM: a double density copy program that copies all files from a source disk to a destination disk.
- Being a dual density system, the computer automatically distinguishes between single and double density disks. Densities may be mixed.

**SPECIAL OFFER:**
$199.95

$149.95

#2 CO-POWER-88

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

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

**PRICING:**
- 64k CO-POWER-88 ................. $ 699.95
- 128k CO-POWER-88 ............... 799.95
- 256k CO-POWER-88 ............... 1049.95
- 256k CO-POWER-88 with CP/M-86 ... 1250.00
- CP/M-86 for CO-POWER-88 ........ 250.00
- MSDOS for CO-POWER-88 ..........——CALL——
- *Add-on RAM cards are available. Call.

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

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

CP/M and CP/M-86 are trademarks of Digital Research, Inc. MSDOS is a trademark of Microsoft. IBM-PC is a trademark of IBM. Z-80 is a trademark of Zilog.
This time we’re covering a most important topic for those of you doing your own thing—getting something out the door. The next column will be on Hampton Miller’s experiences as he begins his own consulting business. (You’ll have a chance to talk to Hampton in person at the Get Together.)

Dear Editor

“I have an inexpensive 300-baud modem board. If I ever get the time, I will send in an article about it and even offer kits for sale.”

Daniel Lang
24661 W Passavant
Round Lake, IL 60073

This note really hit me because this is exactly why many of us don’t ever get out on our own—and why many of those of us who do, are often forced to go back to the sweatshops.

The problem is that we get something almost done, almost ready, almost available, almost documented, almost published. There is always that last hump to get over before something is really finished.

Daniel has already done a lot of things right. He’s got a product a lot of people are interested in, he can make it available in kit form which is perfect for the Micro C group, and it’s not a big item so he can stock a few sets of parts without going into hock. He can get free publicity by writing an article about it (and ads in Micro C are very inexpensive). (In fact, if you are interested in his modem, write to him.)

What usually happens

Often, a new project comes along that looks bigger and better (or at least more interesting) than the present one. So you drop what you’re doing and move on. You’re never going to sell anything that isn’t finished (unless you are a major corporation), and you aren’t going to sell anything to folks who don’t know you have something to sell.

I can count on 10 hands and 10 feet all the times I’ve invested time in a project that I didn’t finish. Usually the problem was that I became too busy on another (and later equally unfinished) project. I can count on one hand all the projects that I have actually finished and tried marketing, and I can count on that same hand all the successful projects.

In fact, once my projects started being successful, my completion rate went to nearly 100% and the success rate went way up too.

Complete, complete, complete

I can’t overemphasize the importance of completing something—really giving it your best shot—and then covering your eyes and holding it out to see if someone grabs it.

If folks don’t grab it, despite a good presentation to an appropriate audience (audience and presentation are books unto themselves), then it’s time to tackle a new project. But, look at the new project carefully. Use the knowledge you gained from the unsuccessful project when you make your next selection.

Take full advantage of the flop. Find some folks who are successful in the field; show them what you did, how you marketed it, and to whom. I’ve seen beautiful products that wouldn’t sell because the ads, the literature, and the documentation were absolutely horrid.

The printed materials were afterthoughts for the designer but they were the purchaser’s only impression of the product. Your product is not ready to go out the door until it is well documented and well displayed.

Talk to the people who might purchase this item. Do they want it? Will they want it in a year? How large is the audience. Is the audience easy to reach? Is there any competition? How and where is the competition advertising.

Your second product also may not fly, but it should do better than the first. If not, and the third time isn’t the charm either, then you probably ought to try another stunt in the mines.

What sells

There about probably 6,000 to 8,000—perhaps more—Big Board I’s loose out there waiting to gobble up anything that looks interesting. Some VERY useful things have remained un gobbled (AB computers Microtime 80 and LA Software’s XLT translator) while others have really been slurped up (AZTEC CII, Software Publishers dual density, the $10 disk controller from Phenix, and the new Dyna disk). The ECRL board really met a need; Tom just didn’t ship them—and now, I understand, the whole “company” has disappeared. If you are interested in designing a new board for the BB I, you might still do very well redoing that one. I recall Tom Brandt, the sole proprietor of ECRL, mentioning to me that orders were running better than $100,000 per month. Many of those were initial orders from outfits who would have based new systems on the combination of the Big Board I and the ECRL board.

If you are designing a product either for the BB I or II, or for the general CP/M market, you should consider a display ad in Micro C. A sixth of a page is only $40 and the ad works for a long time. We are keeping all the issues of Micro C in print, (we have reprinted issue #1 three times already). So there’s no cheaper way to test the waters if you are after a sophisticated audience.

Competition

Obviously, if two or three folks are already supplying your product to the Big Board market, then you ought to look for another product or another market. But if you are aiming at a larger market it’s a different story.

If Non Linear had given up because Osborne hit the market so fast and hard, they wouldn’t now be selling 10,000 KayPros a month. The portable computer market is huge and growing rapidly.

I don’t have to tell you how many of the rest of us thought about building a portable BB I. You could still do it and do it successfully if you researched the market carefully and added the appropriate new bells and whistles. However, you’d better have a couple of million bucks in your pocket before you start.

So

Pick your project carefully. You need to know early: who will finance it, who will design it, who will document it, who will publicize it, who will buy it, who will build it, and how do you reach the buyer? And once you know all these things, remember—that if it doesn’t get out the door, then none of the above really matters.
GET IN THE FAST LANE
WITHOUT BURNING YOUR WALLET on a
U.S. ROBOTICS
1200 BAUD MODEM

Micro Link 1200, 1200 baud............................ $299
Auto Link 1200, 1200 baud, auto answer........... $333
Auto Link 212A, 1200/300 baud, auto answer..... $379
Auto Dial 212A, 1200/300 baud, auto answer, auto dial $425

The latest I.C. technology gives these modems superior performance at $100 to $300 under the competition. All units are direct connect, answer/originate, full duplex 212A stand-alone in a metal case, with analog loopback selftest, two RJ11C jacks, reversible data pins, DTR override, 9/10 bits/char, and status LED's. The Auto Dial is software compatible with the Hayes Smartmodem II.

Two year warranty
Two week delivery
Cash price includes shipping; Visa/MC add 4%.

Widener Consulting
270 SE 15th #5
Hillsboro, OR 97123
(503) 648-0363

NEW LOW PRICES
Word Processing Programs
$24.95

A unique, modular set of software tools designed to make your word processing chores faster and easier.

PROGRAMS INCLUDE:
* Text formatter - generates justified text for manuals, letters, etc.
* Print utility - for program listings, rough drafts, non-justified printing jobs
* File encryption/decryption - protect your files against accidental display or casual probing
* File transliteration, word/line counting, and more - 9 programs in all

BIG BOARD SOFTWARE - $19.95

TIME & DATE - Real Time Clock programs designed for BB's with a Z80 CTC chip installed. Time programs, time/date stamp files and more. • X - a disk copy program so easy to use that you'll never use PIP again to copy files! • ARK - maintains an archive of up to 64 single density 8" disks on a master disk - no more looking thru dozens of disks for one program! Get organized!

8080/8080
ASSEMBLY LANGUAGE
TRANSLATOR - $29.95

Why go nuts hand-translating 8080 mnemonics into Z80 mnemonics, or vice-versa? Our XLT macro processor does the work for you!

For CP/M 2.2 8" single density disk systems -48k RAM or more
USER'S MANUALS ONLY: $5.00 ea.

BUY ALL THREE FOR $49.95!

Send check or money order to:
L.A. Software
6708 Melrose
Los Angeles California 90038

HARD TO GET PARTS
The Easy Way

COM B116 $12.50
CRYSTALS
13.89 MHz 3.00
20 MHz 3.00
5.0688 MHz 3.00
POWER CONNECTOR 3.00
RESISTOR PACKS For the Pair 1.00
POSTAGE 2.00

DIGITAL RESEARCH COMPUTERS
PO Box 401565
Garland, TX 75040
(214) 271-3538

For Sale

Bare Big Boards, parts, disk drives in stock.

Integrand 700DV vertical drive cabinet with power supply. Room for 2 or 3 drives & Big Board $275.

Stock horizontal drive cabinet with Borchert Power supply. Room for 2 horizontal drives and Big board, $250.

The Electronics Shop
131 North Decatur
Olympia, WA 98502
206-357-6304
206-357-7400 CBBS
Burning 2716s on the BB II.

The following will let you program 2716s on the BB II without modifying the board.

Doug Durland's article in issue #10 pointed out the problems the BB II has programming the 2716. Pin 21 does need to remain at +5V during a read operation. Jumper pin 21 to WR/not (Ed. note: appears to be from U-42 pin 9) which will always be high during chip reads. If the program reads the 2716 with pin 21 jumpered to WR/not and then waits for you to change the jumper to the OE/VPP line, then everything should work fine. You can use a similar compare algorithm to determine if a byte should be programmed to be skipped but in this case the comparison must take place between the RAM image of the ROM and the new data.

Doug also mentioned that the 2716 needs to see a low to high transition on the chip enable pin. He said that it is difficult to guarantee that RCE/not will stay low during address changes. We agree. However, RCE/not can stay high during address changes. If we disable all REC/not lines before writing each new data byte, we can then drop RCE/not, raise it for 50ms, and then go to the next address. It is this low to high transition with VPP present that programs the 2716.

I make these comments because I don't like hardware modifications unless they are absolutely necessary. For just a couple of 2716s I wouldn't modify the board. And, if I were doing production runs on 2716s, I'd set up the prom programmer to burn 5 chips at a time using the PGM/not line. (This line is common to all 6 sockets and can be used in place of the RCE/not line to pulse pin 18 of several chips at a time.)

Note that we made MOM of PROM configurable so that without re-assembling etc. you can read or burn any EPROM that can be physically handled by the Big Board II. In fact, with an external adapter you can handle any EPROM up to 256K.

Cindy Hollenbeck
Industrial Software
19623 Autumn Creek
Humble, TX 77346

Head Load Pads

For those of you wanting to follow the drive maintenance article in issue # 8 by replacing your Shugart SA800/801's head load pads but not wanting to buy a whole package of pads (probably 100 per pack for $25.00) you can make them out of scrap felt.

I found some fairly dense felt and a leather punch and made little circles about 1/8" diameter and 1/8" thick. I reduced these to 1/16" thick (thickness is critical; if they're too thick you get bad sectors too) and rounded the edges slightly. Then I removed the plastic pad assembly from the head load arm (don't lift the arm too high), scraped off the old pad and used cyano-acrylate glue (any good glue should do as long as it doesn't impregnate the felt) to install the new pads.

Bad sectors went from 1 per 8 hours computing to 1 per 48 hours computing and I use some Wabash disks.

Andy Robinson,
73 Conroy Cres. #102
Guelph, Ont. CANADA
N1G 2V5

Cutting Restores

I noticed my drives (Siemens FDD200-8) were doing random restores to track 0 during file I/O. I lowered the step but that didn't help. However the problem stopped when I made a patch to PFM.

At F7A5 there is a time delay which takes 44 microseconds. By lengthening this delay, I cured the problem.

Change:
F7A5 from CD A8 F7 to CD E6 F7
;Call new pause

Add:
F7E5 C5 ;PUSH BC
F7E7 06 20 ;LD B 20H
F7E9 10 FE ;DJNZ (to F7E9)
F7EB C1 ;POP BC
F7EC C9 ;RET

This little routine takes 184 microseconds at 2.5 MHz.

Bob Felton
4803 Nebilina Dr
Carlsbad, CA 92008

Simple 50 Hz video mod

Using the BB I (and KayPro) in countries with 50 Hz mains is a problem because of the jittery screen (caused by the beat between the 60 Hz vertical and the power).

Fortunately you can slow the vertical up to 50 Hz without cutting foils or changing the video crystal. Just slow down the vertical timing for 50 Hz by having the scan counter (U22) divide by 12 instead of 10. You can do this by replacing U22 with a small piggyback board containing U22 (74LS290), plus a 74LS161 and a 7410.

Uwe Pitz
Hauptstr.36 3180 Wolfsburg 29
West Germany

Editor's note:
It appears to me that the only lines you bring up from U22's socket are those marked (as pins) on the 74LS290 (and you bring up the same pin numbers that are marked). Then you tie the 74LS161 and the 7410 to the appropriate pins on the LS290.

Big Board Bulletin Boards

Twin Cities 612-432-0428
24 hrs, 300 & 1200 baud
Chris Torkildson
13791 Heywood Ct
Apple Valley, Mn 55124

There are two other BB bulletin boards, that I'm aware of (though I'm sure there are more). Both run by authors who have articles in this issue.

See the BB I article by Trevor Marshall and the BB II article by Brett Berg for more information. Both are 24 hours, and I know that Trevor's handles both 300 and 1200 baud.
THE CONTINUING ADVENTURES OF Bugsbury

Career Opportunities For Your Software Bug...

MAILMAN

DEEP SEA DIVER

LOGGER

DEMOLITIONS EXPERT

LIGHTENING ROD

Copyright © 1983

Micro Cornucopia, Number 11, April 1983
Micro C works because it is a central information exchange for the doers in this crazy industry. So we encourage you to share your trials and tribulations. That way we can invent new wheels rather than redoing the old ones over and over.

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

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Price Each</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USER'S DISKS—8&quot; SSSD, CP/M #’s</td>
<td>$15</td>
<td>$15</td>
</tr>
<tr>
<td></td>
<td>BACK ISSUES #’s</td>
<td>$3</td>
<td>$3</td>
</tr>
<tr>
<td></td>
<td>SUBSCRIPTION (1 year—6 issues) □ New □ Renewal</td>
<td>□ $16 (Bulk)</td>
<td>□ $20 (1st Class)</td>
</tr>
<tr>
<td></td>
<td>OTHER ITEMS:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

Make checks payable to: MICRO CORNUCOPIA

TOTAL ENCLOSED

Card No. ___________ ___________ ___________ ___________ Exp. ___________ ___________ ___________ ___________ Signature

☐ Visa ☐ MasterCard

NAME __________________________ PHONE (?) ___________

ADDRESS ____________________________ STATE ______ ZIP

MICRO CORNUCOPIA · P.O. Box 223 · Bend, Oregon · 97709
(503) 382-8048
**BIG BOARD USERS DISKS**

$15.00 each  
(US, Can, Mex)  

$20.00 each  
(Other Foreign)

**USERS DISK #1**  
1-20 fast disk copiers  
2-The manual for Small C+  
3-Crowe Z80 Assembler  
4-Modem7  
5-Serial  
7-Serial print routine-Port B

**USERS DISK #2**  
1-20 single disk drive copy programs, both with source  
2-Crowe Z80 Assembler source  
3-New Crowe.COM file, debugged version  
4-New CBios with parallel print driver & other extensions for CP/M 1.4 & 2.2  
5-Disk mapper with source

**USERS DISK #3**  
1-CBios, used to boot for BB I  
2-Reset bit 7 (unWordStar a file)  
3-Disk file CRC checker  
4-New fast copy program & source  
5-DU77, disk inspector/editor  
6-FINDBAD, isolates bad disk sectors  
7-Print fancy page headings

**USERS DISK #4**  
1-CBios, custom bios for Tandon drives  
2-ZCPR, dynamic CCP checks drive A for missing .COM files; improved commands  
3-ZCPRBLOC, identifies CCP location

**USERS DISK #5**  
1-CAT, disk cataloging routines  
2-Modem7 for Port A  
3-Modem7 for Port B  
4-PACMAN, the arcade game  
5-FAST, buffers the disk to speed up assembles  
6-NOLOCK, removes BB I shift lock  
7-VERIFY, cleanup & verify a floppy disk  
8-DUMPF, enhanced for BB I  
9-UNLOAD, create .HEX file from .COM file

**USERS DISK #6**  
1-REZ, 8080/280 disassembler, TDL mnemonics  
2-PRINTPRN, prints Crowe listings  
3-RUNPAC, run-time utility package for 8080 assemby language programs. Has 51 functions. Includes source which assembles under ASM.

**USERS DISK #7**  
1-CHNPFM, PFM monitor mods  
2-TERM, terminal routines you set up BB as simple terminal, as a file receiver, or as a file sender.  
3-Checkbook balancing package  
4-Disk Utilities - copy to memory, from memory, and dump.

**USERS DISK #8**  
1-BDSCIO, custom BDSC I/O for BB I  
2-YAM, Yet Another Modem program in source & .COM form. Turns BB into paging intelligent terminal, complete with printer interface, baud rates to 9600.  
3-ROFF, text formatter  
4-SIGNS, prints large block letters  
5-INITSI0,  
6-UMPI, very fancy RAM test  
7-ZSID, display improvement for ZSID  
8-PPIP, modifies PIP so you can reset system from within PIP  
9-@, lets you use the BB as a calculator, including HEX  
10-SORT, sort package written in C80.

**USERS DISK #9**  
1-ADVENTURE, expanded SSO pt version  
2-Keyboard translation program  
3-CBios, serial & parallel printer interface  
4-EPROM programming package for BB II, for 2732s only

**USERS DISK #10** - Lots of Disk Utilities  
1-REBOOT, sets up the CP/M auto load  
2-SWEEP, directory/file transfer routine  
3-A, lets BB I recognize a double sided drive as one drive with 494K of usable space  
4-FIX, super disk utility, does everything, much easier to use than DU77  
5-Compare files routine  
6-UNERA, retrieve erased files  
7-FIND, check all drives on system for a file  
8-MENU, menu program for CP/M  
9-NEWCAT, enhanced disk catalog program  
10-Single drive copy program that does track by track copies rather than file by file  
11-Extended CRC checker, creates file & checks file  
12-Super disk format program for BB I

**USERS DISK #11** - Printer Utilities  
1-Microline 92 printer routine  
2-Draws library package for MX-80 with Graftrax, very fancy  
3-Epson MX80 setup for BB I with 59.5K CP/M  
4-Epson MX8 setup for any CP/M, lets you print in modes.  
5-Micro Tek print driver, Ports A & B

**USERS DISK #12** - Games for BB I  
1-ALIENS, a fast, exciting arcade game  
2-ZCHESS, chess with a 1-6 level look ahead  
3-MasterMind, match wits with the computer  
4-C80, Biorhythm charts complete with Biorythm charts  
5-L1FE, so fast it's real animation!  
6-CRAPS, biorythm routine for BB I  
7-WUMPUS, Yet Another Modem program in source & .COM form. Turns BB into paging intelligent terminal, complete with printer interface, baud rates to 9600.  
8-RU NC, truncates each line to specified length  
9-VERIFY, displays menu of .COM files, enter number to run file  
10-SMRTMOD, sets realtime clock built into BB II  
11-ListSet, printer interface, auto-enables RTS, ignores DCD

**USERS DISK #13** - General Utilities, BB I  
1-ZZSOURCE, disassembles to real Zilog mnemonics  
2-EX14, superset of submit or supersub  
3-MVPATCH, lets you use MOVECPM on other copies of CP/M  
4-XMON, 3K expanded BB monitor, use in ROM or as overlay  
5-CURSOR, prompts you for cursor char you want  
6-PPAT, modify PIP so you can reset system from within PIP  
7-ZSID, display improvement for ZSID  
8-PRINT2, modified print which keeps BB II clock  
9-BOX, draws a thin line box on screen determined by HL and BC  
10-ALIENS, space invaders arcade game  
11-LISTSET, printer interface, auto-enables RTS, ignores DCD

**USERS DISK #14** - BB II Software  
1-PROM32, latest 2732 reader & programmer  
2-SM7MOD2, lets BB II talk to Hayes Smartmodem  
3-GRADFM, demonstrates BB II graphics (in BASIC)  
4-ATTRETEST, demonstrates BB II graphics (in JRT Pascal)  
5-INITSI0, initializes port B for 300 or 1200 baud  
6-MENU, displays menu of .COM files, enter number to run file  
7-SETCLK, sets realtime clock built into BB II  
8-PRINT2, modified print which keeps BB II clock  
9-BOX, draws a thin line box on screen determined by HL and BC

**USERS DISK #15** - Word Processing  
1-EDIT, very fancy line editor which almost looks identical to EX (Unix). Includes help menu, programmable key, and full manual on disk  
2-TEL, simple minded line editor, easy to learn & use. Very fast.  
3-TTY, typing training program written in BASIC  
4-TINYPLAN, very simple-minded spreadsheet. Whets your appetite for a fancy one.  
5-C80 Text Utilities  
6-CHOP, cuts off file after N bytes  
7-ENTAB, replace spaces with tabs where possible  
8-MS, double or triple spaces a file to output  
9-RTW, removes trailing spaces from file  
10-TRUNC, truncates each line to specified length  
11-WRAP, wraps at column 80, plus pretty pretty printing, page #...
FOR 'MOST EVERY' RS-232 TEST YOU HAVE
THE ROMAC LINE CHECK WILL DO IT!

Tri-color LED’s, mounted nearest the source signal, clearly display activity, polarity and validity of seven of the most commonly used RS-232 signals.
  TD, RD, RTS, CTS, DSR, DSD and DTR. A switch reverses TD (pin 2) and RD (pin 3)

Versatility is provided by either standard wire-connect or printed circuit mount DB-25 connectors which can be soldered to the board.

- A convenient RS-232 tester by using standard wire type connectors
- An easy to use monitor for a data set or computer port by using PC board connectors mounted to the back
- A parallel connector to a communication port by using both types of DB-25 connectors

PC BOARD with instructions  $7.50
BOARD and PARTS KIT: Includes 7 tri-color LED’s, 7 resistors, male and female DB-25 connectors and switch  $25.00

ROMAC COMPUTER EQUIPMENT
240 W. Market St. Box 589
Somenauk, Illinois 60552
815-498-2111

$2.00 Shipping
Full implementation of "C" with standard floating point, library, and I/O subroutines. UNIX VER 7 compatible. Produces relocatable 8080 (optional OZ80) assembler code. Relocating assembler and linker supplied with package or use Microsoft M80 and L80, SID/ZSID debugger interface. FAST· COMPILATION AND EXECUTION.

AZTEC CII FOR CP/M $199
(Special price for Micro C subscribers $149)

MANX software systems
Box 55, Shrewsbury, N.J. 07701
(201) 780-4004

Also available for Apple DOS, HDOS, CP/M-86, PC-DOS

INTRODUCING

UNIFORTH

One of the finest implementations of the FORTH language, Field tested and reliable, UNIFORTH is available for Z-80 and most 16-bit systems using 8" disk drives.

As a task, UNIFORTH is compatible with and supports all features and file types of the CP/M, COOS, MS-DOS and DEC operating systems. As an operating system, UNIFORTH will function "stand-alone" on most commercial microcomputers.

The FORTH-79 Standard language has been extended with over 500 new words that provide full-screen and line-oriented editors, array and string handling, enhanced disk and terminal I/O, and an excellent assembler. Detailed reference manuals supply complete documentation for programming and system operation, in an easy-to-understand, conversational style using numerous examples.

Optional features include an excellent floating-point package with all transcendental functions (logs, tangents, etc.), the MetaFORTH cross-compiler, printer plotting and CP/M file transfer utilities, astronomical and amateur radio applications, etc.

Compare these features with any other FORTH on the market:
- Speed and efficiency
- Variety of options
- Ease of use
- Quality of documentation

You'll find UNIFORTH is superior.

Prices start at $35. Call or write for our free brochure.

Unified Software Systems
P.O. Box 2644, New Carrollton, MD 20784, (301) 552-1295