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MICRO CORNUCOPIA

THE SINGLE BOARD SYSTEMS JOURNAL

October 1982 No. 8

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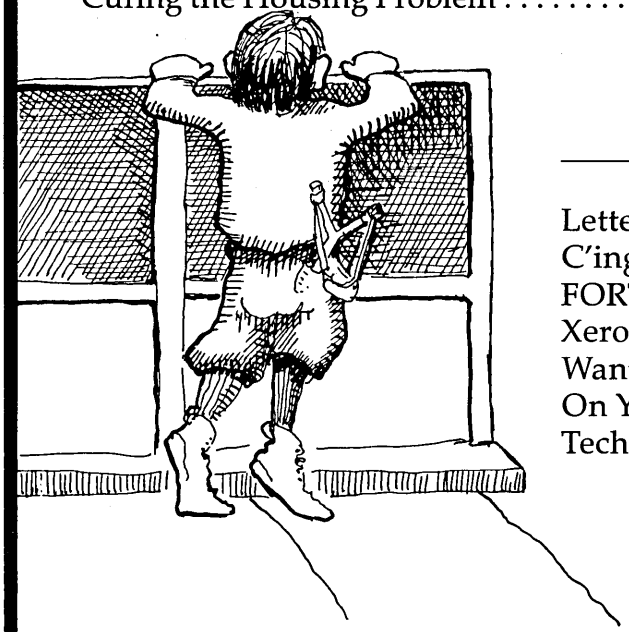

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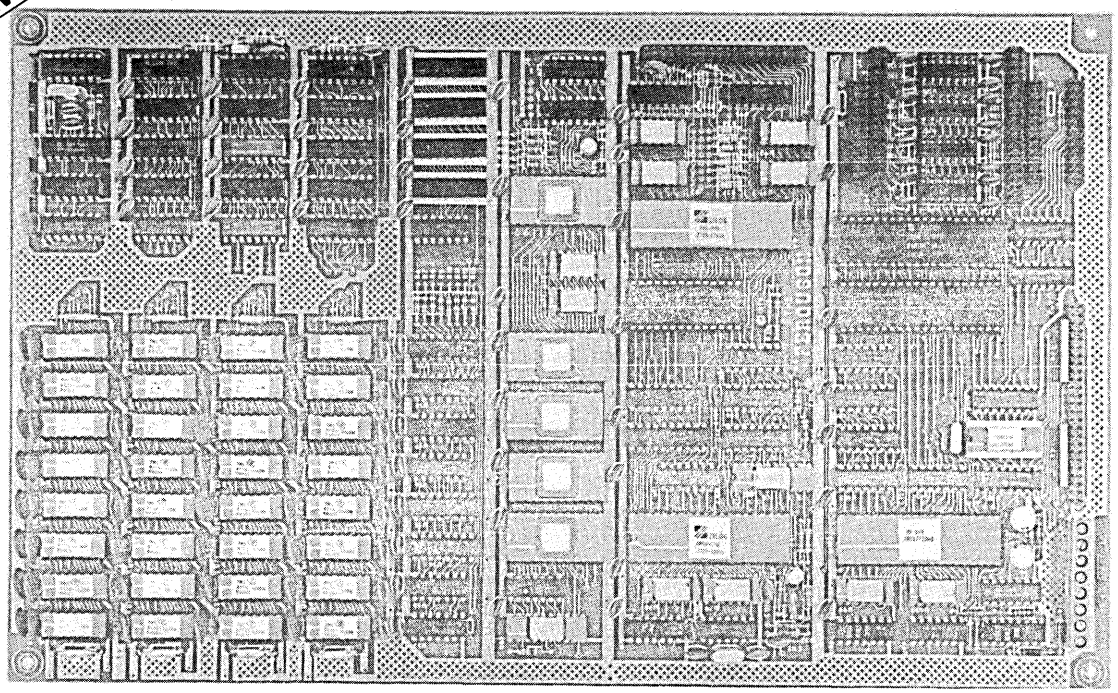

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MICRO CORNUCOPIA

October 1982 **The Single Board Systems Journal** **No. 8**

Great Time!

The Get Together

Those of you who didn't make it to the 1st annual, semi-official, Micro C get together really missed a great time. Over 60 folks came, most of them from the West Coast, but we even had a few from farther afield. There was Jim Ferguson from Texas (yep! THE Jim Ferguson) demonstrating the Big Board II complete with 5-megabyte hard disk! There was Andy Bakkers from Holland demonstrating his hard disk interface for the original Big Board and he was using a 5-megabyte drive! There was Rod Irving and his wife from Australia, where Rod is a major hardware and software retailer. He went back with some new products to market.

All day the place was buzzing with questions and answers, problems and solutions. What appeared to be the most interesting group, however, formed around the tables of potato salad, baked beans, fresh corn, zucchini bread and other Big Board specialties. It must have been a most interesting group because everyone seemed so intent. (Certainly food for thought.)

John Marlin called from Maryland the evening before to say that he was sorry that he couldn't make it. But like magic, the next morning, a local florist showed up with six of the prettiest flower arrangements. We even had flowers up in the computer room. Thanks, John.

You'd probably like to see pictures of the volleyball game or the presentation (semi-official get togethers have to have semi-official presentations). We gave Jim Ferguson a genuine Big Board Game (by Parker Brothers). It is probably the only copy left in existence.

I got the camera out but got so wrapped up just trying to spend a few minutes with each person that I just plum forgot. And besides, picture taking seems to get in the way of what's happening by making folks self-conscious.

So I can't show you what happened, and for that I apologize. We'll definitely give you more notice before the next one so maybe you can come.

Wanted: C and Pascal Software

Well, now that we are finally supporting C and Pascal, we are looking for utilities and programs written in these languages. I've already started working on the first C users disk and I have a number of volumes from the Pascal-Z user group that contain a lot of interesting software. Don Bell sent me volumes 5-15 and they contain a wealth of interesting Pascal software. Charlie Foster, 7963 Center Parkway, Sacramento, CA, 95823 puts the Pascal-Z disks together and from the way Don talks about him (they are practically neighbors), Charlie is a super guy. Contact Charlie if you are interested in participating in the Pascal-Z user group. I haven't talked to Charlie yet but I plan to, so say hi for me if you talk to him.

It appears that quite a bit of the Pascal-Z software was transmutilated from UCSD Pascal. So in turn we should be able finagle the more interesting stuff into something JRT Pascal can digest.

Contributing to Micro C User Disks

We really appreciate all the submissions of software for the user disks, both the public domain material that you find particularly useful and software that you wrote or modified.

When you contribute software that you wrote or modified, please include the following information (as comments) at the beginning of the program: Your name and address (phone number is nice too), the date it was last revised, the name of the compiler (or assembler) it was written for, the compiler/assembler/linker command lines necessary to create a com file, a list of features you'd like to see added, and anything else you'd like to mention. (However, try to avoid long letters to your mother. "Hi MOM!" is usually sufficient.)

(continued on page 24)

LETTERS

Dear Editor,

I have just finished building a new board and during the process of debugging, I noticed that -5V from the RAM protection circuit was showing up in strange places. It turned out that the small electrolytic (or tantalum) capacitors supplied by DRC with the kit had no insulation around the metal cans. So when I installed them down tight they shorted to runs on the board.

I cured the problem by heating the solder at the leads and lifting them slightly above the board.

Now, however, I am now faced with a screen full of alternate characters.

Doug Henry
30 W 211 Claymore Ln
Naberville, IL 60540

Editor's note:

A screen filled with two alternate characters usually means that PFM isn't running properly out of high memory, which usually means a problem with the RAM or with the processor's ability to interface with it.

Note that only the top 16K of RAM needs to be working to use the PFM monitor so you can start off by swapping the two rows of RAMs nearest the edge of the board to check for a single bad chip.

If the swap doesn't cure the problem, verify that there is continuity between the RAM pins and the corresponding pads under the board. (Check with a magnifying glass for bad solder joints!) Use your ohm meter to check for shorts between adjacent pins. Then power up the system and check the RAM supply pins to make sure all three voltages are present and proper. Touch the chips to see if some seem significantly hotter or cooler than the rest. They should all run a little warm to the touch.

Check the address and data buffers and the MUXs by connecting a logic probe or a scope onto an address or data line and hitting the reset button. Do this for all the lines into and out of U54, U57, U58, and U59 to make sure each moves when you hit reset. (See schematic 3 in your Big Board documentation.) Obviously if you see a line moving on one side of one of these chips and not on the other, then you need to swap the chip and see if that moves the problem and then go from there. After all this, check all the lines at the RAM chips and at the processor.

If this doesn't locate the problem, you'll probably need to find a logic analyzer and see how far the system is getting into the initial ROM boot routine. See issue #4, page 5 for a list of the first 16 bytes in the ROM.

If you don't have access to a logic analyzer, good luck. Most of the problems have been with sockets (the TI open frame sockets have been particularly undependable), solder joints or bridges, shorted or open board runs, RAM chips, and LS parts, in that order. In fact, most pros go over hand-soldered boards with a magnifying glass and a bright light, joint by joint, before applying power.

There is also a possibility that your processor is not running properly (usually leaves garbage on the screen). Be sure the processor is getting a clock (pin 6), a reset pulse when you hit the reset button (pin 26), and make sure it is generating a refresh signal (pin 28) and an instruction fetch (pin 27).

Simple parts-swapping sometimes finds subtle problems very quickly but don't swap without reason. Even good sockets can get flakey if you exercise them too much. You'd be surprised how much you can learn with a simple scope or a logic probe if you just poke around for a while.

Dear Editor,

I wanted to ask you about the PR program on USR disk #1. My MX-80 printer is dropping characters two at a time. My printer has a 2K buffer and the problem doesn't occur until after the first 2K characters. I have a Diablo 1640 that doesn't drop characters but the horn blows at the end of every line.

Kenneth Schurr JR
529 Candlewood Dr
Liberty, NC 27298

Editor's note:

The PR routine was written for the MX-80 with the 80 character buffer (though it works properly on almost all other printers). The routine appends two null (00H) characters to each 0DH (CR) and 0AH (LF). It does this because I was losing two characters at the end of each line. You see, when the MX-80 drops the clear-to-send (CTS) line indicating that it doesn't want any more characters, it really will not accept any more, period! However, the following two characters are already in the SIO buffer and though the SIO notifies the processor that the line has dropped, the SIO goes ahead and dumps out the last two characters. Since my MX-80 drops the CTS line whenever it sees a CR or LF I simply appended two nulls to either of these characters to flush the SIO's buffer.

Most printers will accept a few more characters after they drop the CTS line so they don't have this problem and most of these printers ignore null characters (except your 1640).

Randy Dickinson mentioned that his SIO was not dumping out characters after the CTS line went low. The only thing I could see different on his listing is that he is setting something called auto-enable in control register 3. (He sends a 0E1H to that register.) Hopefully we'll have more about initializing the SIO shortly.

Dear Editor,

I would like to offer a few points about disk maintenance.

Adjustments should not be made without the manufacturer's maintenance manual and a good adjustment/alignment diskette.

The easiest and most effective maintenance project is replacing the head load pad (Shugart PN-50542 available from Hamilton Avnet) and cleaning the head with alcohol. CAUTION—avoid bending the head load arm out too far or you will damage the spring. And, do not lubricate the stepper motor lead screw.

Also, do not loosen the stepper motor plate (painted screw heads on the Shugarts) it will affect azimuth and head penetration and these are not field adjustable.

Jim Chamberlain
PO Box 81
Pittsford, NY 14534

Dear Editor,

What is the status of the Big Board Add On? I paid for documentation and a bare board 3 months ago.

T.J. Aartsma
Dept of Chemistry
Florida State Univ.
Tallahassee, FL 32306

Editor's note:

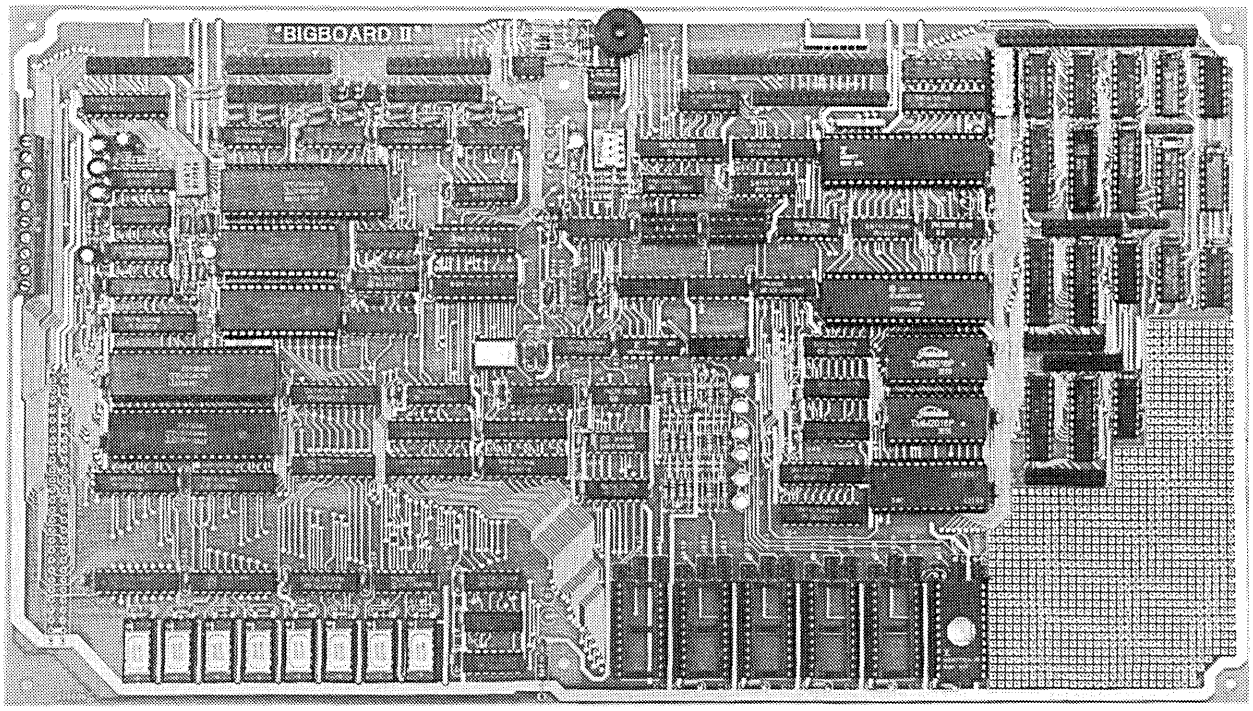
I wish I knew. Tom Brandt (owner and sole proprietor of E.C.R.L) has told me that he is shipping boards but I've gotten a number of queries from folks like yourself who have been waiting quite a while for their orders.

In July he indicated that he would be bringing one of the add-ons over to demonstrate but I haven't seen it yet. I'm sure Tom is not trying to take advantage of anyone but he is a much better engineer than businessman. In fact, this is a good example of how important it is to keep people posted when problems arise or things are delayed.

(continued on page 9)

"BIG BOARD II"

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



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

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

■ 4 MHz Z80-A CPU and Peripheral Chips

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

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

"Big Board II" has three memory banks. The first memory bank has eight 4164 DRAMs that provide 60K of user space and 4K of monitor space. The second memory bank has two 2Kx8 SRAMs for the memory-mapped CRT display and space for six 2732As, 2Kx8 static RAMs, or pin-compatible EEPROMS. The third memory bank is for RAM or ROM added to the board via the STD bus. Whether bought as a bare board, a full kit, or assembled and tested, it comes with a 250 nS 2732 EPROM containing Russell Smith's superb Monitor.

■ Multiple-Density Controller for SS/DS Floppy Disks

The new Cal-Tex single-board computer has a multiple-density disk controller. It can use 1793, 1797, or 8877 controller chips since it generates the side signal with TTL parts. The board has two connectors for disk signals, one with 34 pins for 5.25" drives, the other with 50 pins for 8" drives.

■ Vastly Improved CRT Display

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

■ STD Bus

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

■ DMA

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

SIZE: 8.75" x 15.5"
POWER: +5V @ 3A, + – 12V @ 0.1A

■ "SASI" Interface for Winchester Disks

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

■ Two Synchronous/Asynchronous Serial Ports

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

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

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

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

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

■ PROM Programming Circuitry

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

■ CP/M**

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

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Drive Maintenance

By Denny Fox

6616 Sheridan Ave S
Richfield, MN 55423

How many times have you seen "BDOS ERROR ON A: BAD SECTOR!" and wondered, now what? In the following article we'll cover the "now what" for those of you having disk problems.

Background

Since floppy disk drives have a large number of mechanical components to wear or get out of adjustment, they usually cause much more trouble than the rest of the system. Once you get your Big Board up and running, it should keep running just about forever with very little attention. However, your floppies will need some TLC from time to time, and disk errors usually indicate that TLC is about due.

What Happens Inside?

When you insert a disk and close the door, the 'door-closed' switch actuates, the expanding clutch forces the disk hub over the drive cone, and the disk begins to spin. At this point the index sensor records the passage of the index hole, producing one pulse for each revolution of the disk.

When you do a seek, read, or write; the disk is pressed against the head by the head-load pad (released by a small relay). This soft pad shapes the media slightly to increase the contact area between the disk and the head.

A stepper motor positions the head on the correct track by rotating a lead screw (some newer drives use a taut band).

When the operation is finished, the head load bail (part of the relay) picks up the head load pad allowing the disk to move away from the head.

As you can see, there are a number of mechanical things that have to work properly for the disk access to be successful.

Things to Check

The following are things you should check if you are having drive problems.

1. Worn or missing head load pad. A very worn head load pad may cause the head load arm to ride against the bail, substantially reducing the head load pressure. Also, a hard or worn head load pad cannot shape the disk over the curved head, so the contact area is smaller.

To check the head-load pad for wear, turn your system off, insert an old scratch disk and close the door. With one finger, press down the relay, allowing load arm to lower. With the other hand twist the stepper motor shaft so that the head moves across the entire disk. You should see .015" to .020" clearance between the arm and the bail over the whole distance. If it's less than that, take a close look at the pad, it may be missing or worn flat. If it's OK, adjust the bail.

If the clearance is more than .020" then check that the foam pad (mounted on the bail) is not pressing against the disk jacket too hard. If there is too much pressure against the jacket, the disk will bind and chatter as it turns, causing problems.

2. Dirty head. Oxide is very abrasive and can eat the directory track right off your disks. This is usually where you will notice disk wear first, since this is where CP/M spends a lot of its time. Disk heads should be cleaned with a new Q-tip and isopropyl alcohol.

Caution: Don't grab the head load arm and lift it way up to look at the head and head load pad. You could damage the spring which supplies the head load pressure. If possible, unhook the end of the spring from the arm before lifting it. Otherwise don't lift it more than 90 degrees. If the head looks clean and shiny, you probably shouldn't clean it.

3. Friction. Note how hard it is to twist the stepper motor shaft (when the power is off). If the shaft seems stiff compared with another drive then you probably need to clean the lead screw, the end bushing, or the stepper motor bearings. Use isopropyl alcohol followed by a verrry light application of a verrry light lubricant. (Editor's note: I've had good luck spraying a little silicon lubricant onto a Q-tip and then using the Q-tip as an applicator.)

Too much, or too heavy, a lubricant attracts dirt and gets sticky. In fact, the Shugart maintenance manual states that Shugart drives should only be cleaned, not lubricated.

4. Miscellaneous things. Look for a loose or worn belt, a defective door-closed switch, or a worn or broken expanding clutch (in the center hub). Other things not as easy to find include a bad track 0 sensor, bad index sensor, or misadjusted track 0 or track 76 stops. A "drive not ready" error can be caused by a bad door-closed switch (or switch adjustment) or a defective index sensor.

Aligning the Head

If all the above items appear OK, but you are still seeing errors, then you probably should check the head alignment. You will need a dual-input oscilloscope with external triggering, an alignment disk, a way to load the head, and a way to step the head. The PFM monitor will step the head to the proper track on a scratch disk (via the R command). (The alignment disk does not have its tracks marked.)

Scope setup:
Scope channel 1 to + differential read amp (Shug. tp 1)
Scope channel 2 to – differential read amp (Shug. tp 2)
Probe shields to ground (Shug. tp 5,6)
External – trigger on the index pulse (Shug. tp 12)
Timebase = 20ms/div
Vertical deflection 100mv/div
Sum the two vertical channels

Editor's note: *At this point you would have the scratch disk in drive A (for instance), and with PFM enter R0,26,1 (drive A, track 26H, sector 1). Then exchange the alignment disk for the scratch disk.*

Now, the professional would force the drive to maintain a high holding current on the stepper motor but it wasn't obvious to me how to do that, especially with the new LSI Shugart 801 board. With the high holding current on the motor, you can do the alignment by simply loosening the two motor locking screws and rotating the body of the motor slightly. With the high holding current, rotating the body rotates the shaft and moves the head.

With no holding current, the motor body rotates but the shaft remains stationary. However, with a very steady hand you can rotate the shaft slightly one way or the other to see what gives you the best looking signal, (while holding the relay—not the arm—down by hand) then rotate the motor body the same amount in the same direction and tighten it down slightly. What you are looking for is a cat-eye type signal with two humps of equal amplitude. (You can leave the

motor locked down and just twist the shaft to see what happens without affecting the alignment.)

Now put the scratch disk back in the drive and read track 26H again. Swap the alignment disk back in and see how the signal looks (while holding the relay down). Repeat the process if necessary.

When finished, tighten down the motor lock. Note that because there is no holding current, you must be careful when swapping disks to avoid moving the head.

This process is more tedious than the high-current method but it gets the job done without modifications to the drive.

If you don't have an alignment disk or your scope doesn't have external sync, you can still do a reasonable job. First, connect the scope input to the differential test points, insert a new factory formatted disk (preferably Dysan) and have PFM read track 26H (as above). Now, while holding down the relay (not the arm), turn the stepper motor shaft slightly one way or the other for maximum signal. (When I say slightly I mean that the movement should be almost imperceptible.) Finally, turn the body of the stepper motor the same number of degrees in the same direction that you turned the shaft.

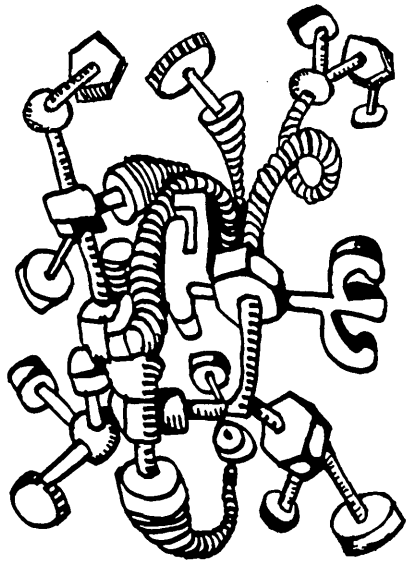
This will be a less exact way of alignment but it correlated almost exactly with my official alignment disk and it allowed me to check tracks 0 and 76 also.

If you compare the size of the signal on two different drives you can get a relative idea of how well each drive is working (and whether one needs a new head-load pad etc.).

High Current Alignment

If you want to align drives quickly and easily then you will want to increase the holding current so that you lock the motor and shaft together. If you can locate the transistor which drives the stepper motor (not available on the new Shugarts) and can force it to remain turned on then you can set your alignment quickly by simply loosening and twisting the body of the motor slightly. Be careful, however, because you'll overheat the stepper motor if you leave it on too long.

With a scratch disk seek to track 0, then seek out to track 38 decimal (26h), which is the alignment track. Put the alignment disk into the drive. Load the head onto the alignment track.



On Shugart 800/801's you can load the head electrically by jumpering the anode of CR1 to gnd. (Editor's note, on my 801 schematic it is listed as CR10). Be sure that you are really going to ground since this line is carrying 24 volts.

Now adjust the triggering, and vertical gain (both channels together) to present a trace which just about fills the screen with the "cat's eye" alignment pattern (looks like an 8 on its side).

A perfectly aligned drive will give a pattern with peaks of equal height. Unequal peaks indicate drive mis-alignment. To change the alignment loosen the stepper motor hold down clamp(s) just enough to free the motor housing to turn – not too much!

Carefully turn the motor housing (this is where you low current folks would turn the shaft and then move the motor housing an equal amount) until the cat's eye pattern on the scope has equal peaks. Then carefully tighten the motor hold down. Re-check to make sure the drive wasn't pulled out of alignment by tightening the screws. Don't tighten the screws too tight, you may have to do this several times to get it right. Shugart states that the lobes must be within 70 percent of each other, however it is easy to get them much more closely matched.

Now check for slop in the positioning mechanism by seeking to track 76 then back to 38. Note the alignment. Seek to track 0 then back to 38. (You have to do the seeking on the scratch disk, remember.) Note the alignment; if you see a difference coming in from different directions and it is not too great, re-align and split the difference so it is equal and opposite. A large difference indicates wear or binding in the mechanism.

Final notes:

Hopefully, the above procedure will put your ailing drive back in business, but you should also be aware:

1. If you change head alignment drastically, you may not be able to read your old disks.

2. If you can validate a new disk (preferably a Dysan) on all drives, freely exchange disks with your friends, and successfully read different manufacturer's distribution disks, your alignment is probably OK. (Some new disk formats have deleted data marks on track 0 which may be flagged as errors.)

3. Some disk problems can be caused by poorly designed disk formatting programs.

4. On multi-drive systems, check all drives to make sure one isn't off one way and another off the other way, causing exchange problems. A mis-aligned drive will format, read and write its own disks just fine but that's it.

5. Temperature and humidity conditions can affect the alignment disk. A little apparent mis-alignment may be OK if all your drives are the same.

6. Re-format flaky disks after re-alignment. Otherwise they probably will continue to cause trouble since they may have been formatted or written by mis-aligned drives.

7. DUMPX program by S. J. Singer from CP/M user group disk #24 is a good tool. It does disk validation; track, sector, and group reading; disk allocation map reading; and direct sector editing. In addition, it does file dumps in hex and ASCII. I have modified it to validate with a 2 sector interleave instead of 5 to reduce validation time. *(Editor's note, Denny's update of this utility is on user disk #5.)*

■ ■ ■

Interfacing CDC Drives

By John Jones

5826 Southwest Ave
St.Louis, MO 63139

Most recently manufactured floppies have Shugart SA800 interfaces and thus are compatible with the Big Board. The used CDC drives I purchased, however, are not compatible with the Big Board without signal translation.

CDC drives were designed to run with a separate cable for each drive, which causes two problems. First, the drives have no drive select input so their output lines are always active. Second, CDC drives do not have a "ready" signal to let the controller know that it can access them.

So, to use CDC drives you must:

1. Generate a "ready" signal which correctly indicates the state of the selected drive.
2. Multiplex drive output signals so that active signals are received only from the selected drive.
3. Demultiplex control signals so that only the desired drive will respond.
4. Route the signals in both directions to the proper connector pins.

The "ready" signal goes true when there is a disk in the drive and the disk is running at 360 rpm. The circuit in Figure 1 is all that is needed to generate this signal.

When the pot is adjusted so that the timing on the monostable is 170 to 175ms the following takes place. If the drive doesn't contain a disk, the monostable times out, resetting the flip/flop and causing "ready" to go false. If the disk is rotating at less than normal speed, either speeding up or slowing down, the monostable will time out between index pulses and ready be false. Only when the disk is running at the proper speed will the monostable be retriggered in time allowing ready to be clocked true on the following index pulse.

In Figure 2 you see how this circuit is combined with the multiplexing circuit. Here is where the index, composite read data, track0, and ready signals come in from two drives. The 74158 multiplexer selects which drive's outputs to pass along to the 1771. The 74158's selection is controlled by SEL0 and SEL1. If neither drive is selected, the 7438 open collector drivers are disabled, which allows you to duplicate the circuit for additional CDCs or allows the parallel connection of Shugart-compatible drives.

Figure 3 shows how the signals to the drives are demultiplexed. The proper bank of 7438 drivers is enabled by the drive select signals (SEL0 and SEL1) from the controller.

The particular drives I purchased have two signals not available on the Shugarts. "Write fault" and "write fault reset" are not compatible with the Big Board so I disabled them by tying "write fault reset" to ground (it's active low).

Finally, both head load and step speed are slower on the CDCs. I lengthened the head load delay by increasing the value of R44 on the Big Board from 100K to 150K. The slower step rate was not a problem. Apparently the specifications for the drives are quite conservative. If the step speed is a problem you'll have to change the step speed select bytes in PFM-80.

After getting past the initial setup and mechanical adjustments, I've had absolutely no problems with the drives.

Editor's note: See John Clark's letter to the editor for information on how he interfaced an apparently Shugart-compatible version of the CDC.

■ ■ ■

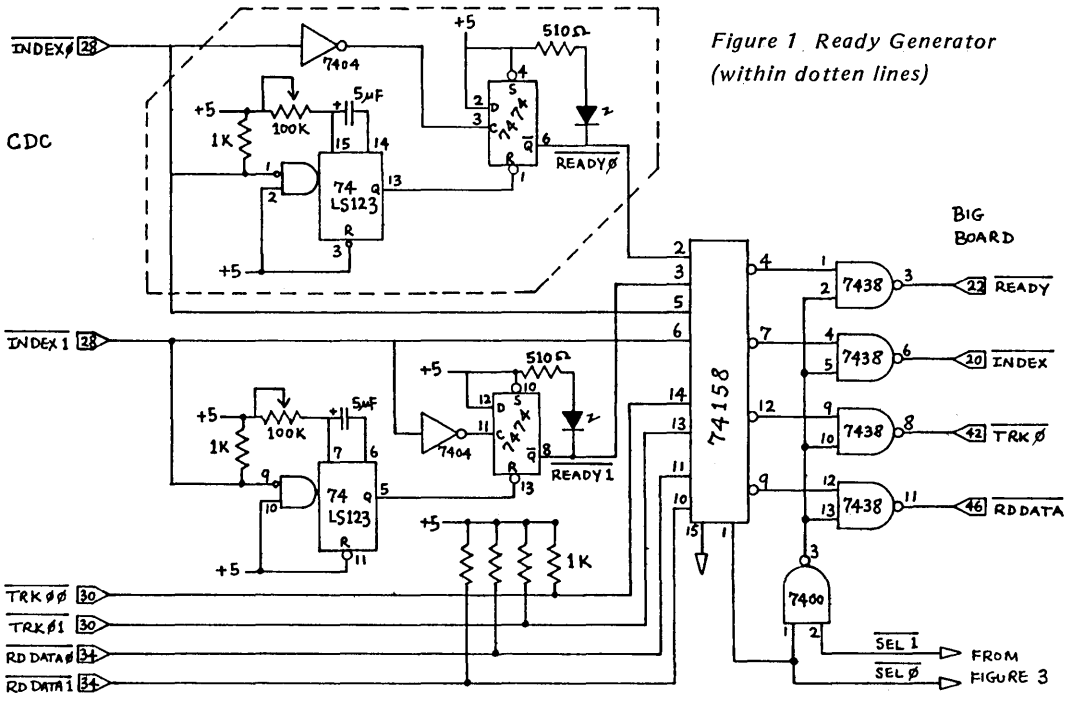


Figure 1 Ready Generator (within dotten lines)

Figure 2 CDC to Shugart Signal Generator and Multiplexor

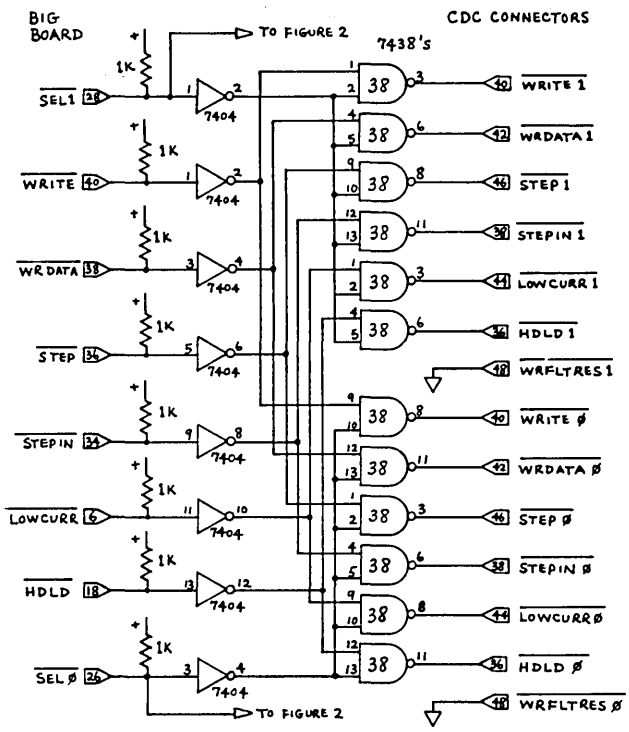
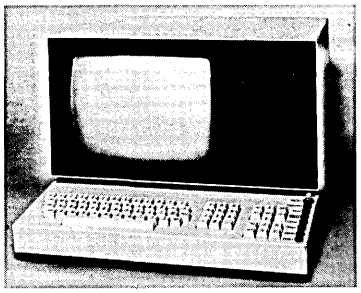


Figure 3 Big Board to CDC Demultiplexer

UNIVERSAL ENCLOSURE



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

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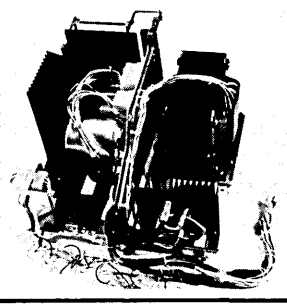
Modular power supply (missing regulator card) fits inside above monitor enclosure. Includes large transformer that outputs +8.5 volts @17 amps, +/−18 volts @1.5 amps each, +15 volts @ 1.5 amps (for monitor), three large capacitors (1-18kuf, 2-8kuf), 1–30 amp, 2–3 amp bridge rectifiers. The transformer 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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dm - disk mapper, reports free blocks and directory space
fid - file identification by unique numbers (CRC's)
hc - horizontal file catenation and column permutation
ln - create file links (multiple names for one file)
ls - intelligent directory lister, optional multi-columns
mv - move (rename) files, even between users
rm - remove (delete) files, with optional verification
sc - source file compare, with resynchronization
sfa - set/reset file attributes, optional verification
sp - spelling error corrector, with 80,000 word dictionary
sr - search multiple files for a pattern
srt - in-memory file sorter, optional duplicate line omission
tee - pipe fitting (copy input stream to multiple outputs)
tr - transliterate (translate character codes)
wc - word counter, counts characters, words, and lines
wx - word extractor, copies each word to a separate line

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

```
sc data.bas;2 data.bas;3
```

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

```
rm -v *tmp*
```

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

```
ls -a >proj.dir
```

(writes a directory listing of all files to file "proj.dir");
Pipes:

```
dm b: | sr free >lst:
```

(creates a map of disk B:, extracts those lines in the map which contain the word "free", and prints them on the listing device).

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

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MFE Interface

By Rick Gerson

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

The rumor is that MFE, Keewaydin Dr, Salem, NH, went under recently. Why, I don't know. But I do know that many of their double-sided Shugart compatible drives are available on the surplus market for as little as $200 each!

I bought two and then burned a great deal of midnight oil trying to decipher the 87 jumpers on their boards. Now that I've figured them out, the drives work very well, and they are deliciously smooth and quiet. So what follows is the recipe for MFE soup a la grandeboard.

For drive 0
Cut: SI, DI, DS2, DL1, J13, RHL
Jumper: J14, DL2, LC6, SE2, L1, SSI, HL4, DS1, HS1, HL1, HL3, J6
For drive 1
Cut: SI, DL1, DS1, J13, RHL
Jumper: J14, DI, DL2, LC6, SE2, L1, SSI, HL4, DS2, HS1, HL1, HL3, J6

Add a 220 or 330 ohm termination dip in location 215 (marked on the board) and jumper J12 if you are supplying -5V. If you are supplying -15V then don't jumper J12.

You should also note (preferably at the store) whether the drive can read both single and double-sided disks or if it can read only single-sided. "And how you be doin' that boss??" you ask.

If the drive has two sets of yellow and black wires that snake up opposite side of the drive from the circuit board (to two LEDs) then it will read and write both (hold onto that one and quickly look for another one). If it has only one set of wires then it will only read double-sided. I have one of each and they are both model 750.

If you are as lucky as I was and get both kinds, make the one that reads both, drive 0, and make the one-eye, drive 1. If each drive has 2 LEDs then cut SI and DI on both drives (besides following the above instructions). If each drive has 1 LED then cut SI and jumper DI on both.

The MFE 700 has an AC motor while the 750 has a 24V DC motor. The 700 draws 1.1 amps at 24V, the 750 draws 1.5 amps.

This should get you started, if you have any problems, get in touch with me. ■ ■ ■

Jumpering The Qume DT-8

By T. Grady Griffin Jr

1010 Rush-Scottsville Road
Rush, NY 14543

The Qume DT-8 and the Big Board make a handsome couple. In my case the marriage has been relatively uneventful and the honeymoon will probably last a long time. *(You've obviously divorced yourself from disk problems. Ed.)*

How do you marry a Qume to the Big Board without a hitch?

First, the BB disk interface is compatible with the Qume with one exception. The exception is that the "low current" line is on pin 6 on the BB and pin 2 on the Qume. Fortunately since the BB doesn't use pin 2 and the Qume doesn't use pin 6 all you need to do is jumper pin 2 to pin 6 on the BB (J1).

Connectors

The AC connector (Qume J0) is a three-pin AMP 1-480700-0 housing with three 350550-1 pins (same as Shugart).

Pin 1 120 VAC
Pin 2 System Ground
Pin 3 120 VAC (neutral)

The DC connector (Qume J5) is a six-pin AMP 1-480270-0 housing with six 60619-1 pins (also the same as Shugart).

Pin 1 +24V input
Pin 2 +24V return
Pin 3 Logic ground
Pin 4 No connection
Pin 5 +5V input
Pin 6 +5V return

Pins 2, 3, and 6 are all connected to logic (power supply) ground. The system and logic grounds should be connected together at the power supply.

Procedure

Unplug everything and remove the PCB from the chassis. Carefully remove the solder from the following pairs of holes: B2, B3, B4, S2, S3 (top left), and S (center between IC U3D and U3E).

Carefully remove the traces between the holes S and S2 (use a sharp razor blade or X-acto knife). Be sure you cut the trace running horizontally between the S2 pads, not the vertical trace between S2 and S1.

Install and solder 12 square pins at B2, B3, B4, S2, and S. Now reinstall the board and reconnect all the plugs.

Head Load Option

There is a programmable shunt at location 1E (left center). Open the traces on this shunt at locations X, HL, and Z. I replaced the shunt with a 16-pin dip switch.

Also jumper locations C and D (just left of the shunt), and at locations DS and Y (upper left).

This completes the head load option and includes an activity LED option so that the LED will only light when the head is loaded.

Drive Select Options

To configure the DT-8 to act as a single drive with a single-sided disk in place or as two drives with a double-sided disk, jumper S3. If you want it to act as a single drive only, jumper S2.

If you jumper S along with S3 then the DT-8 will not access the back of a single-sided disk. If you don't jumper S then you can read and write on the back side of a disk that would ordinarily be single-sided only. A good formatting program (format3 on user disk #1) will format and verify the back side for you.

Drive select for the front side of the disk is set by jumpering one of the options DS1 through DS4 (if it will be drive A jumper DS1, if drive B then DS2 . . .). Drive select for the back side of the disk is set by jumpering B1 through B4 (if the back will be drive C then jumper B3 and so on).

Editor's note: the front side of the disk is the side you would normally use on a single-sided disk (the side opposite the label).

If you are using more than one drive on your system you will need to remove the terminators (two 16-pin resistor packs) from all but the last drive on the 50-line cable. (This is important no matter what brand drive you're using.)

Second Editor's intrusion: My Qume has been an absolutely dependable drive but it is noisy because I'm giving it a 6ms step rate. I understand that it gets absolutely silent at 3ms (3ms is not available on the 1771).

■ ■ ■

GRAPHICS

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[1]TRS-80 is a trademark of Tandy Corporation.
[2]Characters are blocks: 2 wide by 3 high in an 8 x 10 dot matrix, for a total of 11,520 addressable points.
[3]Similar to TRS-80 commands. [4]Switch not included.

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(Letters continued)

Dear Editor,

Thank you for sending me the back issues. The article in the September 81 issue on jumpering the wild Shugart got me up and running. Now I am interested in adding two switches to the front panel of my system so that I could select whether or not the disks would be write protected. Do you know how to do this?

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

Editor's note:

There is a backwards way to get switchable write protection. The 801 contains a shorted pair of pads marked "WP" (for write protect) and above them, an additional pad marked "NP" (for no protect).

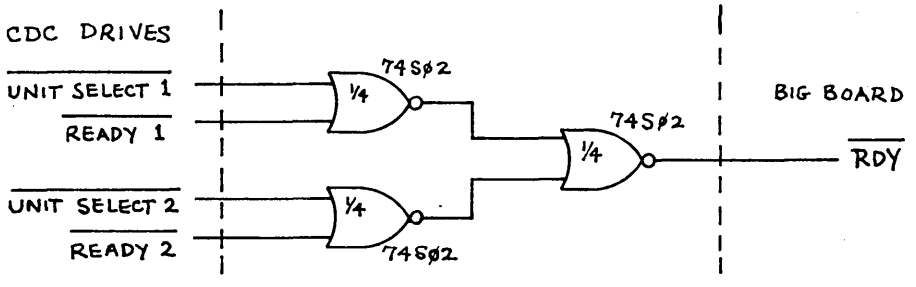
When "WP" is shorted and "NP" is not, then the drive will not write onto a disk which has its write-protect notch uncovered. When the "WP" run has been cut and "NP" is shorted instead, then the drive should write on a "protected" disk.

So, all you have to do is remove all the write-protect tabs from your disks (so they are write-protected) and then set up a single pole double throw toggle switch so that you can short either "WP" or "NP."

Dear Editor,

I have a Big Board running with an 8" CDC disk drive and it seems to work fine. The following is a simple circuit that generates a ready signal from the outputs of the CDC. The rest of the signals are compatible.

John Clark
59 Royal Oak Drive
Welland, Ontario
Canada L3L 5W1



We're Moving!

Just when you thought things had settled down here at Micro C we pull up and move.

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We don't have our new phone number yet but our mailing address (after October 31) will be:

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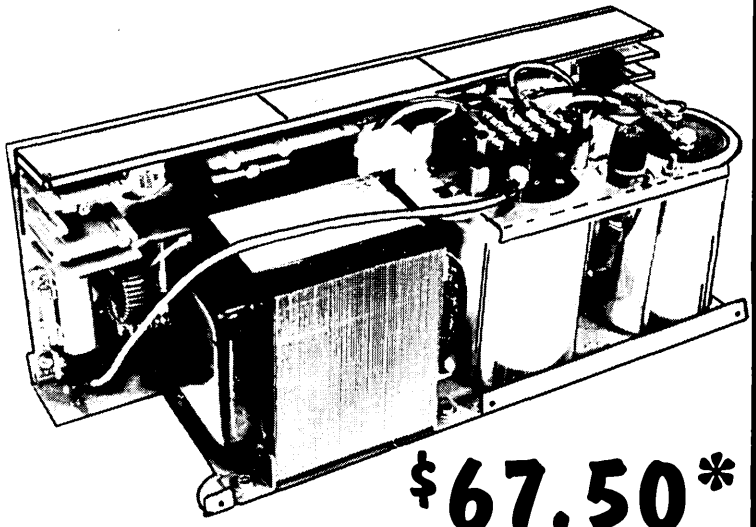

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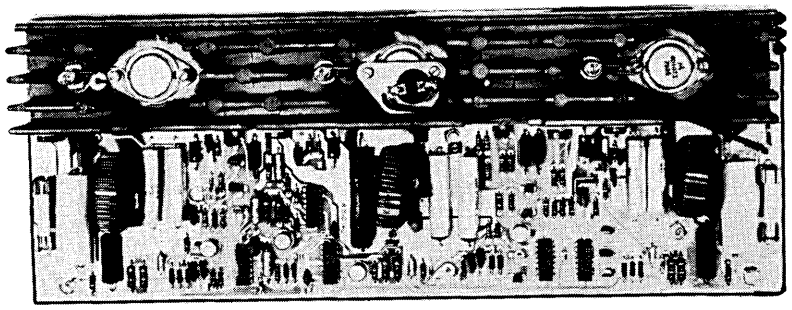

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C'ing Clearly

Column by Tony Ozrelic

L.A. Software
6708 Melrose
Los Angeles, CA 90038

Hi, I'm Tony Ozrelic and I've taken on the task of doing a C column for Micro C. As a little background, I've programmed in a number of languages including BASIC, APL, FORTRAN, and assembly for many different systems. Although I was originally a hardware engineer, I've found that programming gives me a chance to express some creativity.

Through this column I hope to generate more interest in C and help balance some of the emphasis that has been placed on FORTH. When I talk about C, I'm really talking generally about the language unless I specify a particular version.

Why C?

Why should you use C as a programming language? Because its forte is systems programming. The system, of course, is the environment in which the programs run, such as CP/M or UNIX. Plus, the system includes tools, such as compilers and utilities.

With this in mind, it seems to me that C was intended to replace assembly language programming rather than high level languages such as BASIC.

Which C?

If you'd like to get a feeling for the language and its use, I suggest that you choose Small-C or one of its offspring (Small-C+, Q/C, or C80). Small-C is a pretty limited subset of the language (see Micro C issue #7 for details) but it does give you a feel for C's strengths without overwhelming you with details.

The first C I tried was the Tiny-C interpreter. It was interactive but very slow.

After I got my Big Board, I started writing programs in Small-C. I wanted to be able to market the software for both the BB and the Apple, which meant that C was the only choice (assembly language obviously wouldn't do it).

About a year ago, I bought the Q/C compiler from the Code Works (it got rave reviews from friends). It has been an excellent compiler with a good utility and runtime library and an outstanding manual. The .COM files do get to be a bit long, probably a result of the utility library. However, I would rather have a bulky library than do without these utilities.

Meanwhile I started writing a version of the Q/C compiler for the Apple, including a cross-assembler written in M80 macros, and an 8080 instruction interpreter for the 6502. I was 90% finished with the project when the Aztec C folks came out with their full-fledged version which runs on both the BB and the Apple.

Aztec C generates files that are about the same size as Q/C. They run about 10 to 15% faster than Q/C, and, of course support much more of the language. The Aztec manual is somewhat terse but not as unreadable as parts of the CP/M manuals.

Still, if you're beginning, you'll get a friendlier introduction by starting with one of the simpler versions. Working with a subset gives you less to learn at first and more to appreciate when you move up.

As for program compatibility, most of the differences lie in the I/O utilities. For example, Q/C and C80 automatically give you I/O redirection but, sadly, Aztec C does not. I will have to doctor its utilities to make them work like Q/C.

Getting Started

Along with a C compiler, you will need a text editor, and some books.

I mention the editor because you will use it a lot; be sure you can live with the one you pick. To get a taste of an application of C and a full screen editor, I suggest you try the package sold by Micro C for $39. As David says, "where else can you get an editor, formatter, and C compiler all for under $40?"

I strongly recommend you get two books, *The C Programming Language* by Kernighan & Ritchie, and *Software Tools* by Kernighan & Plauger (available either in the RATFOR version or the PASCAL version). The programs outlined in *Software Tools* are the basis for my Programmer's Aid Package (really a collection of word processing programs). (Editor's note: If you are at all familiar with the utilities in Software Tools you know what a great help they can be. Also note that the RATFOR looks so much like C that many folks mistake one for the other.)

What next

Once everything is in hand, including CP/M manuals, you probably should edge-index the C manual so you can look up information about error messages and utilities quickly. Then create a submit utility to handle your compilations. This way you can go raid the refrigerator while your program is compiling. (Although this is an incentive to compile larger programs when you are hungry.)

Here's a submit file for Q/C: (the comments in lower case are not necessary)

```
;compile $1.c for M80,
CC $1.C -M
;assemble it with M80,
M80 =$1/M
;erase the .mac file
ERA $1.MAC
;link in runtime library,
L80 $1,CRUNLIB,$1/N/E
;erase the .rel file,
ERA $1.REL
```

If you saved the above file as C.SUB and you wanted to compile a file called SORT.C, all you'd need to do is have SUBMIT.COM on the disk with everything else and put the disk in drive A. Now enter:

```
A>SUBMIT C SORT
```

and go raid the fridge.

A Simple Program

Whew! I'll bet you thought we'd never get here. The following program doesn't appear to do much but it's actually quite useful. It copies text from one place to another.

```
#include "qstdio.h"

main () {
        char c;

        c = getchar();
        while(c != EOF) {
                putchar(c);
                c = getchar();
                }
        }
```

If you change the #include statement to match your version, this program will run on almost any C compiler. The #include statement calls the Q/C I/O package. C80 will run if you remove the #include and add a #define EOF -1 in its place.

Discussion

Note that main() is the first function called in a C program. The body of main() is enclosed in brackets {}.

Within the body are the subroutines that do the work. First we define c as a character local to main() and usable only by functions called by main(). Subroutines getchar() and putchar() are not defined because they reside in the standard library which is a set of routines which copy strings, open and close files, and handle I/O.

The functions main() and getchar() have no arguments so their parentheses are empty. Purchar(c) must actually put something so we pass along the character that getchar() found. The statement:

```
while(c != EOF){ . . . }
```

says that the statements between the brackets { . . . } will be done as long as the character in c is not an end of file character (-1).

If you compiled this program and entered:

```
A>COPY
```

it would echo on the screen every character you typed on the keyboard (actually double because PFM also echoes characters on the screen).

If you compiled it using C80 or Q/C, for instance, you would be able to redirect I/O. So you could enter:

```
A>COPY <A:TEXT.FIL >B:TEXT.FIL
```

and copy would make a copy of A:TEXT.FIL on the B drive. Don't do this with a file more than 2 or 3 K long because it's going to do the copy a sector at a time which is very slow. Or, if you enter:

```
A>COPY >LST:
```

you have created a simple typewriter using your printer as output. This actually works very well because you can edit each line using the CP/M editing commands before hitting <CR> which activates the printer. Or,

```
A>COPY >TEXT.FIL
```

lets you use copy to create a text file (and it's very easy to use).

Next time we will look at expanding this simple copy program into a filter so that you can process data to your heart's content and spend more time at the fridge.

■ ■ ■

The BDS C Users Group

By David Mitchell

1161 Grow Ave NW
Winslow, WA 98110

In early 1980 John Nall contacted Leor Zolman, creator of BDS C, to ask about a users group. When Zolman said there was no users group, Nall offered to start one.

Nall ran the group for about a year before he had to bow out due to other commitments. At that time Robert Ward, the present coordinator and newsletter editor, took over.

When I joined in the summer of 1980 there were 75 members. It was a loose organization with no dues and a sporadic newsletter, but already there were three disks in the library.

Dues are $10 per year, which buys six issues of the newsletter. There are about 1000 members.

There are 18 volumes in the user group library, with a broad mix of software including C functions in source form, complete text editors, and the source for PISTOL, a new FORTH- like language by Ernest Bergmann, written in BDS C. There are also an additional 10 volumes containing Kernighan and Plauger's Software Tools in RATFOR. Each volume costs $8.

BDS C Users Group sponsors CNET, which will eventually be a nation-wide network of C users connected via computer and telephone. The main CNET node is run by Steve Passe, Box 629, Englewood, CO, 80151, (303) 761-4378. The network phone number is (303) 781-4937 (300 baud, 8 bit, no parity).

The group also provides an update service for owners of BDS C. Updates cost $8.00.

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■ ■ ■

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FORTHwords

Column by Arne Henden & Hampton Miller

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

P. O. Box 816
Carpinteria, CA

This is another one of our famous two-man columns. I have some news in the FORTH world to present, and Hampton has another application to describe.

In the Journals

A friend handed me one of the most useful articles that I have seen in a while – "FORTH from A to Z," an 8-page directory printed in the January, 1982 issue of *Digital Designs*. The FORTH directory lists all commercial suppliers of FORTH as of Fall, 1981. The article lists several distributors and packages that I had never heard of, along with the latest FORTH Inc. prices. Very illuminating and worthwhile fireside reading.

Z-80 FORTH News

Laboratory Microsystems Z-80 FORTH is probably the most widely distributed CP/M FORTH. One of its problems, however, has been that it is compatible with Fig-FORTH rather than FORTH-79. Ray Duncan has announced that version 2 of his FORTH will be FORTH-79 standard and should be released by the time that you read this. He is rewriting his PC-FORTH manual and it's therefore possible that the Z-80 FORTH manual is also getting a facelift. These items are all welcome news.

Joe Barnhart (Santa Rosa, CA) contributed some very useful routines for Z-80 FORTH. While the actual coding cannot be used for ROM-FORTH or UNIFORTH, the basic idea is worth considering.

Joe has created a method of doing a binary overlay; that is, the ability to save and load precompiled FORTH code. The package handles all relocation of high level definitions, but not CODE words (imbedded addresses are difficult to resolve). The package is 15 blocks long.

This capability is pretty exciting since it cuts compilation time by a factor of 10. After I've had a chance to study the package, I'll try to provide a synopsis of the technique so that you can implement it for your FORTH.

New CP/M FORTHs

There are at least two new FORTH versions announced in the past couple of months that operate under CP/M.

Micromotion FORTH has been around for the better part of a year now, and has a very nice manual. Inner Access FORTH is an offering from a group of ex-FORTH Inc. programmers. Also, Stackworks is now selling their FORTH directly instead of through Supersoft (a wise decision). My preference is still standalone FORTH for single users on a single-board computer, but the ability to interface directly with CP/M remains a significant facility.

Hampton's Application:

All you terminal users will be tickled to know that this time we are initializing SIO port A (Arne used port B in issue #6). Using port A is more difficult because you have to do the initialization (PFM doesn't initialize it as it does port B).

In the following listing, lines 1 and 2 define the addresses for the port A baud rate generator, data, control, plus the data available (DAV) and transmit-buffer-empty (TBE) flag bits in the control register.

Lines 3 and 4 are stolen from Arne. Note that when you define ?TERMINAL ROM FORTH complains with a "MSG #4." This means that a word with the same name already exists but it still accepts this new definition.

But if ?TERMINAL is already defined why are we redefining it? Well, ?TERMINAL is one of the non-standardized FORTH words. Thus, its behavior is subject to the whim of the implementor.

On many systems, ?TERMINAL will return a true value if any key has been struck. ROM FORTH follows the "break indication" school of thought and returns a true only when a control-C is entered. Arne redefined it to call PFM and leave the keyboard character on the data stack.

Line 5 defines the SIO initialization word SINIT. Note that all of the data is pushed on the stack in reverse order and then the DO . . . LOOP sends it to the SIO.

First, SINIT sends three resets to the SIO. This is only important during a warm start when the SIO might be waiting for the second byte of a two-byte sequence. Thus a single RESET code would be eaten and if two are good, three are probably even better. (Zilog DMA chips have such long command sequences that you would have to send seven resets to be sure you really reset them.) The 04 44 (control register 04 gets a 44) sets the SIO to 1 stop bit, 16 times clock. The 03 C1 (receive control register 03 gets a C1) enables the receiver and selects 8 bits-per-received-character (and no parity). The 05 E8 (transmit control register gets an E8) enables the transmitter, asserts data terminal ready (DTR), and selects 8 bits-per-transmitted-character.

Line 7 defines ?SIO which mimics ?TERMINAL but for SIO port A. ?SIO returns true if there is data available from the SIO.

Line 8 defines SEMIT which behaves like the standard FORTH word EMIT but sends the output to the SIO. Note that SEMIT waits until the transmit-buffer-empty flag is set before sending data. This may not be significant in this simple program but following the FORTH philosophy, we are building tools that we can use in later projects. Soon we will be sending assembled strings of bytes. If we didn't wait for TBE would guarantee that we would get only garbage out of the SIO.

Line 9 defines SKEY which returns the next available character from the SIO (like the standard word KEY). Note that ?SIO must be called prior to calling SKEY or you will read bad data.

Lines 11 and 12 put it all together. TALK initializes SIO port A and then

(continued next page)

```
 0 ( Port A usage  on Big Board  12-Aug-82 ) HEX
 1 3 CONSTANT ABAUD   4 CONSTANT ADATA   6 CONSTANT ACTRL
 2 1 CONSTANT DAV     4 CONSTANT TBE
 3 : PSCODE <BUILDS HERE 2+ , DOES> EXECUTE ;
 4 PSCODE ?TERMINAL 06CD , 6FF0 , 0026 , 2BCD , 0000 ,
 5 : SINIT E8 05 C1 03 44 04 18 18 18  9 0 DO ACTRL P! LOOP
 6   05 ABAUD P! ;
 7 : ?SIO ACTRL P@ DAV AND ;
 8 : SEMIT BEGIN ACTRL P@ TBE AND END ADATA P! ;
 9 : SKEY ADATA P@ ;
10
11 : TALK  SINIT BEGIN ?TERMINAL IF KEY SEMIT ENDIF
12                     ?SIO      IF SKEY EMIT ENDIF  0 END ;
13 ;S
14
15
```

Flippy Floppies

By David Thompson

I'm sure that most of you already know that punching extra holes in the jackets of single-sided disks makes room for more bits. But for those of you who aren't familiar which this practice, the following should help you double the amount of data you can store per disk.

(FORTHwords continued)

loops forever transferring data back and forth between the console and the port. As a personal project you might extend this to do file transfers. Arne has already done some of the work for you in issue #6.

DTR should be asserted because many terminals and most modems require it. Line 6 sends 05 to the port A baud rate generator setting it to 300 baud. Refer to page 8 of the DRC Theory of Operation manual if you want a different baud rate.

■ ■ ■

Actually, what you will be doing is adding another set of index holes in the jacket so you can flip the disk over and use the back side (that's right, this is for single-sided drives.)

When folks first hear about this they often wonder why the manufacturers don't punch the extra holes themselves so that all disks would be flippies. Scotch, Verbatim, and I'm sure some others do make flippy disks this way. Of course, then they also test and format the back side and charge almost double for the disk.

Punching the Index Holes

First you need an empty disk jacket from a single-sided disk. This means you are going to have to sacrifice one disk (I chose an old Verbatim) by grabbing it in the hub area and simply pulling it out of the jacket. It kind of crinkles and crackles (death sounds) as you pull it out but grit your teeth and do it. Once it's free you can use it to do everything you've ever wanted to do with a disk. Hang it on the wall by putting a thumbtack through track 0 (as an example to keep other disks in line), or be practical and use it as a placemat under the dog's dish.

Now use the empty jacket as a stencil to mark an additional set of index holes on the flippy-to-be. First place the empty jacket and the disk, label-to-label and mark the location of the new hole with a felt pen. Then place them back-to-back and mark the second hole.

Now punch the holes with your handy-dandy ticket punch. (I got a Gem punch by McGill Company at the local five and dime, it was less than two bucks.) Keep the disk jacket in its envelope as much as possible during this process, you don't want to touch, scratch, or bend the part of the disk that the head will read.

Use needle-nose pliers to remove any backing material left in the hole (or get the new BASF disks which don't have backing near the holes).

Once you finish, you can use your disk formatter to format the back side. If the formatter returns an error message then you probably didn't get the holes placed quite right or cleaned out well enough. It doesn't hurt to enlarge the holes.

Results

I have found very few backs that didn't work as well as the fronts but the disk manufacturers don't encourage flipping because they don't test the backs of single-sided disks. (That's OK, I have some 3M's that obviously didn't get their fronts tested either.) ■ ■ ■

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Xerox 820 Notes

Column by John P. Marlin, Jr

NUF Computer Company, Inc.
99 Pennsylvania Avenue
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(617) 964-8041

Introduction

By David Thompson

This is the first installment of a regular column in Micro C. We were lucky to have someone like John volunteer to take on this project since he is quite familiar with both the 820 and the Big Board.

In this column he does an overview of the hardware differences between the two systems. In fact, this information should be especially useful now because Xerox recently dumped a large number of assembled and tested boards on the surplus market (they are gearing up for the 4 MHz, double-density upgrade).

For instance, the Rondure Company, 2522 Butler Street, Dallas TX 75235, 214-630-4621 sells these 820 boards for $435.00 each. I don't know anything about them, I just saw their ad in Computer Shopper.

Origin

The Xerox 820 (R) System is an offshoot of the Big Board. In fact, if you look through the Official Xerox 820 CP/M System Manual you'll notice many similarities between the Big Board monitor and the 820 monitor. Unfortunately, there are enough small differences that the addresses in the two monitors don't match past the keyboard FIFO.

Xerox took the BB logic, added 5-inch floppy circuitry, removed some useful jumpers, re-laid-out the board for their cabinet, and changed all the IC designations and plug numbers.

In the process, they ended up with one of the most solid basic systems on the market, to the surprise of none of the BB users.

Since Xerox owns Shugart, the drives come from Shugart, and, since Xerox owns Diablo, etc . . . ..

Inter-cabinet cabling is shielded with copper-foil (real copper, not metallized) and all the connectors have huge, all-metal shells bonded to the copper foil. RFI/EMI? Not Bloody Likely!

Differences:

CPU. How different can a Z-80 at 2.5 MHz be? Nothing significant here. They added a good +5 V power-up reset and a jumper on the system clock which lets them use automated test equipment (ATE).

CTC. Nothing here, either. All the same.

MEMORY. They left off the third and fourth PROM sockets.

VIDEO. They have removed the composite video parts and the jumpers and just hardwired it to match their monitor. They added a jumper on the video oscillator that sets it up for ATE. The character generator has an output enable, so the ROM does not provide blanking. This allows a second character set in the 2716. The second set is selected by Bit 6 of the System PIO port. Setting the attribute bit (bit 7) still causes the character to blink.

SYSTEM PIO. Bits 0, 1, and 2 are used as disk selects, but with a twist. They are not decoded. Bit 0 controls drive A, bit 1 controls drive B, and bit 2 handles disk side select. If you want stereo, you can output a 03 to the port and select both drives simultaneously.

Bit 3 is K/B Rdy. Bit 4 is used by the system to sense whether it has 5" or 8" drives, connecting a 5" drive pulls this line low. Bit 5 is still not connected to the bell, bit 6 selects which character set you're using, and Bit 7 still handles memory bank select.

Keyboard PIO. This circuit is unchanged, except that the keyboard strobe polarity is no longer selectable.

SIO. SIO-A is unchanged, but SIO-B no longer is jumperable, it has been dedicated as a printer port.

AUX PIO. Unchanged.

DISK CONTROLLER. Still the old friend 1771. However, CLK, RDY, FD-DATA, and XTDS are connected to a quad 2-input mux, the 8"/5" sense bit selects which lines go to the 1771. This is how they set whether the disk controller receives 2Mhz or 1Mhz and whether the external data separator is used. (5" drives do their own data separation.)

The RDY line is the same as the Big Board for 8" drives, but for 5" drives Xerox has set up a timer tripped by the index pulse. The 5" drive motors are controlled by the drive select line.

MONITOR. There are some differences here. Xerox added a (T)ypewriter command which routes to the printer anything that comes in on the keyboard. However, the screen remains blank, and the printer is initialized strangely. I have never seen this command used, outside of a sales demonstration, where it is one of the few things an inexperienced salesperson can't screw up. The old "T" command (memory test) is now "X".

All of the other commands are still there, and are similar to PFM.

The initialization code remains similar, except the SIO-B port is initialized with DTR off. Why?!?! (Editor's note: A number of other folks had this very same question while trying to interface the 820 with their own printer. The only thing I can guess is that Xerox is trying to sell printers.)

KEYBOARD. Xerox did not do an outstanding job on the 820 keyboard. For instance, the down arrow key outputs a control-c which of course haults standard CP/M programs. The keyboard is a Maxi-Switch, and is capable of sending lots of codes with bit 7 set but bit 7 is faithfully cleared by the software. They kept the 16-character FIFO for console input.

Coming Up

By the time this is in print, I will have an 820-MOD II board to dissect and describe in the December issue. See you then . . . ■ ■ ■

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Changing Your BIOS

By James Simon

8 Garces Dr
San Francisco CA 94132

Introduction

By David Thompson

You get the source of the CP/M BIOS (basic input/output system) with your Big Board. The BIOS is the part of CP/M that gets changed when you add a printer port, for instance.

If you have created your own custom BIOS (usually called a CBIOS) but don't know how to incorporate it back into CP/M, then read on. The example Jim uses is specific to the Big Board but it can be generalized to most CP/M systems with a little thought.

In the following you'll note that there are two 60K CP/Ms. One is the standard CP/M that you would create by combining your own copy of CP/M with the Big Board CBIOS you got from DRC of Texas.

If, on the other hand, you got a completely configured CP/M from DRC your CP/M is different. The configured version has 200 hex reserved space in high memory for disk deblocking (though I don't believe any of the double density packages use that space—it isn't large enough to hold 1024-byte sectors). Anyway, the MOVCPM routine has been modified to automatically offset everything down by 200 hex and thus the space for your transient programs is 200 hex (512 bytes) smaller. This is why many people refer to the configured CP/M available from DRC as 59.5K CP/M (even though the command was still MOVCPM 60 *).

Anyway, back to incorporating your newly modified CBIOS (no matter which version of CP/M you have).

Procedure

By James Simon

The following steps should incorporate your new CBIOS into your CP/M.

1. Once you've made your changes in your CBIOS, assemble it into a HEX file called CBIOS.HEX.
2. Determine the size of your system, e.g. 60K.
3. Type "MOVCPM 60 *"
4. The system will come back with "SAVE 36 CPM60.COM."
5. Type "SAVE 36 CPM60.COM" NOTE: the number (36) is determined by the size of your system.
6. Type "DDT CPM60.COM". This loads a copy of your current CP/M into the TPA. The jump table for the BIOS should be at 1F80. You can check this by typing "L1F80". You should see a C3 (jump) every third byte. If you get this then proceed.
7. Now, before the next steps, you're going to calculate a bias and an offset.
8. Take the memory size you put in MOVCPM (60K), subtract 20K from it, and turn it into a hex number. So, 60K—20K = 40K. 40K = 40*1024 = 40,960 = A000 hex. If you created your own 60K CP/M you will use A000H as your bias in the following calculation. If you have a DRC configured CP/M then you will use 9E00H because your bias is 200H smaller (remember the -200H in the bias calculation in the source of your BIOS?).
9. Take this bias (9E00 for example) and type "HD580,9E00". DDT will respond with "7380 3780". The first number is the sum of the two, the second is the difference. We will use the difference as an offset in the following calculation. (Look up page 7 of your CP/M alteration guide to see where the D580 came from.)
10. Type "ICBIOS.HEX"
11. Type "R3780" (or whatever your difference turned out to be) to read in the file with an offset.
12. Type control-C (we are done changing CP/M so get out of DDT.)
13. Type "SYSGEN"
14. Type "carriage return" (you will use what's in memory)
15. Type "A" if you want to put the new system on the A disk.

You are done so type another "carriage return," hit the reset button, and then try a boot. (Good luck!)

■ ■ ■

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The Big Board II

By David Thompson

It's here, I have a Big Board II of my very own. Now, let's see, an 18 M/byte hard disk is $1200, and the Xebec controller is $295. That's less than $100 per M/byte (which is equivalent to $60 for a double density 801).

The Final Push

It's been interesting watching Jim Ferguson, Russell Smith, and Bill Siegmund go through all the gyrations required to get the Big Board II to market quickly. The gestation period on the Big Board I was much longer, probably because they were waiting for low power Schottky parts to come down in price. But this time the primary thing determining the schedule appears to be the number of hours in a day. (There aren't enough, believe me.)

I know what happened at Tektronix as we tried to hurry things to market and I've seen schedules slide so often and so far, that it often appears that companies generate project completion times with random number generators (and then forget to multiply by two). But the BB-II is here, looks great (Bill did a beautiful job building it), and as soon as I get this issue to bed (to the printer) I'll finish the system.

Compatibility

One thing that's neat is that CP/M configured for the BB I will run on the II (only single density of course). That's most encouraging because it means that monitor addresses are the same and that much of the monitor specific software should run with little or no change (I'll let you know for sure when I get my system put together).

Graphics

I have been bugging Jim Ferguson to write an article on how to generate graphics software for the BB II. So far, though, he has been busy finishing up the theory of operation section of the manual so I guess the article will have to wait until he gets that finished.

However, I can tell you this just from looking over the CRT schematic. The new video section has 4K of static RAM (two 6116s). 2K are used to store the displayed characters while the other 2K contain the seven attribute bits corresponding to each character.

The 6845 chip controls the operation while the 8002A contains the alphanumeric and graphic characters. Plus, the 8002 creates the various attributes.

Attributes include: underlining, reverse video, blinking, and graphics; each controlled by one bit from the attribute RAM so you can select any combination of attributes such as blinking reverse video graphics. The graphics is not the dot variety but rather a set of shapes (probably not unlike the TRS 80) with which to build screen characters.

18,600 Hz

There are two versions of the 8002, the A and the B. The 8002A generates 7X9 dot matrix characters (with descenders), the 8002B generates 5X7 characters (without descenders). Because of the additional horizontal traces required to display 24 lines of 7X9 characters the horizontal on your monitor must be able to run at 18,600 Hz which is quite a bit faster than the standard 15,750 Hz (for the 5X7 display).

We're not talking about 15 Mhz or 18 Mhz bandwidth, which is a measure of the monitor's ability to reproduce the characters crisply. This is the horizontal frequency rate.

Some monitors designed for the standard 15,750 will run quite happily at 18,600. The horizontal hold control simply adjusts the frequency of the horizontal by moving a slug into or out of the oscillator coil. By cranking the slug most of the way out of the coil you can sometimes get synchronization at the 18,600 Hz rate. I don't have brand names at this point but those of you who have the BB II, and have off-the-shelf monitors displaying the 7X9 characters, should drop me a note so I can pass the information along.

I've heard that someone is working on a color graphics board for the STD bus but don't call me about it; this is all I know. Hopefully that someone will contact me when he gets done.

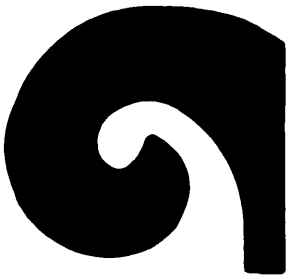
Documentation

The BB II is presently being shipped with a short manual on monitor commands, an assembly manual, and schematics. These are all marked "preliminary" but they are quite readable with just an occasional hand-added correction.

More information coming

We'll have more information on the BB II as it becomes available. Stay tuned, we're just getting started.

■ ■ ■



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JRT Pascal Review

By James Simon 8 Garces Dr.
San Francisco, CA 94132

The first thing I asked myself when I saw the price of JRT Pascal was, "How good could it be for 29.95?" The second thing I asked myself was, "What is wrong with it?" Well after reading the user guide, which is at no risk since you can return the package within 30 days and get a refund as long as the disk envelope is unopened, I decided to check it out. I discovered that JRT Pascal is very good and there is very little wrong with it.

What It Can Do

JRT Pascal is a standard Pascal with a few extensions. It compiles to an INT file which is then executed with their run-time system. The run-time system and compiler can handle external procedures and functions. As space is needed the external procedures and functions are swapped out to disk. This happens dynamically and is transparent to the user! Externals can be on any disk. So in effect you can write programs that fill more than one disk.

The extensions to Pascal include dynamic strings, and two types of random access files. The size of dynamic strings can be from 1 to 64K bytes and of course since they are dynamic the actual space they take up depends on what they hold. Five built in procedures and functions are available for string processing. They are:

CONCAT concatenates n strings
COPY extract portion of a string
DELETE delete portion of a string
INSERT insert one string into another
LENGTH return current string size
POS search string for a pattern

The type of file processing available includes sequential, and random access via relative record number and relative byte address.

JRT systems also provides an 8080 assembler which generates code that you can use as an external procedure. They provide three sample assembly procedures, setbit, resetbit, and testbit. In addition to this simple assembler JRT provides a utility program that converts

(continued next column)

(Pascal Review continued)

RMAC or MACRO 80 REL files into INT format files so that they can be called as external procedures which is a real time-saving addition.

They provide simple trace and activity analysis for debugging and program speedup. The activity analyzer creates a histogram showing the amount of time spent executing each portion of the program.

Things I Dislike

When the compiler finds an error in a line it reports the error next to the line but it doesn't point to the actual. Also, JRT Pascal only lets you pass values from one subrange integer variable to a function variable of the same type and subrange. (i.e. variable type-checking is more rigid than most, which is not necessarily bad.)

However, all in all I would say that JRT systems Pascal is very well worth the 31.75 I spent. It provides me with all the features of Pascal and then some. Plus it has some debugging capability and can call external procedures and assembly language programs. I like it!

■ ■ ■

Curing The Housing Problem

By Bob Barber 7 Jonson Place
Ardsley, NY 10502

Once I got my Big Board up and running, I figured it would be nice if it were in an enclosure instead of being strung all over the place. So I picked up a Hazeltine 1000 terminal.

The Hazeltine cost me $150 at Selectronics, 1207-25 South Napa St., Philadelphia, PA, 19146. This terminal provided not only a home for the system, but also a power supply, CRT display, and a very versatile keyboard.

The power supply provided everything the Big Board needed with power to spare but I had to do some circuit tracing to determine the following pinouts:

Supply/Pins
Ground 3,4,9,13,14,19
+5V 10,15,18,20
−5V 17
+12V 7
−12V 16
+15V 16

I then traced out the video circuit and tested my findings by hooking it up to another computer. The display worked fine. Video pinout:

Signal Pins
Ground 1,5,10
+15V 7 (from power supply)
Video 8
Horizontal 6
Vertical 9

The keyboard was very complete, providing upper and lower case characters, shiftlock with indicator, TTY/typewriter switch, and more.

The keyboard originally supplied inverted data so I removed the 7403s in IC-7 and IC-11 and replaced them with 7408s. Pin 1 of IC-7 was originally pulled high to generate an inverted keyboard pulse signal. I tied one of the three rocker switches to the eighth bit so I could set the bit low at powerup and then high for special functions.

Keyboard pinout:

Signal Pin
Ground 15,16,31,32
+5V 13,29
-12V 30
Bit 0 3
Bit 1 1
Bit 2 19
Bit 3 2
Bit 4 6
Bit 5 17
Bit 6 4
Pulse 18

So after a little patient tracing I had my Big Board in a neat package complete with keyboard, video, and power supply. All together, it gives the system a very professional look.

■ ■ ■

REMINDER

We've cured our housing problem too. Catch us at our new address after October 31st.

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On Your Own

By David Thompson

Hopefully when you're on your own you'll be better organized than I am. I wrote a whole series on working for yourself in one evening (8 hours) and now I can't find it. It was one of those sessions where I sit down and words start flowing from my finger tips.

Sometimes that kind of material doesn't look so great when I go back and look at it later (that's the real test for anything I write). But it had been one of those terribly rare evenings where the ideas come in finished form.

Anyway, this issue's subject was going to be "Making sure you get paid." So, I'll discuss that.

However, I'm really interested in how you should treat mail order customers. I've been getting quite a bit of mail about dealers who are doing pretty well and dealers who are not doing so well with their customer relations. I'll take one shot at the mail order problem before getting on with this issue's topic.

If you get into the mail order business you should plan on giving your customers MORE than they EXPECT (both product and service). If you can't do that then you are giving at least some of your customers LESS than they EXPECT. It's going to cost you real time and money to give people more. In fact, you're going to lose real out-of-pocket dollars on some transactions. However, in the long run it's very important. You need to maintain a "person to person" relationship rather than becoming "dealer/customer."

Getting Paid

Last time we discussed how much you should charge. Once you've set the fee and your client has agreed, you're not necessarily home free.

Be verrry careful of new startups. As a beginning consultant you are most likely to wind up with the shaky little outfit that "will have money as soon as . . ."

When I went out on my own the first time (about 12 years ago) I was so strapped for cash and anxious for business that I didn't look carefully at the outfits I was working for (or wonder why I was getting all those interesting jobs). I didn't get paid for a lot of them and Sandy and I didn't eat very well for a while.

(continued next column)

(On Your Own continued)

I have since watched a number of very exciting looking new software and hardware businesses start up—complete with substantial (thick) business plans and attorneys on their boards. They were offering me and others substantial participation for getting in on the ground floor.

Despite all the best plans and all the super talent that they collected, none of these startups made it.

The dreams were glorious but in the end a lot of people who put in a lot of hours were left with nothing but a lot of memories and a lot of debts.

I'm a good one to talk of course. There are just over 1000 of you and a dozen advertisers (bless your hearts) keeping Micro C afloat. A lot of the big dreamers and big publishers have told me that Micro C would never be more than a hobby because the audience is too small.

On the other hand, we've made it through the first year doing what we want to and eating at the same time. A lot of those big dreamers have packed their dreams and moved on.

In fact the first year is really a significant milepost for a new business. If it's really solvent (not just waiting for that next shot of capital) and growing after the first year, then chances are very good that it will be around quite a while longer.

However, if you're stuck with a startup:

1. Definitely plan to charge enough up front to cover your living expenses until the first milepost.
2. Set definite mileposts, time wise and project wise, that call for additional payments.
3. Stop working if you don't get a payment. I realize that this is something you need to look at on a case-by-case basis but don't count on all those investors who are "lined up to finance the company." They aren't investors until they've signed the check and I've witnessed a lot of non-signings.
4. On the other hand, don't let this stop you from jumping into your own enterprise with both feet. (Better you should go broke on your own ideas right?)

Plan to pay for the best marketing, legal, and business advice you can get and then follow it. I've watched a lot of really good designers learn an awful lot about running a business in a very short time (but not short enough). If you need capital to get started then either get twice as much as you will possibly need (before starting) or do something smaller that you can pay for as you go (that's how we started Micro C).

But whatever you do, enjoy!

■ ■ ■

Just Beep, Beep, Beepin' Along

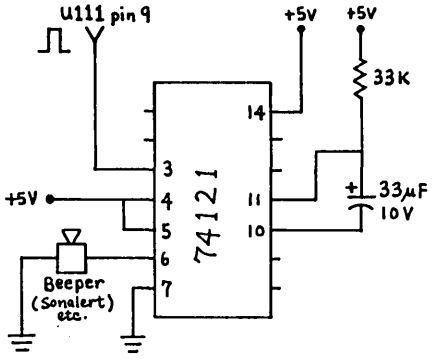
By J.B. Korrubel

"ORYX"
Welbeloond Rd
Constantia 7800 South Africa

My son and daughter insisted that I install a bell on the Big Board so their Basic programs can sound off (they are absolutely enthralled with Tiny Basic in ROM and are programming every minute they get).

This bell circuit is a simple 74121 pulse stretcher. I installed it in my keyboard by running a wire from U111 pin 9 to pin 18 on the keyboard connector J2 and then picking the signal up again at the keyboard end of the cable.

The combination of 33K and 33ufd gives a time constant of about 1 sec. Cutting the capacitance in half cuts the time in half. Total parts cost including the Sonalert tone generator is only about $3.50.



Editor's note: If your Big Board has been kind of quiet lately this is the way to give it voice. Now to speak its language all you have to do is learn to say "BEEEEP!" ■ ■ ■

Especially For The Big Board

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

USER'S DISK #2
Especially for folks with single-drive systems and those who want to try their hand at extending an assembler. Also a new CBIOS with parallel printer interface. Returns to default drive on reboot, stifles head banging, supports CP/M 2.2 and 1.4. Step by step instructions for the simple incorporation into your CP/M.
Including:
1-Two single-disk copy programs, both with source.
2-The source of the Crowe Assembler.
3-New Crowe.com file with larger symbol table.
4-New CBIOS for CP/M 1.4 and 2.2 (& boot).
5-Disk mapper with source.

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

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

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

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

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

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

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

MORE ROMS
Fast monitor ROMs for speed freaks and our famous 'better than Texas' character ROM (V2.3) for screen freaks.

Fast Monitor ROM	$25.00	$30.00
Version 2.3 Char ROM	$25.00	$30.00

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

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

From Micro Cornucopia

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

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

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

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

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

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

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

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

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

BACK ISSUES

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

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ISSUE #6 (6/82)
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Customize Your Chars
Double Density update
Terminal in FORTH

ISSUE #7 (8/82)
6 Reviews of C
Adding 6 K of RAM
Viewing 50 Hz
Technical Tips

ISSUE #8 (10/82)
Drive Maintenance
Flippy Floppies
Interfacing Drives
Installing a New BIOS

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USER'S SOFTWARE

20% - 40% off retail. CP/M software for BIG BOARD USERS

	list	users
Ashton Tate dBase II	700.00	517.00
Condor I (entry level data base sys.)	295.00	218.00
Condor II (relational dbase sys.)	595.00	440.00
Condor III (relational, w/ report writer)	995.00	735.00
Digital Research		
MAC (macro assembler)	90.00	78.00
ZSID (symbolic debugger for Z80)	100.00	86.00
PL/1-80	500.00	431.00
CBASIC 2	150.00	105.00
CB 80 (true compiler for CBASIC 2)	500.00	431.00
PASCAL MT+ VERSION 5.5	475.00	409.00
Ecosoft Microstat (advanced statistics) +	295.00	255.00
Supervyz (simplifies CP/M)	95.00	62.00
Faircom Micro B+ (keyed file accessing) +	260.00	208.00
Quickscreen (screen builder) +	149.00	128.00
Graham Dorian (requires CBASIC 2)		
per module	600.00	443.00
interactive-per module	1000.00	738.00
I.S.A. Spellguard (spelling checker)	295.00	218.00
Ithaca Intersystems Pascal Z	395.00	340.00
Key Bits Wordsearch (spelling checker)	195.00	169.00
Lexisoft Spellbinder (word processor)	495.00	277.00
Microtax Level I (fed./individual)	250.00	154.00
Level II " "	1000.00	615.00
Level III (fed./partnership)	750.00	462.00
Micro Pro		
WORDSTAR (most popular word processor)	495.00	304.00
MAILMERGE	150.00	93.00
WORDSTAR/MAILMERGE	645.00	396.00
DATA STAR (data entry, ret. & update)	350.00	216.00
WORDMASTER (text editor)	150.00	93.00
SUPERSORT I (sort/merge)	250.00	154.00
SPELLSTAR (spell check/dict.)	250.00	154.00
CALCSTAR (electronic spread sheet)	295.00	185.00

	list	users
Microsoft		
Basic 80	350.00	259.00
Basic Compiler	395.00	292.00
Fortran 80	500.00	369.00
Cobol 80	750.00	554.00
Macro 80	200.00	160.00
M-Sort	195.00	155.00
Northwest Analytical Statpak	495.00	366.00
Oasis "The Word" (spell check & dict.)	75.00	56.00
"The Word Plus"	150.00	111.00
Sorcim Pascal/M	395.00	292.00
Supercalc	295.00	218.00
Supersoft		
Diagnostic II (hardware checker)	100.00	80.00
Forth (specify Z80 or 8080)	200.00	160.00
SSS Fortran	250.00	200.00
Ratfor (Fortran Language Enhancer)	100.00	80.00
Tiny Pascal	85.00	68.00
Nemesis	40.00	32.00
Dungeon Master	35.00	27.00
Nexus Zip (screen & print formwriter)	160.00	105.00
Lynx (linker)	250.00	185.00
Select w/ Superspell	595.00	366.00
Crosstalk (Modem to CP/M file)	150.00	111.00
Move It (micro to micro comm)	99.95	68.00
Quickscreen (screen builder)	149.00	128.00
The Protector (encode/decode encryption)	149.00	137.00
Adventure International #1-12	129.00	96.00
Datasoft My Chess (chess game)	49.95	37.00
Infocom Deadline	59.95	45.00
Zork I	49.95	37.00
Zork II	49.95	37.00
ISM Mathemagic	99.95	74.00

+ specify language

Please specify computer and disk format. Enclose $3 for shipping and handling, $4 for air ship. For 24 hr. service send cashiers check or money order. Personal checks take 2 weeks. Send for free catalog, included with each order. Ca. residents include 6.5% sales tax. COD ok, call 213-708-8537. If you don't see it--CALL we probably have it, at the same low prices. THANKS! to everybody who has ordered from us.

USER'S SOFTWARE 7812 White Oak Ave., Northridge, Ca. 91325

(Editorial continued)

Wanted: Heavyweight Software

Do you have the urge to write a compiler, interpreter, data base manager, screen editor, etc. because no one else has really done it right? (Or even just because?) If so, you should take a couple of tranquilizers and go to bed until the urge wears off.

However, if you've already started such a project or don't need the sleep, call or write immediately. I've been working on some very exciting software marketing ideas and they are working astonishingly well (for other folks). These are BIG ideas, ideas that may well dwarf many of today's major software houses or at least put a bunch of us on the map.

The Micro C Index

A number of you have suggested that we do an index of the first year's issues. Well, David Mitchell showed up at the get together with an index of our first year (issues #1—#6). I was really surprised that we had covered so many different things in 6 small issues. (Kinda makes me tired just looking at it.) See his want ad in this issue for information on how to get the index.

Information Wanted

If you have been using a data base package like dBASE II or a standard accounting/data filing type package, please put your experiences down on paper or disk and send them in.

User Disks

I've spent a couple of very interesting weeks putting together all the software that evoked a "WOW" or "GOLLY GEE WHIZ THAT'S NEAT" when it arrived. As a result we now have user disks 4—8, that's right, 5 new disks chock-full of all the mouth-watering goodies that you didn't know you needed until now. All are configured for the Big Board and all were contributed by folks like yourself who said "WOW!"

I'm sure that disk #5 (Pacman) will be very popular (it's really a challenge and it really plays remarkably like the commercial game).

A particularly impressive submission for assembly language programmers is RUNPAC (runtime package) by Dennis Baker. It is an assembly language runtime environment that is so powerful that it's almost like working in a high level language. But the object code overhead is only 2K. Dennis uses this environment when writing software for commercial clients so it is thoroughly debugged.

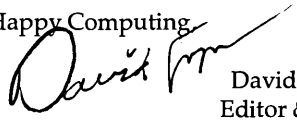
Then there is the new CCP called ZCPR (disk #4). Everyone who has watched it run on my system has refused to leave without a copy (except the guy who fixes my VW but he doesn't even own a computer). Mark Despain mentioned that I was going to have trouble explaining to folks just how impressive ZCPR is. He's probably right.

See the Micro C ad for more information.

Repeating a Winner

The folks at Aztec C called to say they were astounded with the response to their $50 discount in Micro C. So they are continuing the special $149 price for our readers. All the feedback I've gotten from users so far indicates that Aztec C beats Whitesmith's hands down on the BB. See their ad on the back cover.

Happy Computing,



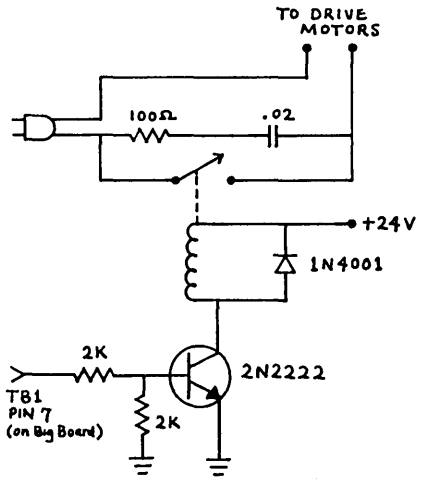
David Thompson
Editor & Publisher

TECHNICAL TIPS

Spiffying up the AC motor control

I want to suggest adding two components to Jim Showker's relay circuit. Add 50 to 100 ohms in series with the .22ufd capacitor to limit the discharge current (so you don't weld the contacts together). Also add a diode (1N4001 or similar) in parallel with the relay coil to discharge the voltage generated as the coil's field collapses.

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



AC Motor Control Circuit

Setting your your own step rate.

The PFM monitor sets up the 1771 disk controller for a 6ms. track to track stepping rate. A simple patch prior to booting CP/M can change this. The rate may need to be slowed down for drives other than Shugart 801's or for tracking down drive problems. Change location FF6A from 00 to 02 for a 10 ms. rate or to 03 for a 20 ms. rate. For example, while in PFM:

*MFF6A (select address FF6A)
FF6A 00 02 (change 00 to 02)
FF6B 00 Q (get out)
*B (now boot CP/M)

Frank Gentges
9251 Wood Glade DR
Great Falls VA 22066
(703)759-2218

Triac AC Control

Two AC motor control circuits have appeared in Micro C (issues #2 and #6) but the solid state relay was hard to locate and I don't like the mechanical variety.

The following circuit is solid state and uses readily available, inexpensive components. It is not critical and may be laid out any way you please, just be careful to not leave 110VAC exposed.

Although all the parts may be bought from the local Radio shack (RS part numbers listed), they are also readily available elsewhere.

Basically the circuit is a triac switch driven by an optocoupler which provides isolation between the logic and AC portions of the circuit. None of the resistors are critical and the value of R1 may be lowered slightly if the switch doesn't output full line voltage. When connected as shown, the AC will be on when the input is high. If you connect R1 to +5V and the logic input to U2 pin 2, the AC will be on when the input goes low.

When using this with the Big Board, connect U2 pin 2 to TB1 pin 2 (ground) and connect the HI input (R1) to TB1 pin 7. This switch has worked silently and reliably and has never glitched the system.

Parts list

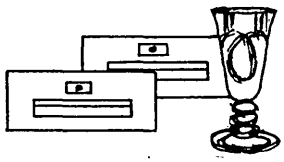
U1	6A, 200V triac		
	RS	276-1001	$0.99
U2	MOC3010 optocoupler		
	RS	276-134	$2.19
C1, C2	0.1mfd, 200V non-polarized		
	RS	272-1053	$0.59
R1-4	1/4 watt OK		not critical

Mark L. Hopkins
1035 Franklin Road, Apt O-5
Marietta, GA 30067

Driving stubborn drives

The 7406 drivers between the 1771 and the floppies do not provide enough drive in some situations. Replacing the 7406 (open collector) with a 7416 (high voltage) will usually cure the problem. The 7416 is pin-for-pin compatible.

Hampton Miller
(Of FORTH fame)



Additional food for thought

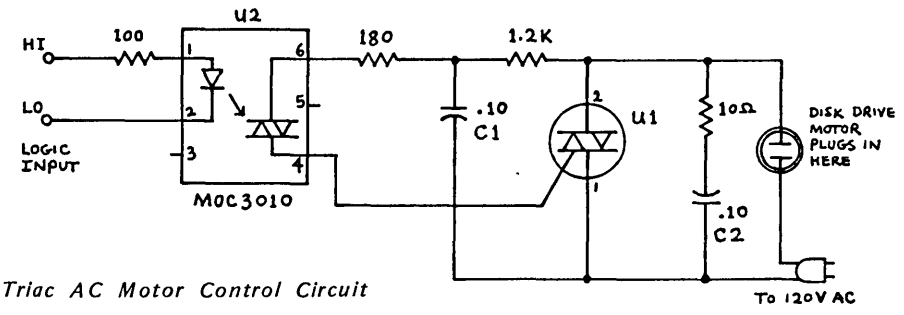
Editor's note: The following is probably more technical than most of you can swallow. However, if you would like to experience the some of the flavor of the get together you might pass the following along to the resident culinary guru. It's really great!

Micro C Get Together Zucchini Bread
(Makes two minidrive-size loaves)

3 eggs
1 cup veg. oil
2 cups grated zucchini
2 cups brown sugar
3 tsp. vanilla
3 cups whole wheat flour
1 tsp. salt
1/4 tsp. baking powder
1 tsp. baking soda
3/4 tsp. nutmeg
3 tsp. cinnamon
1 cup chopped nuts

Mix the dry ingredients, then add the rest. Add zucchini last. Bake at 350 degrees for 1 hour. For glass pans, set oven at 325.

David Mitchell
1161 Grow Ave NW
Winslow WA 98110



Triac AC Motor Control Circuit

BIGBOARD DUAL DENSITY

- A daughter board that plugs into the 1771 socket. With this board the system employs automatic density select.
- Software Publishers' Dual Density gives you several choices:
  - —You can have either 2.5Mhz or 4Mhz Dual Density.
  - —You can run single or double-sided drives.
  - —You can run 5¼" drives on the Bigboard by following a few simple steps outlined in the SWP manual. A 50-34 pin disk drive adapter board comes free with 5¼" Dual Density.
- 8" Dual Density users have up to 674k bytes of user storage per disk. 5¼" users have up to 185k bytes per disk.
- Dual Density software includes:
  - —DDINIT: a double density initialization and verification program. DDINIT options:
    - —8 formats.
    - —Format an entire disk or just system tracks.
    - —Selection of sector skew.
    - —Choice of whether or not to verify formatting.
    - —Choice of which drive to be used.
    - —Has a default which will choose the largest format (9 by 1024 for 8"; 5 by 1024 for 5¼").
  - —DDSYSGEN: a double density sysgen program with three options:
    1) Reads double density system tracks into memory.
    2) Writes double density system tracks from memory onto a double density disk.
    3) Generates a double density system disk complete with a printer driver using your single density CP/M, our distribution disk and a blank disk. Five serial drivers and a parallel driver are included, or there is a user-written driver option. Drivers can be modified.
  - —DDCOPY: a double density copy program. Copies all files from a source disk to a destination disk. Both disks (and the disk DDCOPY is run from) must be the same density and the same format.
- Software Publishers Dual Density comes with a thorough instruction manual.

$199.95

SOFTWARE PUBLISHERS, INC.

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

SUBSCRIPTION FORM

(It's OK to brag!)

☐ I own a _____ computer.

	EXPERTISE Guru=5 Novice=0	INTEREST Fanatic=5 None=0
Software Systems	☐	☐
Software Applications	☐	☐
Languages 1. _____	☐	☐
2. _____	☐	☐
3. _____	☐	☐
Hardware	☐	☐

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

love to ☐
probably ☐
maybe ☐
no ☐

How are you using the Big Board?

Home System ☐
Business System ☐
Software Development ☐
OEM ☐
Education ☐
Other _____ ☐

What kinds of information do you need right now?

_____
_____
_____
_____
_____
_____

What are your hardware/software needs now?

_____
_____

In the near future? _____
_____
_____

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

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

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

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

All The Users Disks Contain Documentation On Disk In .DOC Files.

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

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

USER'S DISK #3
1-ROM programmer software.
2-Disk file CRC checker.
3-Source of new fast copy.
4-Utility isolates bad disk sectors.

5-Reset bit 7 (unWordstar a file).
6-Print fancy page headings.

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

	(US,Can, Mex)	(Other Foreign)
FORTH IN ROM	$65.00	$70.00
in fast ROM	$80.00	$85.00

This is standard FIG FORTH in three 2716's. A simple FORTH line editor and a decompiler are also available on disk.

FORTH ed. & decompiler disk	$15.00	$20.00

TINY BASIC IN ROM	$35.00	$40.00
in fast ROM	$45.00	$50.00

This two-ROM set takes control of the system just like FORTH does, handling its own I/O, loading Basic programs and object code routines on and off the disk (without CP/M) or out of the third ROM. This little Basic is great for controller or utility applications.

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

USERS DISK #6
1-RUNPAC, source and hex for 8080 runtime.
2-PRINTPRN, routine to print Crowe listings.
3-REZ, 8080/Z80 disassembler

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

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

	(US,Can, Mex)	(Other Foreign)
MORE ROMS		

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Version 2.3 Char ROM	$25.00	$30.00

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

BACK ISSUES

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

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

ISSUE #1 (8/81)
Power Supply
RAM Protection
Video Wiggle
1/2 PFM.PRN

ISSUE #2 (10/81)
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Drive Motor Cont.
Shugart Jumpers
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Adding 6 K of RAM
Viewing 50 Hz
Technical Tips

ISSUE #8 (10/82)
Drive Maintenance
Flippy Floppies
Interfacing Drives
Installing a New BIOS

FREE

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

	(US,Can, Mex)	(Other Foreign)
Screen Editor in Small C	$39.00	$44.00

A full-function screen editor plus formatter written in Small C and setup for the BB. Over 400K on disk including source, documentation, and the Small C compiler.

Small C+	$24.00	$29.00

This is a simple extension of Small C (see pg 6 of issue #7). The source and documentation are on the disk.

Your Fortune in the Microcomputer Business	$26.45	$36.45

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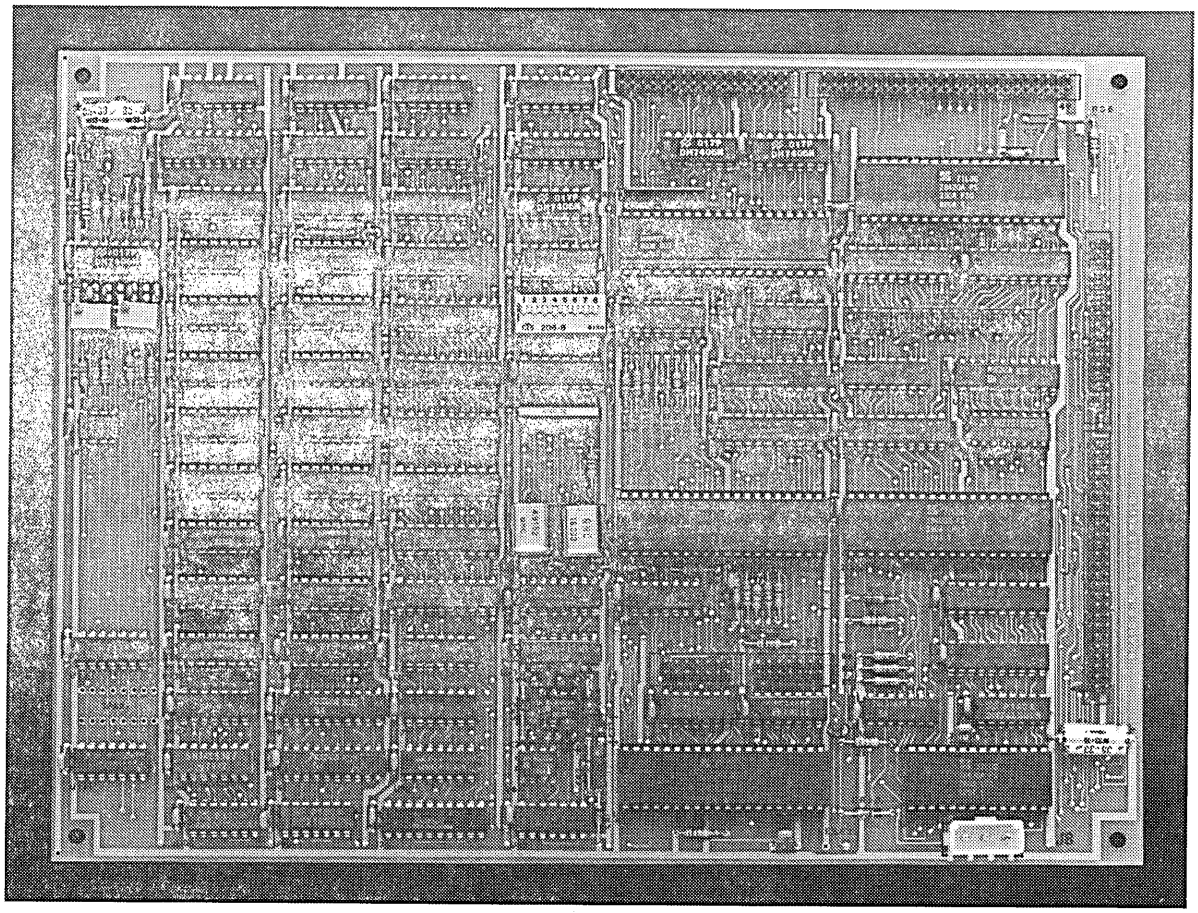

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