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# MICRO CORNUCOPIA

## JOURNAL OF THE BIG BOARD USERS

June 1982 No. 6

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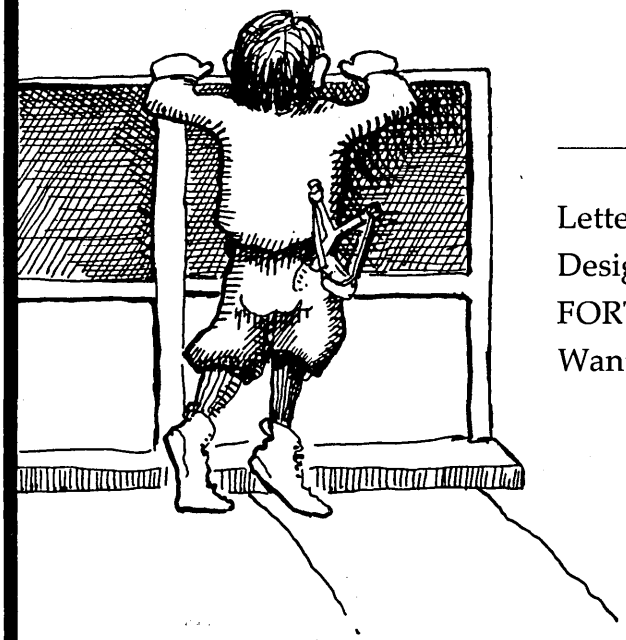

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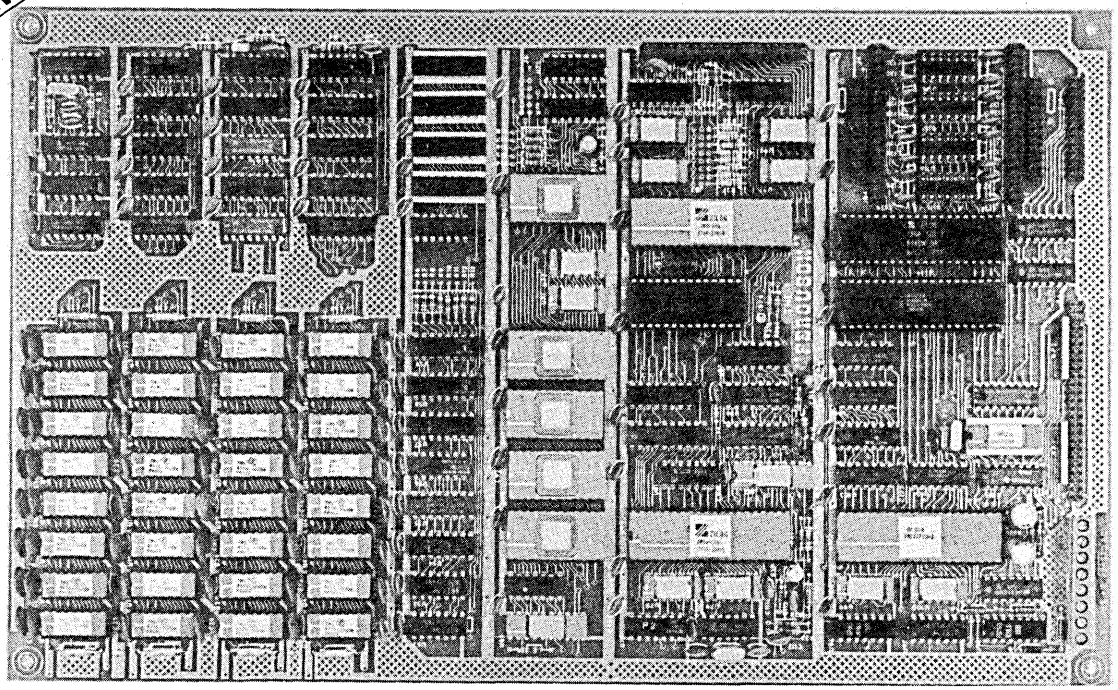

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**LETTERS TO THE EDITOR:** Please sound off.



# MICRO CORNUCOPIA

**June 1982** **The Journal of the Big Board Users** **No. 6**

## *Spare a Dime?*

### New Job

With the economy hanging on by its fingernails (and slipping), and water walkers treading the unemployment lines, it might seem crazy for anyone to quit a good-paying engineering job in order to spend full time editing and publishing a small user group journal.

It is crazy, but the hours I was putting in trying to do both the job and Micro C were even crazier. So, forced to choose between the security and the dream, I chose the dream.

A Little History. On April 8 1981, we distributed 1800 flyers announcing Micro Cornucopia (the one most of you received with your boards) at the Computer Faire in San Francisco. Thirty days later we had received a total of three subscriptions.

At this year's Computer Faire (March 19, 1982) we had a meeting of Micro C subscribers and we had over 50 folks (our meeting followed the Northstar user group and we outnumbered them at least two-to-one). Quite a difference.

So now I'm on my own, free of the job with its biweekly check, free insurance, cheap parts, retirement benefits, and immediate access to some really fine fellow engineers. It's awfully hard to go out on your own when you realize all the cords you are cutting. (And I'm sure that Tektronix and other large companies know that.)

Sandy and I (plus Jennifer and Erin) figured we'd be living on a bare minimum for a while, so we had a dentalling and doctoring spree just before the health insurance turned into a pumpkin.

Of course, Sandy has been working full time on Micro C for over a year so this hasn't been a big change for her, but it's certainly a big (and good) change for me.

Stick around, we've got great things coming up. And, please feel free to tell others about us.

### Get together

Announcing the first annual, semi official, international, Micro C get together. It will be held here at the house, Saturday, July 24. You are all welcome to come and spend the day (from 10 a.m. to midnight) helping us celebrate the first anniversary of Micro C. Bring yourselves, families (including children), friends, and grubbies, for a day of fun and games and eating and relaxing and computering and talking and FORTH and so forth.

We hope to have one of the new systems running by then along with, of course, my two Big Boards and the ROM burner.

Feel free to bring your specialty for the potluck lunch (if it's convenient) or some other healthful munchies. Of course, please let us know if you're planning to come and how many you'll be bringing so we won't be totally unprepared. If you're going to need lodging we may be able to suggest some places, or if you need a ride from the airport, just give us some warning.

If folks want to hang around Sunday we might all go down to the beach and build sand computers (without floppy drives).

### Do You Need to Renew?

Check the subscription form stapled in the center of the magazine. If it's on colored stock and has RENEW emblazoned across the top then you definitely need to renew. If you aren't expiring now but want to know when you are going to expire, check your address label.

*(continued on page 21)*

# Letters

Dear Editor,

Finding an 8116 baud rate generator can be a real problem so it might pay to mention that this chip is functionally the same as the far more common COM 5016. The only difference is that pin 9 on the COM 5016 must be tied to plus 12V. This pin is not connected on the 8116.

The COM 5016 is available from Advanced Computer Products for $15.95.

**Gary Kaufman**
**206 South 13th St. Apt 810**
**Philadelphia, PA 19107**

*Editor's note:*

*Western Digital is also making pin-for-pin equivalents of both the 8116 and the COM 5016. The WD 1943 matches the 8116 and the WD 1941 matches the 5016. I understand that the WD 1941 lists for about $9.95.*

---

Dear Editor,

I might be interested in setting up a modem based bulletin board for Big Board users in this area for software exchange. I have an auto-answer modem by US Robotics hooked up to automatically turn the system on and off with the carrier detect. This way the system can be run remotely.

My Big Board comes up clean with the disk doors closed, so I can leave it set up and run it from the office by modem. I also have a separate phone line which I use for the modem only.

**W.N. Reese**
**2202 Campbell Rd**
**Houston TX 77080**

*Editor's note:*

*Those of you interested in getting together by computer should drop Mr Reese a note and see if you can set something up.*

*Any of you wanting to establish a bulletin board for folks in your area should let me know and maybe we can coordinate things from here. And we can certainly let people know what you are doing.*

Dear Editor,

I finally got my board running (hours of tracing to find one unsoldered pin) and now am struggling with software.

My distribution disk contains a bios that I can't assemble and I have been trying to add the printer driver from Issue #2 but it is also Z80 code.

The FORMAT.COM program returns 'DISK ERROR' without even looking at drive B. I have tried to relocate my BIOS to E800 to be compatible with other users with absolutely no success. The article in Issue 2 is not detailed enough. It just says 'Now reassemble the mess . . .' How about a step-by-step set of instructions on how to change the BIOS to E800? In all the CP/M stuff I have purchased I have yet to find this kind of information. Might be a good article for us novices. Would also appreciate a parallel printer driver in 8080 code from anyone who has done it.

Do you plan any more regional user group meetings in Portland? I would like to attend to share information with other users.

**Dave Knight**
**PO Box 334**
**Chehalis, WA 98532**

*Editor's note:*

*Excellent idea for an article, Dave. If more people knew how to get in and muck around in the BIOS then there would be more custom BIOS's. You ordered user disk #1 so you now have the Crowe Z80 assembler. (If you are going to learn to write assembly code you may as well use the easiest mnemonics.)*

*See the editorial for the announcement of the first annual, international, Micro C get together here in Portland. It should be great fun.*

---

Dear Editor,

I write from Iluka as one of your satisfied subscribers. To date I have only been able to contact two Australian Big Board users (two prospective new subscribers).

Iluka is a small, mainly fishing village 50 miles from the nearest country town and about 2/3 of the way from Sydney to Brisbane.

I am retired on a small cattle farm (100 head). I spent 30 years working in Sydney as an industrial, electrical, and electronic technician. My interests are still electronics and amateur radio. I would like to contact a U.S. Big Board user with similar interests.

Some computer parts are difficult to obtain here because they are too small to be worth ordering from a commercial U.S. supplier. I would like to contact someone who could occasionally purchase electronic parts for me. I would arrange to send a cash advance to cover the cost of the parts.

I enclose cash payment for the user disk because cash is easier to obtain than a bank draft. The nearest bank is 28 miles away and the slight risk of losing $20 is better than travelling 56 miles.

**Ray Evans**
**PO Box 36 Iluka**
**NSW 2460 Australia**

---

Dear Editor,

I'm making a 5 1/4" (single density) Big Board floppy interface package available for $40. The price includes the modified PFM and BIOS routines, copying CP/M and all utilities to mini-disk, plus documentation on connecting the mini to the Big Board. Anyone interested must send an original CP/M disk plus PFM ROM or Big board serial number. The format is 18 sectors/track and 35 or 40 tracks/drive.

A note on your review on text editors. I've been using Compuview's VEDIT for about a year. It is one of the best text editors I know of. Lately I've been evaluating word processors, both for internal use and for sale with systems. If you like I can furnish you with my findings when I'm done.

I've also just received a copy of TURBODOS and will be evaluating it for use on the BB. It is a CP/M replacement that promises a 25-35%

*(continued on page 7)*

# ANNOUNCING
# THE BIG BOARD ADD-ON

****** FEATURES ******

**Program 2708, 2716, 2732, and 2764 type EPROMS.** With four programming sockets you can program lots of memory at once. Programs EPROMS sequentially or in parallel for small production runs.

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# An EPROM Programmer for the Big Board

**By Jim Monesmith**

438 Patterson Road
Dayton, OH 45419

## Introduction
## By David Thompson

The following article by Jim Monesmith will probably become the most thumb-worn piece of text in Micro C's history. After all, connecting a ROM burner to a system as powerful as the Big Board gives you a tool that will compare favorably with any DATA I/O-PDP 11 combination.

When I built the programmer, I did some fiddling with the hardware and with the software. I am including the fiddled and unfiddled versions so you can pick the system that is in tune with your own needs.

As you will see, Jim did a super job designing both the hardware and the software to read and program 2708s, 2716s and 2732s. I didn't need to read or program 2708s so I removed that part from both the circuit and from the software. I also reduced board complexity by getting 5 V and unregulated 30 V from the Big Board supply. Again, both circuits and versions of software are available.

I also got a bad case of software feature-itis and added a few little extras such as the CCITT standard CRC (cyclic-redundancy-check) so that you can tell whether or not the ROM or .COM file has loaded into memory correctly, and a check that verifies that the ROM you are about to burn has been completely erased (you can override the check to do a reburn).

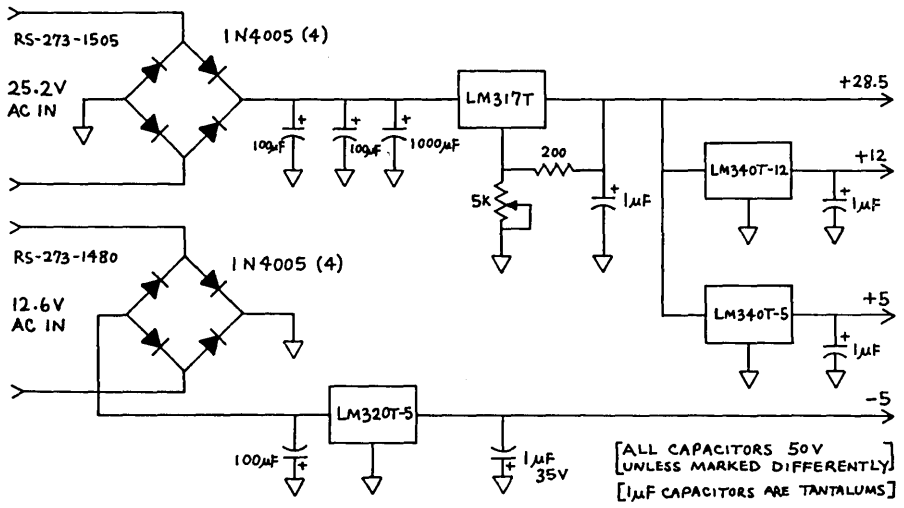
CRCK3.COM (on user disk #3) contains the same CRC algorithm I used in the modified ROM program so a CRC check on EPROM.COM generates the same CRC number as a CRC check on the original ROM. This way you can verify (to 1 part in 65,000) that the disk data matches the ROM. Not even the DATA I/O can do all this.

In both versions, the software reads ROMs into memory, compares the contents of a ROM with memory (byte by byte, reporting any differences), and programs ROMs. They will read a .COM file into the programming part of RAM so that you can burn the data into ROM. Plus, of course, you can enter the PFM monitor and shift, shuffle, and twiddle bits to your heart's content before going back into the programming routine and casting your work in silicon. (Are you drooling yet? Better crank up the old soldering iron.)

All of the software (complete source, .com, and documentation files for both versions) is on user disk #3.

Jim Chamberlain, PO Box 81, Pittsford NY 14534, 716-377-0369, is laying out a circuit board for the 2716-2732 version of the ROM programmer. ■ ■ ■

*Power supply for the original EPROM programmer*




If you need to program a 2708, 2716, or 2732 EPROMs then this article is for you. The article covers construction, bigboard jumpers, and operation.

### CONSTRUCTION

Following the schematic, construct the programmer on a wire wrap board of your choice. Don't forget to use decoupling capacitors between Vcc and ground (one .01 micro farad cap. per IC) even though they are not shown on the schematic. Also use three or four 15 mfd tantalum capacitors between the plus five volt supply and ground. Observe polarity with the + lead connected to Vcc and the other lead connected to ground. Keep these leads as short as possible.

Using connectors of your choice, construct a cable to attach the programmer to the bigboard connector J5 as follows:

Port A

| Name | BB J5 |
|---|---|
| DATA BIT 0 - | PIN 6 |
| DATA BIT 1 - | PIN 8 |
| DATA BIT 2 - | PIN 10 |
| DATA BIT 3 - | PIN 12 |
| DATA BIT 4 - | PIN 14 |
| DATA BIT 5 - | PIN 16 |
| DATA BIT 6 - | PIN 18 |
| DATA BIT 7 - | PIN 20 |

Port B

| Name | BB J5 |
|---|---|
| CLOCK ------ | PIN 26 |
| PGM -------- | PIN 30 |
| PROG ------- | PIN 32 |
| VERIFY ----- | PIN 34 |
| RESET ------ | PIN 36 |

GROUND (ALL ODD PINS)

**Power Supply.** Be sure to observe polarity of the electrolytic capacitors. For the positive supplies, the + lead must go to the positive side of the supply, and the other lead to ground. For the -5 volt supply the + lead should go to ground, and the other lead to the -5 volt supply. Be

sure and mount LM340T-5 plus five volt regulator and the LM317T adjustable positive voltage regulator on heat sinks, using heat sink grease. The LM340T-12 twelve volt regulator and the LM320T-5 minus five volt regulator do not require heat sinks.

**Personality Modules.** Now you need to fabricate the personality modules. On separate 16 pin dip headers make the following jumper connections for the personality modules:

*Editor's note: on the modified circuit, the +5 V is supplied by the Big Board's supply. Only the +25 V is regulated on the programmer board and the LM317 does not require heat sinking. The other voltages are not required.*

2716 Personality Module

pin 1 to pin 16
pin 2 to pin 15
pin 3 to pin 14

2732 Personality Module

pin 4 to pin 13
pin 6 to pin 11
pin 7 to pin 10

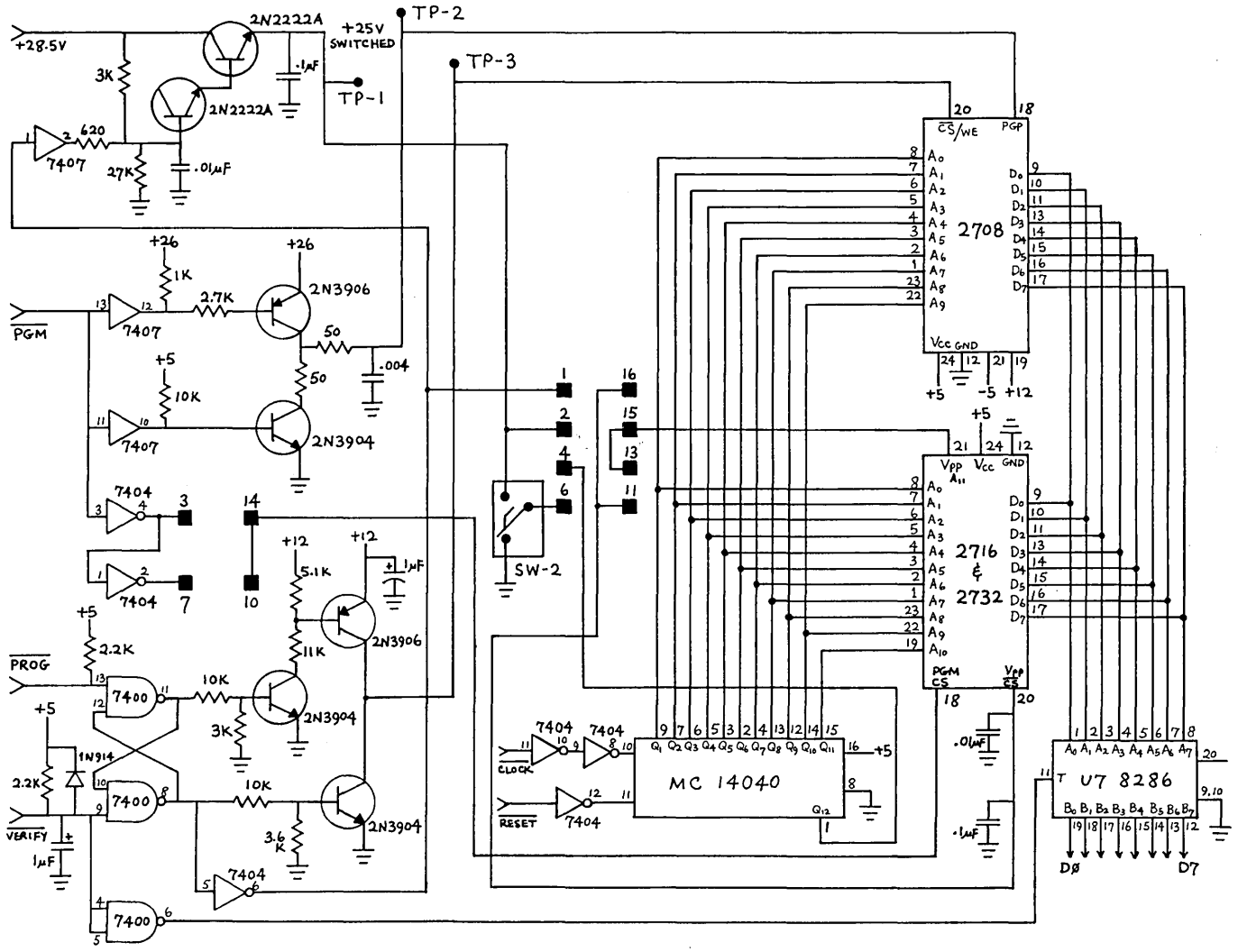
Next mount the 24 pin textool zero insertion force sockets to two 24 pin dip headers. This will make their attachment to the rest of the circuit simpler.

**Finally,** adjust the programming voltage. Adjust R19 while the program is running menu selection number 6 with no EPROMs in the programming sockets! Set R19 so that the voltage between test point TP-1 and ground is exactly 25.5 volts. Use an accurate high-impedance voltmeter. This voltage will work for programming 2708s, 2716s, and standard 2732s.

**CAUTION:** To program Intel 2732A parts you will have to lower the programming voltage from 25.5 V to 21 V. Otherwise you will damage the 2732A. You have been warned!

*(continued next page)*

*EPROM programmer for 2708's, 2716's, and 2732's (original)*



*(EPROM Programmer continued)*

**BIGBOARD JUMPERS**

I assume that your bigboard has the PIO parallel option installed in it. You will also need two 74LS243 I.C.s installed in sockets U90 and U92 of the PIO section. On two separate 14 pin headers, jumper the following pins, and install the headers in sockets U91, and U93:

pin 6 to pin 8
pin 5 to pin 9
pin 4 to pin 10
pin 3 to pin 11

Also jumper JB3 pin 16 to JB3 pin 14 now, jumper JB3 pin 14 to J5 pin 40. This last connection uses bit 7 on PIO port B to control the direction of the bidirectional buffers in U90 and U92. The EPROM data is output and input on port A of the general purpose PIO. The general purpose PIO port B is used to control the programmer, with the following control signal designations:

| Bit | Data |
|---|---|
| 0- | Clock (active high) |
| 1- | Not used |
| 2- | Programming pulse (active low) |
| 3- | Programming mode (active low) |
| 4- | Verify mode (active low) |
| 5- | Reset (active low) |
| 6- | Not used |
| 7- | Buffer direction (0=out 1=in) |

**SOFTWARE**

The program, available on user disk #3, is very heavily commented, and should be self-explanatory. The program has been in use for quite some time now, and I believe it to be bug free.

*Editor's note: The following is a description of the unmodified programmer routine but the operation of both is very similar. Both are menu driven and self-explanatory.*

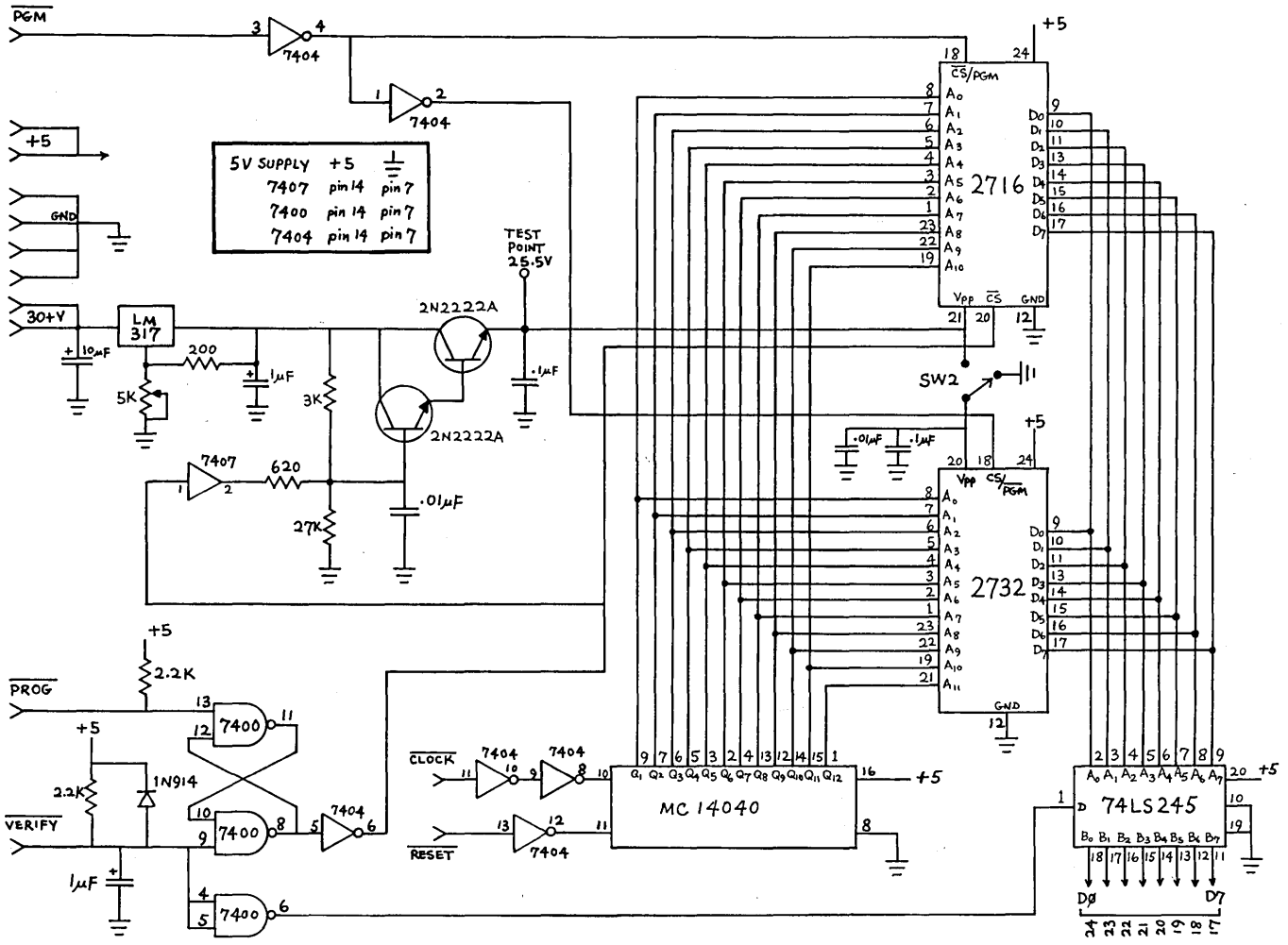
**OPERATION**

First, place the correct personality module (not used in the modified circuit) in the personality socket, and put the EPROM in the correct ROM socket. Then to do a:

**2708 READ**

Enter "1". The program will then

*EPROM programmer for 2716's and 2732's (modified)*



read the contents of the eprom into memory starting at location 4000 hex.

**2708 COMPARE**

Enter "2". The program will read the contents of the eprom and do a byte-by-byte compare with the data in memory. It reports any differences, and their addresses, to the console.

**2708 PROGRAM**

Enter "3". The routine will will program the 2708 with memory data starting at memory location 4000 hex. When the programming is complete (about two minutes) the routine will do a compare (see above).

**2716 READ**

Enter "4". The program will tell you to make sure that the 2716 personality module is in the personality socket and wait for you to type a space. When the program receives a space, it reads the 2716's data into memory starting at location 4000 hex.

**2716 COMPARE**

Enter "5". The program will tell you to make sure that the 2716 personality module is in the personality socket and wait for you to type a space. When the program receives a space, it will read the contents of the eprom and do a byte-by-byte compare with the data in memory. It reports any differences, and their addresses, to the console.

**2716 PROGRAM**

Enter "6". The program will tell you to make sure that the 2716 personality module is in the personality socket and wait for you to type a space. When the program receives a space, it will program the 2716 with memory data starting at memory location 4000 hex. When the programming is complete (about two minutes) the routine will do a compare

**2732 READ**

Enter "7". The program will tell you to make sure that the 2732 personality module is in the personality socket and wait for you to type a space. When the program receives a space, it reads the 2732's data into memory starting at location 4000 hex.

**2732 COMPARE**

Enter "8". The program will tell you to make sure that the 2732 personality module is in the personality socket and wait for you to type a space. When the program receives a space, it will read the contents of the eprom and do a byte-by-byte compare with the data in memory. It reports any differences, and their addresses, to the console.

**2732 PROGRAM**

Enter "9". The program will tell you to make sure that the 2732 personality module is in the personality socket and wait for you to type a space. When the program receives a space, it will tell you to turn on the programming voltage, and will wait for another space. After the program receives the second space, it programs the 2732 with memory data starting at memory location 4000 hex. When the programming is complete (about four minutes) the routine will do a compare (see above).

**READ A .COM FILE**

Enter ":" at the console. The program will then ask you for the file name. Enter X:FILENAME.COM (the drive character 'X:' is optional). If it doesn't find the file the program displays an error message. The file must fit between 4000H and D3FFH, or be broken up into smaller pieces.

**MOVE BLOCK OF DATA**

Enter "0". The program will ask what size block of data to move down to 4000H. The size of the block will depend on the eprom being used. Type 1 for a 2708 eprom, 2 for a 2716 eprom, and 3 for a 2732 eprom.

**SAVING THE CONTENTS OF EPROM**

Read the eprom into memory using the programmer and the appropriate menu selection. Next type ^C. This will take you back to CP/M. Now get into DDT.COM and use it to move the data at 4000 hex down to 0100 hex.

After moving the data from 4000 hex to 0100 hex type ^C and use the SAVE command to put the eprom image on disk.

**EXAMPLE:**

```
DDT
M4000,5000,0100
GO 0
SAVE XX EPROM.COM
```

XX depends on the size of the eprom.

2708 XX = 4
2716 XX = 8
2732 XX = 16

■ ■ ■

*(Letters continued)*

increase in disk storage, faster program loading and execution, print spooling, no-fault disk changes, pipes, and better error recovery. The entire I/O system has to be rewritten for it to run though. I'll let you know how it turns out.

I'll have a PFM replacement pretty soon which will include such additions as: auto boot, reverse video highlighting, status line with time/date and error reporting, plus interrupt driven SIO and PIO ports.

**Andrew Beck**
**PO Box 339**
**Princeton Junction, NJ 08550**

*Editor's note:*

*Yes, I'm sure a lot of people would be interested in your observations on text editors and on TURBODOS. Plus, I've talked to a number of folks interested in a 5" drive interface. I'm glad you're making it available.*

Dear Editor,

I have interfaced my BB to a pair of used Shugart 901s. They work quite well though a bit slower than the newer ones. So I have to put in an extra delay for the stepper motor. To do this I have to set SPEED (at 0FF6AH) to 03. This means I have to make this change with PFM each time I do a hardware reset (a pain). Is it possible to get a modified PROM?

I am using a text editor called MICRO-WYL. It acts almost exactly like

*(continued on page 11)*

# Do It Yourself Character Set

**By Ron Drafz**

4820 Westgrove #2707
Dallas TX 75248

Here is a way to double the number of characters the Big Board can display and design your own special characters to the Big Board. Hardware wise, it is very simple, replace the 2716 character ROM with a 2732 and change one jumper.

By replacing the original 2716-1 (350 ns) EPROM with an Intel 2732A-3 (300 ns) you double the ROM space. To save the original character set just copy the contents of the 2716 into the lower half of the 2732.

The Big Board is shipped with a jumper from U73 pin 21, to U73 pin 24. Remove that jumper and add a new one from U73 pin 21 to U71 pin 11. This upgrades the display from 128 characters to 256 characters by using 8 bits (D0b through D7b) to select the displayed character. See Figure 3.

### Generating a character

A3 through A11 specify which character is displayed and A0 through A2 identify which horizontal line of that character to display. See Figure 1 to compute the ROM addresses.

Following is a description of how you can create your own special characters. Keep in mind that you can only use 5 by 8 out of the total 8 by 8 matrix, the remainder is blanked.

### Down to the nits

First start with an 8 by 8 matrix (Figure 2). Bits 5, 6, and 7 are "don't cares", we'll set those to 1. A "0" in bits 0 through 4 becomes a lit pixel.

Note that you can customize the present ROM if you don't need more than 128 characters.

■ ■ ■

Figure 1

Compute the 8 ROM addresses for "F" (46H)

| A11 | A10 | A9 | A8 | A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D7B | B | D6B | D5B | D4B | D3B | D2B | D1B | D0B | -- | SCAN | -- | = | ROM Address Lines |
| | | | | | | | | | | | | = | Input Data Names |
| 0 | | 1 | 0 | 0 | 0 | 1 | 1 | 0 | | | | = | 46H = "F" (0100,0110) |
| | 1 | | | | | | | | | | | = | Blanking bit (must be 1)* |
| | | | | | | | | | X | X | X | = | Select 8 bytes (000-111) which make up a character |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | = | 630H (Address of 1st byte) |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | = | 637H (Address of 8th byte) |

* All ROM locations 000H-3FFH and 800H-BFFH should contain 0FFH to blank the screen when this bit is 0.

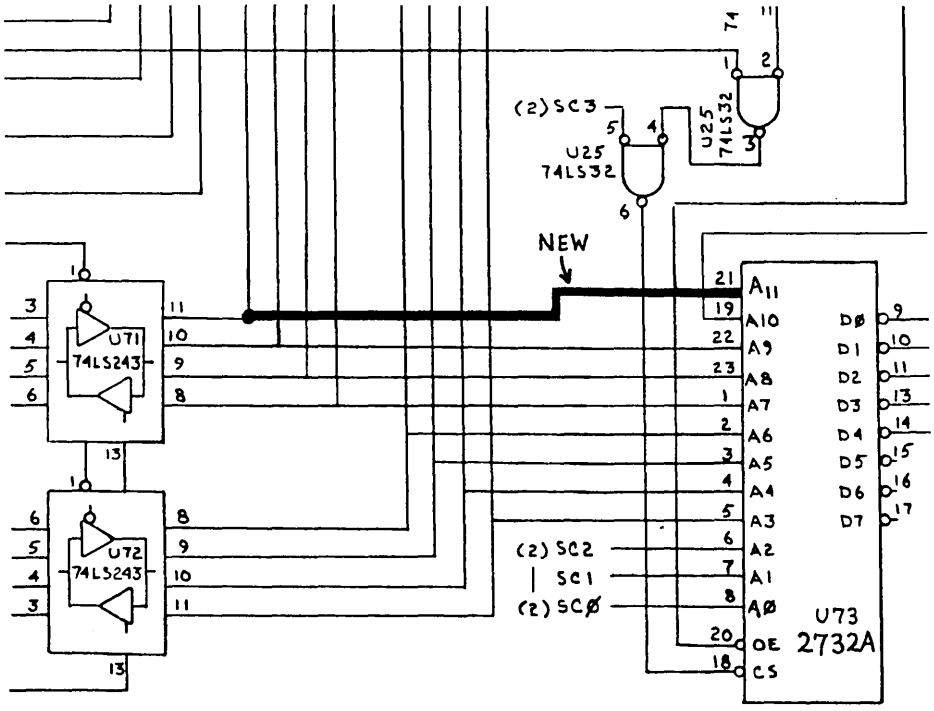
Figure 2

Putting an F into addresses 630H - 637H.

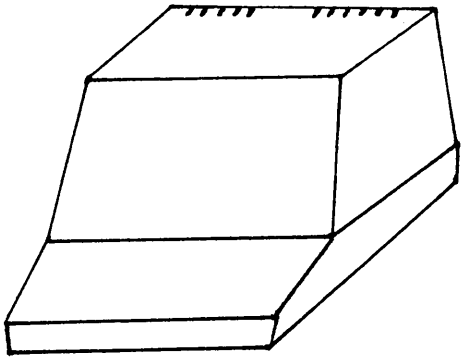
| Addr. | Data | | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 630H | E0H | = | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | | * * * * * |
| 631H | EFH | = | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | | * |
| 632H | EFH | = | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | | * |
| 633H | E1H | = | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | = | * * * * |
| 634H | EFH | = | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | | * |
| 635H | EFH | = | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | | * |
| 636H | EFH | = | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | | * |
| 637H* | FFH | = | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | |
| | | | DON'T CARES | | | 5/8 MATRIX | | | | | | |

* This row is reserved for lower case descenders on Char ROM V 2.X

*Jumper change for 2732 character ROM.*



# SPRING CLEARANCE SALE
## WHILE SUPPLIES LAST



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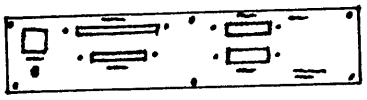

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***LIST $12*** **NOW ONLY $9**
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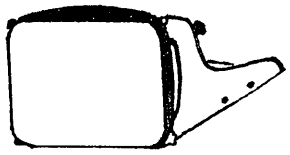

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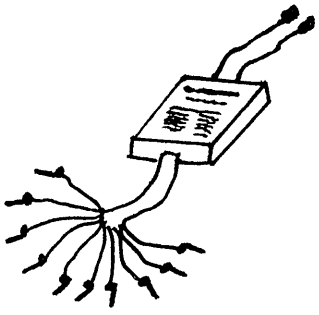

### OCTATRACE

**This dandy little gadget will make just about any scope display 8 channels of TTL level signals. Invaluable for troubleshooting computers. Bandwidth is greater than 3 MHz. Power supplied by circuit under test. Kit includes P.C. board, case, decal and comprehensive manual with parts list.**

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**Send us your name and address to be placed on our mailing list for other great specials.**

# A Self-Loading ROM

**By Rob DeVoe**

3850 SE Grant
Portland, OR 97214

When Dave and I started talking about offering ROM FORTH, we decided that one of the most important design goals was that it be easy to use. In fact, we first discussed adding an 'F' command to PFM which would load FORTH into RAM. However, that would have meant modifying PFM and then selling four ROMs instead of three.

So we decided a more economical approach was to use the 'G' command along with the monitor's little-known 16 byte feature. You see, when the monitor loads itself into high memory it also loads the first 16 bytes of the following ROM space into RAM (beginning at F7F0). All we had to do was create a loader that selected the ROM bank, loaded the ROMs into RAM, and then transferred control to the code in RAM; all in 16 bytes.

To set the PIO bit 7 (select the ROM bank) I had to load the A register and output it to the PIO. The block move entails loading three 16-bit registers followed by an LDIR instruction. And finally, the control transfer is a JP to a 16 bit address.

So we normally have:

```
LD      A,0CEH          2 bytes - load CE into the A register
OUT     (1C),A          2 bytes - output CE to port 1C (select ROM bank)
LD      HL,0810H        3 bytes - HL gets address of source
LD      DE,4000H        3 bytes - DE gets address of destination
LD      BC,1800H        3 bytes - BC gets byte count
LDIR                    2 bytes - move code from ROM to RAM
JP      4000H           3 bytes - transfer control to 4000

                       18 bytes total
```

However, you can reduce this to 16 bytes if you use the data in the C and E registers twice.

So we now have:

```
LD      HL,0810H        3 bytes - HL gets address of source
LD      DE,40CEH        3 bytes - DE gets destination, making sure
                                  that E contains CE (destination
                                  can be anywhere in upper RAM)
LD      BC,181CH        3 bytes - BC gets byte count (since it can be
                                  anything over 1800 we will put 1C in C
                                  for double duty)
OUT     (C),E           2 bytes - write CE to port 1C, this is where we
                                  save the two bytes by using the contents
                                  of the C and E registers.
LDIR                    2 bytes - move 181C bytes from 0810 to 40CE
JP      40CEH           3 bytes - transfer control to 40CE

                       16 bytes (perfect)
```

Now we have transferred the code from ROM into RAM and if the code is happy to run at 40CE, we're done. However, for FORTH I needed to relocate the whole chunk into low RAM between 0000H and 1800H. So the first bytes at 40CEH relocate FORTH again.

```
LD      A,04EH          load A with 4E to reset bit 7 on port 1C
OUT     (1CH),A         output it to select the ram side in low memory
LD      BC,1800H        BC gets byte count
LD      DE,0000H        DE gets destination
LD      HL,40E0H        HL gets source addr, 1st byte past this code
LDIR                    move it
JP      0000H           jump to new location
```

So, all the user needs to do to call FORTH is enter GF7F0 and in no time there appears:

**Z80 fig-FORTH 1.1 BIGBOARD 1.0**

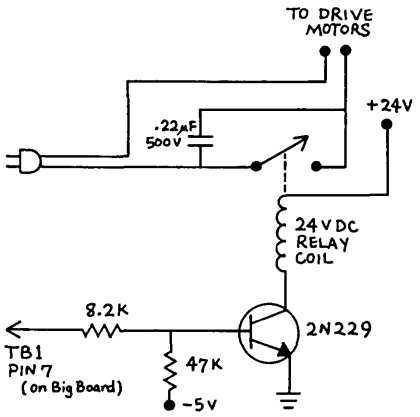
■ ■ ■

# Designer's Corner

I finally got tired of listening to my disk drives grind on and on and decided to do something. So I dug out the article on disk drive motor control and my junk box and put something together.

Initially I had the problem mentioned in the article, a huge transient on the 5V line which sent the CPU off picking daisies. The transient was caused by arcing across the relay points. I added a .22 mfd 500V capacitor across the points and whoopee, the transient was gone.

The relay in my spare parts box had a 24 V DC coil so I added a simple circuit to turn it on and off from the 4 V TTL line.




The -5V provides a reverse bias for the transistor so it turns off. The relay is a Guardian IR-1225-2C-24D.

Jim Showker
User's Software
7812 White Oak Ave
Northridge, CA 91325

*Editor's note, just about any small DC relay should work in this application. You can use a 12 VDC relay by simply substituting the +12 V line for the +24 V or use a 6 VDC relay (they usually pull down at 4 V) by substituting the +5 V line. Otherwise the circuit is the same. Also, just about any one-watt or greater NPN transistor with reasonable gain should work in this application.*

*(Letters continued)*

the WYLBUR editor I am used to. Since editors are controlled by the fingers, not the head, that is a significant advantage. The price is $250 so it is not cheap but it is very powerful.

The electronics division at Argonne National Laboratory has done extensive modifications to MODEM7, and renamed it MODEM7.5. It will handle half duplex systems, and file transfers with line by line protocols (appears to be a terminal session to an editor). The comment section in the assembly listing grants anyone permission to use the package but not permission to market. I wonder if it wouldn't be a good candidate for a user disk if it falls within the copyright permission.

**Dale Koelling**
**5400 Webster**
**Downers Grove, IL 60515**

*Editor's note:*

*Yes, I'll be glad to burn a modified ROM for anyone on the same basis that I'm doing the fast monitor ROMs and character ROMs. Just send your board number, a ROM, and a self addressed stamped envelope along with $5.00. Or send just the board number and $25.00 and I'll return a custom fast ROM prepaid. Of course, include the information on the modifications (please specify the ROM address rather than the destination address, the ROM address for SPEED is 00FCH).*

*About the public domain software, we're operating as a non-commercial user group. $15 per disk is more than CPMug but about half as much as some other groups charge for copies of public domain software.*

---

Dear Editor,

I'm using a Persci 277 dual drive. It has a single spindle and head carriage which leads to problems unless you make the following changes to the head position table:

**Original:**

```
F6C3 2806 JR Z,SEL2-$
;CONTINUE IF NEW DRIVE IS
READY
```

**New:**

```
F6C3 2824 JR Z,HOME-$
;HOME HEAD IF NEW DRIVE IS
READY
```

This homes the head when changing drives. The mod may also be needed for double-sided drives.

**John Ballenthin**
**2 Vine St.**
**Lexington, MA 02173**

---

Dear Editor,

Thank you for reviewing our LYNC data communications program in your February issue. We especially appreciate your printing the initialization parameters required to get LYNC running on the Big Board. We have expanded our manual to 12 pages so it's easier to use.

Since many of your readers have a limited budget we are offering a special price of $80 ($15 off the regular price) to anyone mentioning Micro Cornucopia when placing an order.

Also, enclosed is a check for $16 for a one year subscription to Micro Cornucopia; it's a great publication!

**Eric Randall**
**COMPUTER-AID**
**1122 De La Vina**
**Santa Barbara, CA 93101**

■ ■ ■

# FORTHwords

## A Column by Arne A. Henden

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

Because Hampton Miller is reviewing two FORTHs in this issue, I am handling the column myself. Hampton will be back in force next issue. *(May the force be with him. Ed)* In this column I'll cover some happenings in the FORTH world. Following this I'll present a terminal emulator.

### Benchmark Update

I've run the floating point tests using Big Board UNIFORTH. Z80 software executes basic math operations about as quickly as the 9511 processor. However, for sines, cosines and other transcendental functions the 9511 is about 20 times faster. One of the reasons that the software is so slow is that it is written in high-level FORTH. I have a complete timing breakdown that includes the LSI-11/23 and 8086 versions of UNIFORTH available for anyone who sends an SASE.

If you want fast floating point that is IEEE compatible, you are presently limited to the 2MHz 9512 or its cousin the 4MHz 8232A. These do not have the trig functions built in. It might be possible to interface the Intel 8087 co-processor to the Big Board for some super speed advantages, but the chip costs as much as the Big Board!

### In the Journals

I plan to cover some of the more interesting FORTH utilities presented in various journals. Two of these are listed below, and others will be covered in subsequent columns.

"A Disk Operating System for FORTH, An In-depth Look at How a DOS Operates" (by Peter Reece, *Byte*, April 1982). Reece has developed FORTHDOS, a very useful file-oriented disk utility for FORTH. It provides all of the usual directory, random and sequential record access, file locking, etc. routines and should be seriously considered for your system. It is about 27 screens long and shouldn't be difficult to implement. Extensions to FORTHDOS could include variable-length records and fixed-length records of more than one size.

"A Screen-oriented Editor in FORTH" (by Henry Laxon, *Dr. Dobb's Journal*, September 1981). This is a public-domain editor that is very nice and has a lot of features. Commands are similar to Wordstar. It is 63 screens long and therefore will take a while to enter.

Laxon is a good writer, and you should at least look at the editor; it is an excellent example of how to document FORTH properly. If you don't already have a video editor, I recommend this one highly.

Leo Brodie, who wrote "Starting FORTH", has moved from FORTH, Inc. to Inner Access Corporation (Belmont CA). IAC offers many FORTH classes and consulting services (not cheap). Brodie is also now the editor of FORTH Dimensions, and promises to publish more applications and less system programming.

The Allen Group of Kalamazoo MI. is using FORTH to control its SMART SCOPE automotive diagnostic analyzers. Aregon Systems, Inc. of Anaheim CA. is using FORTH in its product, Data Ace, a relational data base management system. David Beers is giving a talk on Data Ace at the 1982 Rochester FORTH Conference in May. Data Ace is a commercial product and is definitely not within reach of the hobbyist's pocketbook.

### A Programming Preamble

I'll be presenting a FORTH application in every column. These applications will follow FORTH-79 conventions wherever possible. Readers are encouraged to submit their own applications for inclusion, but are asked to keep non-standard words to a minimum. *(Watch your language folks.)*

However, there is no standard for machine-language words. I will

```
SCR # 70
  0 ( A simple terminal emulation program in FORTH)   HEX
  1 (  Using the SIO-B port and the PFM monitor interface)
  2 (  Note:  use either the UNIFORTH or ROM-FORTH versions)
  3 (         of the 3 primitives, but not both!)
  4 ( Written 1982 by A. Henden)
  5 (     ****   UNIFORTH versions of the primitives **** )
  6 0F012 CONSTANT SERSTAT ( serial status routine)
  7 0F015 CONSTANT SERIN   ( serial input routine)
  8 0F018 CONSTANT SEROUT  ( serial output routine)
  9 CODE ?SIO   ( --- t/f ...is any data at serial port?)
 10     SERSTAT CALL,  A L LD,  0 H LD,  HPUSH,  END-CODE
 11 CODE SKEY   ( --- c ...bring in one char from serial)
 12     SERIN CALL,  A L LD,  0 H LD,  HPUSH,  END-CODE
 13 CODE SEMIT  ( c --- ...emit char to serial port)
 14     HL POP,  L A LD,  SEROUT CALL,  NEXT,  END-CODE
 15 DECIMAL ;S

SCR # 71
  0 ( Terminal emulator , screen 2)   HEX
  1 (     **** ROM-FORTH form of the 3 primitives **** )
  2 : PSCODE  ( pseudo CODE defining word)
  3     <BUILDS  HERE 2+ , DOES> EXECUTE ;
  4 PSCODE ?TERMINAL  ( --- t/f ...has a terminal key been struck?)
  5     06CD , 6FF0 , 0026 , 2BC3 , 0000 ,
  6 PSCODE ?SIO   ( --- t/f ...is any data at serial port?)
  7     12CD , 6FF0 , 0026 , 2BC3 , 0000 ,
  8 PSCODE SKEY   ( --- c ...bring in one char from serial)
  9     15CD , 6FF0 , 0026 , 2BC3 , 0000 ,
 10 PSCODE SEMIT  ( c --- ...emit char to serial port)
 11     7DE1 , 18CD , C3F0 , 002C ,
 12 DECIMAL ;S
 13
 14
 15
```

usually use the UNIFORTH Z-80 assembler because it's simple. Its mnemonic conventions are straight reverse polish: "source, destination, opcode." I will present as few CODE words as possible to keep confusion down. If you have any problems converting the UNIFORTH CODE words to your FORTH's assembler, drop me a line and I'll try to help.

Z80 FORTH and ROM FORTH users can minimize the conversion by purchasing the Z-80 assembler and cursor-addressed screen editor from Unified Software Systems *(was Unisoft)*. The price is $25 including shipping.

The listings for the last issue were kindly printed by Dave Thompson. Unfortunately, his printer did not have 'greater than' and 'less than' signs, and printed fractions instead. Replace every '1/4' that you see with a 'less than' and every '1/2' with a 'greater than.'

**A Simple Terminal Emulator**

The terminal emulator shown in the screens below is presented as an example of how to interface with a simple I/O device.

Think of writing in FORTH as "top-down design, bottom-up programming." You first decide what you want the final application to be and flowchart the program. Then, use CODE words (if you must!) to do the most primitive interfacing with the I/O device and test these words. Finally, build on these primitives with high-level FORTH to finish the application.

For our case, the words ?SIO, SKEY and SEMIT need to be machine-language to call the PFM monitor routines that perform I/O and status checks for serial port B. You cannot call the PFM routines directly from high-level FORTH because you cannot fill the necessary registers, and the PFM routines won't return to the FORTH "inner interpreter" (NEXT).

However, once defined, these three primitive words give you full access to the serial port. The first screen shows the UNIFORTH form for these primitives, followed by the ROM FORTH form. Because ROM FORTH does not have a built-in assembler, the words are much more obscure, essentially being hard coded.

The word SIMP-EM is a high-level FORTH word that polls both inputs and performs output accordingly. SIMP-EM uses an infinite loop, and so will emulate a terminal until you reset your system. This basic loop is so simple that it could be entered by hand (hard-coded) with the PFM 'M' command. However, by programming in FORTH, you can add many features to the basic loop.

EMULATE is a more complex version of the emulator. It adds two functions: a means of exiting the emulator and returning to FORTH (CTRL-A from the console), and a simple terminal-to-computer file transfer (CTRL-B from the console). The file transfer routine, SEND-FILE, asks the user to enter the mass storage region to be transferred, and then sends a carriage return to the serial port (ending the last line you sent to the port), followed by the contents of all requested mass storage blocks.

For this version, you are required to have the necessary CR/LF's imbedded in the text, and some sort of file terminator at the end of the text. No handshaking, such as XON/XOFF, is included. EMULATE at least gives you an idea of how you would go about adding features.

The UNIFORTH version of the terminal emulator is far more extensive, and includes port A functions, paging, baud rate selection, etc. In addition, a small turnkey FORTH terminal emulator is currently being developed that will fit in 1-2 ROMs. This application will be discussed in greater detail in the next column.

*(continued next page)*

```
SCR # 72
  0 ( Terminal emulator, screen 3)
  1 : SIMP-EM  ( basic emulation loop...half duplex till infinity)
  2     BEGIN ?TERMINAL IF KEY SEMIT THEN ?SIO IF SKEY EMIT
  3     THEN 0 UNTIL ;
  4
  5 : GETNUM  ( bring in number from console, interactive)
  6     PAD 20 BLANKS PAD 1+ 17 EXPECT PAD NUMBER DPL @ 0<
  7     IF DROP THEN ;
  8 : SEND-FILE  ( send file to computer, interactive)
  9     ." Starting block#: " GETNUM CR ." Ending block#: "
 10     GETNUM 1+ SWAP 13 ( cr) SEMIT DO  ( loop over blocks)
 11      I BLOCK  1024 0 DO  ( loop over chars w/in block)
 12        DUP I + C@ SEMIT LOOP
 13      DROP LOOP ;
 14 -->
 15

SCR # 73
  0 ( Terminal emulator, screen 4)
  1
  2 ( A more compilicated emulator.  CTRL-A drops out of the )
  3 (  emulation, CTRL-B calls SEND-FILE)
  4
  5 : EMULATE  ( endable loop of half-duplex termulation)
  6     BEGIN  ?SIO IF SKEY EMIT THEN ?TERMINAL ( term I/O ?)
  7      IF KEY DUP 1 =  ( CTRL-A ?)
  8        IF DROP 1 ELSE DUP 2 =  ( CTRL-B ?)
  9          IF DROP SEND-FILE ELSE SEMIT THEN 0 ( continue flag)
 10        THEN
 11      ELSE 0 THEN
 12     UNTIL ;
 13 ;S
 14
 15
```

# FORTH Reviews

**By Hampton Miller**

PO Box 816
Carpinteria, CA 93013

## FORTH in ROM

| | |
|---|---|
| Author: | Rob DeVoe |
| Type: | 8080 fig-FORTH |
| Distributor: | Micro Cornucopia |
| Price: | $65.00 - 2716<br>$80.00 - 2716-1 |
| Requires: | Big Board |
| Manual: | 14 pg glossary<br>4 pg examples and implementation notes |

Have a Big Board and want to run fig-FORTH right now? Then FORTH in ROM is for you. Just plug in the three ROMs, tell PFM 'GF7F0', and presto, you're running FORTH!

Rob DeVoe has been fiercely faithful to the 8080 fig model with only a few departures. And these departures have all been in the right direction. This fidelity is both the major strength and weakness of ROM FORTH.

The strength is that your 8080 fig programs will certainly run with little, if any, modification. The weakness is that the disk is accessed on a sector by sector basis so you may load and unload the head as many as eight times each time you read a screen of data (depends on how long it takes to process each sector of data). While there is no easy hardware fix for this, software enhancements (in FORTH) are certainly possible. Watch for these in Micro C.

No application software (editors, assemblers, etc.) were delivered with my pre-release copy but David Thompson tells me that a FORTH users disk is in the making. My above-mentioned enhancements will probably find their way onto it.

### Conclusion

Despite the head banging, I have to admit that ROM FORTH is the FORTH that I use on my own system. The price is right, the media never crashes and it meets its specifications with grace and honor.

---

*(FORTHwords continued)*

### Letters

Comments from readers are beginning to come in, and I greatly appreciate them. While most have been highly favorable, there are some dissenters. Remember, FORTH is an excellent instrument control and interfacing language. It was not designed for data-crunching, where you should use FORTRAN or PASCAL instead.

### Next column

Cross-compiling FORTH to create small kernels dedicated to a single task is a common practice, and one ideally suited to the Big Board. Cross-compiling is the process of generating on one system (the host) a FORTH that is to be executed on a another system (the target). The MetaFORTH cross-compiler is used with UNIFORTH and will be discussed in detail. Hampton will present a simple FORTH application. Good luck and smooth programming! ■ ■ ■

## UNIFORTH

| | |
|---|---|
| Author: | Arne Henden |
| Type: | Z80 FORTH-79 |
| Distributor: | Arne Henden<br>PO Box 2644<br>New Carrollton, MD 20784 |
| Price: | $50.00 |
| Floating pt: | $35.00 additional |
| Requires: | Big Board |
| Manual: | 68 pg spiral bound |

The hardest thing about using UNIFORTH is getting it out of the packing materials. Arne Henden does an excellent job making sure that you get this FORTH undamaged.

### The manual

Included with the disk is a really substantial and excellent manual. It includes step-by-step descriptions liberally sprinkled with superb examples. It's like being taught by a very knowledgeable long-time friend.

UNIFORTH is very easy to use. First you make a working copy of the distribution disk and then boot it up. A simple SYSGEN procedure allows you to tailor the package to your system. Arne has done a lot of work making sure that you can customize the system for your own needs. For instance, most of the UNIFORTH source (in FORTH) is included on the distribution disk. The source for the machine language kernel is available to purchasers at an additional charge.

### FORTH-79 Standard

UNIFORTH is an implementation of the proposed 79 standard. Users should note that most fig FORTHs are not 79 standard. Arne's manual carefully details which words are FORTH 79 standard, fig compatible, and which are unique to UNIFORTH. The glossary specifies which screen holds the FORTH source for each word (unless the word is defined in the machine language kernel).

### Editor

The basic price includes a relatively easy to use editor optimized for FORTH programming. It also can be used as a general purpose text editor.

The editor supports a number of different video terminals. While most users will probably use their built-in ADM-3s, UNIFORTH also knows about H-19s and even the IBM ASCII terminal. Bravo! The editor alone is worth the price of admission.

### Special features

UNIFORTH is custom fitted to the Big Board. Disk I/O is optimized, and the CTC, if present, is used to keep time and date. These added features make UNIFORTH a pleasure to use.

### Conclusion

UNIFORTH is an excellent implementation of FORTH. It is easy to use, has many useful features and utilities, and is a real bargain. I haven't used the assembler or floating point but they appear to be of the same high caliber. More goodies are on the way from Arne which will increase the value of UNIFORTH.

■ ■ ■

# UNIFORTH

You've heard about FORTH's interactiveness, speed and versatility. NOW HERE'S YOUR CHANCE TO OWN THE BEST! UNIFORTH is a stand-alone FORTH for the Big Board. No operating system is needed -- save your bucks for more important purchases -- but if you have CP/M, there is a utility available for file transfer.

UNIFORTH is FORTH-79 standard, with the double precision integer and assembler extensions. Don't get stuck with the 128-byte "blocks" and slow disk access of fig-FORTH! All code is FULLY OPTIMIZED for the Z-80, and all Big Board devices are supported, such as the CTC for listings with date and time. Included with UNIFORTH are:

- All SOURCE CODE except for a 5K byte kernel, so you can easily modify the system. The kernel source will be available in June as part of the Programmer's Manual.

- An interactive CURSOR-ADDRESSED EDITOR (the best around!). Others charge the price of UNIFORTH for just this alone. All keystroke commands are logical, and include string search and replacement, even across block boundaries. Forget a command? Just inspect the omnipresent menu.

- Full Z-80 ASSEMBLER, using Zilog mnemonics, with completely logical syntax; and it supports the undocumented index register instructions.

- Full IEEE-compatable single-precision FLOATING POINT software. Eight-bit signed exponents yield more range than the AMD-9511. All functions are included, such as sines, cosines and logarithms. Compare with the other FORTHs and see the difference!

- A 136-page USER'S MANUAL. Broken into logical function divisions, it includes many examples and leads you step-by-step through the learning process.

Pricing:

| | |
|---|---|
| Version 1 (without floating point) | $50 |
| Version 2 (with floating point) | $85 |

Own Version 1? You can upgrade to Version 2 for only $35. All versions distributed on IBM 3740 standard eight-inch single-density floppy disk. Postage is prepaid within the continental U. S.

UNIFIED SOFTWARE SYSTEMS
P. O. Box 2644
New Carrollton, MD 20784
(301) 552-1295

# HIGH RESOLUTION MONITOR FOR A LOW RESOLUTION PRICE

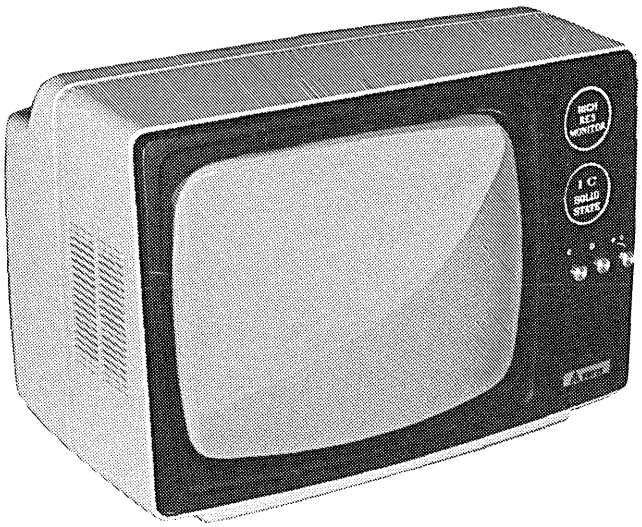
**SUPER DEALS ON HIGH RESOLUTION TECO MONITORS.**

Like Leedex or Zenith monitors, these 12 in. Teco monitors are complete, ready to connect to the Big Board's composit video output. Unlike the Leedex or the Zenith, however, the top of the line Teco features a 20 MHz bandwidth for unmatched resolution and P31 fast green phosphor. This model is crystal sharp even when displaying 132-characters per line.

However, if you insist on a display that our competition can match, we also have standard 15 MHz models with either P31 green or B&W phosphor.

These monitors are regular stock and include a complete money back guarantee. If you have any problems within three months, simply return the monitor for exchange or refund.

Also, ask about our quantity discounts on monitors and about our prices on Scientific, I-Ching, and game software.



**CHECK THESE PRICES**

20 MHz, green phosphor ... $138
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15 MHz, B&W ..... $118

Add $8 for shipping & handling.

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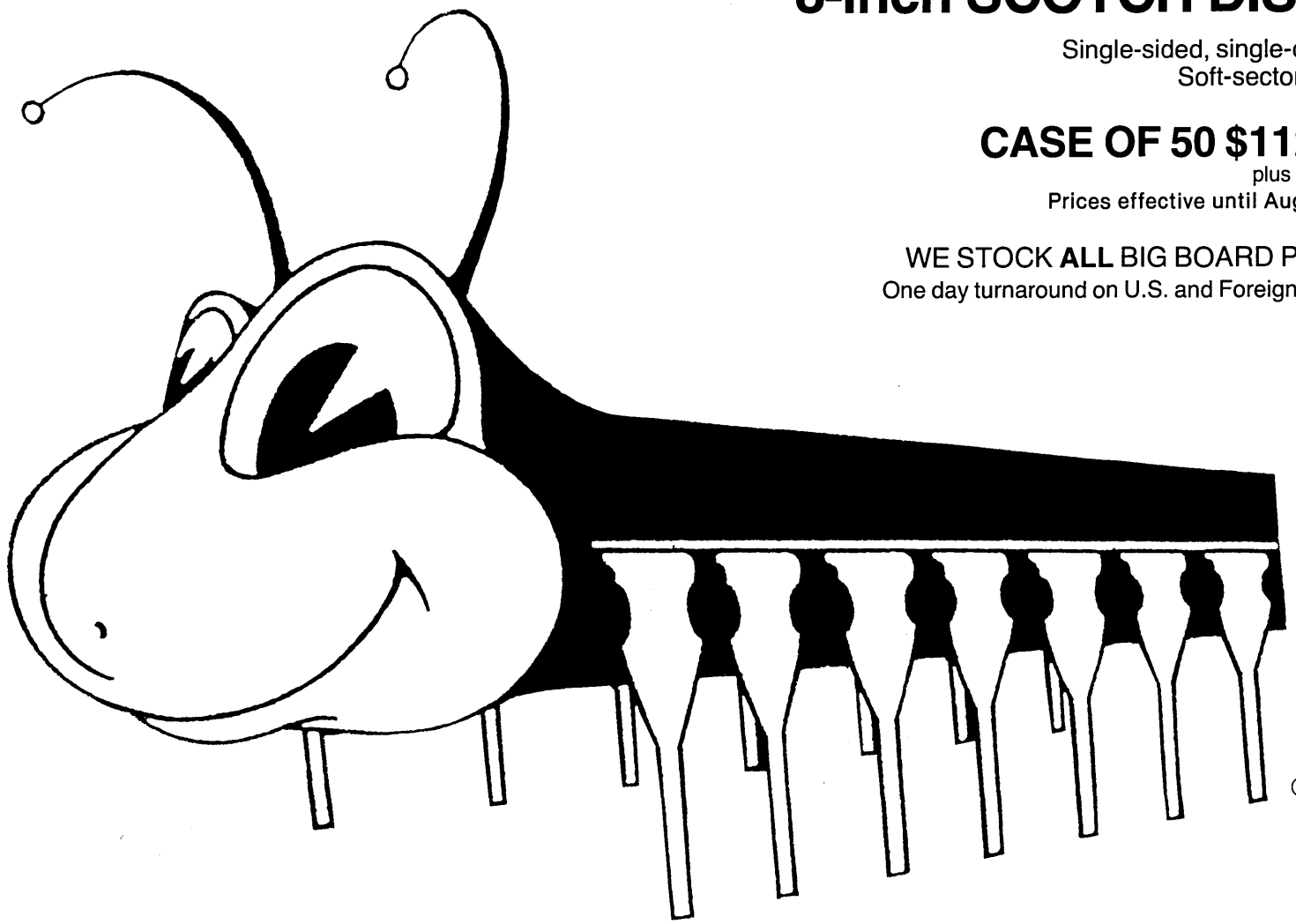
# 8-inch SCOTCH DISKS

Single-sided, single-density
Soft-sector 740-0

## CASE OF 50 $112.50

plus shipping
Prices effective until August 1st

WE STOCK **ALL** BIG BOARD PARTS
One day turnaround on U.S. and Foreign Orders




*NORVAC ELECTRONICS*

12905 S.W. BEAVERDAM ROAD, BEAVERTON, OREGON 97005 TELEPHONE: 503/644-1025

# DUAL DENSITY

YOU CAN RELY ON QUALITY BIG BOARD ADD-ONS FROM THE BIG BOARD'S ORIGINAL SOFTWARE DESIGNER—RUSSELL SMITH. SOFTWARE PUBLISHERS' LATEST COLLABORATION PRODUCED AN EASILY-INSTALLED, ADD-ON DUAL DENSITY BOARD. SPECIFICATIONS:

- ➪ An assembled and tested Daughter board that replaces the 1771, plugging into the 1771 socket, enabling you to run either single or double density.
- ➪ Uses a 1791 disk controller plus a field-proven digital data separator and write precompensation circuit.
- ➪ Requires absolutely no Big Board modifications. Runs with 2.5 MHz clock and standard PFM monitor ROM.
- ➪ Includes a disk that contains:
  - DDSYSGEN—A double density SYSGEN program
  - DDINIT —A disk initialization and verification program. Allows disks to be formatted in all standard single and double density formats.
- ➪ Available for 5¼" and 8" drive systems. (5¼" DUAL DENSITY board includes a 50 to 34 pin cable adapter.)

$250

SOFTWARE PUBLISHERS, INC.
2500 E. Randol Mill Rd., Suite 125
Arlington, Texas 76011
(817) 469-1551

# SOFTWARE PUBLISHERS, INC.

# Updated Double Density

**By David Thompson**

This is part two of the continuing review of double density packages available for the Big Board. The latest information from:

**Software Publishers**

John McFarland of Software Publishers sent me a review copy of Russell Smith's double density board. Installing the board was trivial (just lay the 8116's crystal on its side and plug in the new board), but incorporating the new CBIOS into my CP/M was definitely not trivial. The incorporation routines are very well done and easy to use except that my BIOS ORGs at E800 (like most Big Boards).

After half a day of trying everything that appeared logical, I called John and he walked me through it in a couple of minutes. Since then, they have redone the instructions for E800 so they are very easy to follow.

You should ask about getting a new monitor ROM from Software Publishers if you order their board. Otherwise you have to use the monitor to change the contents of FF6AH from 00 to 01 each time you reset the system. The step rate of 00 on the 1793 is too fast for most drives. If you are planning to get a fast monitor ROM for your board then order one from Micro C with the modified step rate (it's the same price as the regular fast ROM).

You have to be running 2.5 MHz in order to use the double density disk formatting routine. John mentioned that he would be sending the modification needed to use formatter with a 4 MHz system.

**Jim Monesmith**

I noted in issue #5 that my characters shifted to upper case after I used my rubout key. It turned out to be a hardware problem.

You see, I made my keyboard cable 12' long so I could move around pretty much at will. That is too long for ribbon cable.

Since I shortened it to about 7' my rubout key works fine, no longer sending phantom nulls to change the case. If you have phantom nulls changing your case, try putting your keyboard on a shorter leash.

**Otto Hiller**

Otto is working on a 5" drive interface that will be compatible with the Xerox 820. This means that you will be able to read and write disks from the latest Osborne system because they also can read and write 820 disks. (Standardization in the 5" world?) ■ ■ ■

| FEATURE | HILLER | SMITH | MONESMITH |
|---|---|---|---|
| DD Sector Size | 256-1024 | 256-1024 | 512 |
| Bytes/Disk (K) | 480-670 | 480-670 | 600 |
| Extended Monitor | Yes | No | Yes |
| Parallel Print | Yes | Yes | Yes |
| Serial Printer | Yes | Yes | Yes |
| CBIOS sourc | No (1) | No | Yes |
| Monitor source | No | Yes (2) | Yes |
| R/W single dens | Yes | Yes | Yes |
| Auto Density | Yes | Yes | No (3) |
| Added utilities (4) | Yes | Yes | Yes |
| Supports 5" | No (5) | Yes (6) | No (7) |
| 4 MHz req. | Yes | No | Yes |
| Other BB mods | Yes | Yes | Yes |
| Startup time | 2 hrs | 40 minutes (8) | 30 minutes (9) |
| 2 Sided drives | Yes | Yes | No (10) |
| Documentation | ? | 13 pages | 100+ pages (11) |
| Price | $220 | $250 | $175 |

*1. Otto plans to make the source for his monitor and CBIOS available later this summer.*
*2. Since Russell Smith is using the present monitor, the source is available. This also means that most monitor-dependent software such as printer drivers will run unchanged.*
*3. Monesmith supplies a simple .COM routine for setting or changing the density on a particular drive. The default for all drives is double density.*
*4. Monesmith has added a number of very neat features such as automatically searching drive A for any file not on the default drive and automatically returning to the default drive after a reboot. He has also cured the head banging which occurs when accessing data on a non-default drive. Both Monesmith and Smith have added serial and parallel print drivers.*
*5. Hiller is working diligently on making his compatible with the Xerox 820.*
*6. Specify either 5" or 8" when you order, does not support both.*
*7. However, supports 8" and the new 3-1/2" double density simultaneously.*
*8. Time is spent laying the baud rate crystal on its side, formatting a disk, and incorporating the new CBIOS.*
*9. Monesmith returns the disk you sent him with DDENSITY already incorporated into the system tracks. So you spend 30 minutes laying the baud rate crystal over on its side and adding a couple of jumpers.*
*10. Monesmith is working on double sided drive capability.*
*11. Mostly on disk. Very well written and organized.*

# WANT ADS

**The following folks are reaching you for only 20 cents per word. If you would like to reach the same audience, send your words and 20 cents for each, to Micro Cornucopia, 11740 NW West Rd., Portland, OR 97229.**

Wanted, software for Ham Radio, disk or ROM. Paul Cooper, K6PY, 9845 Oakdale, Chatsworth CA 91311. 213-332-4987 days or 213-993-8459 evenings.

---

For Sale: Big Board computer. Complete system, all options included. Board, power supply and two Shugart SA800 drives in 19 inch rack mount type cabinet. Separate monitor and keyboard. Looks and works fine. $1200.00. 412-741-7396, Bill Artzberger, RD#2 Box 250, Nicholson RD, Sewickley, PA 15143.

---

IMPROVED MONITOR PROMS. Big Board monitor rewritten to your specifications and blown into a PROM or executable program on disk. Extra screen commands, port initialization, personalized sign-on message, etc. Also customized character PROMs, and any programming or consulting work on the Big Board. Jeff Richards, 25 Bowline St, Jamboree Heights, QLD, 4074, Australia. phone (07)376-3323.

# A New Type of Game

Welcome to an astonishing new experience! ADVENTURE is one of the most challenging and innovative games available for your personal computer. This is not the average computer game in which you shoot at, chase, or get chased by something, master the game within an hour, and then lose interest. In fact, it may take you more than an hour to score at all, and will probably take days or weeks of playing to get a good score. (There is a provision for saving a game in progress).

The original computer version of Adventure was written by Willie Crowther and Don Woods in Fortran on a PDP-10 at MIT. In this version the player starts near a small wellhouse. Upon entering the house, he finds food, water, a set of keys and a lamp. Armed with only these items, he must set out to explore the countryside in search of treasure and other objects of play. He must also confront dwarfs, snakes, trolls, bears, dragons, birds, and other creatures during his quest. The game accepts one-or two-word commands such as GET LAMP* SOUTH* or KILL DWARF. Of course, if you don't have the proper tool to carry out an action, or if you do something foolish, you may find yourself in big trouble.

In playing the game you wander thru various 'rooms' (locations), manipulating the objects there to try to find 'treasures'. You may have to defeat an exotic wild animal to get one treasure, or figure out how to get another treasure out of a quicksand bog. You communicate thru two-word commands such as 'go west', 'climb tree', 'throw axe', 'look around'.

## Adventure

# BIG BOARD SOFTWARE!

ORIGINAL ADVENTURE (by Crowther, Woods, Manning and Roichel) - Somewhere nearby is a colossal cave where others have found fortunes in treasures and gold, but some who have entered have never been seen again. You start at a small brick building which is the wellhouse for a large spring. You must try to find your way into the underground caverns where you'll meet a giant clam, nasty little dwarves, and much more. *This Adventure is Bi-Lingual* — you may play in either *English or French* — a language learning tool beyond comparison. Runs in 32K CP/M system (48K required for SAVE GAME feature). Even includes SAM76 language in which to run the game. The troll says "Good Luck."

THROUGH SPECIAL ARRANGEMENT WITH CREATIVE COMPUTING WE ARE ABLE TO OFFER ONE OF THE MOST CHALLENGING AND EXCITING COMPUTER GAMES EVER DEVISED. BESIDES BEING FUN, WE HAVE FOUND THAT RUNNING "ADVENTURE" IS ONE OF THE BEST TESTS FOR A BIG BOARD. SUPPLIED ON 8 IN. DISKETTE WITH INSTRUCTIONS.

# $29.95 (ADD $2.00 POSTAGE)

**Digital Research Computers**
(OF TEXAS)
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**TERMS:** Add $2.00 postage. We pay balance. Order under $15 add 75¢ handling. No. C.O.D. We accept Visa and MasterCharge. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50, add 85¢ for insurance.

*(Editorial continued)*

**ROM programmer.**

Be there a programmer with soul so dead that he never raised his head and said 'I'd sure like to burn this into a ROM.'

Raise your head no longer, here is a ROM programmer by Jim Monesmith. Jim sent a complete package, schematics, software etc. All I had to do was build it up, check it out and then pass it along.

So for the past several weeks I've been building and testing out the board. After a couple of days chasing an apparent problem on the burner, I located a bad run on my Big Board.

Now I'm having all kinds of fun. For instance, the character ROM just moved up to Version 2.3 when I moved the comma, semicolon, and colon down one pixel. See the article for more information.

**Do it yourself characters.**

Here is a chance to try out your new ROM programmer and be creative too. Ron Drafz demonstrates how you can create an extended character set in a 2732.

The characters you create are limited to a 5/8 dot matrix, but within this restriction you are free to do whatever you want. The single hardware modification is incredibly simple. This article should also be a good starting point for anyone interested in replacing the 2716 monitor ROM(s) with one or more 2732s.

**User's Software?**

I have received more than a couple of phone calls from puzzled people pondering a purchase from User's Software (see page 12 in issue #5). It turned out that both of the phone numbers in the ad were wrong. (They hadn't proofed that part of the ad carefully.) Jim Showker took another shot at the phone numbers in this issue.

**4 MHz Modifications**

An informal poll indicates that for a while, the Digital Research Computers 4 MHz modification was the most popular (issue #2, page 4). But a lot of folks including Digital Research have found that it doesn't work dependably with all boards. So the most popular modification now is 3.5 MHz (issue #4, page 9), with Otto Hiller's dependable 4 MHz (issue #3, page 3) running a close second. You have to be running 4 MHz (3.5 MHz won't do it) if you have either Hiller's or Monesmith's double density package.

**Second Year**

It's kind of mind boggling to think that we are actually entering our second year with the next issue. Its a tribute not only to the gnomes here (especially Sandy and Patty) who have to make up for my inadequacies but to you folks who not only subscribed to an unknown quantity but then supported us with cards, letters, articles, and phone calls. I thank you all and hope to meet you July 24th.

David Thompson
Editor & Publisher

THE DUTCH CONNECTION

A group of Big Board users in Twente, The Netherlands, have interfaced 5 1/4 inch Winchester disks to their Big Boards. They plan to introduce the host adaptor and CP/M CBIOS of their system to the American users in June 1982.

It is expected that in kit form, an entire system, hardware and software can be made available for a little as $1500.00. The Dutch Connection will consist of a CBIOS and host adaptor to interface to a "SASI-bus". Winchester disks, controllers, cables, and power supplies to complete the system will be available from designated American sources.

There will be a complete announcement in the August issue of The Cornucopia.

APPLIED i, of Palo Alto, California, will be the American Distributer. If you wish details as soon as they are available in Palo Alto, write:

APPLIED i
200 California Ave, Suite 205
Palo Alto, California 94306

( Please, no orders at this time. Wait for the product announcement. )

# DOUBLE DENSITY

# FOR THE LAZY

Want the storage capacity of double density without the hassles of incorporating it into your CP/M? Want lots of extra utilities but still want the best price around?

**Then check this out:**

1. Ready to boot single/double density system.
2. Complete documentation of simple hardware modifications.
3. Assembled and tested double density board (1795 based).
4. Extended monitor in two 2716's.
5. Serial and parallel print drivers.
6. Reads and writes 8" SD and DD or Sony 3½" and 8" double density.

**Plus the following utilities:**

- Clock set and display.
- SD and DD formatters.
- Disk utility for SD and DD.

**Particulars:** Requires 4 MHz. Send a disk with CP/M on system tracks and two 2716-1's. Choose either 8" SD and DD, or 3½" DD and 8" DD ($5.00 extra for both). **(Call for an incredible price on Sony 3½", 300K drives.)**

Double density price is $180.00 plus $4.00 shipping.


**Jim Monesmith**
**438 Patterson Road**
**Dayton, OH 45419**
**513-298-6926 - Home**
**513-426-6000 ext 481**


# Real Time Clock For Big Board Users $25.00*

- ★ **No extra hardware required** - uses onboard Z80 CTC channels 0 and 1
- ★ **Easy setup of time and date**
- ★ **Allows timestamping of files and listings**
- ★ **Uses memory at EFOO - EFFF hex**
- ★ **Unix-like user interface through the use of CP/M .COM files** - no assembly language experience needed
- ★ **For CP/M 2.2 8'' single sided, single density disk systems**

---

# Programmer's Aid Package For CP/M Users $45.00*

- ★ **Unix-flavored utilities** designed to make documentation and text processing easier
- ★ **Utilities include:** text formatter, ''pretty'' printer, file transliteration, word and character counting, file encryption/decryption and more
- ★ **For CP/M 2.2 8'' single sided single density disk systems**

---

***To order the above packages, send check or money order for the appropriate amount to:***

**L.A. Software**

6708 Melrose
Los Angeles
California 90038

California residents add 6% sales tax
CP/M is a trademark of Digital Research
Unix is a trademark of Bell Telephone Labs
*** Introductory Price - Limited Time Offer**

# Especially For The Big Board From Micro C

| | US,CAN,MEX | Other Foreign |
|---|---|---|
| **USER'S DISK #1** | $15.00 | $20.00 |

Over 200K of software especially for the Big Board.

**Including:**

1-Two fast disk copiers.
2-The manual for Small C+.
3-A Z80 assembler.
4-Two disk formatters.
5-Othello.
6-A serial print routine.
7-Modem software.
8-Documentation for all the above.

See issue #3, page 15 for more information about the disk. Also see "Using Modem7" in the same issue for information about configuring the modem software.

| | | |
|---|---|---|
| **USER'S DISK #2** | $15.00 | $20.00 |

Especially for folks with single-drive systems and those who want to try their hand at extending an assembler. Also a new CBIOS with parallel printer interface. Returns to default drive on reboot, stifles head banging, supports CP/M 2.2 and 1.4. Step by step instructions for the simple incorporation into your CP/M (using only DDT and SYSGEN). CBIOS source also included.

**Including:**

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

| | | |
|---|---|---|
| **USER'S DISK #3** | $15.00 | $20.00 |

This is the disk for folks who are building Jim Monesmith's ROM programmer. Two versions of programmer software plus a disk file CRC checker. Also contains a sophisticated disk utility (DU77) and source for a substantially updated fast copy routine, plus more. (And documentation.)

**Including:**

1-Unmodified ROM programmer.
2-ROM programmer with CRC.
3-Disk file CRC checker.
4-Source of new fast copy.
5-Utility isolates bad disk sectors.
6-Reset bit 7 (unWordstar a file).
7-Print fancy page headings.
8-And more.

## FREE

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

| | US,CAN,MEX | Other Foreign |
|---|---|---|
| **FORTH IN ROM** | $65.00 | $70.00 |
| **in fast ROM** | $80.00 | $85.00 |

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

| | | |
|---|---|---|
| **FORTH editor & decompiler disk** | $15.00 | $20.00 |
| **TINY BASIC IN ROM** | $35.00 | $40.00 |
| **in fast ROM** | $45.00 | $50.00 |

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

**MORE ROMS**

Fast monitor ROMs for speed freaks and our famous 'better than Texas' character ROM for screen freaks.

| | | |
|---|---|---|
| **Fast Monitor ROM** | $25.00 | $30.00 |
| **Version 2.2 Character ROM** | $25.00 | $30.00 |

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

| | | |
|---|---|---|
| **BACK ISSUES**(each) | $ 3.00 | $ 5.00 |

Because of the demand from new subscribers (bless their hearts) we are keeping back issues in print.

| ISSUE #1 | ISSUE #2 | ISSUE #3 |
|---|---|---|
| Power Supply | Parallel Print | Four MHz Mods |
| RAM Protection | Drive Motor Cont. | Configuring Modem 7 |
| Video Wiggle | Shugart Jumpers | Safer Formatter |
| 1/2 PFM.PRN | 1/2 PFM.PRN | Reverse Video Cursor |
| Plus More (16 pgs) | Plus More (16 pgs) | Plus More (16 pgs) |

| ISSUE #4 | ISSUE #5 | ISSUE #6 |
|---|---|---|
| Keyboard Translation | Word Processing | EPROM Programmer |
| More 4 MHz Mods | Two Great Spells | Customizing Characters |
| Modems, Lync & SIOs | Two Text Editors | Double Density update |
| Undoing CP/M ERASE | Scribble, a Formatter | Terminal in FORTH |
| Plus More (20 pgs) | Plus More (20 pgs) | Plus More (24 pgs) |

| | | |
|---|---|---|
| **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?

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## Latest on the New Board

More information about the Cal-Tex 8200 has filtered in during the last month.

**1.** The prices are: $245 bare board (with ROMs and PALs), $695 for complete 4 MHz kit (not $595 as they originally announced), and $895 assembled and tested.

**2.** Delivery of the bare boards is scheduled to begin sometime during the first two weeks in June, with the kits and assembled packages to follow a few weeks later.

**3.** They are not planning to make the source of the CBIOS or monitor available free. If they decide to make them available at all, there will probably be an extra charge.

**4.** Bill Siegmund mentioned that he will not have time to provide lots of support to purchasers and he says that because of the DMA, troubleshooting the new system will be much more involved than the Big Board. So he is discouraging beginners from tackling a bare board or kit. He also plans to charge more for factory service than Digital Research Computers, and may refuse to repair boards that were badly assembled or damaged. (We've noted that a surprising number of folks are planning to purchase the assembled and tested units.)

You can reach Cal-Tex at 780 Trimble Road, Suite 504, San Jose, CA, 95131. (408) 942-1424.

Micro C will be supporting the 8200 as well as continuing to support all the super Big Board folks.

■ ■ ■

# ANNOUNCING

# DOUBLE DENSITY DISK INTERFACE FOR THE BIG BOARD

New floppy interface package for the Big Board lets you read and write single and double density disks with 128, 256, 512, and 1024 Bytes/sector.

The package includes:

1. Fully assembled and tested board, cable and connector to replace the 1771. Board contains 5 ICs including a Western Digital 1795.

2. An extended monitor in two 2716s.

3. A disk containing:
   - Disk formatting program. (128, 256,512,1024 bytes/sector)
   - Disk copying program.
   - An overlay for MOVCPM.COM
   - A double density SYSGEN

4. Documentation
   - Dependable 4MHz mod
   - Jumpers to add to the Big Board.

Sector size is determined by how the disk was formatted and is totally transparent to the user.

Disk capacity ranges from: 241K for SS, SD, 128 bytes/sector to 668K for SS, DD, 1024 bytes/sector

Requires minor modification to Big Board and requires that Big Board run 4 MHz.

Available December 15, 1981.

Price: $220

**Otto Hiller Co.**
**Scientific Equipment**
**P.O. Box 1294**
**Madison, WI 53701**
**608-271-4747 3-5 pm**

# Bring the flavor of Unix To your Z80-based CP/M system with Unica

*"Unicum: a thing unique in its kind, especially an example of writing. Unica: the plural of unicum."*

The Unica: a unique collection of programs supporting many features of the Unix operating system never before available under CP/M. The Unica are more than software tools; they are finely crafted instruments of surgical quality. Some of the Unica are:

bc - binary file compare
cat - catenate files
cp - copy one or more files
dm - disk map and statistics
hc - horizontal file catenation
ln - create file links (aliases)
ls - directory lister
mv - move (rename) files, even across users
rm - remove files
sc - source file compare, with resynchronization
srt - in-memory file sorter
sr - search multiple files for a pattern
sp - spelling error detector, with 20,000 word dictionary

Each Unicum understands several flags ("options" or"switches") which control program alternatives. No special"shell" is needed; Unica commands are typed to the standard CP/M command interpreter. The Unica package supports several Unix-like facilities, like filename user numbers:

sc data.bas;2 data.bas;3

(compares files belonging to user 2 and user 3);
Wildcard patterns:

rm *tmp* -v

(types each filename containing the letters TMP and asks whether to delete the file);
I/O redirection:

ls -a ►list

(writes a directory listing of all files to file"list");
Pipes:

cat chap* ! sp ! srt ►lst:

(concatenates each file whose name starts with"chap", makes a list of mispelled words, sorts the list, and prints it on the listing device).

The Unica are written in XM-80, a low level language which combines rigorously checked procedure definition and invocation with the versatility of Z80 assembly language. XM-80 includes a language translator which turns XM-80 programs into source code for MACRO-80, the industry standard assembler from Microsoft. It also includes a MACRO-80 object library with over forty "software components", subroutine packages which are called to perform services such as piping, wildcard matching, output formatting, and device-independent I/O with buffers of any size from 1 to 64k bytes.

The source code for each Unicum main program (but not for the software component library) is provided. With the Unica and XM-80, you can customize each utility to your installation, and write your own applications quickly and efficiently. Programs which you write using XM-80 components are not subject to any licensing fee.

Extensive documentation includes tutorials, reference manuals, individual spec sheets for each component, and thorough descriptions of each Unicum.

Update policy: each Unica owner is informed when new Unica or components become available. At any time, and as often as you like, you can return the distribution disk with a $10 handling fee and get the current versions of the Unica and XM-80, with documentation for all new or changed software.

The Unica and XM-80 (which requires MACRO-80) are priced at $195, or $25 for the documentation. The Unica alone are supplied as *.COM executable files and are priced at $95 for the set, or $15 for the documentation. Software is distributed on 8" floppy disks for Z80 CP/M version 2 systems.

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