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MICRO CORNUCOPIA

THE SINGLE BOARD SYSTEMS JOURNAL

June 1983 No. 12

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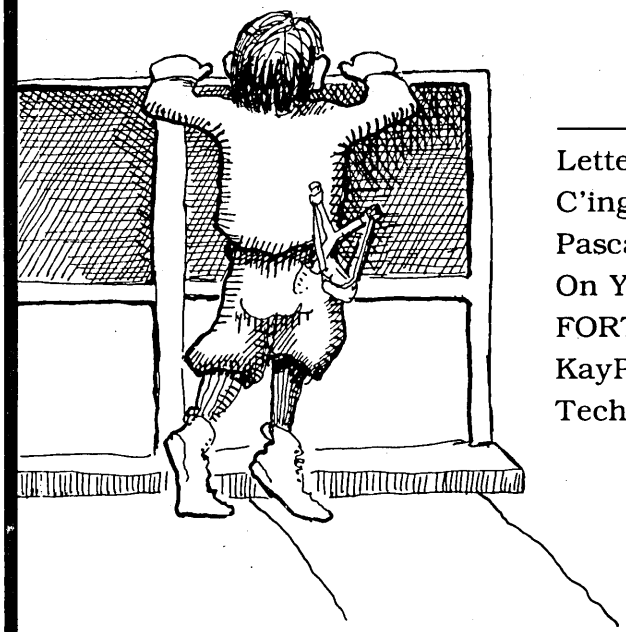

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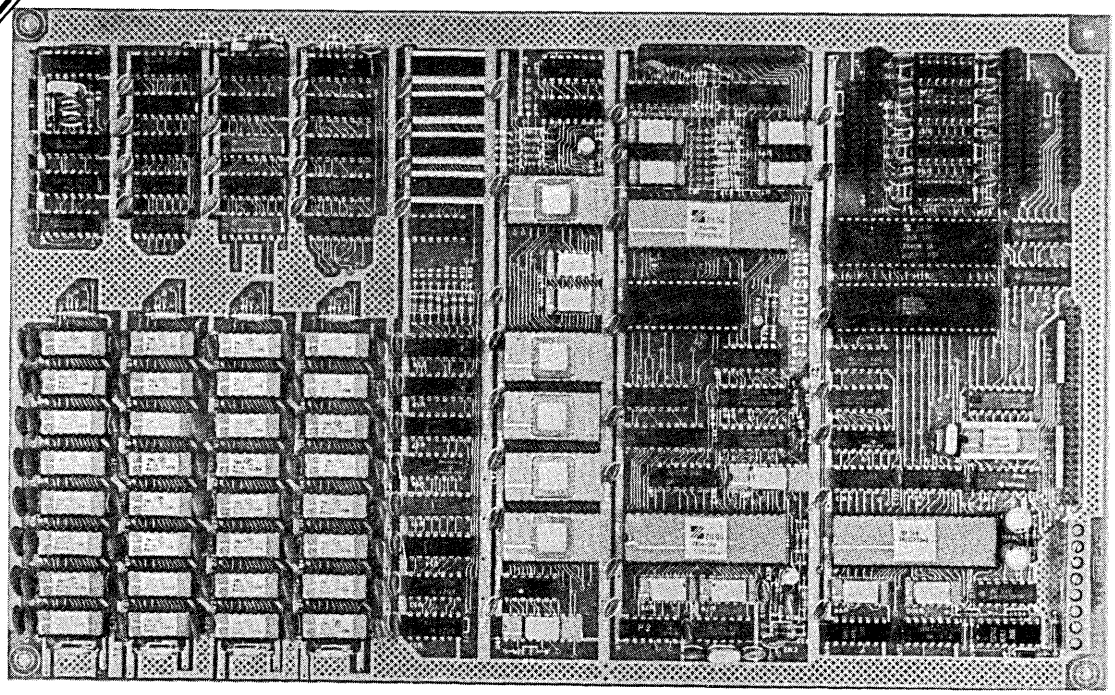

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MICRO CORNUCOPIA

June 1983 The Single Board Systems Journal No. 12

All Wet!

Almost SOG

The Semi Official Get-together (SOG) is almost upon us so we need to get some idea how many of your are planning to come. If you are even thinking of coming, be sure to call or write immediately.

If you are planning to participate in the Friday afternoon raft trips (professionally guided) and/or the cookout which follows, you need to get your $25 per person to us by July 7 so we can reserve a place for you. See the article on the SOG in this issue, and be sure to let us know right away if you are even considering coming!

The Slicer

I've been bitten by the 16-bit bug. Whether the byte is fatal or not I'll soon know. I'm getting an 80186 based board called the Slicer from Slicer Computer Inc.

They placed a one-page ad in the May issue of Byte and got about 800 responses (so far) so they are working feverishly on the final versions of the monitor and bios so they can start shipping boards.

The 80186 is like an 8086 with a few extra math instructions, two DMA channels and 3 timers for starters.

The Slicer contains the 80186, up to 256K RAM, a 1797 double density controller (5 and 8 inch drives simultaneously), SASI interface, a 90 pin expansion interface, and two serial ports (up to 38.4 K baud). It does not have a video monitor on board so you you have to use a separate monitor. The board runs at 8 MHz with no wait states. It measures 5.85 by 11.75 inches.

At only $140 for the bare board with documentation, power connector, the monitor in two 2732s, and the source of monitor and BIOS—it should be just the ticket for those of us wanting to get our feet wet with a real 16-bit machine (rather than an 8-bit pretender). In fact, it looks like we're going to have a whole new system to fondle and fuss over in the pages of Micro C.

Come to the SOG and you'll have a chance to try out one of the first units in existence and meet Otto Baade, the designer.

CO-POWER-88

Guess what else you'll see at the SOG? I purchased Software Publishers CO-POWER-88 board (I already had SWP's dual density package) and now have my original BB I running single density Z80, double density Z80, and single/double density CP/M 86.

Anyway, Dana and I hooked up the 8088 board and got it running in just a few minutes. (It was the easiest MOD I've ever added to the BB. You boot up in CP/M 80 just like usual and you have the option of using the 8088 memory as a RAM disk (drive M:) or running a Z80 program which suddenly transports you into the domain of the 8088. However:

CP/M 86 Software

I don't have a speck of software to run on under CP/M 86 except the 8086 versions of ASM and ED (groan!) that came with it. I hadn't thought about that when I drooled over the new boards.

You've no doubt seen all those glowing ads about new software for CP/M 86, but look at the fine print (the prices) and you'll find that most of the packages are half-again as expensive as their CP/M 80 cousins.

I'm really spoiled by the 100-volume CPMug library I have in the corner and by all the great things you folks send in. For the 8088/86, I'm high and dry.

So, we're going to have to start a new library. If any of you know a mad 8086 programmer who is writing really great code and tossing crumbs of it here and there for hungry CP/M 86 users to snatch up, then by all means let us know. We'll all practice up on our snatching (I understand it looks very much like aerobics).

(continued on page 30)

LETTERS

Dear Editor,

I've found that Smartkey (see issue 5), is a particularly helpful utility program which allows redefinition of the console keyboard. Keys can even be redefined to generate strings.

For example, Wordstar lacks a left word deletion command. If you don't like the word you've just typed, you have to delete it one character at a time or else move the cursor to use the "delete word right" command. Smartkey lets you create a macro so that a single keystroke will delete the word to the left. Smartkey also lets you define cursor and function keys, especially helpful in speeding up multi-key commands. Smartprint, a companion program, really makes it easy to create a translation table for characters going to the printer.

FBN Software has moved. The new address is 16 Coles Place, Torrens ACT 2607, Australia. In the United States, Smartkey continues to be available from Lifeboat Associates, 1651 Third Avenue, New York NY 10028, phone (212) 860-0300, and from ICI Computers, PO Box 255, Aurora OR, 97002, phone (506) 678 2778.

John S. Allen
40 Rugg Rd
Allston, MA 02134

Dear Editor,

We have several Tandon Model 848 Thinline 8" drives here, both single and double sided models. We chose them because they were half height but were also pleased to find them sturdy, well made, and fast.

Then a problem . . .

We began to lose data, and I really mean lose data! After very short use (less than a week at a few hours a day) we found tracks on our Dysan disks which had been worn down to the plastic base. We could see right through the clear tracks on the disk!

We tried changing the drive mounting from horizontal to vertical but it didn't help. Then we turned to the service manual which stated:

"The head is loaded into contact with the recording medium whenever the drive lever is latched."

In other words, the heads are loaded against the disk and remain loaded as long as the latch is closed. So the head grinds away the track it's sitting on!

We also find that there is a head load option which consists of a head load solenoid, a couple of logic gates and some resistors. There is space on the circuit board for the parts but they aren't installed.

A call to Tandon headquarters revealed some interesting news. They are aware of the problem but they will not retrofit any Model 848 with head load option, nor will they sell parts for the modification. The person we talked to insisted that the option must be specified in the original order. (We talked to Renee at 213-993-6644, ext 425.)

She also implied that they will not service any drive which wasn't purchased from an authorized dealer and I don't know of any mail order outfits which are authorized dealers. So we are out of luck.

In a nutshell, the thinline 848's most of us are buying will, with relatively short use, destroy our disks. You can save yourself some of the grief if you keep the door unlatched as much as possible.

However, anyone planning on purchasing Tandons should insist on the head load option, or even better, consider buying someone else's drives.

Willard E Johnson
Department of Physics
California State University
Hayward, CA 94542

Editor's note:

Anyone have any inside scoop on Tandon? Is it really impossible to get this head load option?

You might take a look, Will, at enabling the DC motor timeout so that it will shut itself off immediately after a drive access, or use the BB motor control line to turn off the drive motor (and then set the timeout down to a couple of seconds). However, with their attitude toward support, perhaps it's best to stay away from them altogether.

Dear Editor,

Just a quick correction for BB II people. Port 88 is the baud rate generator for serial port B. Port 89 is the baud rate generator address for serial port A (opposite what was indicated in issue #11).

Jim Skinner
20435 SW Alexander
Aloha, OR 97006

Dear Editor,

I have recently joined the ranks of the BB II owners. The only real problem has been choosing a monitor. I've been lucky enough to have access to several monitors and would like to share my findings.

First, if you use the 50Hz patch provided in the documentation (from Taylor Electric), just about any 24/80 monitor will work with the BB II 7X9 controller. The only problem with the 50 Hz vertical rate is that it may beat against you 60 Hz AC. The resulting flicker is most pronounced on white and green monitors. With amber phosphor, the flicker is barely evident.

The patch is:

```
ODC,2
ODD,5F
ODC,0
ODD,6F
ODC,7
ODD,18
```

The Sanyo 18 MHz, 12" green—the USI Pi3 20 MHz, 12" amber—and the Amdek Video 100 12 MHz, 12" B&W, all work with the BB II. Depending on the monitor, you might need to change the parameter in the second line of the patch. I have used values between 57h and 5Fh. My choice among the three monitors listed is definitely the USI Pi3.

Also, my 7X9 display appeared to be twinkling because the video was randomly dropping dots. This is caused by glitching in the shift register U45. You can fix this by changing U33 from a 74LS30 to a 7430. Another way to fix the problem is to add a 22 pf capacitor between U31 pin 11 and ground.

The last problem is that the BB II composite video signal suffers from high frequency roll-off. So the horizontal lines appear to be brighter than the vertical lines. This is most apparent when the brightness is turned down low. The following mod should fix this.

1. Change U24 from a 74LS86 to a 74S86.
2. Change R13 from 1K to 750 ohms.
3. Add a 22 pf capacitor across R13 (the Sanyo needed 100 pf).

Cole Chevalier
17862 Fitch
Irvine, CA 92714

Dear Editor,

I use MicroPro's CalcStar spreadsheet for financial and inventory projections. The problem with CalcStar is that it keeps all data in memory so the size of the spreadsheet is quite limited.

I saw ads for Supersoft's Spreadsheet called Scratchpad. It touted their "VM" feature. I bought it knowing that it

would be somewhat slower (by definition).

I was really disappointed though with their tedious formula entry. It is so slow that entering a spreadsheet large enough to need virtual memory wouldn't likely occur during my lifetime. I feel that scratchpad would be a waste of money at $29.95 and I paid $212.00! I hope other SuperSoft products are easier to use.

Are there any Micro C readers who would like to work with me on a better spreadsheet?

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

Dear Editor,

I wonder if you or any readers might shed some light on several problems I have had with my Big Board.

I have noticed that cntl-S will sometimes cause an untimely end of the display (while TYPING out a file) rather than just stopping the text.

When I'm in WordStar with a parallel keyboard, the system can't accept keyboard input while it is doing anything else. Any character entered at this time will come out an "F". Occasionally a stray ":" will appear in the file, which is bad news if I'm going to be assembling it. I don't have these problems if I'm using a serial keyboard.

If I'm using WordStar to edit a file that is larger than will fit into RAM, I tend to get blocks of errors such as a string of e's or I'll just notice a chunk of text missing or duplicated. Any suggestions?

John F Ingham
VK5KG
37 Second Ave
Sefton Park
South Australia 5083

Editor's note:

A few shots in the dark. You may have a buffer in the serial keyboard (besides a couple of characters in the SIO) and let's see, serial port B generates interrupts but so does the keyboard PIO. During disk access, interrupts are disabled most of the time so you have to send characters quite slowly or the processor will miss them.

It sounds like your parallel keyboard is generating some garbage characters. If your keyboard cable is quite long you might get some glitching that would cause the cntl-S problem etc.

As for the large file problem, I'm at a total loss unless you have a marginal drive or a bad copy of WordStar. What say anyone?

And, by the way, thanks for the nice comments about Micro C.

Dear Editor,

Here is a small correction to Tony Ozrelic's C'ing Clearly on page 12 of issue #11. The line "answer = &query;" should read "answer = query;" or "answer = &query[0];". Page 89 of *The C Programming Language*, Kernighan and Ritchie state that the & operator can be applied only to variables and array elements. On page 94 they write: "pa = &a[0]" can also be written as "pa = a". I tried Tony's statement on my Zilog S8000 at work and got a warning.

I realize that this may appear to be picking nits, but after programming and teaching programming for almost ten years, I feel that nit picking perfectionists make the best programmers. But in the same breath I would like to praise Tony for doing the C column. I think he should be commended for doing a fine job.

Finally, I think Micro C is the most enjoyable computer magazine I've ever read. Please keep up the good work! You'll be hearing more from me when I get off my duff and submit something to either the C or Pascal columns.

A simple request: Does anyone know where I can locate the source of the Othello program on user disk #1? I'd really like to try extending it.

Adam S Moskowitz
221 Summer St #2
Somerville, MA 02143

Dear Editor,

I have been plagued by video jitter ever since I got my BB up and running. The symptom was that all the dots on a line would move back and forth about 1 dot width.

After verifying that I had the right crystal, adding extra filtering, checking the CRT, and everything else I could think of, I finally located the problem. It was caused by U51 and U38, the series one-shot combination used to generate the horizontal sync pulse.

I solved the problem by bypassing U38. Do this by bending out U38 pin 13, and adding a jumper on the bottom of the board from U51 pin 13 to U38 pin 13.

This modification shifted the screen image but my CRT had an adjustable delay.

The problem is caused either by variation in the width of U51's pulse or variation in the trigger point of U38. If you are having this problem, this fix may work, or you might try a different brand of one-shot.

Henry Holcomb
7 Belmont Place
Lynchburg, VA 24502

■ ■ ■

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256K In Detail - Part I

By Art Boehm

2000 29th Ave NW
New Brighton, Minn 55112
612-633-9292

The following article is much larger than I had planned. However, it covers not only specific hardware and software modifications but also tools and techniques. There should be something here for just about everyone.

Four Banks of RAM

Converting the Big Board to 262K is actually rather straightforward. Most of the work involves rearranging capacitors on the RAM voltage buses.

As Karl-Wilhelm Wacker noted in Micro C, issue 9, U82 (74LS241) has plenty of power to directly drive the RAM Write signal, and that opens a selector bit on U59 (pin 9) that can be used to select between two new bank bits (on pins 10 and 11) to drive A7 of the 64K RAMs.

The obvious choices for new bank bits are System PIO bits A4 (unused) and A5 (bell). If you really can't live without the bell and will never have more than three drives, you could use A2. Or if you never need a remote console, you could just assume the keyboard and use A3. But those bits require reworking PFM.

Incidently, we have had this modification running reliably on both 2.5 MHZ systems and those with the 4 MHZ modification described by Otto Hiller on page 3 of issue 3. The key to reliability is filtering, which is why a good deal of the modification involves rearranging the bypass caps.

The new bank bits control U13 through U46 (0000 to BFFF). U1 through U8 (C000 to FFFF, i.e. PFM) are not currently switched to avoid the "traveling through hyperspace" problem. You could use compatible 16K parts (i.e. 2118's) for U1 to U8, though we chose all 64K parts (e.g. 4164's or 6664's) to keep our future options open. (See Figure 1)

Since power-up reset selects input mode (and therefore a hi-Z signal) on the System PIO, when PFM moves itself out of the ROM it goes into "bank 3" (A5 and A4 are both high) if RAMs U1 through U8 were bank switched. But PFM promptly initializes the PIO port A bits 0 through 2 and 5 through 7 as outputs and these outputs are initially cleared (low) by power up.

So, as execution switches to "bank 1" (bit 5 is low and 4 is high) which of course is not PFM.

You can cure this problem by changing PFM INIT3 to put 030h into the port A output register after loading the vector (but before setting the mode). In addition you need to initialize all the bits except 3 as outputs.

Reworking the board

Before we actually make changes to the board, we must talk about how to rework a board as complex as the Big Board.

First, remember that it is full of static-sensitive components so be careful. Always ground or discharge (if you've never been discharged before, you ought to try it) yourself before touching the board, and especially before touching any MOS parts (like 65K RAMs).

Second, use the right tools. You would not cut picture frame molding with a chain saw, and you cannot rework a board with such small features without precision (but not necessarily expensive) tools.

Tools You'll Need

1. A 12-18 watt soldering iron with a precision point or micro-spade tip. Anything bigger risks foil delamination, burned components, or frequent solder bridges.

2. High quality 21-22 gauge (around 1/32") multi-core solder; the thicker stuff just blobs on and makes a mess.

3. Solder removal tools; narrow width (.025-.050) desoldering braid works good but nothing beats a vacuum desoldering tool. Radio Shack has a mini-desoldering tool (#64-2091) that works great and only costs $6.49. The rubber bulbs don't develop vacuum quick enough to do the job.

4. A wet sponge for keeping the solder tip clean and blob-free, or a combination iron holder and sponge.

5. An X-acto knife with a heavy duty handle (7/16" dia. or more) The thin handle version is not sturdy enough to cut tough foil without risking a snapped blade. Shallow angle blades have to be held too upright to cut easily (and safely).

6. A miniature (i.e. 4") needle or long nose pliers. You cannot get along without one, and it should have scored jaws and plastic coated handles.

7. A miniature flush cutting, angle blade pliers. Most other types of cutting pliers can't get in close enough or leave stubs that are too long (and may touch neighboring parts).

8. A needle pointed tweezers; the only reliable way to pickup fragments of 30 ga. wire or solder.

9. A set of jeweler's screwdrivers; you'll need them to adjust your glasses after staring at the board for 15 hours.

10. A way to drill .041" holes; a #59 drill is the correct size, but you need some way to hold it like a pin vise or miniature drill. You can get these drills with larger shanks for use in a Dremel moto tools.

11. Some 30 ga. wire and a 30 ga. wire stripper. Finer wire is too hard to work with (much less find or strip) and heavier wire makes too big a lump at the connection points. Besides, if you get some prestripped 2.5" lengths, they are exactly the right length for 80% of the jumpers you'll need.

12. A decent ohmmeter. This is included under rework tools because it is used to verify that your cuts and adds worked right (i.e. cuts are open and adds are shorts) before you try it out. This is especially necessary when working with the power and ground busing as this change does (+5V should not be shorted to ground when you are done).

Incidentally, cuts will not necessarily show as true opens due to other components. Mainly you are verifying that there are no shorts.

13. An IC puller and inserter. Big chips you can pry out successfully with a screwdriver. With little chips you get one end or three corners loose and when you grab it to get the rest, it flips over and buries its leads in your finger. Radio Shack has a nice puller/inserter combo (#276-1574) for $6.95. You can swap all 32 RAMs in 5 minutes with it.

Techniques

Now that you have all these fine new tools, let's talk about technique.

You'll be doing four basic things, removing components, adding components, cutting foils, and adding jumpers.

Removing components

Remove components by first remov-

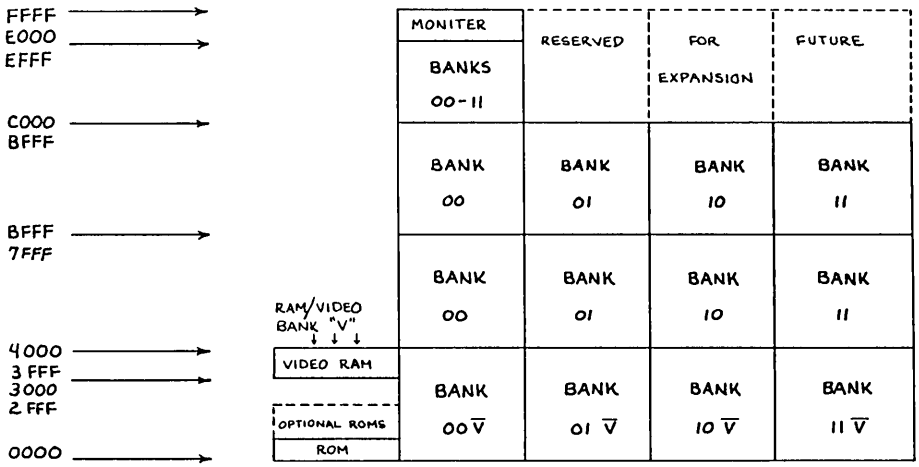


Figure 1 - Storage Bank Assignment

ing the solder from their leads with a solder sucker.

When you have done all the leads you should be able to pull the part out from the component side with a pliers with at most, a touch of the iron to the leads.

Adding components

You have to find a place for new components to reside. Small components (e.g. diodes, miniature resistors) can go on either the component side or the foil side. Larger components should go on the component side.

Small components can be tacked to a foil on the same side as the component. Scrape the protective coating off the foil and then bend the component lead to jog down and lay on the foil for at least 1/8" (more if you have room). The solder joint must provide mechanical strength.

Components can also be soldered into vias (the holes that get signals from one board side to the other), or can be inserted through new .041" holes to intercept foils or jumper wires on the other side of the board.

When you cannot solder to a foil on the other side, you must bend the leads for mechanical strength. If you grab the lead 1/8" above the hole and push diagonally down, you should get an L-shaped bend that will work.

By the way, before you drill a hole in the big board, mark your spot and hold the board up to the light to see what is on the other side. You might be surprised.

Cutting Runs

Cutting foils is quite simple. Make two cuts 1/32" to 1/16" apart through the foil and "lift" (remove) the piece between the cuts. On boards with quality copper like the Big Board, "lift" really means undercut and scrape. Always check your cuts with an ohmmeter to make sure they worked.

Adding Jumpers

Adding jumpers is similar to adding components, except it is nearly always done on the foil side. You can solder to runs, vias, socket pin, or component pin.

Use 30 guage wire and leave just a little slack (maybe 1/16" extra). On long runs, you can tack the wire to the board in a few places with RTV.

When soldering directly to a pin, watch closely for shorts to nearby pins and foils. To minimize this, melt the solder already on the pin/pad, and push or pull the stripped portion of wire down (into the solder) until it touches the pin and the insulation just touches the solder. Then clip off the excess wire flush with the solder. If the solder blob is too big, remove it and resolder the pin before again adding the jumper.

BB I Layout

You need to be thoroughly familiar with the layout of the Big Board. It has a component side and a foil side. It also has four quadrants—the CPU, RAM, Video, and I/O. We will use these terms for orientation.

The main ground plane is on the component side and is generally cross-hatched. There are three main voltage grids in the RAM quadrant: +5, -5, and +12.

The -5 and +12 come up the CPU/RAM edge on the foil side, and then run down each of the four RAM rows on the component side. These two supplies also have traces at 90 degrees down each of the eight RAM columns (on the foil side).

The +5V supply comes from between the video and I/O sections to the CPU side of the RAMs on the component side, and then forms a half-grid by running traces down each of the eight RAM columns on the foil side.

Bypassing

Filtering on the +5V grid is provided by a small capacitor on each end of the column traces (C1-8 and C78-85).

The filtering on -5V and +12V supplies is more complicated.

Each supply has a large capacitor on each of the four row traces, (notice that they alternate sides). C21, 38, 51, and 68 filter -5V, while C22, 37, 52, and 67 filter +12V.

The -12V and +5V supplies also have 20 small capacitors (between them) distributed in alternating, interlaced patterns down each of the eight RAM columns.

In odd numbered columns, the five capacitors (between the +5V filters) (e.g. C13, 25, 39, 55, and 70 in column 1) filter +12, -5, +12, -5, and +12. In the even numbered columns, the five capacitors between the +5V capacitors (e.g. C14, 26, 40, 56, and 71 in column 2) filter -5, +12, -5, +12, and -5.

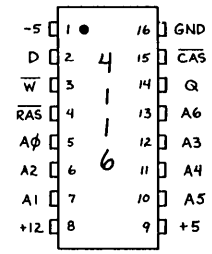
Changes

Now that you have all this straight, the following changes should make perfect sense (See Figures 2, 3, and 4).

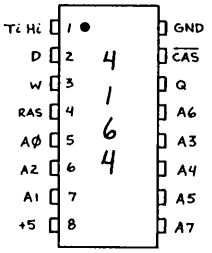
Pin 1 of the present RAMs is tied to the -5V grid. Remove all the filters from the -5V grid (we'll reuse the big capacitors later), cut the -5V supply, and tie the grid HIGH through a pullup and filter. Some 65K rams don't use this pin, but those with internal refresh need to have this pin tied high (to disable the function). (See Figure 2 for pinouts.)

Pin 9 of the present RAMs is tied to the +5V grid. Remove all 16 +5V filters for later reuse. This cuts off the +5V supply. We will also cut all eight column traces between rows 1 and 2. Pin 9 of the RAMs in row 1 will be tied together and to ground (C000-FFFF will always be located in bank 0). Pin 9 of the RAMs in row 4 (U39-46) will be tied together and to the output of R12, which connects to U59 pin 9.

(continued next page)



4116 - 16K Chip (top view)



4164 - 64K Chip (top view)

Figure 2 - RAM Chip Pinouts

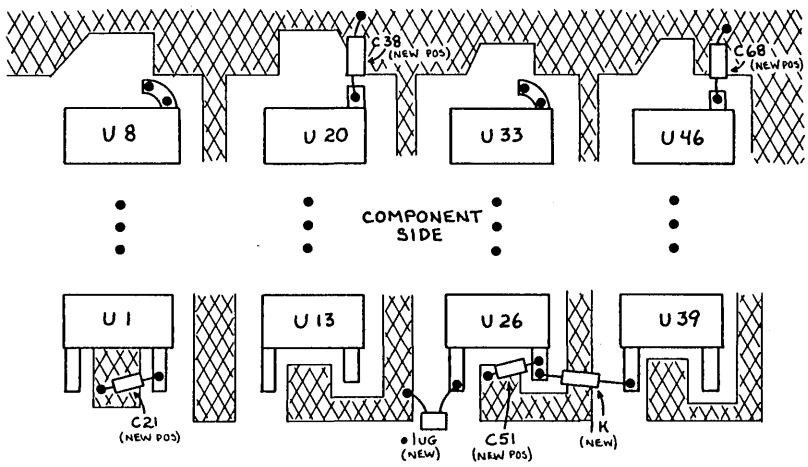


Figure 3 - Component Side Modifications

(256K In Detail continued)

Pin 8 of the present RAMs is tied to the +12V grid. Cut off the +12V supply, tie the grid to +5V, and add all the leftover capacitors for extra filtering.

Disconnect the WRB signal (U82 pin 5) from U59 and connect it to the RAM WRB grid directly. Separate U59 pins 11 and 10 and tie them to system PIO outputs A4 and A5.

Add extra bypass capacitors to the +5V supply in the video section to assure jitter free video, and replace the RAMs.

The actual step-by-step changes are as follows:

1. Remove the -5V filters: C14, 16, 18, 20; C25, 27, 29, 31; C40, 42, 44, 46; C55, 57, 59, 61; and C71, 73, 75, 77.

2. Remove and save the large -5V filters: C21, 38, 51, 68.

3. Reinstall C21, 38, 51, 68 in roughly their same locations as follows: locating the capacitor bodies on the ground plane, attach the plus leads to the old +12 (new +5) grid lines emerging from U1, 20, 26, and 39 (pin 8) by either tacking to the lines or using vias, and then tack the minus leads to the ground grid.

4. Isolate the +5 filters and new A7 nets by making the following cuts between:

Ui pin 9 and Ci for i=1, 2, 3, 4, 5, 6, 7, 8 (8 cuts)
Ui pin 9 and Ui+12 pin 9 for i=1, 2, 3, 4, 5, 6, 7, 8 (8 cuts)
Ui pin 9 and Ci+39 for i=39, 40, 41, 42, 43, 44, 45, 46 (8 cuts) (e.g. U39 p9 to C78, U40 p9 to C79, etc)

5. Tie together the new A7 nets by adding the following jumpers:

Ui pin 9 to Ui+1 pin 9 for i=1, 2, 3, 4, 5, 6, 7 (7 adds)
U1 pin 9 to ground (the uncut foil side of C1)
Ui pin 9 to Ui+1 pin 9 for i=39, 40, 41, 42, 43, 44, 45 (7 adds).

6. On the component side, locate the via by the pin 7 & 8 end of U56. Cut the trace between that via and where it goes under U57 (near pin 7). This isolates WRB from U59 pins 10 and 11.

7. Locate and mark U59 (and pin 9 for reference) on the foil side of the board. Cut the trace between U59 pins 10 and 11, thus isolating those inputs.

8. On the foil side, cut the trace leaving the U60 side of R12. Make the cut where the line jogs (around 1/2" from R12). This isolates the U59 driven WRB signal from the RAM WRB net.

9. Follow the trace you just cut toward the RAMs until you find the first via (around the old location of C68). Solder one end of a 33 ohm resistor in this via, point the free end toward the CPU.

10. Connect one end of a jumper wire to the free end of the 33 ohm resistor, and connect the other end to the via described in step 6 (find it again on the component side and stick a 30 ga. wire through it to locate it on the foil side). Trim the resistor lead with the attached jumper so that it doesn't short to anything. This connects the WRB signal to the RAM WRB net.

11. Run a jumper from U43 pin 9 to the U60 side of R12. This ties the new address selector bit to the RAM A7 grid.

12. Still on the foil side, locate U111, the system PIO. Pin 10 is connected by a component side trace to a via 1/4" from the pin (toward crystal Y3). Cut the trace from this via on the foil side, it goes to the power connector.

13. Attach the following jumpers on the foil side:

U111 pin 9 (Bell) to U59 pin 10 (new A14)
U111 pin 10 (Spare) to U59 pin 11 (new A7).

14. Tie 10K pullups to these new U59 inputs. Find a place to put two 10K resistors with one end of each tied to +5 and the other end available on the foil side to be jumpered to U59 pins 10 and 11.

15. On the foil side, cut the -5V power supply trace near C67 next to where the +12V supply trace jogs. This disconnects -5V from the RAM pin 1 net.

16. Tie the just-isolated RAM pin 1 net HIGH by connecting it to the new +5 grid through a 1K resistor and to ground through a .1 uf capacitor. U39 pin 1 has 2 vias within 1/4" for one end of the resistor, the other end can be tacked to the new +5 trace coming from U26 pin 8. The trace from U26 pin 1 has a nearby via for one end of the capacitor, the other end should be tacked to the ground plane.

17. On the foil side, cut the main +12V power bus going to the RAMs up the CPU/RAM edge of the board; make the cut just inboard from TB1 (main power connector) pin 4, without disturbing the trace going toward the I/O section.

(continued on page 8)

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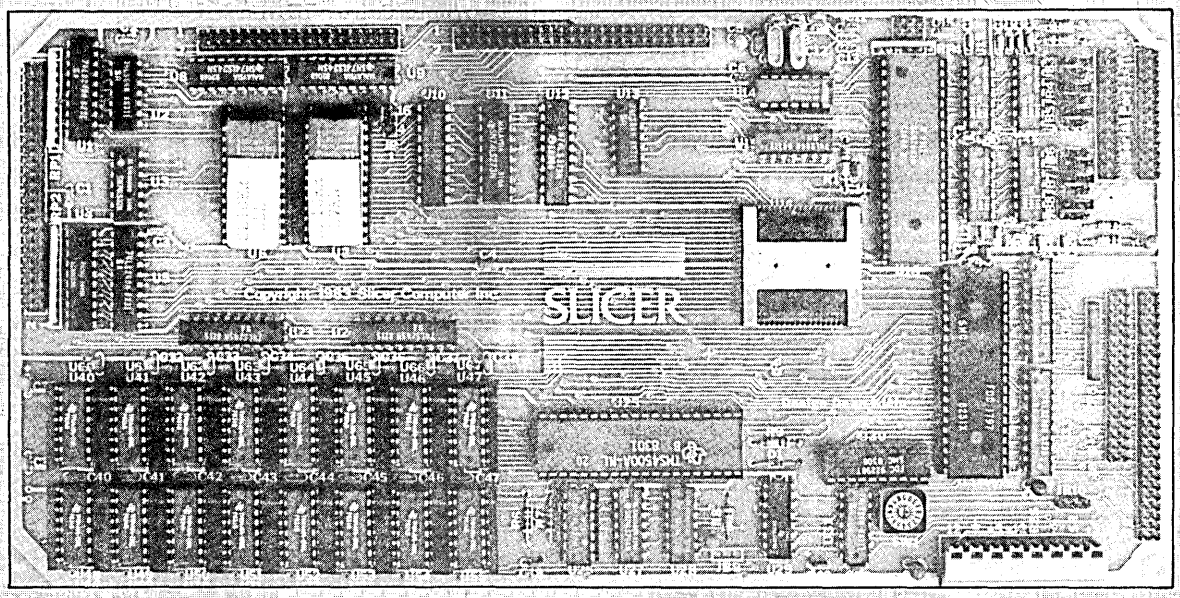

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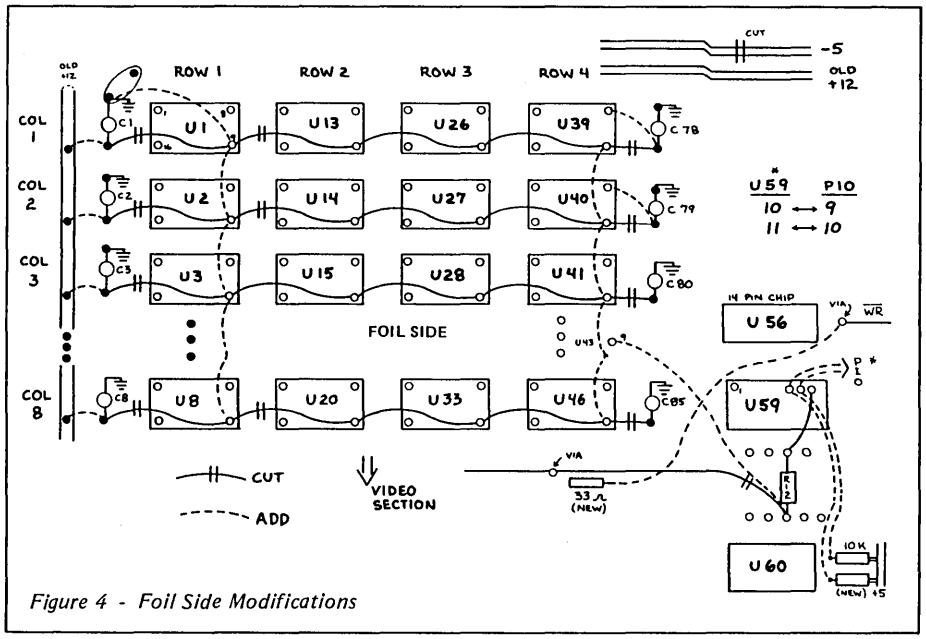

Figure 4 - Foil Side Modifications

(256K In Detail continued)

With a short piece of 20 ga. wire, jumper the just-cut end of the main +12V supply trace to TB1 pin 3 (+5 volts).

Roughly 3" from TB1, following the power bus toward the RAMs, there is a trace coming off the bus and going to a via by C112:

Cut the trace between the bus and the via, and run a jumper from the via to TB1 pin 4 (+12 volts).

If you had installed the RAM saver circuit, it is no longer needed and should be removed (patch up the +12V foil).

18. On the foil side, tie the +5 power supply to the old +12V by adding the following jumpers:

+39 (mc #13, P3)

Ui pin 8 to Ci~~+26~~ cut foil end (+5V side) for i=39, 40, 41, 42, 43, 44, 45, 46 (8 adds)

19. On the foil side, tie the remaining filters to the +5V supply by tacking short jumpers from the cut foil end lead of C1, 2, 3, 4, 5, 6, 7, 8 to the old +12 (new +5) bus that runs next to them along the card edge.

20. To assure that the new demand (and noise) on +5V does not affect the video stability, add the following capacitors to the ground plane (by tacking or drilling) and vias in the +5 lines in the following places:

By U12 pin 14: a 1-10 uf tantalum capacitor (+ lead to +5V),
By U51 pin 16: a 1-10 uf tantalum capacitor (+ lead to +5V),
By U64 pin 18: a 50-100 uf min. electrolytic (- to ground).

21. Recheck all your work, test for shorts, and make sure the power supplies and ground are not shorted together. Look for solder blobs and splashes or wire fragments. Reflow any cold solder joints and clean up any resin deposits.

22. Pull out the 16K RAMs and carefully insert the 64K parts.

23. Update your Big Board documentation (i.e. prints) to reflect any changes you made.

Your board is now modified and ready to go. Carefully apply power and go for the magic prompt! If it doesn't work, recheck your work and proceed as if bringing up a new big board. You may have blown out something else while doing the modification. For related articles see Micro Cornucopia issue 4, page 16, and issue 9, page 8.

The list of parts needed to make the change is as follows:

You need 32 64K RAMS (or 24 64K RAMS and 8 compatible 16K RAMs). The RAMs should be 200ns or better (especially if you intend to go to 4 MHz).

resistors:
1—33 ohm (anti-ring damper)
1—1K ohm (net pullup)
2—10K ohm (input pullup)
capacitors:
1—.1 uf disc
2—5 uf tantalum
1—100 uf electrolytic

Editor's note: This is the hardware portion of this article. Next issue, we'll look at the software ramifications (heh, heh) of these mods. Art also included some really super information on correcting video shake for good. (Issue 13 is already looking pretty lucky.)

■ ■ ■

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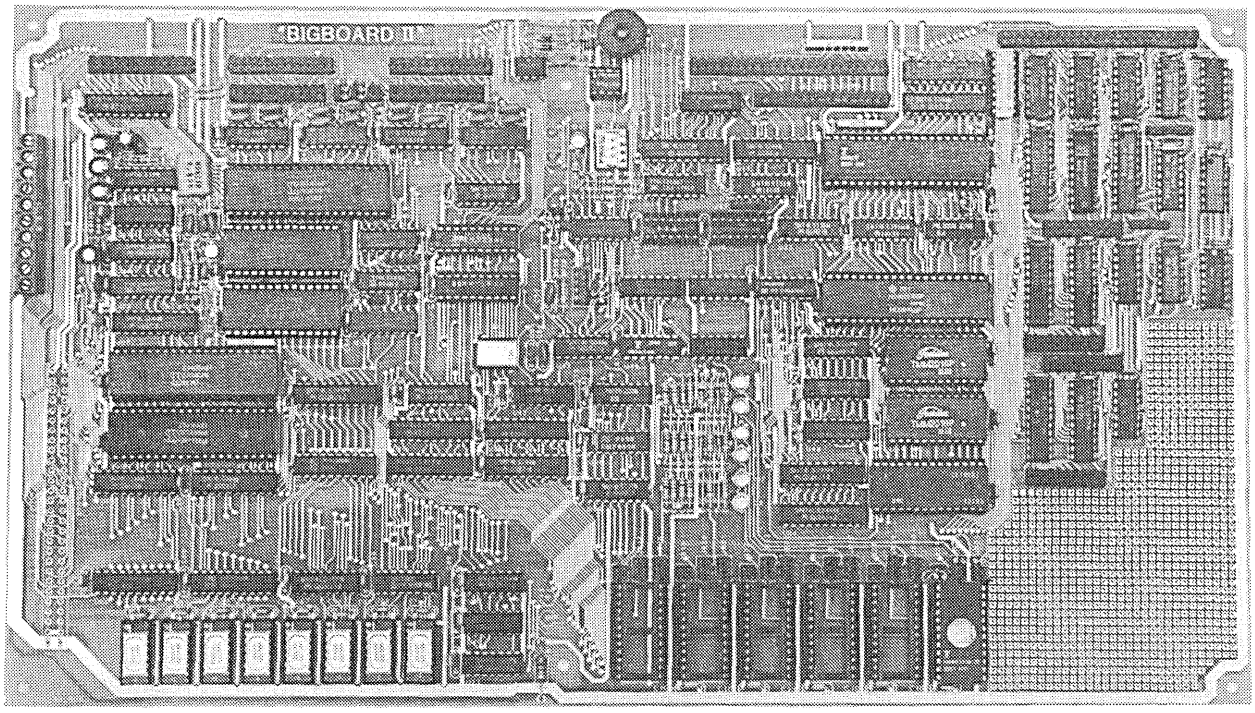

$795 ASSEMBLED & TESTED $545 "UNKIT"* $245 PC BOARD WITH 16 PARTS

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

■ 4 MHz Z80-A CPU and Peripheral Chips

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

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

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

■ Multiple-Density Controller for SS/DS Floppy Disks

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

■ Vastly Improved CRT Display

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

■ STD Bus

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

■ DMA

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

SIZE: 8.75" x 15.5"
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■ "SASI" Interface for Winchester Disks

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

■ Two Synchronous/Asynchronous Serial Ports

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

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

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

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

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

■ PROM Programming Circuitry

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

■ CP/M 2.2**

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

---

* *The "unkit" is a fully-socketed, wave-soldered "Big Board II". It requires NO soldering. All an "unkit" purchaser must do is carefully insert the prime ICs we supply in the proper sockets and systematically proceed to bring up and test the board.*

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Packet Radio

By Peter J. Eaton WB9FLW

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Radio amateurs in Canada, Sweden, and the U.S. have been experimenting with packet radio, a system of computer-based communications. This new mode can provide high-speed communication that is interference resistant and is efficient use of the spectrum.

What is packet radio?

Packet radio is a communication of digitally encoded data (similar to teletype and ASCII) that includes handshaking and error detection. The error checking is done by including a frame check sequence (FCS) with each transmission (called a packet of data). The receiver acknowledges an error-free packet by sending back an acknowledge (ACK) signal.

If the sending station does not receive an ACK within a certain period of time, it automatically retransmits the packet.

A packet also contains an address, so a packet station will ignore any packets not addressed to it. Since packets are sent in short bursts, many stations can use the same frequency without conflict. On very busy frequencies you might notice some delay in sending data or receiving an acknowledgement, but you never hear the other stations.

Requirements

Each station has to have a terminal, a terminal node controller (TNC), and an amateur radio transceiver.

The terminal can be a simple dumb terminal, a printing terminal, a personal computer, or even a mainframe type system.

Most terminals generate asynchronous characters. These characters have 1 or more "marks" (binary 1's) which indicate where each character begins (start bits) and ends (stop bits). The characters are sent at a specific baud (bit) rate. There is no set time interval between characters.

The TNC

The terminal node controller (TNC) is the heart of the system. It has an asynchronous serial port which connects to the terminal (etc.) and an additional port which connects to the transceiver's microphone line, speaker line, and transmit control line.

The TNC collects the data coming in from the terminal, until it has enough for a packet. It then attaches a header which includes the address of the destination and control information for the network, and it attaches the error checksum and flags to mark the beginning and end of the packet.

The TNC then sends the packet out through the transmitter at the packet channel baud rate. Usually it produces AFSK modulation, which means it sends one tone for a mark and another for a space.

The receiving TNC decodes the audio tones (from the speaker line), removing and checking the address information and the checksum. If the packet is correctly addressed and correctly received then it passes the information to the terminal (at whatever baud rate is appropriate for that terminal).

The modem part of the TNC translates the tones into ones and zeros. Most packet radio modems operate at 1200 baud, and the tones are 1200 Hz and 2200 Hz. This is the same pair of frequencies used by the bell 202 (half-duplex) modem which is available as surplus.

The Transceiver

The transceiver (transmitter and receiver) usually operates on the amateur radio 2 meter (144-148 MHz) band. The main requirement is that the transceiver be able to pass 2200 Hz audio tones adequately. Most 2 meter rigs will do this.

Handling the Protocol

The functions of the TNC which would be difficult to duplicate on a personal computer are the protocol decoding/encoding and simultaneous operator control.

The protocol sets the contents of the packet header and trailer so that the receiving TNCs know the purpose of the packet. For instance, is the packet being used to check into a net? Or is it part of a communication with another station? Or is it simply acknowledging receipt of another packet? Meanwhile, the station operator may want to interrupt the proceedings.

Obviously, a system running under a BASIC interpreter would not keep up, so we've had to write the software in assembly language. If the TNC were replaced by personal computers, we would have to write new software for each different computer.

Since the TNC must be constantly listening to both ports while putting packets together or taking them apart, the hardware of personal computers may not even be capable of handling the task.

Editor's note: Peter is obviously not aware of the incredible feats of engineering taken on by inspired BB owners. The common ham (amateur radio operator) with his hand-held appliance (I have one too) won't know what hit him if we turn the BB group loose on the airwaves. (Legally, of course!)

Packet Details

A packet is the basic message unit. It usually consists of text typed in by the operator and sandwiched between the header and the trailer.

During a typical QSO (conversation on the air) a packet would be put together and sent out each time the operator ended a line by hitting a carriage return. The length of the packet is limited to no more than 128 characters. This limitation helps a single user from hogging the frequency as well as making sure that the sending and receiving TNCs don't get swamped.

The data inside the packet need not be ASCII characters. They could be BCD, EBCDIC, or even binary data such as .COM files.

The TNC uses a bit-oriented protocol called HDLC (high level data link control). This protocol was chosen because it is supported by a single LSI communications chip, which simplifies both the hardware and the software. Also, in this mode, data is transferred faster since individual characters no longer need start and stop bits in this synchronous mode. See Figure 1. *(Editor's note: the Z80 SIO supports HDLC very nicely, handling the CRC and flag generation. It also checks the first byte of the address for a match. See a Z80 SIO manual for details of HDLC which is also called SDLC.)*

The address field contains routing information for the packet. This information may include the destination station, the originating station, and possibly, some intermediate routing instructions.

Identification of the stations might be by network address number or by amateur call sign.

The control field describes the purpose of the packet. It identifies packets which are network check-ins or check-outs, packet acknowledgements, or requests for information from net control. It may also contain a sequence number for a multi-packet message which must be received in the correct order.

The data field contains the message.

The FCS is just another name for a CRC, a fancy checksum.

What is a packet network?

A local area packet network (LAN) is made up of a net control station (station node) and a number of individual stations (terminal nodes). The net may operate through a digital repeater which can be a single-frequency repeater or a standard duplex repeater.

As operators sign on to the net, they are assigned address codes by the net control. An operator wanting to talk to another station logged onto the net can simply address his transmissions to that station.

An operator can choose to listen in on all transmissions or just those addressed to him. Of course, he will only send acknowledgements for transmissions directed to him.

The operator who is acting as net control operates his station just like anyone else; the special net control functions are taken care of by his TNC.

Connecting LANs

Some stations will be able to access more than one LAN. These stations could be members of both groups and serve as communications links through which packets can move between nets.

Plus there are three other ways being considered for transfer of data between LANs.

1. TERRACON would be a high-speed ground-based link using UHF and microwave relays. It could handle most packet radio communications in the U.S. and Canada. It will probably be a few years before this system becomes useful.

2. AMICON would be a satellite-based utilizing one of the special services channels on the AMSAT phase II-B satellite. This system will allow intercontinental linking with isolated areas which would not be accessible by TERRACON.

3. SKIPCON is the projected high frequency network. The nature of HF propagation requires slower data rates (50 to 600 baud) and error correction as well as error detection protocol. Experiments with this long range mode began in 1981.

How to get started.

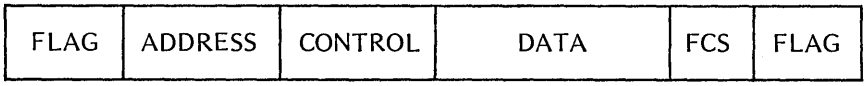
There are now two TNC designs. The first TNC was designed by the Vancouver (BC) Amateur Digital Communications Group and they sell a bare board with instructions. They also sell a modem kit. This TNC is based on the 8085 and the 8273 HDLC controller. It includes 4K bytes of 2114 RAM and four 2708s.

The Tucson Amateur Packet Radio Group is testing a second TNC design. This TNC has the modem, radio interface, serial and parallel terminal interfaces and power supply circuit on a single board. It is based on a 6809 and can contain up to 48K of RAM and ROM. The 1933 HDLC chip on this board is compatible with the 8273 chip used on the Vancouver group's board.

Editor's note, I don't have the addresses of the two clubs mentioned but hopefully I'll have that information by the next issue. If you can't wait, contact Peter or get on the air and locate folks from these areas who could tell you.

■ ■ ■

Figure 1 - Makeup of the HDLC Packet



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C'ing Clearly

Aztec CII Compiler Ver. 1.05

Review by Bill LaFay

1214 Westridge Circle
Lynchburg Va. 24502

I am new to the world of C programming. I used to use BASIC for all my program needs. BASIC was easy to learn and use. C is quite different from BASIC and not being familiar with structured languages, I decided that the C I would buy must follow "the book" (Kernighan & Ritchie) religiously. Through the urging of a friend, I bought AZTEC C.

Overview

Aztec C comes in two flavors: Integer and Floating Point. Two for the 8080 and two for the Z80. It also comes with its own assembler, linker and librarian. These, according to the user manual, are a sub-set of Microsoft's M80/L80. If you have M80 & L80, you can use them along with your personal external libraries.

The compiler is a one pass compiler so all references must be forward. It has switches which: allow the source text to be added to the assembly language output as comments; define the length of expression lines in the source program (default is 120), and define the size of internal work tables. The output of the compiler is an 8080 assembly listing in the case of the 8080 versions and expanded 8080 for the Z80 versions (not true Z80 mnemonics).

Strengths

1. Compiles for own assembler/linker or for Microsoft's M80/L80.
2. Initializers on declarations.
3. Random access file I/O.
4. Very complete error message definitions.
5. Compilation, assembly, and linking under SUBMIT file.
6. Supports 16 significant digit floating point arithmetic.
7. FP exponent range E+-128.
8. Dynamic storage allocation.
9. .MAC compiler output can be hand optimized.
10. Structures, pointers, casts.
11. Long, Float, Unsigned, double, static, register, extern.

Weaknesses

1. Calls must have same type & number of arguments as the called function.
2. No FCALL function for calls to existing FORTRAN LIBRARY routines.
3. Internal floating point notation is not compatible with the MICROSOFT FORTRAN or BASCOM conventions.
4. No tracer option for single step debugging. ZSID must be used on the .COM file.
5. No built-in utility for easy debugging.
6. No code optimization option.
7. No bit fields.
8. No pipes.

Documentation

The manual is new with this version and is chock full of information. It gives good coverage of all facets of Aztec system operation.

MANX SOFTWARE SYSTEMS sent an update disk that included the needed libraries called for by the linker. This saved a lot of compiling, assembling etc.

The user's guide seems to contain the information needed but it is "impossible" for the uninitiated. I've seen much better and would hope the needed improvement will be made.

Ease of Use

The submit file that comes with the package makes compiling, assembling, and linking very easy. I use the CZII floating point compiler with M80 & L80 and it works very nicely.

Code Size And Quality

The Aztec C is a single pass compiler and does no optimizing but still generates good code. The CLIBZ80 library is large and no doubt accounts for the large object file size.

Conclusions

There were a number of problems with the early versions of the floating point compiler (CZII) but now things seem to be in good shape. The people at Manx have given me prompt and courteous service. The compiler works like the book (Kernighan & Ritchie) says and has all the features except those indicated above. Would I buy it again if I had to do it over? I think I would.

For the benchmark test, I used the same program as shown on page 4 of August 1982 Micro-Cornucopia. I also am running a 4MHz Big Board.

Benchmark Results
4MHZ Z80 Bigboard

Compile Time 16 sec
Assembly Time(M80) 16 sec
Linker Time(L80) 51 sec
Run Time:
-original prog. 32 sec
-static variables 22 sec
-register int var. 22 sec
Object File Size 17K (.COM)

NOTE: I have written my own version of the trig functions I needed. They are written in Aztec C and are accurate to 9 significant digits which is fine for almost all applications. These will work for Aztec C version 1.04 which doesn't have them.

They should also work on any C compiler that handles double precision numbers. I have also interfaced Aztec C with the MICROSOFT FORTRAN library. This speeds up computations by a factor of 3.

Editor's note: Any novice who is writing trig functions has my vote for "novice of the year." Also, version 1.05 not only adds such things as I/O redirection, the scientific math functions, scanf, and relative byte support for unbuffered I/O—it also has a fancy new manual. And still, it is available (to Micro C readers only) at $149.00 Anyone interested in Bill's scientific routines and FORTRAN library interface should contact Micro C. If you are interested we will put them together as a user disk.

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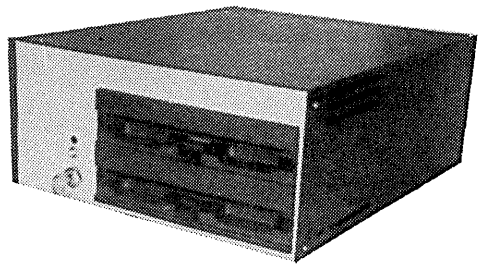

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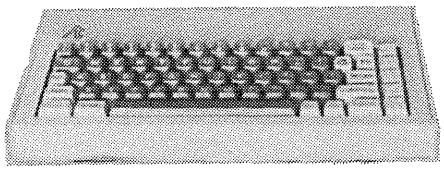

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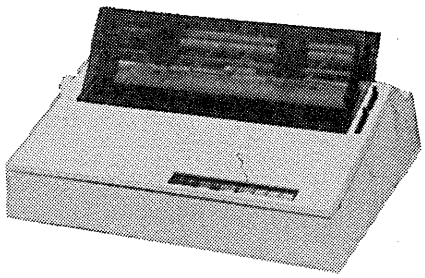

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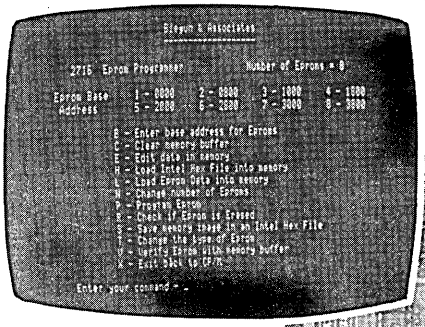

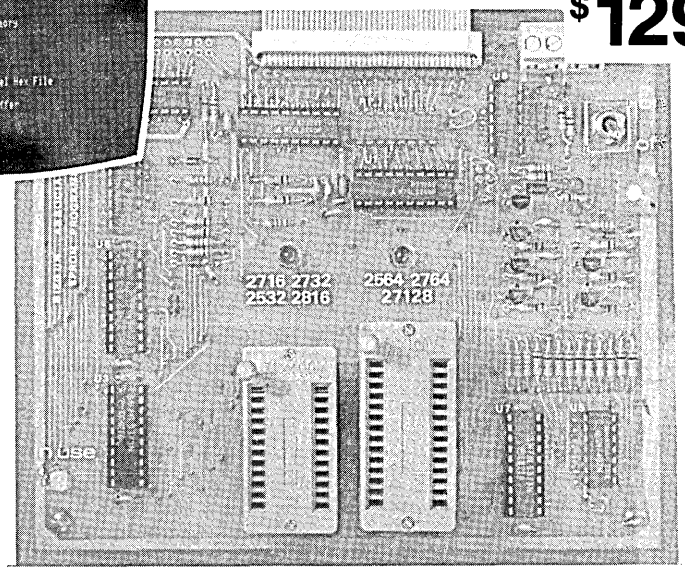

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Bringing Up The BB II

By Jim Showker

11174 Penrose #C
Sun Valley, CA 91352

Sometime during the first week of December '82 I sold my BB I and the next day ordered a BB II bare board from Cal Tex in San Jose. I had talked to them twice in the previous month to confirm that they could ship from stock immediately, since being without a computer at home for any length of time makes me feel semi-naked. I was concerned because I waited quite a while for my BB I.

However Cal Tex was temporarily out of various parts the day I placed my order. I received my bare board, a "hard to get parts kit," and CBIOS on disk about 2½ weeks later.

Assembly

I very carefully assembled and soldered the sockets and components to the board. I then cleaned the rosin off the back of the board and over a period of two days was able to find 10 errors in soldering. There were 4 connections unsoldered, 5 possible cold or otherwise disreputable looking solder joints and 1 solder bridge.

After carefully installing all the IC's and applying power to the board I was quite happy indeed to hear, after about two seconds, a loud beep from the board. This meant that the CPU, memory, and I/O ports were probably working correctly.

Debugging

I had no video, however, and was able to quickly establish that the CRT section was not working at all. There was a 16 MHz clock, but that was it. It didn't take too long to establish that U45 was bad. After replacing it, I still had no video. I now had all the necessary video signals, but no composite output. I figured that the output transistor had been taken out when U45 went. That was when my troubles began.

I was now trouble shooting from the schematics, of course. I pulled the video output transistor, and put in a 2N2907 like it said on the schematic. (I didn't notice that the component layout sheet listed the same transistor as a 2N2222.)

I now had a completely inverted composite video signal. I assumed the design was faulty and eventually ended up designing a composite video generator on the "breadboard" portion of the PC Board. Only recently did I notice the error and replace the 2N2907 with a 2N2222. This silly error probably cost me 25 hours.

Drives

I then hooked up the disk drives (2 ancient Siemens, that had worked perfectly on SD with the BB I). Installing the CBIOS turned out to be quite easy, unexpectedly so. But, I could not format in double density without LOTS of errors. I got sidetracked with the schematics again, thinking something was wrong on the board as there are many hookups that are not as shown.

After a few days I went out and bought a new drive, to see if that could be the problem. Being not a rich person, I bought another $250 Siemens drive (a mistake). The older ones had worked fine for me on SD and these were specified for double density. Anything else I could buy was $380 or more. I still had the same problems with the format program. Two weeks of hair pulling and chin scratching followed.

On a Sunday, I went to my office and disassembled the computer there (a custom installed rack mount S-100 System) and brought home two Shugarts that I knew worked fine on double density. Voila, no more errors.

I resigned myself to spending $400 a piece on drives and went back to Priority 1 to trade up or get my money back. They convinced me to try another Siemens as they said they were getting very few returns. I took another one home and it worked perfectly.

The next day I went to buy another, for drive B:, and after hooking it up, it had the same problems as the first. I exchanged it and the fourth one did not work at all, either. It made horrible clanking noises and wouldn't load the head. I was able to fix it though and now have two Siemens drives working reliably. (Beware of Siemens drives.)

Modem

I recently tried to hook up my modem. In the assembly portion of the manual that came with the BB II there is a jumper diagram for utilizing SIO A as the modem port. Elsewhere in the manual, under a section called "BETTER BOARD UPDATE" there is a list of jumpers for configuring a modem that is the opposite of that in the assembly manual. In the very next paragraph after this list it reads: "To connect a serial terminal to the Better Board, install the Modem jumpers. To connect the Better Board to a modem, install the Terminal jumpers." Confusing.

As usual, when I get confused about configuring or don't quite understand something, I look through my issues of Micro C to see if I can find a reference. In issue #9 there's a short article called Talking Serially by David Thompson. All became clear. Like most Big Board owners, I am not an expert in this field; it's my hobby. Without Micro C, I wouldn't have had a BB I that worked and would not have bought a BB II.

YAM and MODEM7 configured for the BB I will not run on the BB II. The port numbers are different. (User disk #14 has BB II modem software.)

Documentation

Bill Siegmund apologized for the schematics, said there would be new ones soon. When? The documentation I received has dates on it of 5/25/82 and 8/20/82. Surely there's been enough time.

The BB I documentation was sparse, but everything I needed was there. There is no list of Disk Drive error codes, there's no list of port numbers, and the jumpering info for a modem or terminal is confusing. A list of port numbers is in the ROM listing, included on disk with the system.

Bill was very helpful when I was trying to solve the problem with my drives. He spent a lot of time with me on the phone and his willingness to help impressed me.

Bad documentation is a very common complaint, and perhaps I shouldn't expect too much with a computer kit that sells for this amount of money, but I would have saved at least 30 hours if the schematics had been correct. The other missing or incorrect info would be appreciated also.

Monitor

My NEC 1201 monitor will sync up

(continued on page 26)

Pascal Procedures

By John Jones

6245 Columbia Ave
St Louis, MO 63139

Finally, after what seemed like an endless wait, I got my copy of JRT PASCAL V3.0. It seems that whatever other problems they've solved, JRT Systems still hasn't solved the slow shipment problem. On the good side, my first impression is that it was worth the wait.

This review will just hit the high points since I haven't been able to completely "wring out" the new features.

Improvements

One of the major complaints with earlier versions of the JRT compiler was that it frequently would go "off in the weeds" when it encountered errors in the source. The new compiler seems to be much more resistant to that. Listing control directives and options have been added which allow page-formatted output to the printer, disk file or console. Frequently used routines can be inserted as source with the %INCLUDE command.

Support for file (window) variables through standard GET/PUT statements has been added. Programs written for another compiler will require fewer changes for JRT.

Extensions

Standard PASCAL shows less flexibility for array handling than some other languages since the size of all arrays must be declared at compile time. JRT V3.0 has added the ability to ALLOCATE array bounds at execution time, a significant improvement. The use of dynamic arrays, though, is somewhat restricted.

Utilities

Indexed file support (single key) is provided as a set of external procedures. The demo program in the manual runs properly for me - but it is not very fast. Number output formatting similar to both BASIC's "PRINT USING" and COBOL's "PICTURE" is implemented as an external function. High speed search of memory data is also provided as an external function.

The external procedure source file generator program, CRTMAP, lets you format screen displays with simple, high level commands.

The Manual

The User's Guide has been expanded by about 50 percent. Most of the expansion is coverage of the additional features and utilities. However, there is a new section on common problems (many of which I had to discover on my own with V2.1) and an expanded introduction. Plus, the 16-page reference card makes trips to the manual much less frequent.

Overall, the package is quite improved. All but one of the programs I've been running under V2.1 compiled without error on the first attempt. The only apparent problem with the compiler I've found is that it doesn't seem able to tell when it's out of memory.

The program mentioned above would not compile correctly until portions had been moved to external procedures. Before the program was trimmed down, the compiler would drop back to CP/M or even PFM without an error message—frustrating.

In future articles I'll try to give more details on various portions of the package as space and time permit.

Tutorial

This issue's PASCAL tutorial is on loop and control structures. For all the examples, where the word STATEMENT is used, either a simple statement or a compound statement within a BEGIN . . . END construct can be used.

PASCAL provides three methods of iteration or looping. See Figure 1.

Figure 1

```
FOR I := START TO ENDING DO
  BEGIN
  .
  .
  END;

FOR INDEX := 'P' DOWNTO 'B' DO
  STATEMENT;
```

These should look familiar to anyone who has used BASIC or FORTRAN. The FOR statement is a means to execute a portion of a program a specific number of times. Unlike BASIC, the loop control limits are calculated before the loop is entered so if START **>** ENDING the loop is not executed even once.

The loop control variable, which must be a type for which SUCC and PRED are valid (integer, char, enumerated etc.), cannot be modified within the loop. Nothing equivalent to the STEP clause in BASIC is available. See Figure 2.

Figure 2

```
WHILE BOOLEAN_CONDITION DO
  STATEMENT;

WHILE NOT ( EOF(INFILE) ) DO
  BEGIN
  READ (INFILE; VARIABLE_LIST);
  PROCESS (VARIABLE_LIST);
  END;
```

The WHILE statement is used for iteration with control at the beginning of the loop. When CONDITION evaluates to 'FALSE' the loop is not executed. See Figure 3.

Figure 3

```
REPEAT
  STATEMENT;
UNTIL CONDITION;

REPEAT
  READ(INFILE; V_LIST);
  PROCESS(V_LIST);
UNTIL EOF(INFILE);
```

The REPEAT statement is used for looping when the end condition test is needed at the end of the loop. For both WHILE and REPEAT the boolean value which terminates the loop MUST be capable of alteration within the loop. If it is not, an infinite loop will result.

There are three basic methods available for controlling the execution of a PASCAL program. The IF statement is similar to IF constructs in other languages. See Figure 4.

Figure 4

```
IF BOOLEAN_EXPRESSION
  THEN STATEMENT1
  ELSE STATEMENT2;
```

The THEN clause will be selected if the BOOLEAN evaluates to TRUE and the ELSE (which is optional) will be executed on FALSE. Note that no semicolon follows the statement preceding the ELSE. If it were present, the compiler would interpret it as the end of the IF statement, not desired in this case.

Multi-way branching is accomplished with the CASE statement. See Figure 5.

Figure 5

```
CASE INPUT_CHAR OF
  'A','B','C' : STATEMENT1;
  'Z','X'  : STATEMENT2;
  'Q'   : STATEMENT3;
  'Y'   : STATEMENT4;
  ELSE  ; STATEMENT5;
END;
```

For most PASCALs, the case selector must be an ordinal expression. The ELSE is an extension (for JRT and others), other compilers have no provision for a non-match or use the word OTHERWISE. JRT PASCAL is unique in that expressions may be used as case labels. For example, see Figure 6.

Figure 6

```
CASE BOOLEAN OF
  (SALARY > 0) AND (SALARY < 10000.0) :
    TAX := 0.10 * SALARY;
  (SALARY > 10000.0) AND (SALARY < 20000.0) :
    TAX := 0.20 * SALARY;
  (SALARY > 20000.0) AND (SALARY < 100000.0) :
    TAX := 0.30 * SALARY;
  ELSE  TAX := SALARY - (SALARY / 10.0);
END;
```

Finally, PASCAL does allow the use of GOTO. The destination statement must have a label, and all label values must be declared. See Figure 7.

Figure 7

```
PROGRAM XYZZY;
  LABEL 10;
   .
   .
  IF WIZARD THEN GOTO 10;
   .
   .
  10: PERFORM(MAGIC);
   .
```

I avoid using GOTO statements but am not adamant about it. You'll find that in most cases, programs will be easier to understand and follow without GO-TO's.

String Handling

One of the criticisms of JRT PASCAL is that it implements non-standard features in a non-standard way. Leaving the validity of the argument aside, one of the problems with JRT's implementation of the non-standard type STRING is that string variables cannot be read from files, only from the console.

The BOOLEAN function getstring presented here can be used to read a dynamic string from a file. The file is assumed to be a standard ASCII text file with lines terminated with carriage return or linefeed (or both) and end-of-file signalled with cntl-Z. The constants can be changed if your operating system uses different values. The file should be RESET (opened) in binary format.

The function is equivalent to the statement READLN (STRINGVAR); for a console read and will return TRUE on end-of-file. The function could be used in any program where text data needs to be manipulated on a line-by-line basis, see Figure 8.

Figure 8

```
(* This type declaration is needed in the main program *)
type text_file = file of char; (*JRT does not recognize 'TEXT'*)

function get_string(var f:text_file; var line:string): boolean;

 const (* constants for normal line & file delimiters *)
       cr = 13;
       lf = 10;
       endfile = 26;

 var
       ch : char;
       i : integer;
       new_line : array[1..256] of char;(* long enough for most *)

begin
 new_line := ' '; (* clear assembly variable *)

 repeat   (* read chars til first non-terminator *)
       read(f;ch);
 until not ( ord(ch) in [cr,lf]);

 i := 1;

(* now read characters until get terminator *)
 while not ( ord(ch) in [cr,lf,endfile]) do
       begin
       new_line[i] := ch;
       i := i + 1;
       read(f;ch);
       end;

 line := copy(new_line,1,i-1); (* assign to dynamic string *)

 get_string := ( ord(ch) = endfile ); (* then assign EOF *)
end;
```

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Note: Disk Inspector requires an 80x24 screen on your CRT.

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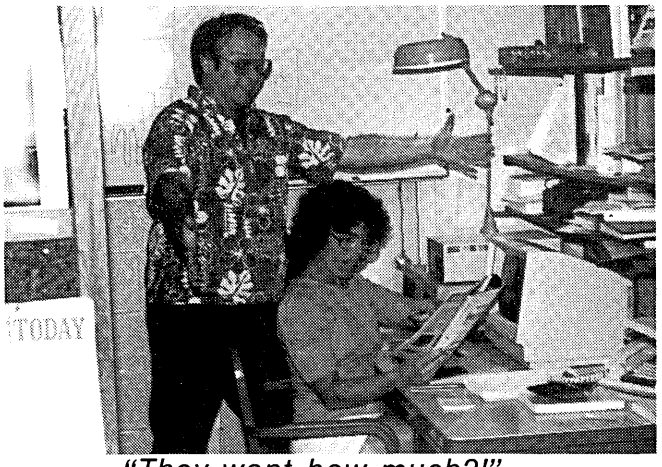

"They want how much?!"

On Your Own

By Guest Columnist
Hampton Miller

Computer Consultant
PO Box 816
Carpinteria, CA 93013

Few books are available to help you if you are providing a service. I suppose that this is the case because the books wouldn't be very long.

Contract programming, for example, requires no store front, no inventory, and none of the other trappings of typical business. Your expertise is all the ticket you need for this kind of self-employment.

Self-employment used to be the normal thing and people lived and died on the basis of their own decisions and "Acts of God." However, these days, people figure it's best to be secure so they attach themselves to a large organization. In fact, self-employment is so unusual now that we're called something different—like "Entreprenuers" (which is French for Broke).

Rules

Let's discuss some of the rules found in various guides to self-employment. All of them make sense and after I've broken them (with painful results) they've made even more sense.

1. There are many things you can do for free—other people's work is not one of them. Most people seem to believe that "self-employed" means "unemployed" and "independently wealthy." Their interesting projects which do not pay, DO NOT PAY! You will be very sad, indeed, when the bills arrive.

2. Get paid. Some consultants are embarassed about arranging payment. If you're one of them, change or get out. You know you are worth it—if they don't agree then you don't really want to work for them.

Charging for time and materials (T&M) can be a gold mine but most of my clients have been burned badly this way. So I propose T&M for the up-front analysis which establishes the milestones. This way I root out all the necessary resources in the company, get a good overall picture of the project and get paid for doing it.

With the project clearly laid out, then you and the client can more easily agree on a reasonable fee and time schedule.

Be sure to set partial payments at the milestones with a balloon at the end. This way you can survive along the way while the client still retains control (the balloon) should he not be pleased with the job. If the milestone payments are enough to live on, then you can afford to walk away from a really bad situation.

Be careful if you are performing a service through a broker or service company. Specify that you get paid upon client acceptance. Otherwise, you might wait two months for payment.

3. Don't let them make their problems your problems. Watch out for "we're sorry but after paying all the fixed costs, we don't have enough for you right now" or the ever popular "we should get some money real soon now." Make it abundantly clear to them that you are very much a fixed cost which must be dealt with up front.

4. Put it in writing. You don't have to have a full blown contract, but writing out all the details as you understand them makes it easy to discuss things with the client. It's a lot more pleasant to find misunderstandings early than after you have spent months building something. Of course, if the client agrees to all the points, signs the document, and then disregards portions—it's time to find someone else.

5. Have more than one client. There are three reasons for this.

First, it gives you a lot of freedom in choosing what you want to work on (it's easier to say no to an unpleasant project if someone else has a project waiting).

Second, you can increase your pay by letting clients bid against each other for your time. Let them set your hourly rate.

Third, the IRS can make things pretty tough if they think you are an employee rather than an independent contractor. If you have more than one client, they can't complain.

6. Don't burn any bridges. Your best future clients are your past clients as long as you don't make waves. i.e. don't say anything controversial such as promoting self-employment to your clients' employees. Just do the work, submit your invoice and get out!

Editor's note:

Hampton called me the day he quit his 9 to 5 to begin consulting in earnest. He was ecstatic! Later he called looking for a shoulder to cry on. He had set up milestones for a project but wasn't going to be paid until he had finished (and part of it was taking longer than he had figured). At that point I asked him to do one of the "On Your Own Columns."

When he sent this article, he sent a real bonus. In the margins were scrawled some intriguing comments which I've taken the liberty of excerpting:

"Things are going much better now with money coming in at last! Last week we were down to NO money, NO food, and NO working car (or gas)."

"This is repeat (of) material (in Micro C) but these few points make all the difference between real success and failure. Paper successes can get VERY hungry!"

"I'll be in touch and am looking forward to the big whoop de doo!"

You'll all get a chance to meet Hampton and his wife at the SOG.

■ ■ ■

Canned Lightning For Your Big Board!

If you're hot for speed and have a standard BB with a parallel interface, flash on this:
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FORTHwords

A Column by
Arne A. Henden 7415 Leahy Road
New Carrollton, MD 20784
(301) 552-1295

This is going to be a fairly long column, covering the FORTH-83 Proposed Standard, along with a FORTH application. But first, news from the FORTH world.

FORTH Vendor News

Laboratory Microsystems has released their FORTH 2.0 for the Z-80. While 2.0 is not FORTH-79 standard, it has most of the features of that standard, such as the 1024-byte blocks. The user's manual has been expanded and reprinted on a daisy wheel. The real advantage of 2.0 is that Duncan has included a simple I/O-driven multi-tasker, allowing ten background tasks and one foreground task. The best news: the price remains the same: $50 for a multitasking FORTH!

Unified Software Systems has added hashed vocabularies in their latest release, making UNIFORTH the fastest FORTH-79 system when it comes to compilation. Readers who mention Micro Cornucopia are entitled to a 30% discount on any UNIFORTH version.

FORTH-83

I've finally received the draft proposed FORTH-83 standard. There are more changes than I expected, and many of the areas that were begging for standardization were omitted. Here are some of the details.

All truth flags are either 0 or all ones (i.e., -1). This simple change causes all kinds of problems! You can't perform operations such as " 0= VAR +!" to increment a variable by 1, and words such as UNIFORTH's MATCH and CMPS cannot be used as precursors to conditional tests like IF and WHILE.

State smart words are removed. By "state smart" I mean words that have different actions depending on whether FORTH encounters them during compilation or execution. The primary example of this is dot-quote (."). It has now been replaced with two words: ." for compilation mode, and .(for execution mode. Tick (') has been replaced by ' for execution and ['] for compilation, and now leaves a word's code field address (CFA) instead of its parameter field address (PFA).

All arithmetic divide operations are floored. This means that the result of truncating -3.6 will be -4 under FORTH-83, whereas it could have been -3 under FORTH-79 if your system truncated numbers toward zero.

Two words have their names changed for consistency: U* becomes UM*; and U/MOD becomes UM/MOD.

ROLL and PICK now have indices from 0 to n instead of from 1 to n; "0 PICK" is the same as DUP.

LEAVE has immediate action, instead of just setting the DO-LOOP parameters so that the next encounter of LOOP would terminate.

NOT now performs a one's complement of the entire 16-bit value, thereby replacing the current NOT and COM.

EXPECT no longer adds nulls to the end of the input string (yea!). A new variable, SPAN, has been added to provide the user with a count of the characters actually entered with EXPECT. WORD moves a packed string to the dictionary and always adds a blank at the end (FORTH-79 added the delimiter character).

Other new words are: 2/ for an arithmetic divide-by-2; D2/ provides the same function for double precision integers. ABORT" prints the error message following it (like .") and then aborts. #TIB indicates how many characters are present in the terminal input buffer. CMOVE> is like UNIFORTH's -CMOVE, moving a string starting at the end of the string and working towards lower memory. >BODY gives a word's PFA from its CFA.

One unclear aspect of the proposal concerns KEY and EMIT. Of course, 8-bit characters are environmentally dependent, and a transportable program should only use 7-bit characters. However, the proposal makes it sound like KEY and EMIT can only work on 7-bit characters, which would be a gross error.

Overall, the new standard is an improvement from FORTH-79, clarifying and making definitions consistent. I personally don't like the removal of state-smart words, because two words are required to do the work of one. I particularly think the new truth flag definition is abysmal, and will cause a lot of headaches in converting FORTH-79 programs over to the new standard.

The main question I have with the new proposed standard is not what changes were made, but with the areas they overlooked: floating point, strings, data base management, file systems, and multi-programming. They didn't have to define the action of the words, just standardize the names of typical operations in each area. By the time the next standard comes out, there will be such a proliferation of extensions with differing names and actions that it may become impossible to standardize.

Accessing the Big Board Video RAM

If you've read the Big Board manuals, you know that the lower 16K bytes of address space are bank-switched to select between EPROM/video RAM and program RAM. This application shows how you can gain access to the video RAM from FORTH, and gives a screen dump utility as an example.

The bank select is controlled by bit 7 of the general purpose parallel port 1C (hex). You set the bit to select video RAM, and clear it to select program RAM. Simple enough, right? The problem is that while video RAM is selected, you cannot run any program that requires the lower 16K bytes of program space. That happens to be where the FORTH address interpreter (NEXT) and most of the primitives reside. What we need to do is write a CODE word that moves bytes from video RAM space into program RAM space, and then store the CODE word and text buffer somewhere above the 16K lower limit.

The CODE word CRT >PROG shown in screen 1 moves bytes from video RAM to any other memory region. The inverse operation is much harder because of the cursor and character attributes, and is left as an exercise for the reader. CRT >PROG selects video RAM by setting bit 7 (leaving bits 0-6 alone), moves bytes, and then returns to program RAM space.

The video RAM starts at 3000 (hex) and continues for 3K bytes (24 lines of 128 characters, labelled 0 through 23). When first accessed, line 0 of the screen (top) is stored starting at 3000; line 1 at 3080, line 2 at 3100, etc. As you enter lines, a carriage return moves you down on the screen until the bottom line is reached. The next carriage return causes scrolling—the top line disappears, the remaining 23 lines move up, and a blank line with cursor appears at the bottom.

You could perform scrolling in software by moving 23 lines of bytes starting at 3080 down to 3000, and blanking the line at 3A80. Instead, the Big Board uses hardware assist with scrolling. A "register" contains the RAM line which should appear at the bottom of the screen (initially 23), and when decremented, moves lines toward the top with the old top line wrapping around to the bottom. This movement only occurs in the video

generation; the RAM contents are not changed. This means when the scroll register contains 8, line 10 (hex) is at the top (but stored at address 3800).

In screen 2 are the screen dump words built upon the primitive video access word, CRT >PROG. The word RAMADR performs a video line to starting video RAM address translation through the use of the scroll register contents. PRINTLINE works exactly like TYPE, except characters are sent to the printer instead of the console. Finally, SCREENDUMP performs the 24-line translation and printing function.

Next Month

A new text book, *And So FORTH*, will be reviewed (it looks good). I would like to cover some more Epson applications. How about some suggestions as to future topics, folks? Enjoy the summer!

Reader Feedback from:
Raymond Buvel
Box 3071
Moscow, ID 83843

The following is a repair that should be done to Arne's random number generator published in issue #10. I looked up the algorithm in Knuth (so I could understand how it worked) and discovered that the array indexing is off.

The program is supposed to implement the difference equation X(n)=(X(n-24) + X(n-55)) mod m. where n >= 55 and m = 65536. In other words, unsigned addition is used and the overflow is ignored.

When Knuth presents the algorithm for computing the above sequence he starts with 1 while the arrays in FORTH start with 0 so the indexing must be modified to work properly. The modification in Figure 2 will correct the code.

■ ■ ■

Figure 1 - Accessing the Big Board Video RAM

```
SCR # 1
 1 ( CODE word to access video RAM)  HEX
 2 24 ARRAY TEXBUF       ( 80-byte text buffer)
 3 01C CONSTANT VIDPORT  ( video bank-switching port)
 4 FF77 CONSTANT SCROLL  ( adr of scroll register contents)
 5 CODE CRT>PROG  ( srcadr dstadr #bytes --- ...move vid to RAM)
 6    VIDPORT ) A IN,    ( get current port contents)
 7              80 OR,   ( set bit 7)
 8   A VIDPORT ) OUT,    ( and turn on video RAM)
 9            BC POP,    ( get byte count)
10            DE POP,    ( get prog RAM dest adr)
11            HL POP,    ( get video RAM source adr)
12              LDIR,    ( perform the move)
13           07F AND,    ( clear bit 7)
14   A VIDPORT ) OUT,    ( and ret to program space)
15   NEXT,  END-CODE     ( and also to FORTH)
16 DECIMAL -->

SCR # 2
 1 ( Routine to dump CRT screen to printer)  HEX
 2 : RAMADR  ( scrline --- vidadr ...perform translation)
 3    17 SCROLL C@ - + 18 MOD 80 * 3000 + ;
 4 : PRINTLINE  ( adr cnt --- ...output line to printer only)
 5    OVER + SWAP DO I C@ PREMIT LOOP 0D PREMIT 0A PREMIT ;
 6 : SCREENDUMP  ( --- ...dump screen to printer)
 7    18 0 DO I RAMADR TEXBUF 48 CRT>PROG TEXBUF 48
 8    PRINTLINE LOOP ;
 9 DECIMAL ;S
10
11
12
13
14
15
16
```

Figure 2 - Random Number Generator Correction

```
Change:
  24 CONSTANT JINDEX

To:
  23 CONSTANT JINDEX

And change the FORTH word RAND to:

: RAND ( -- N ... Leaves 16-bit random number )
    JINDEX RNUM @ KINDEX RNUM @ + DUP KINDEX RNUM !
    JINDEX 0= IF 54 ELSE JINDEX 1- THEN ' JINDEX !
    KINDEX 0= IF 54 ELSE KINDEX 1- THEN ' KINDEX ! ;
```

IFORTH

Review by Hampton Miller

PO Box 816
Carpinteria, CA 93013

An exciting new implementation of Fig-FORTH is now available for the BB I. It's called IFORTH (Idaho FORTH), and in the Fig-FORTH tradition, it has been placed in the public domain.

Whether it's booted from User Disk #18 or run directly from ROM, this FORTH replaces PFM, adding new capabilities.

Any FORTH in ROM gives you the advantage of quick and easy access to all parts of your system. In addition, the IFORTH "copy" words are always available so you can switch back and forth (pun?) between it and CP/M.

Replacing PFM

IFORTH totally replaces PFM whether it is booted from disk or resident in four ROMs. All of the usual PFM functions—except the RAM test—are still available.

New commands include a disk copy routine (which even works for single drive systems) and a FORTH word which compares two blocks of RAM.

Detailed instructions come with IFORTH so you should have no trouble incorporating any changes you have made to PFM.

Comparing IFORTH and fig FORTH

IFORTH is really a fig FORTH in which only the lowest level disk I/O words are defined. For example, SEEK, HOME, READ, WRITE, TRKREAD, and TRKWRITE are available—while BLOCK, BUFFER, LIST, and LOAD are not. (You could easily add these, however.)

The absence of the usual FORTH words used by a text editor, is partially made up by IFORTH's ability to save and restore compiled dictionaries from disk. While a decompiler would really round out this version, none is provided. (An exercise left to the students?)

Conclusion

This brief review cannot do justice to the rich FORTH environment provided by IFORTH. I feel it's the FORTH of choice for the BB I if you are looking for a solid foundation for building bigger and better systems.

Watch for enhancements to this great package here in the pages of Micro C.

■ ■ ■

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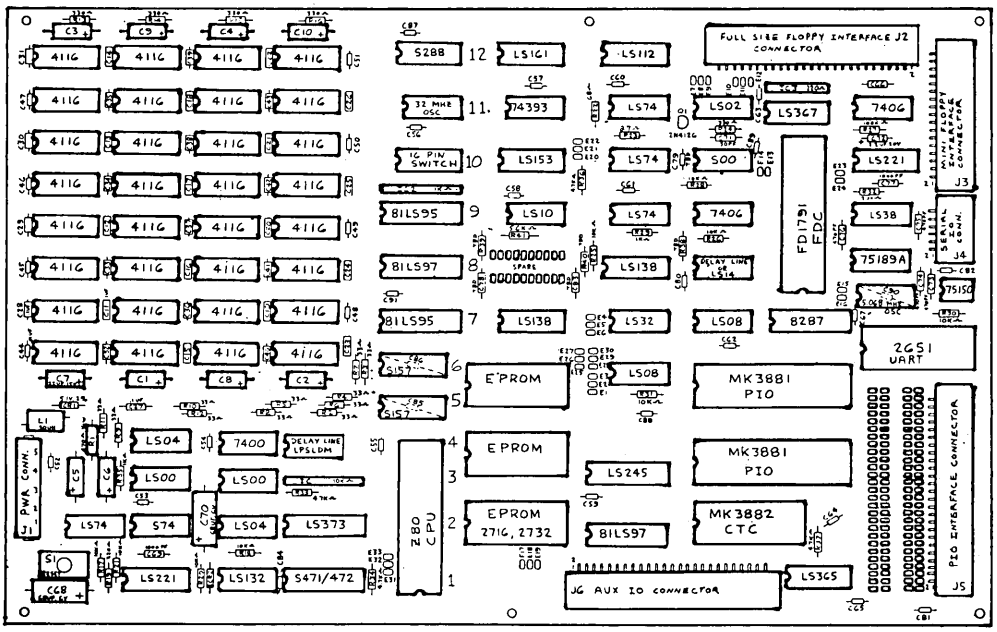

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KayPro Column

By David Thompson

Non Linear has had its share of problems with drives. The first problems they had, included the clock timing problem (see the fix in the last KayPro Column), and the Tandon drive's sensitivity to an electrostatic field (the Cathode Ray Tube).

Drive heat

They fixed the timing and improved the shielding around the drives, but the additional shielding appears to have created a heat problem, especially on drive A. I've talked to a number of owners who have placed small fans behind their drives to reduce the heat.

I got wind of the problem when I picked up a new system from a local dealer and found that it was generating sector errors on drive A (the same marginal disk worked just fine in drive B and in both drives of my older model).

I took the new system back to the dealer and we checked the disk in the only other unit they had in stock. Both drives of the other unit could read the disk just fine for a few minutes, but soon its A drive began to throw up on that one weak sector. Well now, heat was obviously contributing.

Chuck, the dealer's hardware expert, had dissected large systems for years but hadn't dug into a KayPro, so he welcomed a chance to jump in.

When I left he was on his way out to purchase an allen wrench. It turns out, to remove the drives you just remove the allen screws from each side of the drive housing, unplug the cables from the back of each drive and then pull the drives forward out the front of the cabinet. You don't remove the housing at all.

It wasn't long before Chuck was surrounded by drives, and parts, and cables . . .

Terminators

He found a manufacturing error. On one system there were terminators on both drives, on the other KayPro there wasn't a terminator on either drive. Well, now!

The terminator (in socket 2F on a Tandon drive) is simply a set of pull-up resistors. These resistors make sure the signal lines are high except when pulled low by the drivers on the processor board. Terminators are installed on the last drive on the cable to reduce garbage (ringing) on the line. If there are terminators on more than one drive, it gets difficult for the system to pull the lines low.

A terminator is supposed to be installed on drive B but nowhere else, so both systems were wrong (and there was a difference of about 3,000 between their serial numbers). How much the terminator problems contributed to the errors, I don't know, but it appears that they contributed. We're back to checking for errors, but so far things look better, much better.

Tandon Alignment

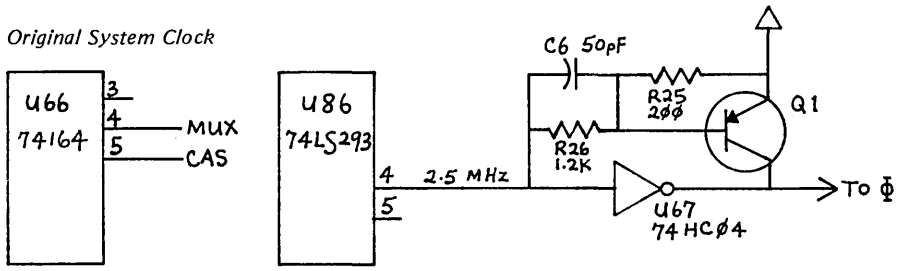
I've gotten calls from individuals and manufacturers who use Tandon drives in their products. The consistent theme of these calls is that about half of the received drives don't meet Tandon's own specs so they have to do a complete alignment procedure before using them in new equipment. Disk manufacturers have been telling me the same thing about all the drive manufacturers so Tandon is not the only one having problems.

After I ordered the OEM manual from Tandon, I got a call from one of their marketing types who was concerned that I might publish something without letting them read it first. Of course, if I were selling 24,000 drives a month to Non Linear, I'd be a little worried about what got into the press. (And, of course, my only reason for starting Micro C was so I could become a corporate mouthpiece.)

To their credit, Tandon shipped the manual promptly and it's the best I've seen. You can get the manual ($25) by calling 213-993-6644 and telling them you want to order the OEM manual for the TM-100-1 drive (manual number 179022-001).

Speeding Things Up

The Kaypro can easily be converted to 4 or 5 MHz with just a few jumpers. The best thing about this modification is that the only fast parts needed are the monitor ROM and the CPU. We tried a few Mostek Z80-As which are only supposed to be good to 4 MHz but half of them ran at 5 MHz with no problems. However, it's really safest to use a Z80B for either 4 or 5 MHz (heat really slows down Z80s and things get quite warm in the KayPro).



First do the drive fix described in issue #11 (Kaypro column). The 4MHz mod assumes you've made this change and it's not a bad idea anyway. If you have a newer system, you'll find that this mod has already been done (there will be small wire-jumpers on U87).

CAS and MUXC must be moved down a pin on the shift register in order for the DRAM timing to be correct. To do this you should unplug U66 and bend out pins 4 and 5 so they won't go back into the socket. Put U66 back in its socket and connect the trace that used to go to pin 4 to pin 3, and connect the trace that used to go to pin 5 to pin 4.

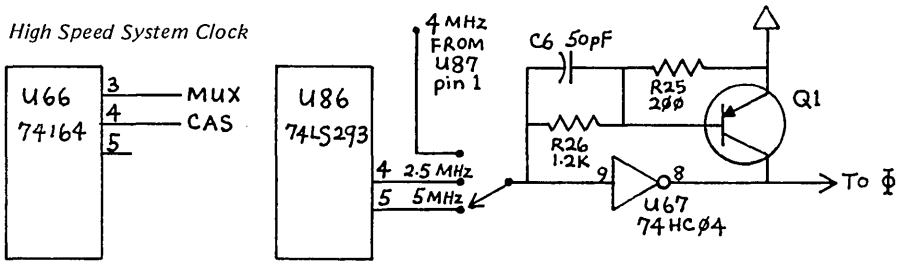
The next step is to bend out pin 4 from U86. This is the 2.5 Mhz clock. 4 Mhz is available on pin 6 of U87 and 5 Mhz is available on pin 5 of U86. The clock of your choice needs to be brought to the forward end of R26 (i.e. the end which is nearest the front of the KayPro).

You can use a single-pole-double-throw switch to select between 2.5 Mhz and one of the faster clocks. You can mount the switch in one of the ventilation slots on the back. The slots are just the right width for the small toggle variety so you don't need to modify the cabinet at all.

The early versions of the disk format and copy programs don't work with the faster clock (which is probably why some commercial mods go back to 2.5 MHz for disk I/O). So you may need to slow down the system once in a while.

If you want both fast speeds then you need to use triple pole version or equivalent. The difference between 4 and 5 MHz is not very obvious but the difference between 4 and 2.5 MHz is like night

High Speed System Clock



and day. Note: You will usually need to do a hardware reset when you change speeds since the glitch usually sends the system out to pasture.

The 4 MHz signal is not a true 50% high/low waveform. It is 60% high and 40% low because it is generated by dividing the 20 MHz crystal by 5. This waveform isn't perfect but it has worked well on my Big Board for two years now. Even so, it's a good idea to use a Z80B part just to be on the safe side. The 5 MHz signal is 50% high and low.

Now that I am used to a fast Kaypro, the standard 2.5 MHz version seems to crawl.

Deluxe Size KayPro Schematic

Non Linear has finally produced a KayPro II schematic on a half-dozen pages but it's easy to spend a half hour trying to locate all the places a single signal goes.

So we have done a single-sheet schematic (wall size) and we're finalizing a theory of operation that's keyed to the schematic.

Frank Guthrie did a super job with the schematic layout and drawing. He organized the circuit into processor, video, and I/O sections, and then drew the whole thing in positive logic. In the process, he found uncounted errors in Non Linear's originals. (We ran out of hands and toes.)

Anyway, there'll be no more searching the "twisty maze of passages, all different," for the other end of a line.

Dana Cotant, who's just joined Micro C's technical department (he IS the technical department), is doing the theory of operation. He is doing detailed circuit descriptions keyed to the schematic and to block diagrams. If you are at all interested in what's going on inside the KayPro, this is for you. (See our KayPro ad in this issue for price.)

KayPro User Disks

Dana and I have been modifying some of the BB I software so it will run on the KayPro (and vice versa). There are enough differences between the KayPro and the BB monitors that some software needs futzing to move over. We've also been making some of software we've received for the KayPro available on the BB I disks. Modem7+ for the BB I is an example of this.

The KayPro disks are $12 instead of $15 because they are cheaper and because they only hold 191K.

Eight Inch Drive

We've just received an announcement of the Expander, an 8" floppy interface for the KayPro. The interface lets you use an 8" drive as drive C (241K single-density only). The original 5" drives continue to work as usual.

The Expander retails for $199.00 (not including the 8" drive, power supply, and cabinet). It's available from:

Auburn Computer Center
1265 Grass Valley Hwy
Auburn, CA 95603
916-885-1040

15 Megabytes on a KayPro II

You have to realize that I've never had 15 Megabytes of anything, so having "drives A and B" with over 7 Meg each is pretty unreal. The one I have is called the Delphi and is manufactured by the Computer Collaborative.

I heard about the drive from Wayne Campeau at Anchor Computing in Seattle. Anchor is already installing these drives in KayPros and people have really liked them.

The winchester itself is a 19.4 Megabyte (unformatted) 5.25" unit manufactured by International Memories Inc. It is shock mounted and includes: thin-film plated media, a dedicated area for the heads during shipping, and heavy duty head positioning. The folks at the Computer Collaborative chose this unit because they wanted a hard disk that would be rugged enough to be hauled around with the KayPro. The drive comes with a 2-year guarantee.

They added a Data Technology Corp controller, a power supply, a fancy cabinet and made it run.

Installation is trivial. Unplug the Z80, plug the SASI-like adaptor board into the Z80 socket and plug the Z80 into the adaptor. A ribbon cable runs out under the lid to the winchester. Then you boot up their version of CP/M and you are on your way.

The present manual is simply step-by-step instructions on installation (along with suggestions of things to check if it doesn't come up) followed by the OEM manuals for the controller and the winchester. I'd like to see them add a commented source of the CBIOS. (I'm not your average KayPro owner.)

So far it has run flawlessly and has made the KayPro really super for text editing and software development. You still have access to the original KayPro drives as C and D for backing up data.

If you boot up your original KayPro system disk, the 5" drives are back to being A and B and the system runs as though it had never heard of the Delphi.

I have a preliminary version of the Delphi. They are working on cutting the costs of the cabinet, controller, and power supply by designing their own. If they succeed, then they should be able to get the price of the unit under $2,000 and still maintain their high quality. (It looks like they might just pull it off.) They are also finishing up a version for the BB I.

The Delphi winchester drive is available from:

Computer Collaborative Inc
6273 19th Ave NE
Seattle, WA 98115
206-524-5369

For Hardware fanatics

Those of you who want to get much more intimate with your KayPro (maybe "friendly" is a better word)—and much more familiar with inner workings of computers in general—should consider building a Big Board.

You can order the documentation on the Big Board for just $5.00 which includes schematics, construction instructions (step by step) and a good description of the system.

■ ■ ■

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WITHOUT BURNING YOUR WALLET
on a

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Product:	Features:	Price: List	1-4	5+mix
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Auto Link 1200:	1200 baud, auto answer	$499	$350	$335
Auto Link 212A:	1200/300 baud, auto answer	$549	$390	$370
Auto Dial 212A:	1200/300 baud, auto answer/dial	$599	$425	$405
Password:	Coat-pocketable Auto Dial 212A	$449	$350	$325
S-100:	Auto Dial 212A on an S-100 card	$449	$350	$325

Latest Technology------Fewer Parts------Two Year Warranty

All units are direct connect full duplex 212A, with analog selftest, DTR override and 9/10 bits/char. The first four have two RJ11C jacks, status LED's and a metal case. Password has a smaller plastic case. The last three are software compatible with the Hayes Smartmodems. Cash price includes U. S. shipping; Visa/MC add 4%, COD add $6.00.

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

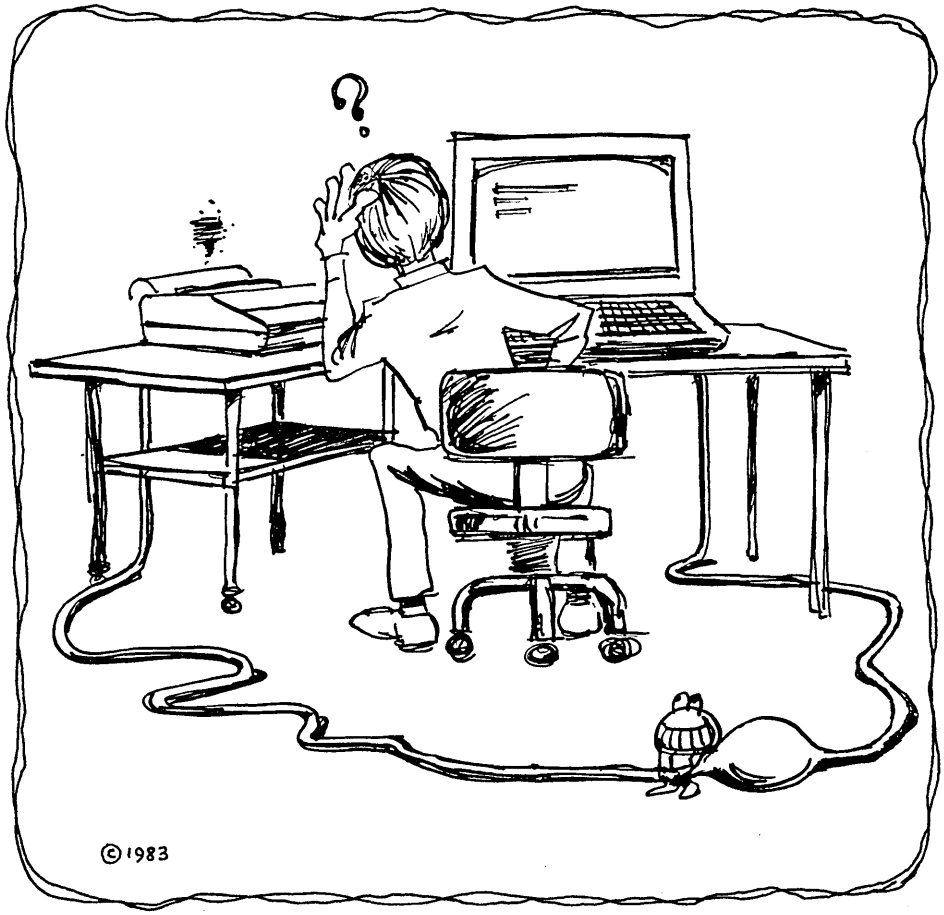
(Bringing Up the BB II continued)

with the higher horizontal rate with no internal modifications. The CRT programming in ROM is very bad though, horizontal sync pulses actually cut off the rightmost 6 or 7 characters. In the manual there is a short series of port plugs that will change the display (no explanation of what's what though). On my NEC monitor I get a slightly better display by changing the 6f to 73 and the 18 to 19.

Conclusion

Once it has all gotten working, I'm very happy with my BB II. If I had it to do over, I would buy the thing assembled. I do feel that the bad documentation is at least partly responsible for the troubles I had. The vastly increased speed, double density, and 7X9 display are great improvements.

■ ■ ■



A UNIVERSAL TRANSLATOR?

Possibly. The XLT macro processor is a powerful utility for translating from one language to another or extending the usefulness of a current language.

To translate, a file of definitions is read by XLT and compared to the input text. A match causes the input text to be replaced with the definition's contents.

XLT allows up to ten arguments in a definition, arguments containing spaces or tabs, incrementing/decrementing strings, a stack, and conditional text replacement.

Included are definitions for translating Z80 to 8080 mnemonics and vice-versa, and definitions to implement CSAL, a C-structured assembly language. This allows code like *add a,(hl)* to be written as *a+ = *hl.*

XLT costs 29.95 plus 5.00 shipping and handling. For CP/M 2.2 8" single density Z80 disk systems.

Send check or money order to:

L.A. Software
6708 Melrose
Los Angeles
California 90038
213/932-0817

California residents add sales tax
CP/M is a trademark of Digital Research

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.

Xerox

Xerox 820 Board, Power Supply, 12" green CRT, Microswitch keyboard and cable, all schematics, ROM source. No enclosures. $450. Dual 8" Shugarts, enclosure, all cables, Power supplies, fan, circuit breakers, filters, room for 820 or Big Board. $375. Spare 820, Power Supply, $285.

Harold Choate
415-641-5696

3360 Data Point terminals.

New condition. Only two available. New keyboard with number pad and special function keys. New cases. RS232 compatible center port. Maintenance manual. $300 each or $450 for both.

Bill Gardner
#4 Brookforest Court
Arden NC, 28704
704-684-4809

Contact

Want to contact other Big Board owners in my area. Have BB with Software Publisher's DD, 4 MHz, and Applied I interface. Also BB II. Want to share technical and programming information.

Jim Holzman
Mountain TV Inc
2727 S College
Ft Collins CO 80525
303-226-6973

Keyboard

IBM PC-like keyboard from Keytronics for the Big Board. Uses serial interface described in Micro C #10. Connection via modular phone cable. Price $175, plus shipping. Call for details evenings, 619-448-2527.

Especially for the KayPro From Micro Cornucopia

KayPro Schematic

This is a complete schematic of the KayPro, logically laid out on a single D-size sheet — no more searching to see where a signal goes or comes from. Even the unused gates are shown.

It's drawn in positive logic, lines are labeled, and we've tossed in hours and hours of careful checking for accuracy. Then we added a **Theory of Operation** that's keyed to the schematic.

KayPro Schematic Package $20.00

KAYPRO II USERS DISKS

The following are full disks of software assembled specifically for the KayPro II. Each program has a .DOC (documentation) file and many come with source.

KayPro Disk K1 - Modem software

This disk is absolutely priceless if you will be using a modem to communicate with bulletin boards, other micros or mainframes.
MODEMPAT. COM: Menu selection of baud rate, bits/character, stop bits, & parity for serial port.
MODEM7.COM: Very popular MODEM7 configured for KayPro.
MODEM7+.COM: This is MODEM7 & MODEMPAT combined - you can communicate with anything!
KMDM795.COM: Super-version of MODEM7 set up for KayPro.
TERM.MAC: Commented disassembly of the TERM program you get with your KayPro so you can configure it for any interface.
SQ/USQ.COM: Programs to squeeze and unsqueeze files for faster transfer.

KayPro Disk K2 - Utilities

Really oodles of spiffy little (and big) programs to help you get full use of your KayPro. This 191K is a goldmine of problem solvers.
ZESOURCE.COM: A true Zilog format disassembler for 8080 and Z80 object (.COM) files. Now you can turn .COM files into .MAC files.
UNERA.COM: Simply enter' 'UNERA" followed by the name of the file you just erased and presto, the erased file is back! A lifesaver.
FINDBD54.COM: Checks an entire disk, reports bad sectors, and then creates a special file containing those sectors. You save a bundle on disks.
CAT2: This is a group of programs which create and maintain a single directory of all the programs you have on all your disks. Even keeps track of which programs are backed up and which aren't.
UNSPOOL.COM: Use your KayPro II and print files at the same time. Doesn't slow down system response!
Plus many more:
DUMPX, DU-77, COMPARE, SUPERSUB, FORMFEED, DIR-DUMP,... and all have documentation on disk.

KayPro II Users Disks . . . $12.00 each ppd.

KayPro Disk K3 - Games

Note: this disk is sent in a plain, unmarked box to protect you and your KayPro from video game freaks.
PACMAN.COM: Despite the KayPro's lack of graphics, this one looks and plays amazingly like the real thing! Keep it hidden.
ZCHESS.COM: Chess with a 1-6 level look ahead.
OTHELLO.COM: You learn it in minutes, master it in years.
BIO.COM: Generates custom graphic biorhythm charts.
MM.COM: Master Mind.
WUMPUS.COM: The classic wumpus hunter's game. Plus many more!

KayPro Disk K4 - Adventure

This disk contains one 191K game, Adventure.
ADV.COM: This is the latest, greatest, most cussed adventure ever devised by half-mortals. This is the 550-point version so the cave is greatly expanded and the creatures are much smarter.

KayPro Disk K5 - MX-80 Graphics

A complete MX-80 graphics package including example files.

KayPro Disk K6
Word Processing Utilities

A powerful line oriented text editor that looks like Unix's EX, plus a scad of text utilities written in C which handles pretty printing, shortening a file, multiple space output, add tabs, remove trailing whitespace, and more.

KayPro Disk K7
Small C Version 2 Compiler

This is a greatly extended version of Ron Cain's original C compiler. Version 2 includes many more expressions, a substantially extended library, and much more. This disk contains the compiler, documentation, and library.

KayPro Disk K8 - Small C Version 2 Source

More of Small C Version 2. This disk contains the compiler, documentation, and the source of Small C version 2. It compiles itself.

VISA

Micro Cornucopia
P.O. Box 223
Bend, OR 97709
(503) 382-8048

dBASE II

Review by Duane A. Huseby

1807 Andrea
Pasadena TX 77502

This article is for those of you who are planning to purchase a database management language, (in particular dBase II).

dBASE II is a relational database management system written in assembly language for the 8080, 8085, and Z80 microprocessor systems, and it runs under CP/M. It is a product of Ashton-Tate, Los Angeles, Ca. and sells for anywhere from $399 to $700.

According to a recent survey by Software News, nearly 40% of the respondents using a database management system were using dBASE II. The second most popular database system was used by only 8% of this group. Thirty three percent of the respondents who were considering the purchase of a database management system in 1983 were planning to purchase dBASE II. All this indicates the popularity of dBASE II.

My first exposure to dBASE II came after I had done some work with systems like CALCSTAR and DATASTAR. I found them to be good for many applications; however, I soon discovered that these systems had limitations that made some of my applications very difficult or impossible.

Canned applications programs rarely meet a buyer's needs. So, a programmer has to modify the software (if it's possible to get the source.) dBASE II, on the other hand, has all of the functions I need.

Two Levels

The first is a basic level of capability that the first time user will encounter. This level is similiar to the spreadsheet systems and is menu driven. The creation of the database structure is straight forward and easy to do. The data entry facilities are also easy to use unless your database structure exceeds a dozen or so fields.

If you are working with many fields you will need to carefully organize the data entry. Otherwise dBASE II's report generator provides quick screen generation.

Secondly, dBASE II is a complete database handling language that is extremely versatile and powerful. With this language you have complete control over data entry, manipulation, and reporting.

The capability to generate your own unique application program (command file) with dBASE II makes it a very powerful system.

Expertise Required

dBASE II is not for just anyone (contrary to the claims made in the advertisements). To fully implement the capabilities of dBASE II, programming expertise is required.

Several books are now on the market to help the user implement dBASE II. Fox and Geller is marketing programs advertised to do the programming for you and to debug the ones you write. The University of Houston has a continuing education class on dBASE II (costs $300). Plus there are a number of other programming aids not on the market.

No graphics

The most serious feature lacking in dBASE II is graphics. Many of the applications for dBASE II are suited to the enhancement of reports that include bar charts, pie charts, line graphs, and combination piebar charts as produced by dGRAPH from Fox and Geller. I don't have dGRAPH yet; but, I intend to get it soon.

■ ■ ■

dBase II, Another View

By David Thompson

Duane has touched on the primary strength and problems of dBASE II. The strength is its versatility, with just a few critical limitations (the limits of 64 variables and 32 fields are the two primary ones).

dBASE II forces you to write very structured code which is really great, plus, adding a field, or a new heading, or whatever is a real joy.

However,

The primary reason dBASE II needs all those aids is that it is a cluge. It has developed over many years, with a hodge podge of new commands. Each command has its own peculiarities.

Some commands work with numeric data, others with character data or logical data, and still others work with two or three of the above. In many cases it is not immediately obvious which works with which.

Let's say you store characters in a variable.

STORE "NEWNAME" TO TEMP

Now you can use TEMP in place of the character string "NEWNAME".

STORE TEMP TO ANOTHERTEMP

Now ANOTHERTEMP contains the characters "NEWNAME".

However, if you wanted to call a file from the disk and you said:

USE TEMP

You'd get the file named "TEMP" rather than the file named "NEWNAME". To use TEMP as a variable with the USE command, you'd have to say:

USE &TEMP

Which turns TEMP into a macro. This is just the tip of a very inconsistent iceberg. For instance, if you wanted to check to see if a record has been deleted you'd say:

If *
. . . . then do something

And if you wanted to see if a record had NOT been deleted you'd probably say:

If .NOT. *
. . . . then do something

Unfortunately this sends my copy into never-never land. The .NOT. operator is supposed to work with any logical (true/false) statement or value, but it will not work with the "*" operator. There is obviously something special about the way the "*" was created but with all these special cases the whole thing is impossible to document.

Ninety percent of the problems I have had with dBASE II have been due to these little surprises. I've even had two identical lines of code, act in two completely different ways even though both lines were in the same routine. Try debugging that! I went nuts the first time it happened! Now I'm a little more wary.

Since some dBASE commands are sensitive to data types, you'd think that you could specify the data type of the variables, so you'd have some error checking. You can't. Pascal with its rigid data structure is a refreshing improvement in this regard.

(continued on next page)

Superfile

Review by Rex Buddenberg

1910 Ash St
North Bend, OR 97459

Superfile is an electronic card file style of program. It can perform the kind of chore that used to be done with a big tray of 3 x 5 cards with keywords and pointers to the source files all manually alphabetized.

The current edition of Superfile is published by FYI, Inc., PO Box 10998 #615, Austin, TX 78766. The predecessor program was published by a company called Island Cybernetics, which apparently no longer exists (an order sent to their old address came back to me a couple months later—from the dead letter office).

When I called them, I asked why they were selling the same program at several times the price that Island Cybernetics had charged. According to the gentleman, the program was rewritten, an auxiliary program was added and a comprehensive manual was added. At $200, I felt a 30-day trial was justified. I still have the program. While it certainly has limitations, I have one good use fully implemented now, and more possibilities as time goes on. For me, the program is worth the money.

Documentation.

The CPM-80 manuals are probably the best examples of manuals written by the people who wrote the software. They don't have the perspective to write so the rest of us can understand. Additionally, they are earning their money being genius programmers, not writers. (CPM-86 manuals are considerably better, by the way.)

Superfile is one of the exceptions to the rule. The manual is easy to read and really helps you get the program up, installed, and working. It has an index. With that and the separator tabs between chapters, I have had no trouble finding information when I need it.

Superfile has an installation program so you can tailor it to your terminal. It supports both my Hazeltine terminal and my Big Board video system (ADM-3), so installation is a cinch.

Once you have gotten this far, you put Superfile aside for the moment and get out your favorite text editor (my WordStar works fine and Superfile handles the D)ocument mode OK). Text files are created with the delimiters specified in the manual; this is the source information in your data base. A rolodex type of file entry follows with comments in the brackets.

```
*C          [this tells the system that this is
             the C)ommencement of the entry]
Thompson/ Dave
Micro Cornucopia      [the / will reverse
P.O. Box 223           names on command
Bend, OR 97709         for mailing labels]
*           [this * optionally divides the source
             text into two parts, useful for
             mailing label applications...]
Dave edits Micro C and is knowledgable about
Big Boards. His phone is 503-382-8048.
*K          [this ends the free form text and
             starts the list of K)ey words]
THOMPSON / BIG BOARD / EDITOR / BEND
*E          [this E)nds an entry. The next
             one starts with a new *C]
```

There is no theoretical limit to the length of the entry. 250 keywords can be accommodated per entry.

Superfile can accommodate up to 10 files of entries like the above and that number can be expanded by using ambiguous file names. The number of entries is essentially unlimited, as the source files can reside on any number of disks. The number of keywords is limited by memory—800 unique keywords is the practical limit on a Big Board-sized system.

Once you have your files all made up, enter Superfile and create the keyword index. The system is menu driven at this point and is fairly easy to run. It will scan each source file for the keywords and create two new files containing a dictionary and an index. Then back to the menu—keywords can be displayed in alphabetical order. Partial matches can be searched for as well.

Then you can search the data base itself by specifying any number of keywords that the system will separate, on your command with the the logical operators AND, OR or NOT. Then the system goes out to the source files and extracts those entries that meet the keyword search criteria. They can be displayed, printed, or routed to a disk file. Abbreviated entries (everything above the '*') can be output if your application is, for instance, a mailing list. There are a number of options, all fairly well explained in the manual.

The system will prompt you to change disks if your data files are on multiple disks. As the system is disk based, its speed is limited to disk rates. In this respect, a hard disk ought to really take off and fly.

An Application

My current application contains miscellaneous data on a large number of boats and people. Each entry averages around a half dozen lines and 5 keywords. I am currently running 3 data files of 5-10 pages and will probably double that within a month. I am well over a hundred keywords. Thus far, the system has performed well. The one awkward aspect is that any change in any of the text files—updated data—requires reindexing the entire system. This inhibits interactive updating of the data base, but with a little organization, you can live with it.

Unlike data base systems written in BASIC, Pascal or any of the specialized data base languages such as DBASE, or MUMPS, the Superfile system uses variable length records. Your disk space is not sucked up by vacant space from unfilled or unused fields.

Support

At this writing, I cannot comment on FYI's responsiveness toward repairing bugs or answering customer questions; I haven't found any serious bugs and the manual is thorough enough that I have been able to dope things out for myself.

Conclusion

If you need this kind of data system and want to get it up and running with little fuss, then I can recommend Superfile as a program that works.

Superfile
$200.00
FYI Inc.
PO Box 10998 #615
Austin, Tx 78766
800-532-5033

■ ■ ■

(dBase II, Another View continued)

A New dBASE?

Ashton-Tate is circulating beta-test copies of a totally new data-base language. I hope they've kept the structured language approach and the easy to read command style, but I hope they've started over from scratch on the inside.

I have yet to see anything else on the market that comes as close to meeting my need for a versatile, powerful, quick to write, easy to read, database handling language as dBASE II. That is why dBASE II is so popular. But when something better does come along, I'm going to be first in line!

■ ■ ■

HDS
HUNTINGTON DATA SYSTEMS

Winchester Interface for Big Board I

each $70

Features are:

- Interfaces easily to Western Digital's WD1002 Winchester disk controller for 2.5 MHz Big Board I. Simply remove Z80 processor, insert daughter card, place Z80 on daughter card, attach Winchester controller cable and Winchester controller.
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(Editorial continued)

UNIX

The word I hear is that MicroSoft is working on a UNIX-like operating system for the 8088/86.

It appears the vrs 3.0 will have some UNIX facilities (I don't know which ones yet) and hooks for many more. Vrs 4.0 will be a more complete (whatever that means) UNIX environment. This is quite interesting since the UNIX-like operating systems have been running on PDP-11s and 68000s. Full-blown UNIX takes up a gargantuan amount of RAM (256K or more) so the MS folks may not be keeping everything in RAM, who knows. Anyway, by writing their own version of UNIX, MicroSoft will avoid paying huge per-copy royalties to Bell Labs.

Meanwhile Bell Labs has been scurrying around signing contracts with all the chip manufacturers. They want to supply real UNIX for all the 16-bit processors. Bill Randle brought back these tidbits from the UNIX convention in SF.

David Thompson
Editor & Publisher

The SOG

We're making final plans for the Semi Official Get-Together (SOG) and we need some idea of who's planning to come. So if you're even thinking of coming, let us know as soon as possible.

Whitewater Preliminary

We'll kick off the SOG with a Friday afternoon (July 29) soak and feed. You can choose the excitement of rafting some of the best white water in the West, or you can put on your sunglasses and broad-rimmed hat and relax in the easy solitude of the slack water trip. Who knows what wildlife you'll see while lying on your back with your eyes closed.

After the float trips everyone will gather for a real western cookout complete with some excellent guitar music.

The rafting, dinner, and transportation are being handled by Sun Country Tours and they've really come up with something spectacular for the SOG.

If you want to participate in the white or slack water rafting (plus the dinner) send $25.00 (per person) by July 7. (Or you can call us by that date and put it on your charge card.) Busses will pick us up and take us out to the river at 3 pm sharp. White water rafters should bring a change of clothing. (dinner only, $10).

Warning, anyone caught discussing computers during the white water run will be tied to a rope and tossed overboard. (The trout get really hungry in these icy waters and trolling is legal.)

The Main Event

Of course, Saturday and Sunday (July 30 and 31) are the official SOG days.

There will be folks bringing new SASI interfaces for the BB I, Otto will be here with the Slicer (80186 board), and we'll have hard disk designers, consultants, plus lots of other very special folk. (Like you.)

Potluck

All of the Saturday and Sunday events will take place right here at Micro C (1259 NW Iowa, Bend). The only charge for attending the SOG is food. Please bring potluck goodies (whatever is practical).

That way we can munch our way through just about any computer problem or presentation imaginable.

■ ■ ■

WordStar, Volumes of Hints

By John S. Allen

40 Rugg Road
Allston, MA 02134

This article is in two parts. First there's a review of two useful books on Wordstar. This is followed by some special tips that will make this editor easier to live with.

Books

Ettlin, Walter A.: *WordStar Made Easy.* Berkeley, Osborne/McGraw-Hill. 128 pp., illustrated.

Naiman, Arthur: *Introduction to WordStar.* Berkeley, Paris, Dusseldorf; Sybex Books. 202 pp., illustrated.

WordStar has a well-deserved reputation as an easy word processing program to learn and use, with its on-screen help menus and formatting; yet its manual, like those of many other programs, is more useful as a reference than as a learning guide. These two books attempt in rather different ways to fill the gap.

WordStar Made Easy

The Osborne book is a carefully graded text with numerous exercises; the title *WordStar Made Easy* is honest. It is aimed mostly at secretaries or high school business students, and contains appropriate writing projects for this group. The presentation is quite dry.

I began learning WordStar on this book, and after three or four days I found that it left out a substantial number of WordStar's commands, including many I was ready to use and which speeded my editing considerably. Yet this book is strong on formatting—in keeping with its business orientation.

Introduction to Wordstar

This book, on the other hand, includes almost all the commands. It describes not only WordStar but also its companion programs MailMerge and SpellStar.

This book is aimed more at people writing academic papers and books. Introduction to WordStar includes graded exercises too, and is a good learning text, but it's also a decent guide to the capabilities of these programs. The book is fun to read: the text and exercises are laced with humor, and there are some pleasant, silly cartoons in addition to the down-to-business illustrations.

In General

You'll probably find yourself not doing the exercises in either book, beyond the first one or two, unless there's nothing you need to write—but then why would you need WordStar? I found it possible to learn WordStar easily enough by looking up the commands as I worked on my own writing projects.

User-developed hints can be an invaluable supplement to the program's manual. In non-formatting subjects, the Naiman book has more such hints than the Osborne book so I would recommend this book first to Micro Cornucopia readers.

Wordstar Tricks

As you get more familiar with WordStar, you will discover many tricks to make it work more efficiently.

For example, WordStar spends most of its time updating the onscreen text display. However, the display takes second priority to input from the keyboard.

When using repeated formatting or search and replace commands, a keyboard auto-repeat can make WordStar blaze through many paragraphs of text, even though WordStar's own repeat feature would take minutes to execute the same thing. The slower WordStar repeat feature is, however, very useful if you have to proofread as you go.

Hints

1. Get rid of the main help menu as soon as you don't need it—after two or three days. It uses one-third of the screen, it really limits the amount of text you see at one time. Also, upward scrolling becomes much faster when you discard the menu.

2. Type Control-O H at the beginning of a writing or editing session to turn off Wordstar's hyphen-help feature. This feature greatly slows down formatting; it stops wherever you might want to insert a hyphen, instead of formatting a whole paragraph at once.

If you'll be using search strings of more than one word, turn off the auto-justification feature so extra spaces between words don't confuse the search subroutine. Use these functions, if you wish, only for the final formatting of a file after you're done editing.

3. If you know what command you want, there is usually no need to wait for a secondary help menu or the prompt to appear on the screen before finishing the sequence of keystrokes for the command. Just keep typing. The command will execute anyway—and much faster. In a few cases, the command will not execute, but no serious harm will be done.

4. WordStar likes to move forward rather than backward in the text (it being more forward than backward). This is true in many ways.

For example, WordStar has no left word delete command, and scrolling backwards is much slower than scrolling forwards (if you remove the main help menu).

So, as you type and edit, let errors and odd-length lines stand, then move the cursor back to the beginning of your file and proofread as you read through to the end. After all changes have been made, then format the paragraphs, again going from beginning to end.

5. The computer isn't a typewriter with typebars that jam. Assuming that your keyboard has n-key rollover, you can press two keys at once to execute two commands: for example cntl-Z and X for an upwards line scroll while keeping the cursor at the same place on the screen.

6. Print function toggles such as Control-P B for boldface can be inserted into search strings by leaving off the P. For example, type just Control-B. In other words, type them as they appear on the screen. This lets you check that you've terminated these commands so long stretches of your printout don't inadvertently end up in boldface or other special print styles.

The exception is Control-P S for underlining, which has another, special meaning in a search string. However, Control-S can be escaped into a replace string (see the WordStar manual for details). So use another symbol for underlining, check it, and then replace it with Control-S. Control-N in a search string will find the return character at the end of each line—useful in changing between single and double spacing.

7. WordStar has many editing commands using the control key in combination with other keys at the left side of the keyboard.

Since most keyboards are supplied with a control key only at the left side, these commands require you to move your right hand to the left, out of touch-typing position. When I enabled the optional auto-repeat on my Maxi-Switch keyboard, the repeat key at the lower right was disabled; so I hard-wire paralleled it with the control key. Instant speedup! ■ ■ ■

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.

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#2 CO-POWER-88+

HARDWARE

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- 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.

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

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Microwyl, a Line Editor

Review by David Thompson

I haven't used a line editor for over a year now (ed.com on the BB and EX on a PDP-11) and using this type of editor definitely feels strange. However, if I had to go back to a line editor, I definitely would pick the Microwyl over the editor on the "11" and over the impossible line editor which comes with CP/M.

Microwyl is definitely easier to learn and use than either of the others. The manual is not fancy but it is clear and straightforward, as is the editor.

As with any line editor, you have to select a line by number and list it by typing something like "LIST 100." This would list the 10th line in the file because the line numbers normally increment by 10's (like BASIC).

Weaknesses

Microwyl requires you to have an available line number for inserting a new line. So, you can insert up to 9 new lines between each old line before having to renumber the file (unless you set a larger line number step). I find that to be a bit of a handicap because it forces me to keep track of how many lines I've already inserted. Also, the line number and mode indication take up half a dozen columns on the left hand side of the screen. When I was using the 132-column terminal on the PDP-11, I didn't miss the wasted space but with the 80-column display it means that lines can't get much longer than 70 characters before they get split by the PFM monitor.

Microwyl does not automatically rename the old file as .bak when you "SAVE" or "RESAVE" the file you are working on. You have the option of renaming the old file while you are in the editor or giving your newly edited file a new filename when saving it.

Finally, it is still a line editor. You still have to specify line numbers or ranges rather than simply scrolling or stepping by screen through a file. When I was using only line editors, that didn't seem to be too much of a problem. Plus, this editor makes looking through the file relatively painless—but after using a screen editor for a while it definitely feels cumbersome to go back. It takes more keystrokes to move about and edit a file using a line editor than most screen editors.

Strengths

Editing a line with Microwyl is almost as easy as editing with a full screen editor. When you are on a line in "Modify" mode you can use the space bar and the backspace key to move your cursor. You then hit "I" for insertion, "R" for replace (typeover), or "D" to delete.

Files do not appear to contain any extra garbage—so assemblers, compilers, and other editors should have no trouble with the files. Line numbers are displayed during editing only and are not stored with the text.

Again the editor is very easy to learn, easier than most screen editors and infinitely easier than ed.com.

It has a fast, powerful "CHANGE" command. You can change anything to just about anything and it will show you the changes as they are being done. You can specify which column(s) you want changed in which lines, plus more. You cannot, however, change a carriage return to a space in order to patch together short lines.

You can insert control characters (just about anything except carriage return and tab) into a line just by typing them in. No muss, no fuss.

Conclusion.

If you are still using ed.com and want something much easier that isn't going to cost you an arm and a leg, then this is definitely an option. In fact, the change command is so powerful and easy to use, that you could probably get $29.95 worth out of this command alone if your screen editor is somewhat limited in that area. Plus, if you need to insert control characters for your printer, or whatever, Microwyl makes it trivial.

However, for standard text entry and editing, I'm really convinced that there is no substitute for an editor with full screen editing.

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■ ■ ■

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A Two-Faced Drive for the BB I

By Craig A Bergman

26 James St
Binghamton, NY 13903

The following program will let you use a double sided drive as a single drive rather than as two drives. Thus, a double sided drive containing a double sided disk will give you 494K. With a single sided disk you get the standard 241K. A simple cntl-C allows you to change back and forth between types of disk.

You need a double-sided drive with a negative logic side select line. Jumper the Big Board user-defined bit in the system port (TB1 pin 8) to the side select pin on J1.

Double Side Format Procedure

Use FORMAT3 from user disk 1 and format side 1 normally. Then load FORMAT3, hit reset, and type the following:

```
<cr>
o1d,cf<cr>
o1d,08<cr>
o1c,4c<cr>
g100<cr>
```

Then load the double sided disk and answer the drive question with:

```
A<cr>
```

Here I get a "wrong, try again" so I type

```
A<cr>
```

At this point it goes ahead and formats side 2. Once it is through, be sure to hit the reset button and then reboot.

SYSGEN Procedure

Put a standard SSSD disk in the drive, boot the system, and call SYSGEN. Then type:

```
A<cr>
<cr>
Reset, then type

<cr>
m2074<cr>
1a
00
04
0f
00
f6
00
7f
```

```
00
c0
00
20
00
02
00
<space>
g100<cr>
```

```
Now install the double-
sided disk and type:

<cr>
A<cr>
<cr>
```

You will now have a disk which will boot and warm-boot. The allocation units (or blocks) are 2K (16 sectors) instead of the standard 1K (8 sectors). CP/M's STAT accurately reports the remaining space, but XDIR does not. Copying from the single sided environment into the double sided environment is still a pain (involving reset and warm boot and reset and goto 0100), but I hope to fix that with a short goto program.

One final note of caution: I have not done anything with the drive DPH's for drives 2 and up and I believe also that the CHKO space at EC09 must be expanded from 16 bytes to 32 bytes. This is no problem with one drive because it is OK to let it spill over into drive 2's ALL1 space.

PS: A.ASM can be assembled by CP/M's ASM but don't use LOAD to get a .COM file. Instead use:

```
DDT A.HEX
med00,ed72,0128<cr>
^c
SAVE 1 A.COM<cr>
```

This will give you the proper A.COM file.

■ ■ ■

```
;PROGRAM A.ASM
;ROUTINE FOR SS AND DS DISK ENVIRONMENTS
;CRAIG A. BERGMAN         18 DEC 82
;
;MOVE DOUBLE SIDED DISK PARAMETER BLOCK AND PROGRAM FROM
;0128H TO ED00H
        ORG     100H
        LXI     H,128H          ;FROM 0128H
        LXI     D,0ED00H        ;TO ED00H
        LXI     B,75H           ;MOVE 75H BYTES
        DB      0EDH,0B0H       ;Z80 LDIR INSTRUCTION
;REESTABLISH SINGLE SIDED DISK PARAMETER BLOCK IN BIOS IN
;CASE THE SYSTEM WAS COLD-BOOTED FROM A DOUBLE SIDED DISK
        LXI     H,119H          ;FROM 0119H
        LXI     D,0E8F4H        ;TO E8F4
        LXI     B,15            ;MOVE 15 DEC BYTES
        DB      0EDH,0B0H       ;Z80 LDIR INSTRUCTION
        JMP     START           ;JUMP AROUND SUBROUTINES
;SINGLE SIDED DISK PARAMETER BLOCK
        DB      26,0,3,7,0,242,0,63,0
        DB      0C0H,0,16,0,2,0
;RE-ORG THE ASSEMBLER AT ED00 WHERE THE FOLLOWING STUFF
;WILL RESIDE
        ORG     0ED00H
;DOUBLE SIDED DISK PARAMETER BLOCK
DPB:    DB      26,0,4,15,0,246,0,127,0
        DB      0C0H,0,32,0,2,0,0
;SUBROUTINE TO SENSE WHETHER A SINGLE OR DOUBLE SIDED
;DISK IS IN THE DRIVE AND PUT THE RIGHT VECTOR INTO
;DRIVE 0 DPHTAB AT E90DH
SENSE:  IN      1CH
        ANI     0EFH
        OUT     1CH     ;SET SIDE B
        CALL    0F7A8H  ;CALL PAUSE
        CALL    0F6E9H  ;CALL HOME
        JNZ     SSID    ;SS DISK
        LXI     H,DPB   ;DS DISK
        JMP     FIN     ;DS DPB
SSID:   LXI     H,0E8F4H;SS DPB
FIN:    SHLD    0E90DH
        IN      1CH
        ORI     10H
        OUT     1CH     ;SET SIDE A
        RET
;SUBROUTINE TO SET SIDE (A OR B) AND TRACK NUMBER (0-76)
;FROM INPUT TRACK NUMBER (0-153)
SEL:    MOV     A,C     ;GET TRACK NO.
        LXI     H,0EB42H;SAVE
        MOV     M,A
        CPI     77      ;OVER 76?
        IN      1CH
        JC      SIDA    ;JUMP IF NO
        ANI     0EFH
        OUT     1CH     ;SET SIDE B
        MOV     A,C
        SBI     77      ;SIDE B TRK NO.
        JMP     DON
SIDA:   ORI     10H
        OUT     1CH     ;SET SIDE A
        MOV     A,C
DON:    MOV     C,A     ;TRACK IN C
        RET
;THE FOLLOWING 4 LINES CHANGE THE FIRST 4 BYTES OF THE
;BIOS SEEK ROUTINE TO CAUSE IT TO CALL SUBROUTINE
;SEL (ABOVE)
START:  LXI     H,0CD00H
        SHLD    0E98CH  ;SET "NOP,CALL"
        LXI     H,SEL
        SHLD    0E98EH  ;SET SEL ADDR
;THE FOLLOWING 2 LINES CHANGE THE JUMP TO CCP AT THE
;END OF WARM BOOT TO JUMP TO CON (BELOW)
        LXI     H,CON
        SHLD    0E89BH  ;SET CON JMP ADDR
;THE FOLLOWING 4 LINES MAKE THE USER DIFINED BIT ON THE
;SYSTEM PORT OPERATE AS AN OUTPUT BIT (PFM INITIALIZES IT
;AS AN INPUT BIT)
        MVI     A,0CFH
        OUT     1DH     ;SET BIT MODE
        MVI     A,08H
        OUT     1DH     ;ONLY BIT 3 IN
;WHEN THIS PROGRAM IS EXECUTED, IT WILL END BY FORCING A
;WARM BOOT
        JMP     0       ;JUMP TO WARM BOOT
;AT THE END OF WARM BOOT,SUBROUTINE SENSE IS CALLED
;BEFORE JUMPING TO CCP
CON:    CALL    SENSE
        JMP     0D200H  ;JMP TO CCP
        END
```


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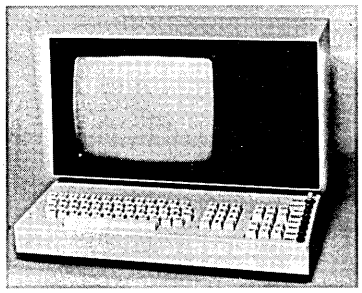

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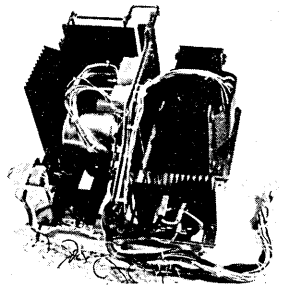
Modular power supply (missing regulator card) fits inside above monitor enclosure. Includes large transformer that outputs +8.5 volts @17 amps, +/−18 volts @1.5 amps each, +15 volts @ 1.5 amps (for monitor), three large capacitors (1-18kuf, 2-8kuf), 1−30 amp, 2−3 amp bridge rectifiers. The transformer and rectifiers/capacitors make a perfect unregulated SS-50/S-100 power supply. The schematic for the regulator card is available.



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5-Disk mapper with source

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3-Disk file CRC checker
4-New fast copy program & source
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6-FINDBAD, isolates bad disk sectors
7-Print fancy page headings

USERS DISK #4
1-CBIOS, custom bios for Tandon drives
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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-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
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11-Extended CRC checker, creates file & checks file
12-Super disk formatter program for BB I

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

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3-MOVPATCH, lets you use MOVECPM on other copies of CP/M
4-XMON, 3K expanded BB I monitor, use in ROM or as overlay
5-CURSOR, prompts you for cursor char you want
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REMEMBER
FREE Users Disks in exchange
for submitted software or articles

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IFORTH, this is Idaho FORTH which can be burned into ROM or loaded from disk. It replaces the PFM monitor & handles all the monitor functions. See issue #11 FORTH column for more info about IFORTH and this disk.

NEW!
USERS DISK #19 - BB I Double Density
New BB I Monitor, BIOS, Character ROM, Winchester interface, ZCPR, and formatter from Trevor Marshall. See BB I expansion article in Issue #11.

All Users Disks .....$15.00 each (US,Can,Mex) .....$20.00 each (other foreign)
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TECHNICAL TIPS

6 by 10 Dot Matrix for BB I

Through a little experimentation, I discovered how to make the character generator display the entire 6 X 10 dot matrix. I swapped around the signals which blank the character generator so that the 9th and 10th horizontal traces select address line A-10 in the character ROM.

Pin 8 of U22 is active during the 9th and 10th horizontal lines on each character. This signal (SC3), usually turns off the character ROM (U73 pin 18). Horizontal retrace (U60 pin 8), also blanks the screen by selecting the blank half of the ROM during horizontal retrace.

Vertical retrace (U37 pin 6) is the third blanking control. It controls the output enable pin (U73 pin 20) on the character ROM.

So, with all this in mind, I have made the following modifications to my character generator:

1. Remove U60, bend out pin 8 and replace it.
2. Remove U25, bend out pin 5 and replace it.
3. Cut the trace between U37 pin 6 and U73 pin 20 (careful, don't cut any other runs).
4. Jumper U25 pin 5 (the PC board) to U66 pin 9.
5. Jumper U66 pin 8 to U73 pin 19.
6. Jumper U60 pin 9 to U73 pin 20.
7. Jumper U25 pin 5 (bent out pin) to U37 pin 6.

I invert SC3 so that this modified video generator will be compatible with the original character ROM.

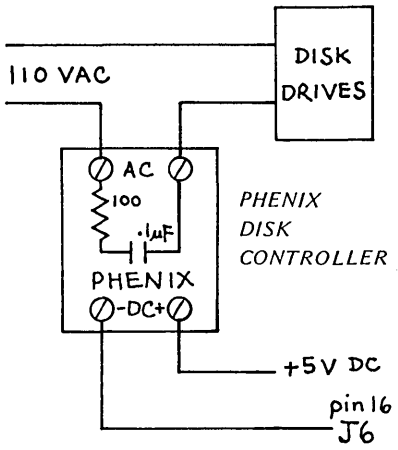
With the above modifications, your character generator can control all ten horizontal lines. If you want to control the 6th horizontal dot between each character, note that it is controlled by pin 12 of U75 (normally tied high). To get mastery of this lone haranger do the following:

1. Cut the trace between U75 pin 12 and +5V.
2. Jumper U75 pin 12 to U74 pin 10.
3. Jumper U74 pin 11 to U73 pin 15.

Now you have full control of the video bits. You can create a custom PROM with 5 by 9 characters, and if you substitute a 2732, you could add an additional 64 graphics characters such as the TRS-80 blocks.

Maybe I'm just lazy, but I'm inclined to leave the ROM to you. However, if we use data bit 7 (high bit) to address the graphics part of a 2732, then we have to come up with a new way to implement a cursor.

John J Phillips
Attorney At Law
Suite 222
Park-Cherry Building
114 East Park
Olathe, Kansas 66061



BB II Drive Motor Control

If you have a BB II and want your drive motors to time out, check out the following.

Pin 16 (motor/not) on the mini-floppy header (J6) is grounded whenever a drive is accessed and stays low for about thirty seconds following completion of drive access. The line is able to sink about 5 milliamps which is adequate for most solid state relays.

We used a Phenix solid state relay (see advertisement) and had it installed in about 5 minutes. Just connect the minus input of the solid state relay (or your homebrew circuit) to J6 pin 16 and the plus input to +5V. Then connect the AC output in series with one side of the AC supply.

Dana Cotant
Micro C Technical Dept.

More 5 MHz

I am running 5 MHz now and the improvement is really noticeable, especially when compared to 2.5 MHz. During the conversion I noticed that:

1. My 2716-1's are barely making it. Often they won't restart the system once they are warm. I have had better luck with hand-selected Intel parts. I'm going to switch to using half of a 2732A-2 (200 ns).
2. Change the CTC initialization at F119H from 93 (decimal) to 186 (decimal) so the interrupts will remain 1 second.
3. Shift the Auto Baud routine's (F0CBH) table down one byte. This will correct for the doubled clock rate.
4. If you are using a PROM programmer, remember to adjust the pulse timing or you will underburn all your PROMs (they'll barely get warm).
5. Forget PACMAN, it's just too fast!

Installing ZCPR . . .

Based on the calls I've been getting it seems that a lot of people are wasting a lot of time installing CBIOS's and ZCPR into their systems (incorrect assemblers and difficulty with printer drivers etc.).

I've installed CP/M for about 25 folks already and can do it in my sleep, so the following offer.

1. Send a disk with CP/M on the system tracks, SYSGEN, and a complete description of your printer (parallel, serial, bits/char, stop bits, baud, whether handshake is needed . . .).
2. Send a stamped, self addressed, package that I can return the disk in (makes turnaround days instead of weeks). I'll return the disk with two version of CP/M, one with the new CBIOS, and one with ZCPR, complete with source/doc files.
3. The catch. You'll also have to send along a spare disk of software for me to play with. I'll forward the best of this to Micro C for everyone to share. If you really can't come up with a disk of interesting software, send $15 and I'll install CP/M for you and send you some of my favorites that you can play with.

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2-The manual for Small C+
3-Crowe Z80 Assembler
4-Two disk formatters
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 CBIOS with parallel print driver & other extensions for CP/M 1.4 & 2.2
5-Disk mapper with source

USERS DISK #3
1-EPROM burning software for BB 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, 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-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 formatter program for BB I

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

USERS DISK #12 - Games for BB I
1-ALIENS, a fast, exciting arcade game
2-ZCHESS, chess with a 1-6 level look ahead
3-MasterMind, match wits with the computer
4-BIO, Biorythm charts complete with graphics on the BB I
5-LIFE, so fast it's real animation!
6-CRAPS, see how much you'd lose in Vegas
7-WUMPUS, a caver's delight, kill the Wumpus or be killed
8-PRESSUP, similar to Othello
9-Games, 7 games in one program, includes blackjack, maze, and animal

USERS DISK #13 - General Utilities, BB I
1-ZZSOURCE, disassembles to real Zilog mnemonics
2-EX14, superset of submit or supersub
3-MOVPATCH, lets you use MOVECPM on other copies of CP/M
4-XMON, 3K expanded BB I monitor, use in ROM or as overlay
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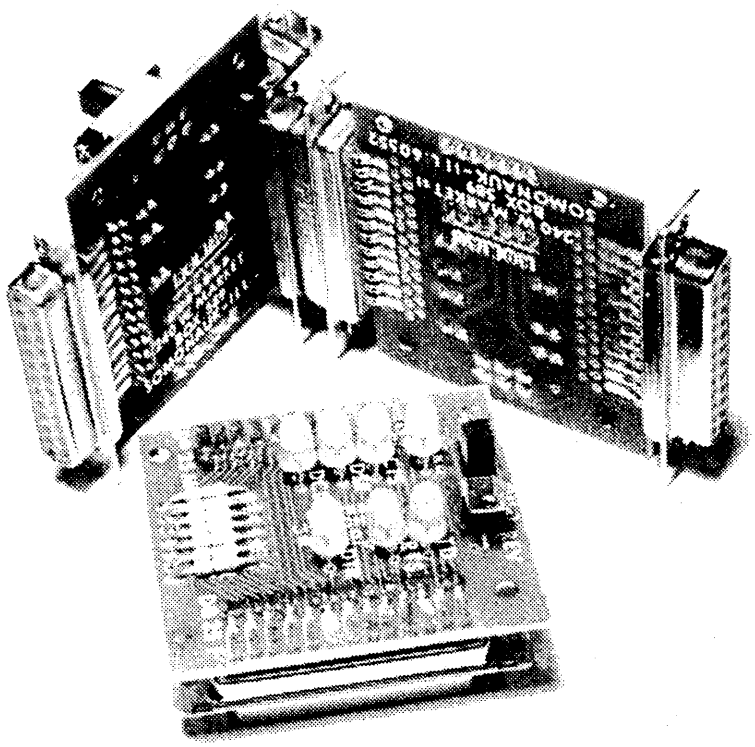

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