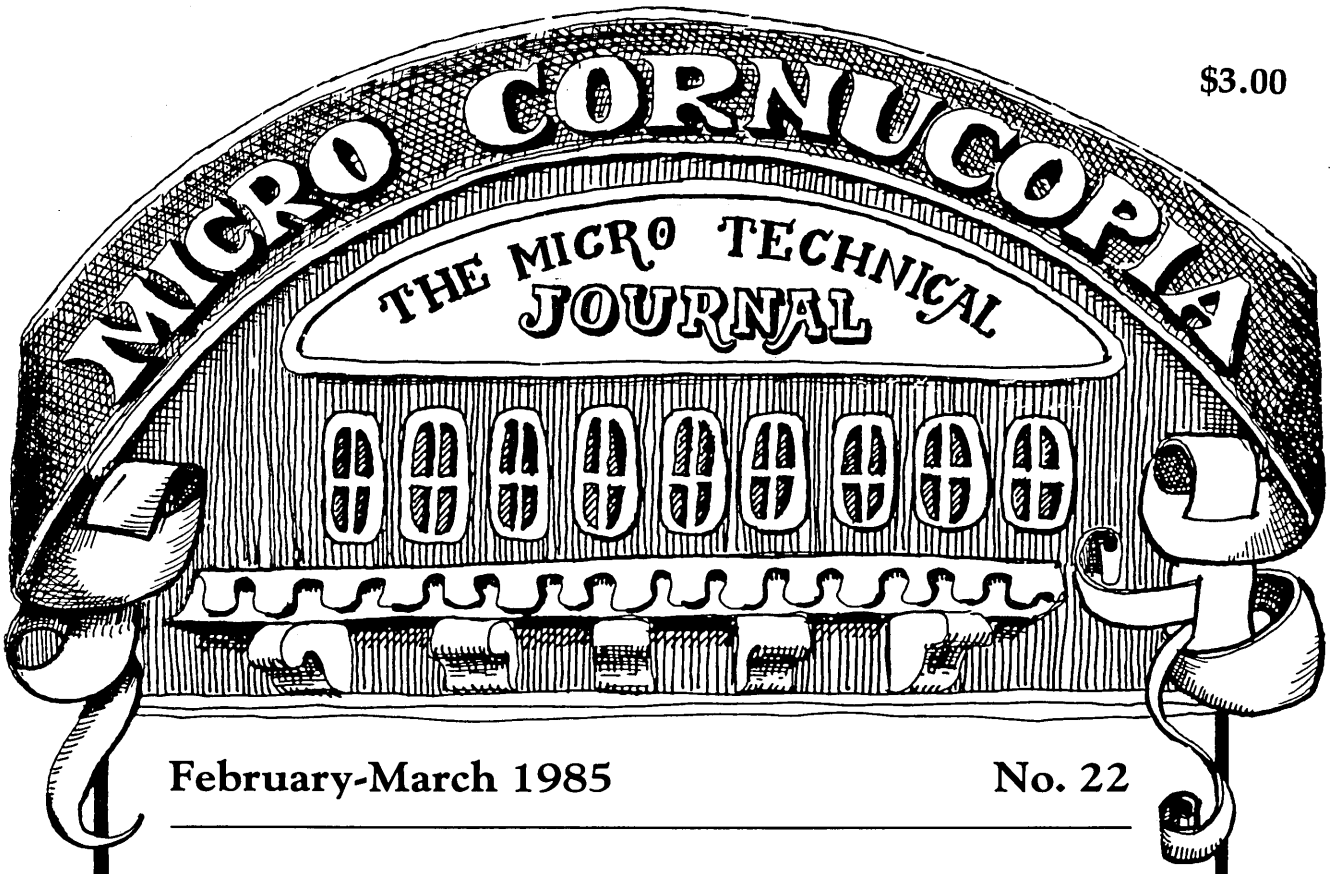

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February-March 1985 No. 22

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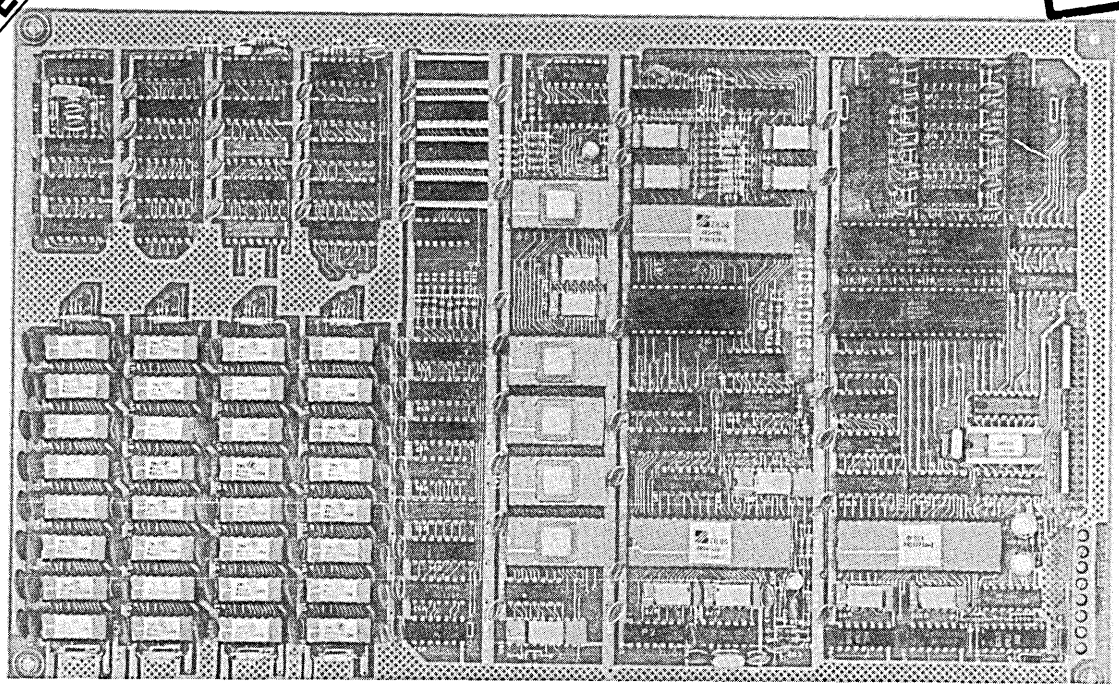

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MICRO CORNUCOPIA

February-March 1985 **No. 22**

July's Coming! July's Coming!

SOG IV

Already, SOG IV is looking bigger and better. If past years are any indication, over 500 frenzied, foaming, fanatical freaks should show up in Bend for the Thursday through Sunday (July 25–28) event.

This year it will be at Central Oregon Community College and the school will be going all out to put us up. They are co-hosting the event so we'll have all the meeting and classroom space we need.

COCC is certainly the most beautiful campus in the Northwest. Many of the rooms have unobstructed views of a whole line of snow covered Cascade Mountains and the buildings are nestled into the tall pines and fragrant junipers that abound in this area.

It looks like you'll be able to camp on the soccer field and use the showers and rest rooms in the adjoining gymnasium. The gym will also be open for a game or two of basketball (or racketball in the enclosed courts). There will also be room for at least 30 of you in the dorms.

We will have classrooms and other meeting facilities within a couple hundred yards of the dorms and camping area. What a deal. There will be free table space for anyone who wants to display new products or swap stuff. Last year's swap and demonstration area was so popular that the tables were swarming the entire time. The college is even providing the tables.

Of course, the SOG is still free. The only thing you'll have pay for is transportation, meals, white water rafting, and lodging. Local restaurants have great food and are reasonably priced, or you may opt to purchase all-you-can-eat buffet meals at the college cafeteria for about $12 per day (and the food is uncharacteristically excellent).

On The Technical Side

If you want to hear some really top-notch technical discussions and then have a chance to follow up with one-on-one exchanges with kindred souls, this is your spot.

Philippe Kahn mentioned that he refuses to attend user group meetings because so few people were interested in the technical aspects of compiler design (and not many more care about starting a software company). He had a great time at SOG III.

So, if you are looking for an informal gathering of doers, don't miss SOG IV. Bring the whole family. Wives and kids had a good time last year, and this year we're planning special trips and activities for the non-computer set.

Put us down on your vacation calendar. Then watch for more information and the RSVP form in the April issue. We'll have all the details for you then.

Modula II For CP/M 80

I had a chance to catch up on the latest in Borland's plans at Comdex. Philippe really made my trip worthwhile when he told me that Turbo Modula II would be available this February, and the FIRST release would be for CP/M 80 systems! What a coup!

The price will be under $100 and the package will include an editor. Beat that!

Borland is also releasing a Pascal tutorial (I haven't seen it yet) which will include examples on disk and on paper. I understand that the package will retail for $37.50.

Programming In A Thunderstorm

I have a confession to make. I no longer write or program in complete silence. You see, by about midnight, I get so wired just sitting at the keyboard concentrating on debugging a sticky piece of code or rewriting an unresponsive spot

(continued on page 76)

LETTERS

Dear Editor,

Thank you for trying to fill the void left by Microsystems. Your choice of new columnists is excellent. I have put a notice on my RCP/M letting my callers know about Micro Cornucopia.

The other important feature of Microsystems that I hope you continue was the annual S-100 product survey. It was worth the subscription price all by itself.

While I have your ear, can you verify that Ziff-Davis offered no refunds for unexpired subscriptions? Do magazines that fold ever offer refunds? I didn't get one, and my label says I have a year to go. Seems to me they could have given their mailing list and part of the unused subscription money to some other magazine (like Micro C) for picking up the slack. At least that would have given us Microsystems readers our money's worth.

I've considered asking the postal service and 50 attorneys general to file fraud charges.

Dave Crane
5314 Harbor Town Drive
Dallas TX 75252

Editor's note:

Thanks for the plug, Dave. Sol and I have discussed the S-100 product survey and I think it makes sense—we might also do a survey of Z80 single board systems. (Anyone have any thoughts about on this?) It is not unusual for magazines to just disappear these days without so much as a fare-thee-well, but you should have received a notice offering you the option of a refund or an equivalent number of PC Tech Journals. All of us would prefer to see Microsystems continue but Ziff-Davis has not been ripping folks.

Dear Editor,

Thank you for the sample issue of your magazine.

My company subscribed to Microsystems until Ziff-Davis decided to complete our subscription with an "IBM magazine." This is fine, and we may purchase some ATs if IBM ever gets them right, but right now we have an IMS 8000, a leased Kaypro 10, and a Kaypro II. All are single-user.

We are planning on going multi-user, multi-tasking, and after evaluating minis vrs micros, we decided on micros because they can run both CP/M and MS-DOS. The programs are more widely available and less expensive than those made for minis. (A word processor for a mini costs more than our Kaypro, and Kaypro threw in WordStar.)

Although we had seen your ads in Profiles, we did not realize until now what goodies your magazine contains.

John W. Meacham
5032 Alhambra Ave.
Los Angeles CA 90032-3490

Dear Editor,

It was a pleasant surprise to receive a copy of your magazine in the mail. I have been looking for a replacement for Microsystems ever since it was torpedoed by Ziff-Davis. Subscribers to Microsystems were offered a subscription to PC Tech Journal as a substitute, but the last thing I want is another IBM PC/MS-DOS rag.

I have been subscribing to several magazines, some since 1977, and very few seem to be able to resist turning into a product review or business person's type of magazine. If you look at the early issues (1977-1979) of Kilobaud, Interface Age, and Creative Computing, you'll see that they're similar in content to Micro Cornucopia, which is why I'm saving them, and subscribing to Micro C.

I imagine most of your readers have a collection of microcomputers. My main system is a Lomas Data T186, CCP/M-86, and Digital Research C. The Lomas board is housed in an old NorthStar box I bought and put together in 1978. I still have the guts and software for the Star—I just need a home for it.

At work, I have to use MS-DOS 2.11 and Lattice C on a PC type system. The two (MS-DOS and Lattice) are so flaky compared to DR's stuff, I can only conclude that the people reviewing these products never write anything but sieve benchmarks and programs that read and write 64K files.

I enjoyed your first issue, and will continue to subscribe until:

1. Ziff-Davis purchases your magazine.
2. Each issue is filled with product reviews (same as being purchased by Ziff-Davis).
3. Jerry Pournelle starts writing a column about his son, Alex, and other really NEAT stuff.
4. Jerry Pournelle writes a column about how busy he is.
5. Allen Miller starts writing a column about Pascal, and tells us in each column the difference between compilers, assemblers, etc..
6. Wayne Green starts writing a column on how everyone can become a millionaire. (Just kidding about Wayne's column—I don't want to get sued.)

Richard Blessing
5068 N Colony
The Colony TX 75056

Dear Editor:

I just received your sample issue of Micro C for Microsystems readers, and was very pleased with the content and format of your magazine. A check for my subscription is enclosed.

As a former Microsystems reader, and S-100 user, I was starting to feel quite abandoned by Microsystems in recent months. In fact, after contemplating editorial comments in their October issue, I wrote a letter to the editor. The day after I mailed my letter I received the final issue of Microsystems and learned of the magazine's demise.

I would like to share with you some of my comments to Mark Rollins, then editor of Microsystems.

"I am interested in most CP/M and MS-DOS based machines. I have limited interest in the IBM PC and absolutely no interest in UNIX or its derivatives. One would have to be very myopic not to recognize the dominant position IBM, and the IBM look-alikes, currently have in the micro marketplace."

"This is not necessarily a good thing for the computer industry, and does not justify the dedication of virtually every computer magazine on the market to the IBM and its clones. PC clones are everywhere, and as incredible as it may seem, even the Microsoft people are busily producing software that will run under PC-DOS but not under their own MS-DOS operating system. Everybody has been trying to jump on the IBM bandwagon, and your magazine (Microsystems) seems to be no exception. I refuse to be driven by the mentality of the herd."

LETTERS

"The rush to embrace IBM may, in fact, do real damage to the booming computer industry in the USA. I believe the move by IBM to implement its own version of UNIX on the new AT model PC is a well planned effort to 'dump' the rest of the computer industry on their collective behinds."

"One must agree that the S-100 bus has difficulty meeting the size requirements of today's desk top computers. However, the S-100 is still a viable standard and is an excellent test bed for system development. Further, the S-100 remains today the most flexible hardware package available for system upgrading. Some of the dual CPU boards and operating system options and enhancements currently being offered for the S-100 are more than a match for any of IBM's."

"Keeping abreast of the current developments for the S-100, and better understanding the capabilities of my own CP/M based system were the primary reasons I subscribed to Microsystems."

Gordon R. Reilly
686 N. Jensen
Port Angeles WA 98362

Editor's note:

Great letter, Gordon. You're not alone in your dislike for IBMish herds. We'll be dealing with PC clones a bit because Kaypro is leaping into the fray (diving into the pit?) but I'm more interested in going beyond the current IBMania.

There are other systems running on Intel's processors (the Slicer, for instance) and there are many others using the 68K, 32032, and Z8000 chips.

At Comdex, I could go from hardware booth to hardware booth asking three questions: Do you have a new system? Is it IBM compatible? How compatible? The answers were "yes," "yes," and "very." How dull! Now you know just about everything I learned about hardware at Comdex.

I could also go from software booth to software booth asking three questions: Do you have new software? Does it require IBM compatibility? How compatible? The answers were "yes," "yes," and "very." How dull! Now you now know just about everything I learned about software at Comdex.

There were a few bus-type systems around, mostly S-100 and VME. They were real screamers compared with the IBMs but they didn't have the 123s or the CAD packages that make clones so useful. They were lucky to run five languages and an accounting package. (I'm being a little harsh, but you get the idea.) Maybe we can decide on a better system standard and then help generate the software that will make it viable. (Obviously not a trivial task.)

Dear Editor:

Last May, after reading advertisements in Micro C, Profiles, and KUG, I ordered a Kaypro II video graphics board and software package from JFN of Los Angeles.

Unfortunately the board didn't work properly. The video display showed four separate 1/4 size screens. The characters on each screen were too small to read.

I called JFN several times and was advised to check the installation. This didn't solve the problem, so I sent the video board back to JFN. They tested and returned it, claiming it met all specifications.

After further discussions, JFN offered to check the system if I would send them their and my Kaypro's motherboard.

I was not able to do this, and then was out of town on business for three months. Now that I'm back home, I'm unable to reach JFN, and have not seen any new advertisements. Are they still in business?

Has anyone else encountered this difficulty, and, if so, how was it solved? Help!!

Colonel John E. Dickson, Jr.
50 Azalea Avenue
Satellite Beach FL 32937

Dear Editor,

I bought a BBI (as a blank board) in June and I have built it as carefully as I could, but now as it is completed it doesn't work. (My skill in electronics is quite limited, though this is not my first project.)

My problem is this—the video works fine but all I get is a screen full of characters, some blinking and some fixed. Sometimes, those characters change without external operation. The reset button doesn't have any effect nor any of the keyboard. I have tried the board without Z80 and the result is exactly the same. I tested the microprocessor and the RAM chips and they both work faultlessly.

Noel Frankinet
140 Av. Des Combattants
1320 Genval Belgium

Editor's note:

When you first power up a BBI, it selects the ROM bank, loads the contents of the PFM monitor ROM into high memory and then starts running the monitor code. One of the first things the monitor code tells the system to do is clear the screen.

Chances are excellent that the processor is simply not getting to the clear-screen routine.

1. Start with the processor, make sure that there is a clock signal on pin 6 (2.5 MHz) and that the M1 line is wiggling.

2. If these are OK, put a scope or logic probe on the monitor ROM's enable pin. The ROM should be enabled, and the ROM should be good. You didn't plug it in backwards just once did you?

3. If the ROM is being enabled and it runs in another system, then chances are the data is not being loaded properly in high RAM. The only RAM that has to work is the group of 8, closest to the edge of the board. The chips themselves might be OK but the sockets or refresh circuitry may be bad. Good luck.

Dear Editor,

The "Cheap and Dirty Talker for your Kaypro" article in the October 1984 issue of Micro C does work, but only on the older model 2 Kaypros. The program will not work on Kaypros delivered in 1984.

Kaypro changed the parallel printer port assignment and data bit on all new models and changed the port socket from J2 to J5. This alteration not only requires a change in line 380 of the program, but screws up the machine language portion of the file (the data statements). By changing line 380 to port 20 and bit 64, the program will initiate and start, but still does not store the information. Also, the '0' in line 600 is an 'O', not a zero.

Does anyone have a solution?

C.E. Harland
P. O. Box 32
Ontario OR 97914

(continued on page 79)

Converting A Xerox 820-II To A Kaypro-8

By Uri Cogan

Box 2 Fulford Harbour
British Columbia V0S 1CO Canada
(604) 653-4563

I always wanted a Kaypro-8 or a similar machine but could not afford one. When I discovered the affinity between the Big Board, the Kaypro and the Xerox, I decided to invest $29.95 in a Xerox 820-I board, $49.95 in Micro C's Pro-Monitor 8 package, and do a Xerox to Kaypro conversion.

I purchased a Xerox 820-I board, a really impressive bit of multi-layer design from B.G. Micro (P.O.B. 280298, Dallas TX 75228). But then I found out the price of components to stuff it with—over $250 in Canada! A call to Jim Ferguson (Ferguson Engineering, P.O.B. 300085, Arlington TX 76010) brought in a fully stuffed Xerox 820-II for $200. Included in the package were a set of unreadable schematics and two disk controller cards, one for floppies and a SASI interface for a hard disk controller.

Rough Sailing

Disaster number one struck when I fired it up. The two monitor chips had been installed backwards. I checked to see if the old Xerox 820 monitor chip or the PRO-8 chip would work instead. Of course, they wouldn't.

Besides that, the clock wasn't clocking, the monitor wasn't booting, and the screen wasn't clearing. Some tracing with the scope revealed that there was no CAS (Column Address Strobe) to the RAM array: a line out of U20 (74S74) seemed to be stuck. Some trace cutting revealed that U20 was bad, and finally, at 5 A.M., I got the Xerox boot message on the screen and started to test the memory. All seemed well.

Trouble shooting a new board is generally more difficult than fixing a previously operating machine, especially when the chips are all soldered in. First, look for shorted traces and solder splashes. Then check the power supply and the system clock.

If things still don't work, start with the CPU and check for the proper signals, working outward depending on what does or does not happen. My favorite tools are a can of freeze spray and an old hair dryer. It's unbelievable how many chips can "go thermal." Jiggling the ICs in their sockets clears up a lot of trouble, as most sockets in commercial and consumer grade equipment are tin coated and prone to oxidation.

Other Parts

Next, I purchased two quad density double-sided Mitsubishi model M4853 5.25" half-height drives from California Digital for $175.00 each. Then I called John Marlin (NUF Computer Company, Inc., 99 Pennsylvania Ave., Newton MA 02164) who shipped me a nice set of schematics.

I felt uneasy about the floppy controller that came with the Xerox. It would work with the quad drives but seemed too complicated for me, and since it was mounted vertically, it would not fit in my enclosure. Fortunately it is a plug-in board so I went ahead and unsoldered the entire card socket (J12) from the motherboard.

Then I hand-wired the original Kaypro II disk controller circuit, plus some "glue" chips, to a section of vector board. This board plugs into a 44 pin socket that I wired to the appropriate spots on the motherboard. This gave me a flexible, mounted, plug-in, flat-lying disk controller (see Figure 1).

Motherboard Mods

The next phase involved some changes to the motherboard herself. Both computers use the same I/O chips but in a slightly different way. Xerox uses two PIOs, and U65 uses side A for the disk control and side B as keyboard input. U92 is unassigned and called GP PIO (for General Purpose).

The corresponding chips in the Kaypro II (pre-1984) are U72, side A for disk control and side B unassigned. U54 in the Kaypro is called GP PIO with side A handling the Centronics printer port and side B unassigned. The Kaypro has a serial keyboard that interfaces with the SIO side B while the communications port is side A. Xerox, however, uses the SIO side A as a printer port and side B is unassigned.

To complicate things further, the Kaypro and the Xerox use the signals out of the disk control side of the PIO quite differently. Figure 2 describes the necessary changes to the PIO circuit.

The Printer Port

To hook up the printer port, cut the traces from J2 pin 1 to pin 9, connect J2-1 and J2-11 as described in Figure 2, and connect J2 pins 2-9 to J8 pins 6,8,10,12,14,16,18 and 20 respectively. This way you can use a flat ribbon cable between J2 (DB25 type) and a standard 36 pin AMP connector to your printer.

The Xerox uses two 2716 ROMs as a monitor, while the PRO-8 is a 2732. You can either write the PRO-8 contents to two 2716s, (they do not have to be high speed types since Xerox uses WAIT states for the ROMs), or do as I did—insert the PRO-8 in the U33 socket with pin 21 bent up, run a wire from that pin to A11 at U51-19, and use the spare gate at U10 for chip select as follows: cut the trace out of U33-18, connect U33-18 to U10-11, connect U10-12 to U25-14 and U10-13 to U25-15.

Serial Keyboard Interface

Remove R54 and R55. Connect pins 28 and 29 together on the SIO (U75) and connect pins 11 and 12 together on the same chip. If you have a 300 baud RS232 keyboard you are done. Hook the data line to J3-2 and the ground to J3-7.

I was not so lucky. I had an old (1978) SOL-20 computer and intended to use its excellent keyboard and enclosure for my new "Kaypro" but the keyboard on the SOL outputs 8 bit parallel ASCII. Besides that, the SOL keyboard did not produce the proper codes for the cursor keys and it had some special function keys that produced codes the Kaypro couldn't use.

The solution was simple. I used the keyboard transmitter circuit from Micro C, Issue No. 10, page 6, to convert the keyboard to serial RS-232.

I then programmed a 2716 ROM with a translation table for the desired codes as follows: the eight bits out of the keyboard connect to the ROM's address lines 0 to 7, and the data you burn in corresponds to the translated value for each address.

The rest of the address lines can be used for page switching or tied to ground. The 2716 has room for four different pages of 256 codes each. That allowed me to switch between pages in order to generate control characters from the cursor and function keys specific to the program I was running.

I could have done the whole thing in software as a BIOS patch except that I really enjoy the smell of hot rosin while soldering and I also like to stick to the

rule of thumb that says "for one-of-a-kind use hardware and for mass production go software."

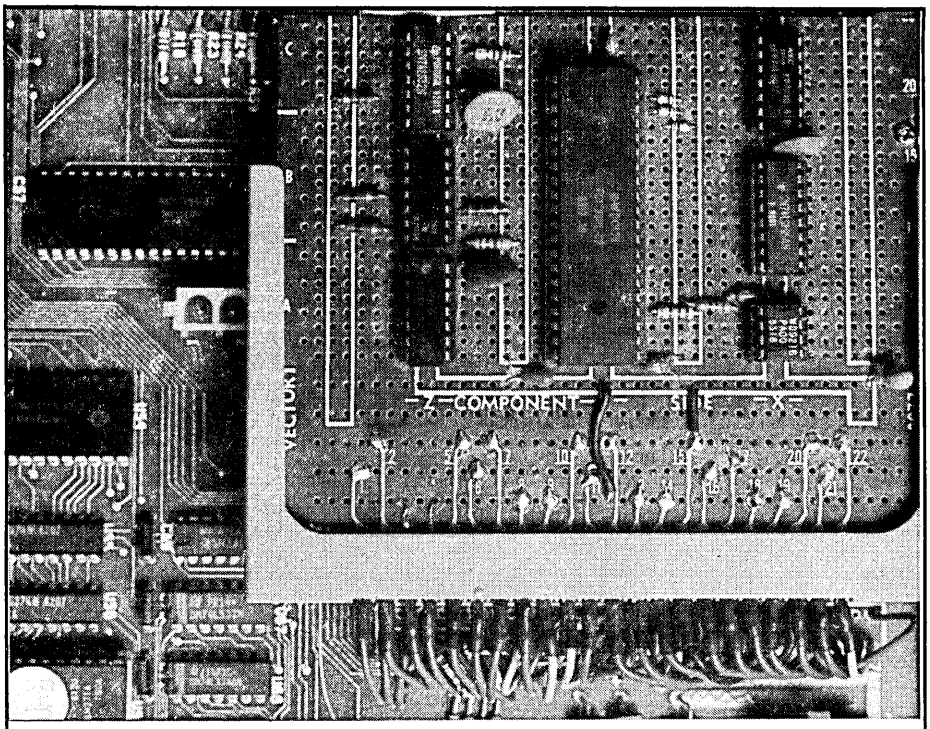
I do not have 100% compatibility yet. My numeric keypad produces the same codes as the number keys (unlike the Kaypro) and so some programs will require patches. I had to rework a couple of screens on my copy of KFORTH so that the editor would obey control codes from the keyboard.

Finishing Up

What remained was the trimmings. I reworked the character ROM to eliminate some graphic characters and add some others.

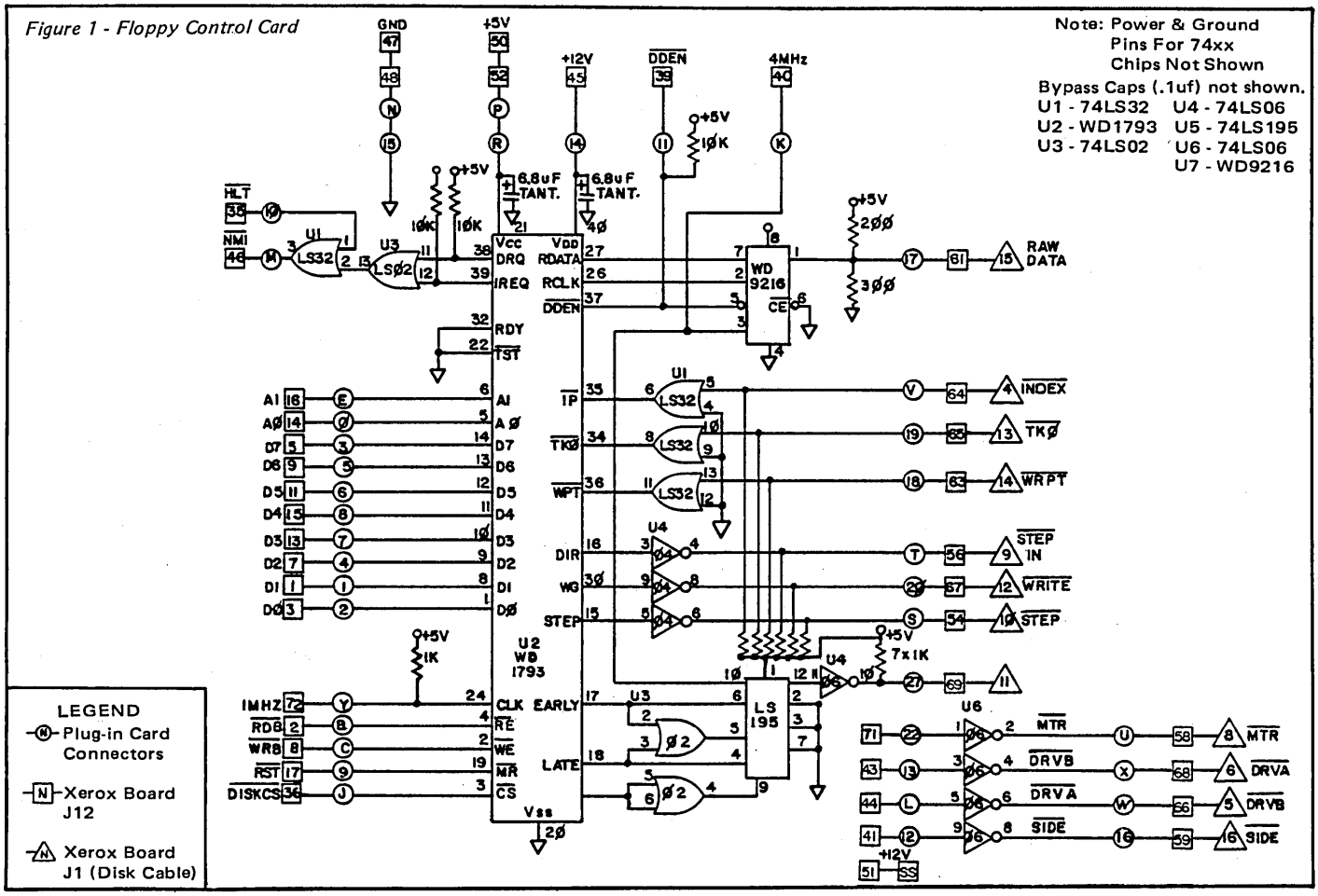
As for the beeper, I almost let it go (it's a port). But then I removed U46 (75451) and installed a 555 chip in its place. I lifted the 555's pins 2 and 4; cut the trace from U18-2 and connected that pin to the

(continued next page)



New disk controller card mounted on flexible leads on the Xerox 820-II motherboard. The card plugs into a 44 pin socket which is wired to the J12 connector pads.

Figure 1 - Floppy Control Card



555 pin 4; cut the trace from U18-1 and connected that pin to U75 pin 26; cut the trace from U46-5 and connected the line from E1-1 to the 555 pin 3; removed R32; cut the trace from the beeper (+) to 12V and connected that pin to ground; connected a 2K resistor from +5V and a 0.33MFD. cap from ground to pin 2 on the 555 and jumpered pins 2,6 and 7 together. This made the beeper compatible with the Kaypro.

Jumpering Around

Set the jumpers on the motherboard as follows:

```
J9, Serial port setup:
    7-8, 11-12, 15-16, 19-20,
    23-24, 27-28, 31-32, 35-36

J11, Printer out:
    9-10, 17-18

Miscellaneous jumpers:
    Connect 1 to 2 on E1, E2,
                E4, E6, E7.
```

Miscellaneous

J10 controls the CTC (an added bonus) but so far I've done nothing with it. Running two wires from the RESET button to a push button on the front of the enclosure almost completed the job. All that remained was to build a video combiner as published in Micro C No.15, page 45, with some modifications (I like to use 96L02s for one-shots) and hook it up to a monitor. My Kaypro-8 (or is it a Xepro-8 or Kayrox-8?) works fine. I have yet to find any incompatibility with any program meant for the Kaypro (with the exception of my keyboard's lack of Kaypro's number pad).

Supplies You'll Need

To do this conversion make sure you have the following:

Xerox 820-II board
Pro-Monitor 8 ROM (from Micro C)
Kaypro II schematics (from Micro C)
Xerox 820-II schematics
A complete set of Micro C issues
Data books for Zilog, Western Digital and TTL
A good set of tools
An oscilloscope (optional but really nice to have)
Freeze spray and an old hair dryer (Who knows, if this doesn't work you could start a beauty parlor.)

You will need a power supply that will deliver a minimum of +5V at 5A, +12V at 2A and -12V at 1A. An APPLE type switching supply will do just fine.

■ ■ ■

Figure 2 - PIO Circuit Changes

XEROX U65 PIN	FUNCTION	KAYPRO U72	FUNCTION	COMMENTS
7	Bank select	Bank select		Just fine.
8	Alternate character set select	Motor on		Cut the trace out of U96-8 and connect that pin to J12-71.
9	PP5	DDEN		Just fine.
10	PP4	Printer strobe		Connect a spare gate, U80-7 to that pin, connect U80-6 to J2-1 and to +5V. through a 1.2K resistor
12	PBRDY	Printer Busy		Cut the trace between pin 12 and pin 21,connect a spare gate, U85-12 to pin 12, connect U85-13 to J2-11.
13	PP2	Side select		Just fine.
14	PP1	Drive B		Just fine.
15	PP0	Drive A		Just fine

Running a line from U48-11 to J12-72 will supply 1MHZ to the disk controller.

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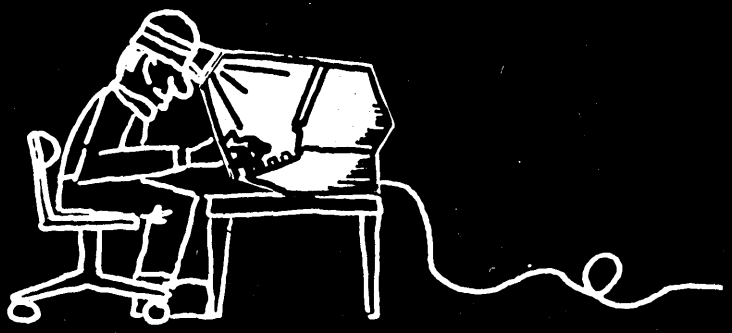

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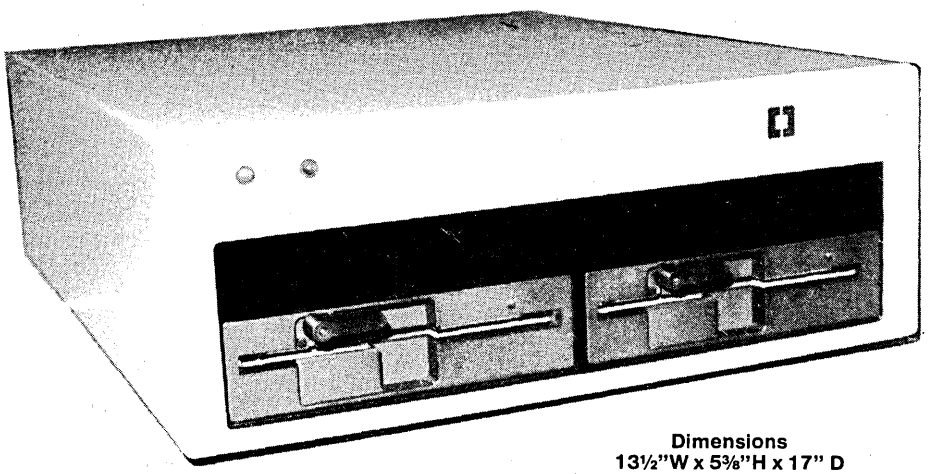

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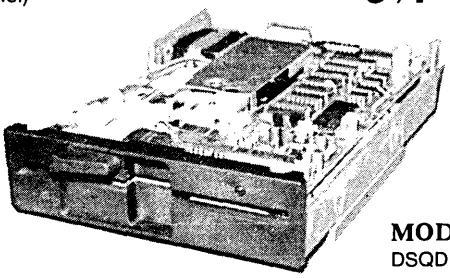

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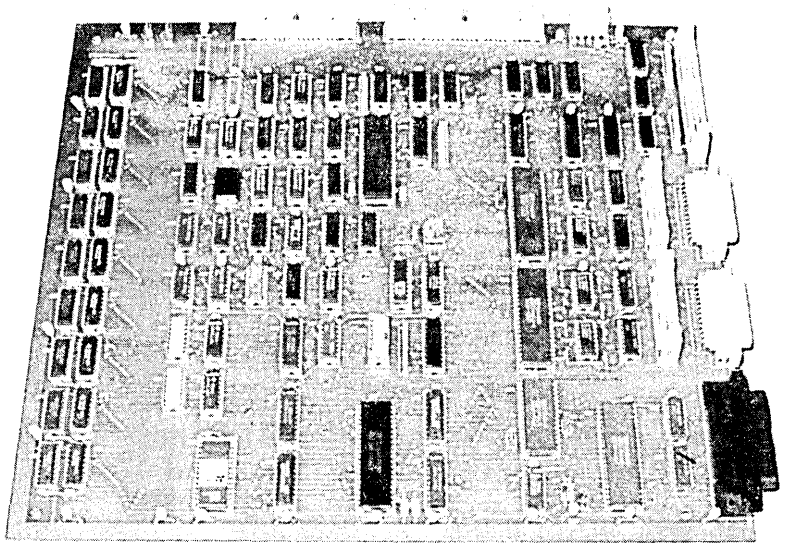

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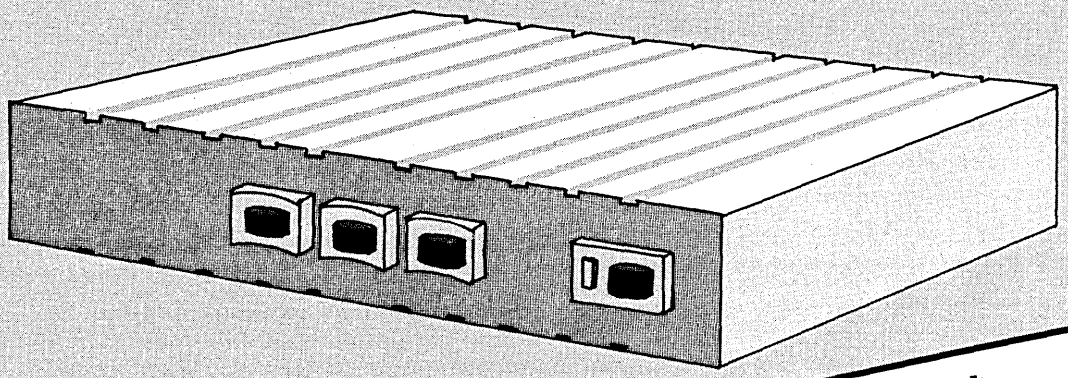

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The S-100 Bus

By Dave Hardy

736 Notre Dame
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Instead of continuing from where I left off in Microsystems, I thought it might be appropriate, in my first S-100 Bus here at Micro Cornucopia, to re-introduce the S-100 bus for the benefit of those who are not familiar with it and the IEEE-696 standard that it spawned.

Some History

In 1975, a small electronics manufacturing company called Micro Instrumentation and Telemetry Systems (MITS) released a personal computer called the Altair 8800. Based on the 8080 microprocessor, this machine used the concept of a system made up of multiple boards plugged into a common motherboard. The motherboard was made up of several 100-pin connectors, which were used, interestingly enough, because MITS bought them as surplus at a very low price.

The bus inside the Altair, called the Altair Bus, became immediately popular. Several other manufacturers, including IMSAI and Processor Technology, began making products that used this same bus (by now just called the S-100 bus because of its 100 signal connectors) and soon there were hundreds of companies making S-100 machines and plug-in boards.

In 1979, a proposed S-100 bus standard was submitted to the IEEE (Institute of Electrical and Electronic Engineers), and a few years later (after several revisions and additions) the S-100 bus was accepted by the IEEE and was renamed to the IEEE-696 standard.

Although not strictly proper, the terms "S-100" and "IEEE-696" are now used interchangeably by many in the industry. S-100 users, however, should remember that all S-100 boards are not necessarily IEEE-696 compatible—a subject we will deal with often here in "The S-100 Bus." In spite of their differences, you will often see the terms used interchangeably in this column. Unless I specifically mention otherwise, IEEE-696 compatibility is always assumed.

Why Use The S-100 Bus?

The S-100 bus became popular because of its versatility and cost-effectiveness. In the middle and late 1970s, even in its non-standardized form, it was light years ahead of anything else of comparable price, and it offered the additional advantage of being upgradeable. Today, S-100 is not quite as cost effective as it was then, but it is still, by far, the most versatile and expandable bus.

S-100 systems offer the following advantages:

Processor Independence: Virtually any microprocessor can be used in the S-100 bus, including the 8080, the Z80, the 8088 and 8086, the 80286, the 68000, and dozens more. The IEEE-696 bus allows for 8 or 16-bit data operations, and 16 or 24-bit addressing. Using multiplexing schemes, even wider processors can be used.

Multi-Processing: Up to 16 processors can share the same S-100 bus, and use all of its resources as if each were the sole processor in the system. In fact, entire single-board systems built on S-100 cards can be plugged in for use with operating systems like Turbo-dos.

Speed: The IEEE-696 standard allows for CPU clock speeds up to 6MHz, and many manufacturers make boards that are even faster (some as fast as 10MHz).

Easy Expansion: Any S-100 board can be plugged into any S-100 slot. S-100 systems can be expanded by just plugging any new boards into the motherboard. In addition, there can be as many as 22 slots in the motherboard, so you will rarely run out of expansion space.

On-Board Regulation: One of the biggest advantages of the S-100 bus is that is has on-board power regulation, which means that expensive well-regulated power supplies are not needed. Each board has its own power regulators, and extracts only the power that it needs. Because of this, S-100 power supplies can be made with just a few components, and without all of the expensive high-current regulation parts ordinarily needed.

Versatility: Probably the most important feature of the S-100 bus is that it can be configured to do just about anything. S-100 I/O boards are available for controlling virtually any machine that can be used remotely. There are boards that can control current in ranges anywhere from from milliamps to hundreds of amps.

Digital to Analog and Analog to Digital conversion boards are available from dozens of manufacturers for test and instrumentation work, and interfacing is simple, easy, and inexpensive.

Advanced Features

This column is primarily concerned with implementing the advanced features of the IEEE-696 standard, including multi-processing systems, the master/slave board concept, mixed 8 and 16-bit operations, extended addressing, networking, and the various control lines redefined by the IEEE-696 standard. These matters will all be discussed in future "S-100 Bus" columns, and I invite reader questions and comments.

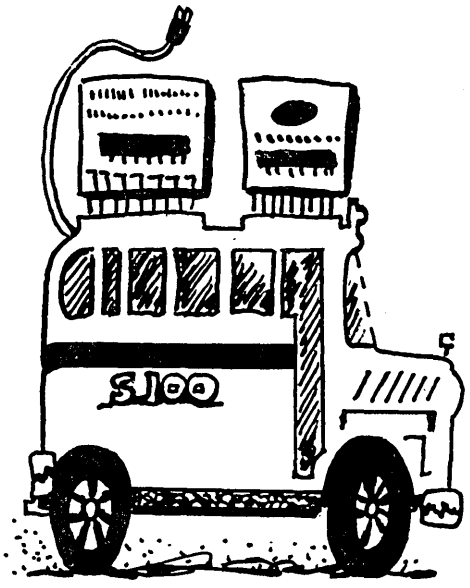
Next Time

My next column will demonstrate some quick and easy I/O interface techniques, and some tips on how to troubleshoot I/O boards, along with a small (and painless, I hope) dose of IEEE-696 theory and how to apply it to your S-100 machine.

Call For Reader Mail

As I mentioned above, "The S-100 Bus" is intended as a forum for S-100 products and procedures, and I welcome reader questions and comments.

■ ■ ■



S-100 Expansion For Any Single Board Z80 System

By Jim Chamberlain

P.O. Box 81
Pittsford NY 14534

As a development engineer with Optronics Technology, my job was to come up with a compact, full-featured and inexpensive S-100 system to burn-in the TimEPROMmer boards that we manufacture for the S-100 bus. After ruling out a full card system, I started looking at the possibility of an S-100 to single board expansion. What evolved was a system which would support 5¼" and 8" drives, have 64k of RAM, 2 serial and parallel ports, a built-in 24 by 80 column (ADM 3A type) terminal, at a cost of less than $200.

A Forty-Pin Interface

Expanding a single board Z80 computer to S-100 seemed the perfect answer to my design problem. I chose a Xerox 820 for the single-board part of this combo since it has a terminal on-board and is available in the surplus market.

The S-100 bus design has many special timing signals that would not be available on a single board computer. Consequently, picking the proper signals off the board and generating the rest could be difficult.

An S-100 Z80 CPU board is an ideal way to generate these signals since it plugs directly into the bus. All you need to do is connect the Xerox board with the S-100 board. The Z80 processor is the natural interface. Simply connecting the Z80 signals from the 820 to the Z80 socket on the CPU board would be easy if we didn't have to be concerned with signal line buffering and I/O arbitration.

Signals from the Z80 go to both the 820 and the CPU board. If there were no arbitration then drivers on both boards would try to send data to the Z80 at the same time.

Signal input arbitration was resolved by specifying that any Z80 Read above port 128 was from the S-100 card, below 128 was from the 820. This allowed us to use the 820 without any software or hardware modifications. Since our TimEPROMmer boards are addressable at any location, restricting their address to the upper 128 port locations was no problem.

Hardware Description

We used a 3 by 4½ inch piggy-back board which plugged into the 820 in place of the Z80. This board contains all the unique circuitry, the Z80 and the tie-in point for the cable between the two systems.

Figure 1 shows the three octal drivers used to buffer the address and control lines. The data lines are buffered by two quad bus transceivers.

Application

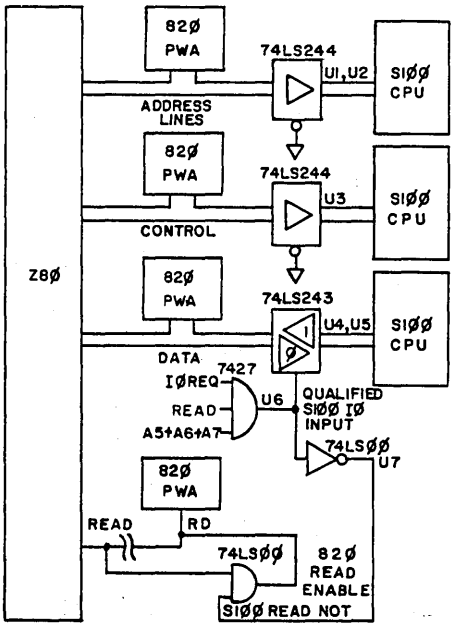
This system works very well for burning, exercising, and adjusting our TimEPROMmer boards. Both real time clock and programmer sections are accessible through ports. We have done this interface on the old 820 with a 2 MHz clock and the new Xerox 16/8 system with 4 MHz clock.

Although interrupts are used on the 820 side, the S-100 does not use them. Wait states were not required, although the CPU board has circuitry to generate them.

This scheme should work with any Z80-based system that requires S-100 expansion capability. On the S-100 side, any Z80 CPU board should work since this scheme doesn't require any modifications.

■ ■ ■

Block Diagram of Figure 1



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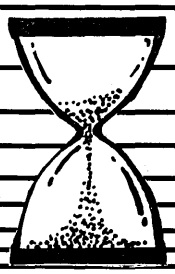

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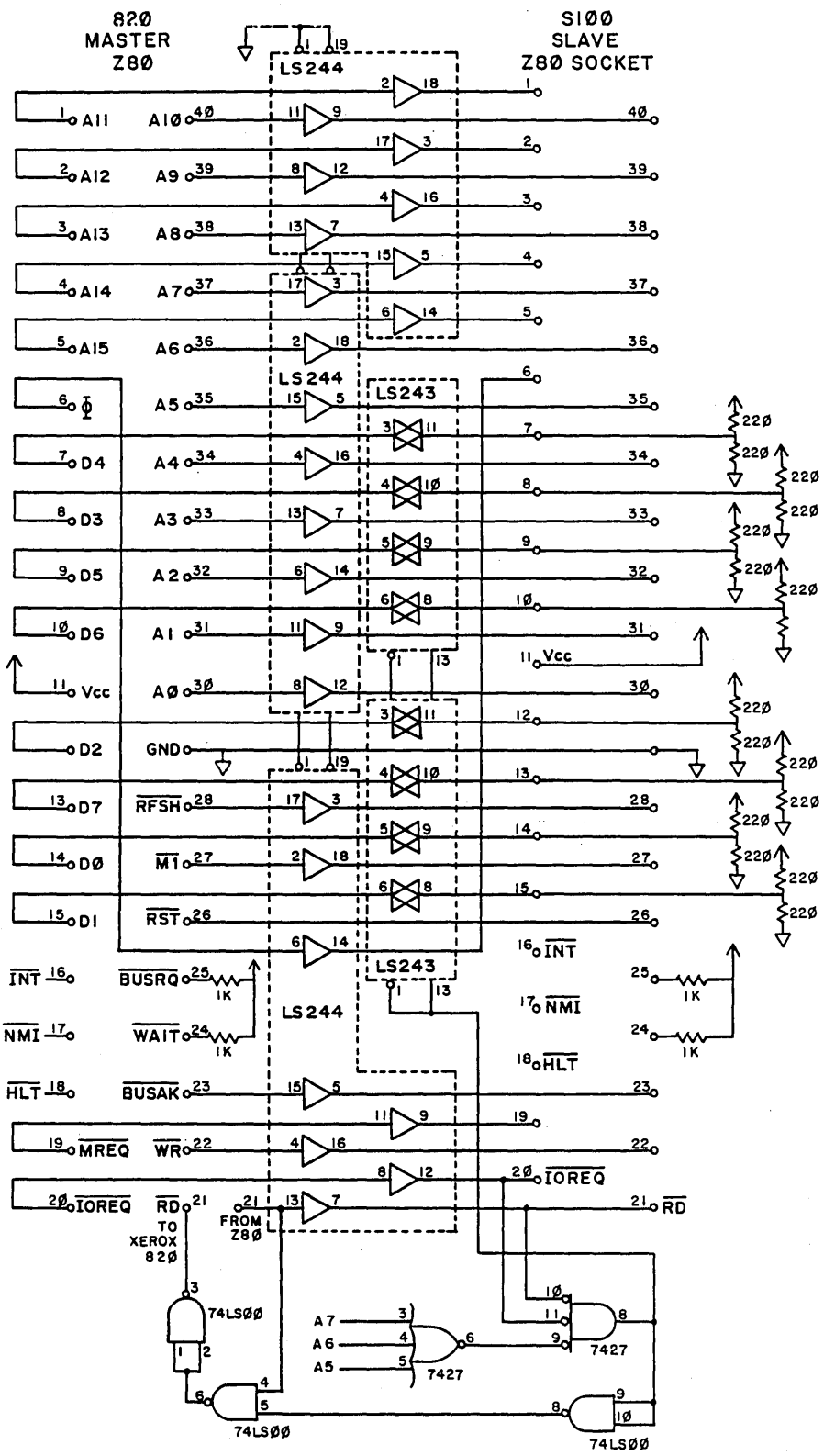
Figure 1 - S-100 Bus Interface



Editor's Note: The $\overline{RD}$ qualification circuit doesn't appear to qualify the $\overline{RD}$ signal to Xerox 820's pin 21. However, Jim double checked the original circuit against the schematic and says that this is the circuit that is working.

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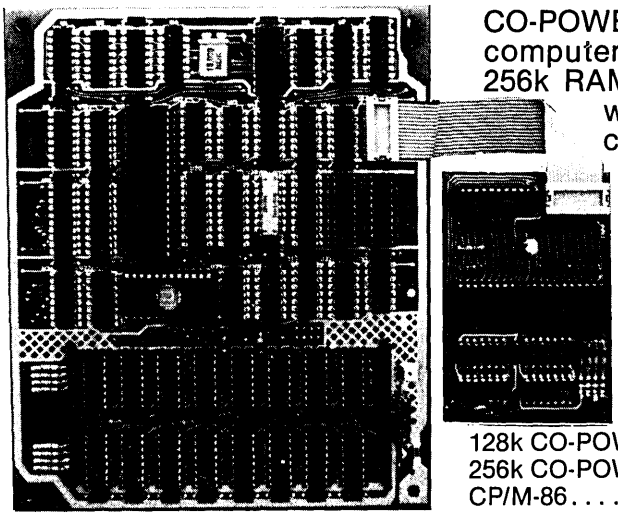

CO-POWER-88 is a 16-bit 8088 coprocessor for Z80 CP/M computers. Both versions of CO-POWER-88, 128k and 256k RAM, include both MSDOS, and RAM drive software,complete with MSDOS, IBM-PC compatibility.

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SWP's ATR8000 is a 64k RAM,Z80A, 4 MHz computer that includes double density CP/M 2.2. The ATR-8000 runs up to four disk drives that are any mixture of size (5¼" and 8"), type (single-sided and double-sided), and density (single, double and quad). The ATR8000 has an RS-232 port for a modem or serial printer and includes software for both. There's also a parallel port with a parallel printer driver. The ATR8000 interfaces to an RS-232 terminal or to an ATARI home computer. Software includes a program that allows the ATR8000 to use CP/M disks from other computers. The ATR8000 can be upgraded to also run CP/M-86 and MSDOS by adding CO-POWER-88.

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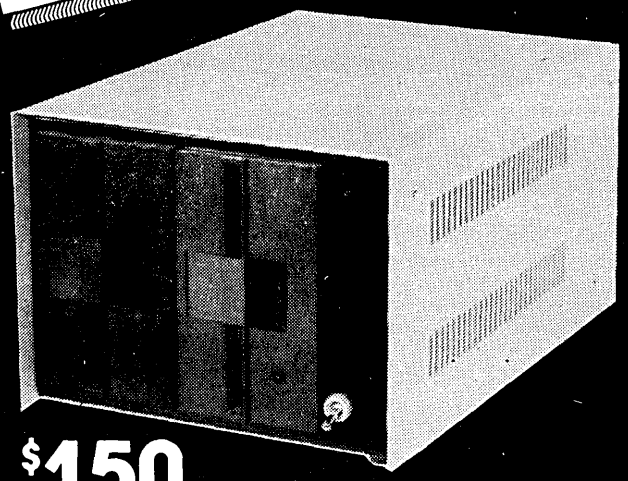

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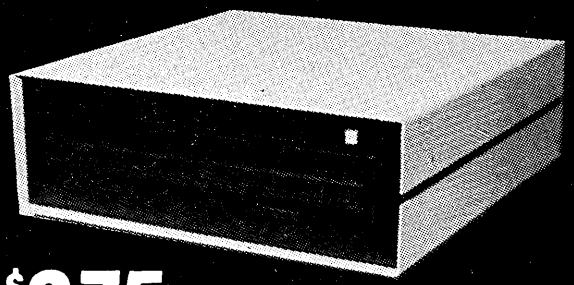

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In The Public Domain

By Sol Libes

Box 1192
Mountainside NJ 07092

This is the first column of what I expect will be a regular feature in Micro C. The objective of the column is to keep you informed on what is happening is the public domain software area.

What Is "Public Domain Software"?

Believe it or not there are a lot of people who create very good software and literally give it away. Such software is in the public domain since it may be freely copied, and is available for the price of a phone call, the cost of a disk, or a small donation to a computer club. It never ceases to amaze me how few people know of the existence of this readily available software source.

In some cases the creator may copyright the program requesting that anyone who uses it for commercial purposes (e.g. selling it) pay something, while those using it for their own personal use need not do so. There are some authors who copyright their software, put it into the public domain, and ask users to voluntarily send them some money to support their efforts.

The Roots Of Public Domain Software

Public domain software has a long tradition in the computer hobbyist community. The oldest public domain software library was begun by the CP/M Users Group (CPMUG) way back in early 1977 and was based on the CP/M-80 operating system.

CPMUG was begun by Lifeboat Associates as an adjunct to their commercial software business. As Lifeboat grew into a big business the CPMUG activity suffered. By late '78 it became apparent to the CP/M hobbyist community that CPMUG had become more of a bottleneck than the active distribution organization that was needed. Although CPMUG still distributes their P-D software disks, they have not released any new disks in over five years.

SIG/M

In 1979, a new group, SIG/M (for "Special Interest Group/Microcomputers"), was formed to distribute CP/M software. The group is operated jointly by the Amateur Computer Group of New Jersey (ACG-NJ) and the New York Amateur Computer Club (NYACC). I am proud to say that I was the founder of ACG-NJ, way back in early 1975, and served as its president for five years. ACG-NJ has almost 1,400 members using all types of systems. I was also one of the founders of SIG/M and today I am still active in both groups. These nonprofit organizations are run entirely by unpaid volunteers.

The SIG/M public domain software library is by far the largest of its kind in the world and contains well over 200 volumes of CP/M-80 and CP/M-86 based software. Each volume is a single-sided 8" disk containing 241K bytes of software. (Several clubs have transferred most of the SIG/M software to 5.25" Kaypro, Apple, and Osborne formats and can furnish copies in these.) Thus, there are presently well over 50 Megabytes of software and more than 8,000 programs in the SIG/M library. Most of this software is in source code form.

What Is Available?

There are languages, application packages, operating system utilities, BASIC programming utilities, software development tools, communications programs, word processors, data base managers, graphics programs, business programs, science, engineering and statistics programs, educational programs, games and much more.

Many of these utilities have become classics and are unequaled in the commercial world. Such programs as MODEM, SQUEEZE/UNSQUEEZE, LIBRARY UTILITY and ZCPR are well known examples of programs in the public domain. Much of SIG/M's recently released software is for systems running CP/M-86.

SIG/M distributes its software through computer clubs and on-line bulletin board systems around the world. There are currently about 70 clubs in the U.S. and 20 clubs outside the U.S. that automatically receive SIG/M software as it is released. These clubs then make the SIG/M software available to their members for copying at meetings or via an on-line bulletin board system. The general practice is for the clubs to ask for a donation of $1 per disk copied to support the operating expenses of the software library.

Other Libraries

With the emergence of the IBM-PC and other machines running MS-DOS it was only natural that hobbyists would develop public domain software for these systems. These libraries have been created by local PC clubs around the country. In most cases this software is distributed only within the local club, but occasionally the club will accept mail orders for their disks.

There are also some dealers who sell copies of public domain software. They usually charge significantly more than the clubs charge, which leads to the question of whether it is ethical for dealers to make a profit off software that authors have put into the public domain and from which they receive no compensation.

PC/BLUE

In 1982, ACG-NJ and NYACC got together and founded a software library to support PC/MS-DOS and called it the PC/BLUE software library. This is without doubt currently the largest and best organized MS-DOS public-domain software library in operation. PC/BLUE has already created close to 90 volumes of software, most on double-sided 5.25" disks containing about 320K bytes. There are more than 1,600 programs in the library totaling over 22Mbytes of software.

There are already about 25 clubs distributing PC/BLUE volumes. Although much of the PC/BLUE software library requires IBM/PC hardware (particularly for the bit-mapped screen and graphics facilities) about one third of the software is generic and should run on any MS-DOS machine such as a Kaypro upgraded with an 8088 processor.

In Conclusion

I will be writing in great detail about public domain software in future columns, pointing out what I think are the best programs in the public domain, telling you how to down-load public domain software from on-line bulletin board systems and where to get it in your local area. I'll also be keeping you informed on new releases and information on some of the other clubs distributing public domain software.

In the meantime, I suggest you obtain copies of the SIG/M and PC/BLUE printed catalogs. The catalogs list the contents of all the volumes in the libraries as well as the clubs and individuals throughout the world who are distributing the SIG/M and PC/BLUE disks. Both groups furnish an information disk (labeled "Volume 0") which contains an up-to-date listing of all the software in their libraries along with a FIND program to help you locate the program you want.

Order the SIG/M and/or PC/BLUE printed catalogs (each is $3, $4 foreign) or Volume 0 information disk ($7, $9 foreign) from: SIG/M-PC/BLUE, Box 97, Iselin NJ 08830. The Volume 0 information disk, as well as all the SIG/M disks, are available in Kaypro format from the following individuals:

California

Kelley Smith, 3055 Waco Way, Simi Valley 93063 CCBS 805-527-9321

Connecticut

Henry B Rothberg, 1 Laticrete Part North, Bethany 06525 203-397-0041 or 393-4220 x-202

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J C Kramer, Box 28355, Columbus 43228 614-279-8271

Canada

Jud Newell, 4691 Dundas St W, Islington Ontario 416-239-2835 CBBS 416-231-9538/1262

Also, I would like to hear from all clubs and other organizations distributing public domain CP/M and MS-DOS software so I can publicize their activities in this column. I also welcome general reader comments. If you expect a response, enclose a self-addressed stamped envelope.

Sol Libes—A Brief Resume

I have been playing around with microcomputers since 1973 with my students at Union County College, Scotch Plains NJ. I am a professor of Electronics Engineering. I have worked for several companies as a consultant on microcomputer design and interfacing (for process control applications). I am the author of 15 books and several hundred magazine articles.

In early 1975, I founded the ACG-NJ, the second oldest computer club in the world. In 1976, I organized the first personal computer show (the Trenton Computer Festival, held annually). From 1978 to 1983 I wrote a monthly column in BYTE magazine analyzing industry trends. In 1979, I founded MICROSYSTEMS, a magazine for advanced CP/M and S-100 system users, and served as its editor for five years.

Editor's note: Welcome to Micro C, Sol, we're glad to have you on board.

■ ■ ■

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256K RAM Expansion For The 820-1

Review By Dale Walter

1624 South Ashwicken Ct
State College, PA 16801

The 820-256 is a 256k RAM expansion board that requires little or no modification to install on the 820-1 or BBI systems. There are no I/O changes, PIO bit re-assignments, or cuts and jumpers to add to the board. Not all 64K DRAMs will work with this board (TIs, for example) because of the Z80's seven bit refresh address, but most will. (Jim Ferguson says he has some 250ns MOSTEK RAMs in stock for $4.50 that will work at 4MHz.)

Editor's note: Both these reviews are about the same board, the one designed by Jim Ferguson. Each, however, provides a little different perspective—partially because one is using a BBI, the other, a Xerox 820.

The kit is reasonably priced, fully socketed, and assembles quickly (2 hours). Supplied with the kit are some extenders to replace the 5 ICs (or their sockets) that have to be removed for installation of the RAM card onto the motherboard. This part of the installation takes about an hour, but I just plugged my RAM card right into the exsisting sockets on my BBI. I altered my pfm monitor ROM to make the necessary initialization of the BANK-REG so that my system booted right up. Jim mentioned that without this initialization, upon startup the monitor would be lost somewhere in memory. The best way to overcome this would be to do several resets until the monitor could find itself. Jim provides the source for the initialization routine with the documentation.

Gory Details

The 820-256 is physically arranged as four rows of 64K DRAMs, and logically represented as sixteen 16K banks of RAM. See Figure 1 for the following functional description. The data path to the RAM is as usual buffered with a Tri-state buffer. And again, address lines A0-A13 are applied to an address multiplexer for memory decode.

When the address lines are equal to 0FFFFH and WR (write) is enabled, the current data on the data bus is written into the BANK REG. The BANK REG stores the lower nibble (four bits) of the data bus into a register specified by the lower two bits of the upper nibble. Those two bits represent the logical bank number assigned to the physical bank specified in the lower nibble. There are only four logical banks as the processor cannot physically address beyond 64K (16k * four logical banks).

When BANK1-4 are generated from the motherboard the RAS BUFFER AND MUX sends RAS to all DRAMs and multiplexes the bank number to specify the logical bank register in the BANK REG. The BANK REG provides the address MSBs to the RAM address mux, determining the 16K block address in the RAM. The two ROW bits are demultiplexed in the CAS DEMUX to select the physical row of DRAMs to be addressed. This method provides a free refresh of the RAM since all rows of memory simultaneously RASed for any memory transaction.

Noteworthy Items

Jim is also providing a RAM disk program (with source) that is usable on the original Russell Smith BBI BIOS. Problem is that the SWP BIOS and monitor use all the memory above the operating system. So with the source code for the BIOS and the RAM disk you have to move the operating system down to make space for the RAM disk patch above the BIOS. This is not really as bad as it sounds, as I am expanding the BIOS for CPM Plus enhancements and I need the space for growth (which will include an integral RAM disk.)

Ferguson Engineering is now preparing to market a BBI SASI interface for under $40 for a bare board that uses readily available parts. Jim is also developing a compact power supply to support an SBC with floppies and a winchester (its footprint is 3.5" x 7.5").

Another Plus

LRU and Directory Buffering together with a queued printer spooler are enhancements provided with the PDQ Cache (PDQC.COM) application, available exclusively from Ferguson. Ken

(continued on page 20)

Figure 1 - Memory Cache Program Commands

```
On invocaton the Cache program prompts for the following options:

(1)     Performance of a memory test (Y/N) - tests memory are
        used by buffer and spooler prior to activation.
(2)     Printer forms separation (Y/N) - inserts form feeds
        between spooled files in spooler queue.
(3)     Enable spooler (Y/N) - makes the spooler queue
        available.
(4)     Deferred writes (Y/N) - if writes are deferred,
        the disk will only be written to when the cache is flushed or
        when buffer space is required that contains a record
        to be written.  The operator is advised to perform a
        warm boot to flush the cache before changing disks.

Once the program is installed the operator can invoke a cache/spooler
control menu with a ^Q.  The following is a description of the menu options:

(1)     Enable spooler - makes spooler queue available.
(2)     Disable spooler - no more files or input can be added
        to the spooler queue (contents of the queue is still
        available for output).
(3)     Start printer - enables printer output of spooler
        contents.
(4)     Stop printer - stops output from queue.
(5)     Delete spooler queue - clears the queue.
(6)     Direct disk write - immediately updates disk for any
        disk write after LRU update.
(7)     Defer disk write - writes to disk only if the buffer
        must be overwritten with new data or if
        a cache flush is ordered.
(8)     Flush cache - writes to disk all deferred write LRU
        buffers.
(9)     Terminate cache program - restores non-cache BIOS
        functions and return to CP/M.
(10)    Return to CP/M from menu.

The PDQ Cache program is not compatable with concurrent XDRIVE.COM operation.
(Combination of PDQ Cache with ZCPR provides
a close resemblance to CP/M Plus.)
```

256K RAM Expansion For The BBI

Review By Jim Mayhugh

8 Lincoln Ave.
Erial, N.J. 08081 (609)-435-1544

The 256K RAM Expansion Module from Ferguson Engineering is an excellent product, well laid out, with plenty of ground plane to help reduce noise, and plenty of de-coupling caps spread throughout the board. The board is designed to run at either 2.5 or 4Mhz. With the exception of a supplied PAL, there are no oddball parts, and the resistors required may be either standard resistors or SIP style parts.

Figure 1 - Memory Mapping Code

```
LD      A,26h           ;2=logical block, 6=physical block
LD      (0FFFFH),A      ;MAPPER ADDRESS
```

Figure 2 - Monitor Mapping Code

```
LD      HL,(0FFFFH)     ;POINT TO MAPPER
LD      (HL),00H        ;PHYSICAL BLOCK 0 TO LOGICAL BLOCK 0
LD      (HL),11H        ;PHYSICAL BLOCK 1 TO LOGICAL BLOCK 1
LD      (HL),22H        ;PHYSICAL BLOCK 2 TO LOGICAL BLOCK 2
LD      (HL),3FH        ;PHYSICAL BLOCK F TO LOGICAL BLOCK 3
```

Beware Of TI DRAMS

The only problem I ran into with the unit was in my choice of DRAM chips. Because the board still relies on the Z80 to provide the REFRESH address to the DRAM, only DRAMs that employ 128 cycle refresh may be used. This normally should be no problem, since most DRAM parts are this type. However, TI DRAMS will not work with this board!! Guess which parts I had. Oh, well, a quick call to Microprocessors Unlimited solved that problem. (PLUG: Microprocessors Unlimited is an excellent company if you are looking for fast service, prime parts, and good prices.)

Plugging In

The board is designed to plug into the socket area vacated by five chips on the BBI/Xerox 820-1. The board occupies the same area as the current RAM array on the board and adds approximately one-half inch in overall height to the main board. Jim Ferguson describes two methods of installing the add-on board, one which makes use of the existing sockets, and one which requires the removal of the soldered-in chips. Both methods work and provide a great deal of mechanical rigidity.

How It Works

The ram board partitions the 256k of memory into sixteen 16k blocks of physical memory. Any of these physical blocks may then be mapped into one or more of the four 16k logical blocks of the Z80 memory area. This is accomplished by writing a byte of information into Z80 memory address FFFFH. The byte contains the logical block information in the upper nibble and the physical block information in the lower nibble.

As an example, to map the seventh physical block of the ram board into the third logical block of the Z80's memory area, you could use the code in Figure 1.

In this way, blocks of memory can be moved about quickly and easily.

The only change required in software is during power-up of the system. Since on power-up the contents of the mapper chip are indeterminate, the first order of business is to map the memory where you want it. This is most easily done by adding a short sequence of instructions to the beginning of the monitor ROM. The sequence should look like Figure 2.

This sequence will load the Z80 with four discrete blocks of memory, and will also leave a contiguous 192k chunk of memory available on the ram board.

Software

Jim also provides, at additional cost, some software specifically for his add-on board. Currently available software includes source code for a monitor ROM that includes the power-up routine and a real-time clock display. Also included on the same disk is a modified version of XDRIVE, a public domain RAM disk.

The XDRIVE software basically uses the available 192k of memory as a super-fast disk. The RAM disk is specified as drive M:, but since the source is provided, you can modify that to any other valid value. The software is solid and the disk accesses are from three to eight times faster than a regular disk. I now use my XDRIVE disk in conjunction with a DYNADISK from L.A. Software for all of my disk-intensive programs.

The Bottom Line

If you are looking for a fast, relatively inexpensive way to upgrade your system to 256k, I definitely recommend the Ferguson Engineering Ram Expansion Module. It's reliable, easy to install and use, and is available in a form to suit most budgets, from a bare board to completely assembled and tested.

■ ■ ■

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The Rivendell RAM (And More) Board

Review By David Thompson

I'm not really sure how to review this unique board. In one sense it is a very normal RAM disk, 256K of RAM that is setup as a 250K drive. Speed wise, it's as fast as I'd expect a RAM disk to be. (I guess I'm getting pretty jaded. I remember the first time I watched a RAM disk work, it was really magic. This board knows how to make the magic, it's just that it no longer surprises me.)

However, in the I/O department, this add-on has no competition. In fact, Jeff Sasmore was thinking of simply throwing a few additional ports onto a daughter-board when he decided to make the new board the same size as the Big Board.

Then he simply filled the space, first with the ports he needed, then he added the RAM, and finally he threw in all the other bells and whistles that he thought would be fun.

Hardware

So you keep all your original Big Board ports, plus you get 2 serial ports (1 SIO), 4 parallel ports (2 PIOs), 7 channels of analog to digital conversion, 2 channels of digital to analog conversion, a CTC timer, and a battery-backed-up real-time clock. (Installation is very simple, you unplug the Z80, plug in an adaptor board, and then plug the adaptor board into the main board.)

Plus, you get an AY-3-8910 sound generator with three-voices, a noise generator, a mixer, and an envelope controller. This chip will create just about any sound from a gunshot to real music. All you need to do is connect up an amplifier. Between the sound generator and the DAC you can do just about anything audibly.

Hardware Documentation

The hardware is quite well documented. You get a step-by-step assembly instructions that are more complete than those you got with your Big Board. Jeff explains the process very carefully and though building this board is equivalent to building a Big Board, you shouldn't feel lost at any time.

He includes jumpering instructions, block diagrams, parts layout, 2 large schematics, and a pretty complete theory of operation.

You do not need to install all the ICs to use the board. The parts you need to support specific functions are well documented.

Those who need only the RAM or some additional ports can bring up their boards very reasonably and then add additional functions later.

Software

This board comes with a gob of software, and Jeff includes the source on everything he wrote. The code is written for Microsoft's M80/L80 package. You will need M80 if you want to change the RAM drive from M: to C: or whatever.

He has included the routines you need to format and run the RAM disk if you are running stock DRC CP/M or running double density with SWP's board.

You also get MODEM7 setup for one of the new board's serial ports, RAM and PIO test routines, sample DAC and ADC drivers, a sound generator routine and more. You also get a program to set and display the battery-backed-up real-time clock.

This package is Christmas, for anyone who has a Big Board and an interest in expanding its capabilities. (And for someone familiar with M80, well, it's seventh heaven. The code is all here and it's very well documented.)

256K RAM EXPANSION

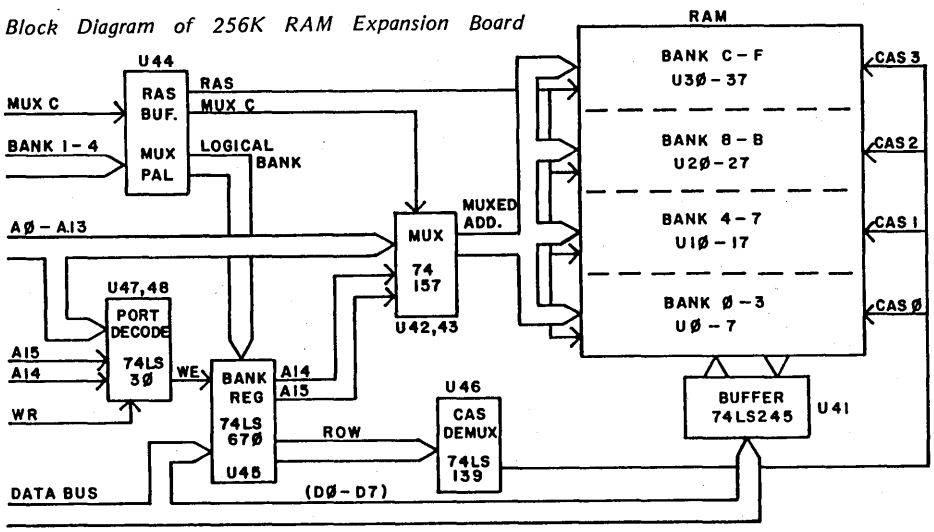
(continued from page 18)

Marshall wrote the code with compatibility for both the original BBI and SWP's DD BIOSs. This application provides CP/M 2.2 with directory and LRU buffering comparable to that of CP/M Plus. See Figure 1 for details.

Speeding Up Slowly

For those of us who want to hit 256k slowly and by degrees, there's still hope! The 820-256 needs only one row of RAMs to function as a normal 64K system. Just use physical blocks 0-3 for the logical blocks 0-3 instead of 0-2 + F and it will work fine. Then you can add more RAM at your convenience.

Block Diagram of 256K RAM Expansion Board



Ferguson Engineering
PO Box 300085
Arlington TX 76010
817-640-0207

■ ■ ■

Conclusion

This is a neat expansion board for the Big Board. For about $117 (including the delay line) you get excellent documentation, a bare (but well made) board, and a substantial amount of software. The fact that it works with both single and double density is a real bonus.

The only problems I found were that EX14 and The Word+ don't work (Spellsys works fine and Jeff says that submit/xsub also work), and you cannot yet set up the system so that the RAM disk can be drive A (for ZCPR) and the original drive A becomes another drive. (Dyna does this and it is really nice.) Also, between the little Z80 plug-in and the main expansion you are adding a solid 2" to the height of the Big Board. So there may be space problems unless you have a pretty big cabinet.

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■■■

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Main board is the same size as the BB I and runs at 2.5 or 4 MHz
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The Xerox 820 Column

By Mitchell Mlinar

1013 W. 210th St.
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In the last issue, I presented an overview of the Xerox 820-II monitor format and commands. This time, I'll discuss the monitor entry points in detail. This is not light reading, but should be of help to all 820 owners (-I or -II).

The -II monitor bears little resemblance to the -I code. Although all of the entries in the -I exist in the -II monitor for upward compatibility, implementation is another matter. Figure 1 lists all the entry points. Since three major ROM sets have appeared (1.x and 2.x for the 820-I and 4.x for the 820-II), differences will be noted where they apply. At the end, I will highlight (and lowlight) some peculiar aspects of the -II monitor.

Dummy Jumps

There are 9 more jump vectors which are available and do nothing at present. As far as I can tell, they are "hooks" for routines from another ROM (which goes into that empty socket). These vectors are called during certain disk operations; maybe some reader can shed some light on this.

Owners of the 820-I may also note some additional jump vectors beyond F027H. Although there are some useful functions out there, it is best to avoid them if you plan on changing your ROMs.

Details

COLD: Resets entire computer system (almost like pressing the RESET button). Monitor re-loads, Z-80 I/O ports initialized, etc. (What's the diff between COLD and RESET?)

WARM: Warm starts ROMs, goes to prompt '*' and awaits monitor command. In 4.x, this vector is executed whenever a CTRL+ESC is pressed on the keyboard. Although this allows resetting the system without reaching around the back of the computer, accidentally pressing it during certain programs can be unfortunate. You can effectively disable this action by putting a 0C9H (RETurn) at 0F003H.

KBDST: Simply returns status of keyboard queue.

KBDIN: Gets character from keyboard buffer or waits for one, if none ready.

CRTOUT: Sends character to video screen. In 4.x, saves all of the registers, calls CRTFST, and restores the registers.

CRTFST: (1.x/2.x) Same routine as CRTOUT (as described below). (4.x) Calls the monitor routine which processes the character. Calling CRTFST in 4.x will return with HL containing the CRT RAM address of the cursor and A containing the previous character under the cursor.

All characters 20H (blank) to 7FH are directly displayed and screen scroll is done, if required. Characters below 20H are defined as control characters. Figure 2 lists the control codes accepted and their meaning. Note that all other control characters and escape sequences are simply ignored and screen display is not affected.

Monitor Differences

The differences between the -I and -II are due mainly to the hardware for the attribute modes. In 1.x/2.x ROMs, the video character was passed directly to the screen with the high bit designating flashing mode, if set. In 4.x ROMs, the high bit is unconditionally reset (set) for all characters when the attribute is enabled (disabled). Changing the attribute MODE (flashing, high/low, or inverse) does not enable or disable the individual character attribute; however, all characters on the screen which are using the current attribute will change with the mode.

As an example, set the attribute mode to low intensity. Send "ABCD", enable (individual character) attribute, then send "EFGH". You now see "ABCDEFGH", but only "EFGH" is displayed as low intensity. Now, set the attribute mode to flashing. Once again, "EFGH" will change (now flashing instead of low intensity), since the individual character attributes have not changed.

SIOST: Returns status of SIO-B input port.

SIOIN: Fetches character from SIO-B input port.

SIOOUT: Sends character to SIO-B output port.

SELECT: (1.x) Selects drive from 0 to 1 for 8-inch and from 0 to 3 for 5.25-inch. (2.x) Selects drive from 0 to 3. Both versions assume drives 2 and 3 are the other side of drives 0 and 1. (4.x) Does its select via physical driver (see below), but disk should be single density. This and the three following vectors were provided to maintain compatibility with the 820-I. You can boot and run any old (single density) 820-I disk on an 820-II system.

HOME: (1.x/2.x) Restores drive to track 0. (4.x) Merely sets the track to 0 for next disk operation—no disk access.

SEEK: (1.x/2.x) Seeks the desired track. (4.x) Just sets track for next disk operation—no disk access.

READ: Reads the specified sector into memory. If you have a double density (-II) disk loaded or logged-in under 820-I CP/M, reading 256 bytes instead of 128 will crash your system.

WRITE: Writes sector to disk.

PHYSDR: The heart of all disk I/O on the 820-II. Register pair HL points to a 9-byte block of memory as shown in Figure 3.

The SELECT command is used to determine the type of media (sides and density) and the monitor sets the physical drive number. (The utility WHATSA-.COM displays the current logical to physical drive mapping table.) The 820-II BIOS uses this vector for all disk operations.

SETCUR: Sets the CRT RAM address passed in registers HL for use in successive calls to the routine below. Normally, CRTFST is called with C = 0 to get the current CRT RAM address, which is then passed to SETCUR.

DSPCUR: Display character direct. This is a super-fast way to put characters onto the screen on the same line ONLY (the CRT RAM pointer is advanced automatically). This does not affect the normal cursor. Since no check is made for control characters, scroll, etc., strange things will happen beyond column 79. Also, the current attribute enabled/disabled status has no effect.

BLKMOV: Moves a block of memory to/from the CRT/ROM bank from/to RAM. Source address is in HL, destination in DE, and size in BC. Register A determines the type of move: A = 00H means transfer is completely within CRT/ROM bank. If A is less than 80H, the transfers are from CRT/ROM to RAM, and if A is greater than 7FH, the transfers are from RAM to CRT/ROM. Note that there are no restrictions on the total size moved; the monitor transfers in

blocks of up to 80 bytes until the entire process is completed. There is no provision for transfering memory solely within the RAM bank.

GETMAP: This vector returns the address of the logical to physical disk map table. The convention whereby 4.x returns the value for GETMAP, TIMDAT, and CNFGST depends on the value in H upon entry. If H is non-zero, the result is stored at the location pointed to by HL (16-bit value)—indirect storage. If H is zero, this indirect store is not made. In either case, the address of the disk map table is returned in HL.

Map Table

The disk map table consists of two parts: logical/physical map and physical driver address table. These are arranged in Figure 4 (assume HL contains address from call to GETMAP).

By convention, physical driver 0 returns an error. Physical driver 1 is the floppy (or hard disk interface), and drivers 2 through 7 are free. It is possible to write your own drivers and modify this table; you could, for example, install a RAM disk without having to modify the BIOS. Remember though, you have to fully support the physical driver concept.

TIMDAT: Using the same convention for HL as GETMAP, TIMDAT returns the address of the time of day location. Besides directly supporting a real-time clock, floppy drive step rate is accessible. INBUF is quite useful: whenever a line is inserted, deleted, or the screen scrolls, the "lost" line is moved into INBUF. It is possible to write a fairly sophisticated full-screen editor for the 820-II just using ROM calls. The monitor locations referenced to the value of TIMDAT are listed in Figure 5.

CNFGST: Returns configuration status in HL using the convention described in GETMAP. Only three bits were supported in 4.01 as defined in Figure 6.

SOUTST: Returns status of SIO-B output port: if busy, returns 00H; otherwise 0FFH is returned.

CONFIG: Get/set configurable data. This vector is used by the BIOS to set the

(continued next page)

Figure 1 - Entry Points

How to Read

'Locn' is address in hex. 'Entry' shows registers and their values. 'Exit' shows useful data contained in registers upon return. 'Registers' shows all registers altered: '8080' = AF,BC,DE,HL and 'all' is every register on the Z80.

Locn	Command	Name	Values/Description
	----- ALL ROM VERSIONS -----		
F000	JP COLD	Cold boot	Entry: none Registers: all Exit: none
F003	JP WARM	Warm boot	Entry: none Registers: all Exit: none
F006	JP KBDST	Keyboard status	Entry: none Registers: AF Exit: A = status
F009	JP KBDIN	Keyboard input	Entry: none Registers: AF Exit: A = keyboard char
F00C	JP CRTOUT	Video out	Entry: A = video char Exit: depends Registers: AF
F00F	JP CRTFST	Video fast output	Entry: A = video char Exit: see desc. Registers: 8080
F012	JP SIOST	SIO-B input status	Entry: none Registers: AF Exit: A = input status
F015	JP SIOIN	SIO-B input	Entry: none Registers: AF Exit: SIO-B char
F018	JP SIOOUT	SIO-B output	Entry: A = output char Exit: none Registers: AF
F01B	JP SELECT	Select drive	Entry: C = drive code Exit: A = status Registers: 8080
F01E	JP HOME	Home disk	Entry: none Registers: AF,C Exit: none
F021	JP SEEK	Seek track	Entry: C = track Exit: none Registers: AF
F024	JP READ	Read sector	Entry: C = sector, HL = address Exit: A = status Registers: 8080
F027	JP WRITE	Write sector	Entry: C = sector, HL = address Exit: A = status Registers: 8080
	----- 4.x ROMS only -----		
F02A	JP PHYSDR	Execute	Entry: HL = driver block Exit: A = status Registers: 8080
F02D	JP SETCUR	Set direct cursor	Entry: HL = cursor address Exit: none Registers: none
F030	JP DSPCUR	Display direct	Entry: C = char Exit: none Registers: AF,C,HL
F033	JP BLKMOV	Block move	Entry: HL=source, DE=dest, BC=size A = type of move Exit: none Registers: 8080
F036	JP GETMAP	Disk map table	Entry: none Registers: HL,DE Exit: HL = address
F039	JP TIMDAT	Time/date address	Entry: none Registers: HL,DE Exit: HL = address of DAY
F03C	JP CNFGST	Config. status	Entry: none Registers: AF,HL,DE Exit: HL = configuration status
F03F	JP SOUTST	SIO-B out status	Entry: none Registers: AF Exit: A = output status
F042	JP CONFIG	Config. monitor	Entry: HL = addr of config byte Exit: A = old val Registers: 8080
F045	JP SCRPRT	Screen print	Entry: none Registers: AF Exit: none
F048	JP DUMMY	User 1 routine	Entry: <From 1 second interrupt> Exit: none Registers: AF,HL

initial attribute mode, printer masks, etc. and by the CONFIGUR program to temporarily set values. Upon entry, HL points to the configuration byte which ranges from 00H to 05H or 80H to 85H; any other values are ignored. Important values which can be changed in the monitor by this vector are listed in Figure 7.

The previous value of the byte changed is returned in register A.

To get the current configuration status into register A, the high bit of (HL) is reset (80H through 85H become 00H through 05H).

SCRPRT: Starts a screen print. It works only through the SIO-B printer port and has some other problems discussed below. The millisecond interrupt (CTC1) is activated during screen dump.

DUMMY: User-accessible 1 second interrupt. Normally set as a jump to a "dummy" routine (just a RETurn instruction), this routine is called once per second. By putting your own jump vector here, any desired routine could be executed once per second. However, there are some restrictions: only registers HL and AF can be changed (there is a 5 level stack provided); the SP cannot be changed; you cannot use DI/EI instructions; you must terminate with a RETurn instruction. Probably most important, keep the routine short and sweet. I have seen a -II lock up when a user-supplied routine was too long.

Figure 2 - Control Sequences

Hex Code	Machine	Function
05	-II	Set cursor character to next character sent.
06	-II	Restore previous attribute mode.
07	-I/-II	Ding! (1.x/2.x) Toggle bit 5 of PIO [U105 pin 9] momentarily high -- you have to add your own buzzer. (4.x) Strobes the internal piezo to produce the beep.
08	-I/-II	Backspace or cursor left (does not erase character).
09	-I/-II	Horizontal tab (8 columns each).
0A	-I/-II	Line feed or cursor down.
0B	-I/-II	Cursor up.
0C	-I/-II	Cursor right.
0D	-I/-II	Carriage return.
11	-I/-II	Clear to end of screen.
18	-I/-II	Clear to end of line.
1A	-I/-II	Clear screen and home cursor.
1B	-I/-II	Activate escape sequence.
1E	-I/-II	Home cursor.
1F	-I/-II	Display next character sent.

Escape Sequences: (ESCape character followed by):

Hex Code	ASCII Char	Machine	Function
28	(	-II	Disable attribute display.
29	)	-II	Enable attribute display.
2A	*	-II	Clear screen.
30	0	-II	Pass 7-bit keyboard data.
31	1	-II	Pass 8-bit keyboard data.
34	4	-II	Set blink attribute mode.
35	5	-II	Set graphics attribute mode.
36	6	-II	Set blink attribute mode.
37	7	-II	Set inverse video attribute mode.
38	8	-II	Set low intensity attribute mode.
3D	=	-I/-II	Set XY cursor position leadin (4 characters total). Whole sequence is: ESCape, =, Y, X where Y = row (0-23 dec.) + 20 hex and X = column (0-79 dec.) + 20 hex. Upper left of screen (home) is X = 0, Y = 0
45	E	-II	Line insert. Moves screen below cursor one line down and leaves cursor at present position (on the blank line).
51	Q	-II	Character insert. Moves remainder of line one character right, inserting blank and leaving cursor over blank.
52	R	-II	Line delete. Deletes line cursor is on, moving remainder of screen up to fill it. Blank line is left at bottom of screen.
54	T	-II	Clear to end of line.
57	W	-II	Character delete. Deletes character cursor is on, shifting remainder of line left to fill space. Blank is put at end of line.
58	Y	-II	Clear to end of screen.

Some Comments

Overall, the 820-II monitor has many features which are nice. However, in my opinion, there are also some major flaws:

1. Xerox (Balcones) can support nearly any printer available to mankind through configuration packages. Why then does the screen dump feature only work through the serial port (SIO-B) regardless of which printer is installed?!?

2. The screen dump routine in the 4.x is unlike the Bigboard stuff because it only interrupts the system every few milliseconds to print a character. This leaves lots of free processor time. Maybe some work could be done in between characters? Yes, but only if no screen change occurs during the dump (read the fine print in the documentation). Well friends, the only reason I can think of for doing a screen dump is because the screen is going to change shortly. So, we have to wait for the full screen dump, despite this "improvement."

3. In this age of double sided/double density technology, I am happy to see that Xerox supports both as long as they are in Xerox format. Double density is restricted to 256 bytes per sector (never mind that the world is working with 512 and 1024 byte sectors). What really hurts is that all the hardware is there—only the software is missing.

4. Double sided is another problem: on a two-sided disk, increased disk I/O speed can be obtained by treating side 0 of the drive as odd tracks and side 1 as even tracks. This is because the most common access is sequential and it is much faster to change sides on a drive

Figure 3 - HL Points

```
HL + 00:  command byte (00H=write, 01H=read, 0FFH=select)
     01:  physical drive set by monitor (LEAVE ALONE)
     02:  logical drive for request
     03:  track number for request (16-bit word)
     05:  sector number for request (16-bit word)
     07:  address of I/O buffer (16-bit word)
```

Figure 4 - Map Table

```
HL + 00H: physical driver for logical disk 0 decimal
     01H: physical disk for logical disk 0 decimal
     02H: physical driver for logical disk 1 decimal
     03H: physical disk for logical disk 1 decimal
     ..H: ..............................
     1FH: physical disk for logical disk 15 decimal

     20H: physical driver 0 address (16-bit word)
     22H: physical driver 1 address (16-bit word)
     ..H: ....................................
     2EH: physical driver 7 address (16-bit word)
```

Figure 5 - Monitor Locations

```
HL - 08H:  16-bit millisecond counter (used only during
               screen dump in 4.01/4.04)
   - 06H:  unused 16-bit value
   - 04H:  ticker increments 16-bit value once per second
   - 02H:  WD1797 step rate (not used for hard disk)
   - 01H:  disk motor timeout in seconds
   + 00H:  day (01-31 decimal)
   + 01H:  month (01-12 decimal)
   + 02H:  year (00-99 decimal)
   + 03H:  hour (00-23 decimal)
   + 04H:  minute (00-59 decimal)
   + 05H:  second (00-59 decimal)
   + 06H-55H: 80-byte INBUF storage
```

Figure 6 - GETMAP Status as Returned in HL

```
        H = 00000001 binary     L = kdf00000 binary
  where
        k is 1 if keyboard is in 8-bit mode, 0 otherwise
        d is 1 if rigid disk is present, 0 otherwise
        f is 1 if 5.25 floppies present, 0 otherwise
```

Figure 7 - Using Vector to Change Values

Contents of (HL)	(HL+1)	Function
80H	AND mask	SIO-B output status AND mask (default: 4)
81H	XOR mask	SIO-B output status XOR mask (default: 4)
82H	PROTOCol	Printer (SIO-B) protocol: PROTOC should be 0 for XON/XOFF and 0C9H otherwise
83H	Step Rate	WD1797 step rate (value 0 through 3)
84H	????	<unknown>
85H	????	<unknown>

than to change tracks. Instead, Xerox chose to treat the disk as continuous—side 0 connected to side 1. You will understand the stupidity of this if you ever have a file that starts near the end of side 0 (track 76) and ends on side 1 (track 2). CP/M thinks it is continuous, but tell your overworked stepper motor that!

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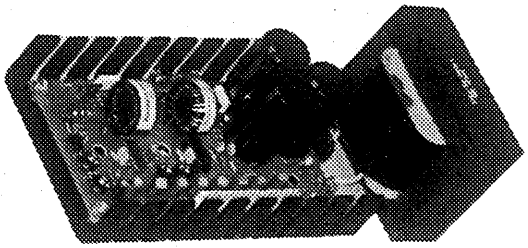

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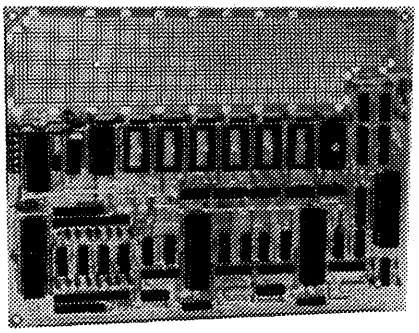

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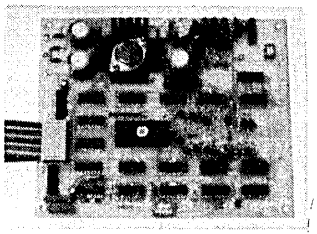

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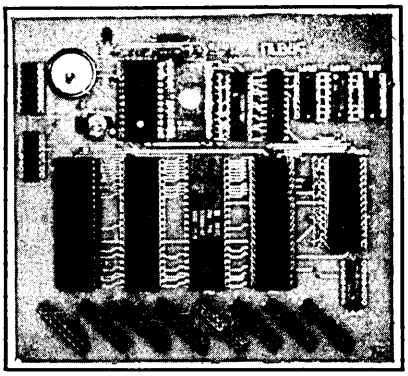

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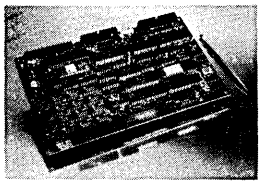

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ADS

C'ing Clearly

By Tony Ozrelic

Micro C Staff

Just as I get my Issue 23 column finished, Dave walks in and says, "Is your column finished?" "Yes," I reply, with a smile on my face, "and only two weeks late this time!" "Wonderful," says Dave. "Maybe one of these times you could write a typewriter program like this one in FORTH so folks could compare the two languages."

He hands me the proofs of Arne Henden's FORTH column, wherein Arne displays all the power and cunning of that language by putting together up a smart typewriter program in eight screens of code. "HA!" I say. "I could do better in C!"

"Too bad you already wrote your column," says Dave.

"Well now, wait a minute," I say. "This might not be too hard to code. I think I might be able to get a program together quickly enough for this issue."

"Sure!" says Dave, chuckling as he walks off.

What Have I Gotten Myself Into?

After a few brief moments, I came up with Figure 1.

Needless to say, it lacks all the bells and whistles. This model just takes a line of text from the console and sends it to the printer. If you enter a control-C, it will exit to CP/M. Also, needless to say, Dave would not pronounce his blessing upon my column. Too simple.

TYPIT Version 2.0

So, I went back and snuck a peek at Arne's column, looking for whatever bells and whistles he had in his version so I could build a bigger and better version of TYPIT. I also added some of my own bells, such as tab stops, boldface, underlining, and Wordstar-ish commands. (I don't use WS, but Chris, the Official Word Processor and Receptionist, uses it, and she would love this program since WS isn't too handy for addressing envelopes.)

Figure 2 shows the fruits of my labor. In all, it was a fun project (albeit rushed) and truly useful.

The Gory Details

Here's what I did: I took the basic program shown above and included a menu of the commands that I would like TYPIT to have. Then I wrote code for those commands, one at a time, debugging as I went. Getline() is the major module in this program. It takes input from the user and, according to a switch/case statement, either interprets the character as a command or puts it in the queue for the printer.

You shouldn't have much trouble reading the source since most of the routines simply reset the cursor, or toggle a flag.

Once we get a carriage return from the operator it's time to print the line. At this point we create two strings: one contains the printing characters, the other is a mirror string which contains only the underlines (but only if the underline flag is on). The character line is printed first, and then we return the printer head and print the underlines.

To produce boldface, we just print the line again without a linefeed, so the text is double-struck. If both boldface and underline flags are turned on, both the text and the underline characters are double-struck. On most printers, this process is simpler and less time-consuming than backing up the printhead and underlining or double-striking letters one by one.

Now What?

Now that you have the program, you can set up the commands to match your favorite editor. Have fun!

Editor's note: I also suggested to John Jones that he write this program in Turbo Pascal and include it in his next column. That way you'll get to see a third variation on the theme. Then, if one or more of you wanted to use one of these as a base for writing a text editor, who's to stop you? You could start it as a line editor and then make it full-screen. And the project would generate a really neat series of articles (as well as a great forum at the SOG).

■ ■ ■

Figure 1 - TYPIT Version 1.0

```
/*      typit - a computer-powered typewriter                   */

#include        "qstdio.h"

#define MAXLINE 80      /* max length of line to be typed */

main()
        {
        char s[MAXLINE];
        FILE *pfile;

        /*
                access printer
        */

        pfile=fopen("lst:","w");

        /*
                now an endless loop to get a line from the user
                and send it to the printer
        */

        puts("TYPIT v1.0 - hit ^C to exit to CP/M");

        while(1) {
                gets(s);
                fputs(s,pfile);
                }
        }
```

Figure 2 - TYPIT Version 2.0

```
/*      typit - a computer-powered typewriter                   */
/*
        Written by Tony Ozrelic. (c)1984 L.A. Software.
        All rights reserved.
        Sale of source or compiled code prohibited.

        TYPIT version 2.0. A utility to turn your computer into a typewriter.

        Compiled with the Q/C compiler.
*/

#include        "qstdio.h"

#define MAXLINE 80              /* length of one line */
#define TYPELINE 12             /* line the user types on */
#define PRINTLINE 20            /* where we show user the previous line */

/*
        various ASCII characters
*/

#define BELL    7
#define ESC     27
#define BEOL    24
#define CLRHOME 26
#define DEL     127

/*
        commands to move the cursor around
*/
```

(listing continued)

FIGURE 2 (Listing continued)

```
#define LWORD   'A'-64
#define LCHAR   'S'-64
#define RCHAR   'D'-64
#define RWORD   'F'-64
/*
        delete/insert
*/

#define DELCHAR 'G'-64
#define DELINE  'Y'-64
#define INSERT  'V'-64
/*
        formatting commands
*/

#define MARGREL 'X'-64          /* margin release, set right, left margins */
#define LMARGIN 'L'-64
#define RMARGIN 'R'-64
#define TABREL  'N'-64          /* tab release, set/clear tabs */
#define SETTAB  'T'-64

#define BOLD    'B'-64          /* boldface, underline */
#define UNDLINE 'U'-64

#define QUIT    'Q'-64          /* quit to CP/M */

/*
        constants to set some of our flags
*/

#define YES     1
#define NO      0

/*
        some global variables
*/

int isinsert=YES;               /* insert on? */
int isbold=NO;                  /* no boldface */
int isunder=NO;                 /* no underline */
char state[2][4]={"OFF","ON "}; /* which state is the flag in? */
int lmargin=9;                  /* left margin starts here */
int rmargin=69;                 /* and right margin here */

/*
        our tab stop map
*/

char tstops[MAXLINE+1];

main()
        {
        char s[2*MAXLINE];
        FILE *pfile;

        /*
                clear screen, set up default tab stops & margins,
                access printer
        */

        putchar(CLRHOME);
        setstops();
        pfile=fopen("lst:","w");

        /*
                show menu, get a line, and print it
        */

        showmenu();
        while(getline(s)) printline(s,pfile);
        fclose(pfile);
        }

/*      setstops - set tab stops at every 8th character                 */

setstops()
        {
        int i;

        for(i=0;i<MAXLINE;i++) {
                if(i&7) tstops[i]=' ';
                else tstops[i]='^';
                }
        tstops[i]='\0';
        /*
                set margins too
        */
        tstops[lmargin]='L';
        tstops[rmargin]='R';
        }

/*      showmenu - show user what commands we can take                  */

showmenu()
        {
        char c;
        int i,j;

        /*
                start at top of screen and show horizontal menu
        */
    moveto(0,0);
    printf("TYPIT v2.0 commands - type ^%c to return to CP/M\n\n",QUIT+64);

    printf("Cursor Moves:\t");

    printf("^%c left word\t",LWORD+64);
    printf("^%c left char\t",LCHAR+64);
    printf("^%c right char\t",RWORD+64);
    printf("^%c right word",RCHAR+64);
    putchar('\n');putchar('\n');

    printf("Insert/Delete\t");

    printf("^%c insert %s\t",INSERT+64,state[isinsert]);
    printf("^%c delete char\t",DELCHAR+64);
    printf("^%c delete line",DELINE+64);
    putchar('\n');putchar('\n');

    printf("Formatting\t");

    printf("^%c mar. rel.\t",MARGREL+64);
    printf("^%c left mar.\t",LMARGIN+64);
    printf("^%c right mar.",RMARGIN+64);
    putchar('\n');putchar('\n');
    putchar('\t');putchar('\t');

    printf("^%c tab rel.\t",TABREL+64);
    printf("^%c tab set/clr\t",SETTAB+64);
    printf("^%c bold %s\t",BOLD+64,state[isbold]);
    printf("^%c under %s",UNDLINE+64,state[isunder]);
    putchar('\n');putchar('\n');
        show alignment ruler
    */
    for(i=1;i<=MAXLINE;i++) {
        if(i%5) putchar('-');
        else putchar('|');
        }
    /*
        show tab stops and margins
    */
    for(i=0;i<MAXLINE;i++) putchar(tstops[i]);
    putchar('\n');
    }
/*      getline - get text to type or do a command                      */

getline(s)
char *s;
    {
    char c,*p;
    int i,j;

    /*
        start with a blank line
    */
    for(i=0;i<MAXLINE;i++) s[i]=' ';
    s[i]='\0';
    /*
        begin by showing line
    */
    i=lmargin;
    goto StartLoop;
    /*
        get chars from keyboard till we get a carriage return
    */
    while(1) {

        /*
            call CP/M's bdos to get a character. If none available,
            it returns a 0
        */
        switch(c=bdos(6,0xff)) {

            case '\0':          /* no char yet */
                continue;
            case QUIT:          /* go back to CP/M */
                return NO;
                break;
            case LWORD:         /* go left one word */
                if(isalpha(s[i])) {
                    while(i>lmargin && isalpha(s[i])) i--;
                    while(i>lmargin && !isalpha(s[i])) i--;
                    while(i>lmargin && isalpha(s[i])) i--;
                    }
                else {
                    while(i>lmargin && !isalpha(s[i])) i--;
                    while(i>lmargin && isalpha(s[i])) i--;
                    }
                i++;
                break;
            case LCHAR:         /* left a character */
            case '\b':
                if(i>lmargin) i--;
                break;
            case RCHAR:         /* right 1 char */
                if(i<rmargin) i++;
```

(listing continued)

```
        break;
case RWORD:             /* right 1 word */
        if(isalpha(s[i])) {
                while(i<rmargin && isalpha(s[i])) i++;
                while(i<rmargin && !isalpha(s[i])) i++;
                }
        else {
                while(i<rmargin && !isalpha(s[i])) i++;
                }
        break;
case INSERT:            /* toggle insert mode */
        isinsert=!isinsert;
        showmenu();
        break;
case DEL:               /* del char to left of cur */
        if(i>lmargin) i--;
        for(j=i;j<MAXLINE;j++) s[j]=s[j+1];
        break;
case DELCHAR:           /* del char on cursor */
        for(j=i;j<MAXLINE;j++) s[j]=s[j+1];
        break;
case DELINE:            /* del line */
        for(i=0;i<MAXLINE;i++) s[i]=' ';
        i=lmargin;
        break;
case MARGREL:           /* release margins */
        lmargin=0;
        rmargin=MAXLINE-1;
        p=index(tstops,'L');
        *p=' ';
        p=index(tstops,'R');
        *p=' ';
        tstops[lmargin]='L';
        tstops[rmargin]='R';
        showmenu();
        break;
case LMARGIN:           /* change left margin */
        lmargin=i;
        p=index(tstops,'L');
        *p=' ';
        tstops[lmargin]='L';
        showmenu();
        break;
case RMARGIN:           /* change right margin */
        rmargin=i;
        p=index(tstops,'R');
        *p=' ';
        tstops[rmargin]='R';
        showmenu();
        break;
case TABREL:            /* clear tabs */
        while(p=index(tstops,'^')) *p=' ';
        showmenu();
        break;
case SETTAB:            /* set tabs */
        if(i>rmargin) break;
        if(tstops[i]==' ') tstops[i]='^';
        else if(tstops[i]=='^') tstops[i]=' ';
        showmenu();
        break;
case BOLD:              /* print boldface text */
        isbold=!isbold;
        showmenu();
        break;
case UNDLINE:           /* or underline */
        isunder=!isunder;
        showmenu();
        break;
case '\t':              /* skip to next tabstop */
        if(!index(tstops,'^')) break;
        if(tstops[i]==' ' && i<=rmargin) {
                for(j=rmargin;j>=i;j--) s[j+1]=s[j];
                s[i++]=' ';
                }
        while(tstops[i]!='^') {
                for(j=rmargin;j>=i;j--) s[j+1]=s[j];
                s[i++]=' ';
                }
        break;
case '\r':              /* all done - print line */
        return YES;
        break;
default:                /* regular char-stick in line*/
        if(isinsert) {
                for(j=rmargin;j>=i;j--) s[j+1]=s[j];
                }
```


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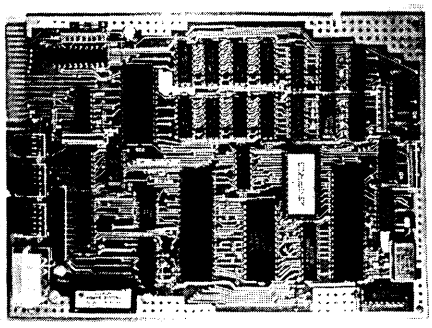

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```
                        s[i]=c;
                        if(i<rmargin) i++;
                        break;
                }
        /*
                show line and return cursor to proper spot on line
        */
StartLoop:
        moveto(TYPELINE,0);
        showline(s);
        moveto(TYPELINE,i);
        /*
                ring bell if we've gone too far
        */
        if(i==rmargin || i==rmargin-8) putchar(BELL);
        }
}

/*      printline - print the line out on the printer           */

printline(s,f)
char *s;
FILE *f;
        {
        char c,ps[MAXLINE],us[MAXLINE];
        int i;

        /*
                show old line for reference
        */
        moveto(PRINTLINE,0);puts("Previous Line:");
        showline(s);
        /*
                copy string into ps, keeping track of letters to be
                underlined in us (assuming the underline option is on)
        */
        for(i=0;i<=rmargin;i++) {
                c=s[i];
                ps[i]=c;
                us[i]=' ';
                if(isunder && isalpha(c)) us[i]='_';
                }
        ps[i]='\0';us[i]='\0';

/*
        now print the line according to the options
*/

        if(isunder && isbold) fprintf(f,"%s\r%s\r%s\r%s\n",ps,us,ps,us);
        else if(isunder) fprintf(f,"%s\r%s\n",ps,us);
        else if(isbold) fprintf(f,"%s\r%s\n",ps,ps);
        else fprintf(f,"%s\n",ps);
        }

/*      showline - show updated line to user                    */

showline(s)
char *s;
        {
        int i;

        for(i=0;i<=rmargin;i++) putchar(s[i]);
        for(;i<MAXLINE;i++) putchar(' ');
        }

/*      moveto - move cursor to location on screen */

moveto(r,c)
int r,c;
        {
        printf("%c=%c%c",ESC,r+32,c+32);
        }
```

End of Listing

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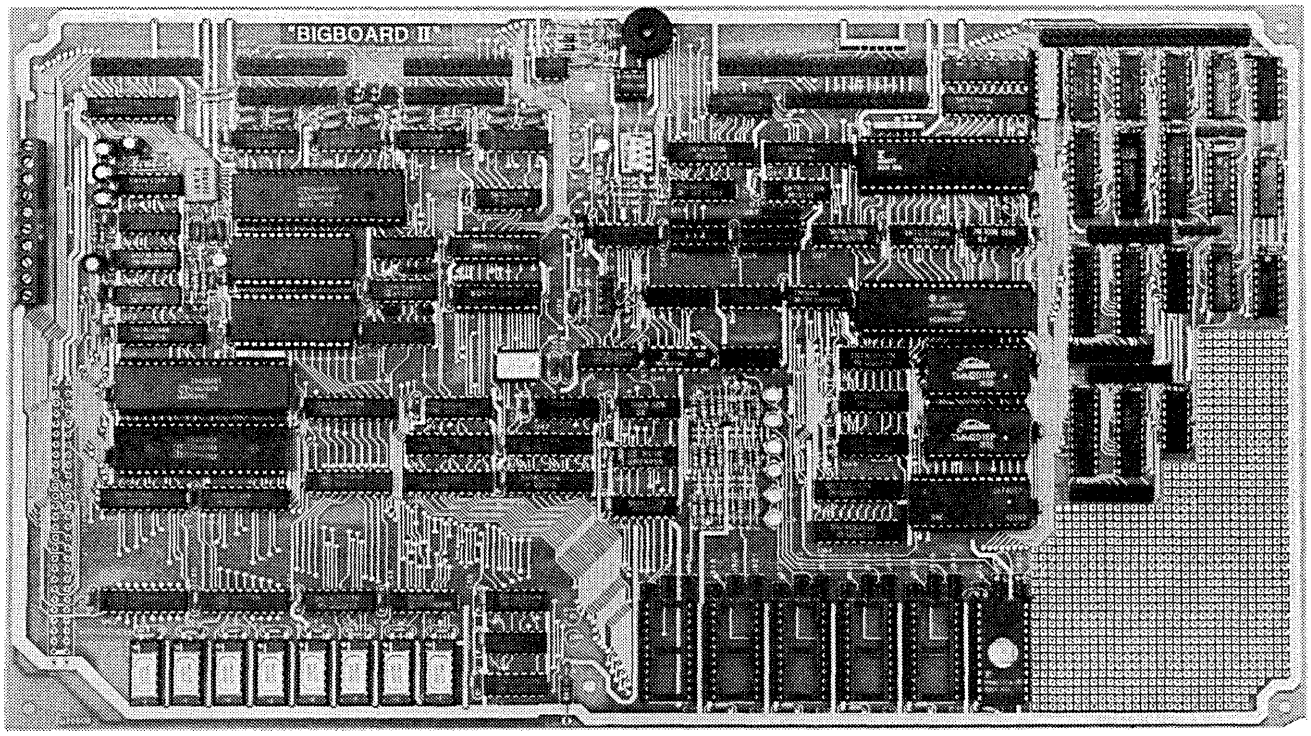

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Jim Ferguson, the designer of the "Big Board" distributed by Digital Research Computers, has produced a stunning new computer that Cal-Tex Computers has been shipping for a year. Called "Big Board II", it has the following features:

■ 4 MHz Z80-A CPU and Peripheral Chips

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

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

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

■ Multiple-Density Controller for SS/DS Floppy Disks

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

■ Vastly Improved CRT Display

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

■ STD Bus

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

■ DMA

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

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■ 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 2.2**

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The Slicer Column

By Laine Stump

Micro C Staff

I have just finished one of the most time consuming semesters of my entire isolation from the real world. I haven't done laundry in three weeks (I have been wearing my sweat pants for the last five days) and haven't slept normal hours in over a month. Most of you have already been through that silly "get an education" stage of your life. I will be through (one way or another) before long.

This month, aside from airing my pent-up frustrations with equipment that doesn't work, I will give you a good start on a method of using the Slicer's SASI port as a parallel printer port (or a parallel anything port, for that matter). I also have a few notes on CCP/M and the PC board.

PC Or Not PC

Most of us have been waiting for this for quite some time now. It is finally here. For those who still don't know what it is, the PC board is a board that plugs into the Slicer, giving it PC compatible video, PC ROM calls, and PC expansion slots. This makes the Slicer almost completely IBM compatible, only much faster.

Dean (the board's poppa) said demand for the PC board is incredible. It will be sold in many configurations: "not-so-bare" kit, easy kit, full kit, and assembled and tested. Buying the not-so-bare kit allows you to plug in IBM expansion cards without spending the extra money for the video section of the board. While it is possible to use a standard IBM video card with the PC board, its built-in video memory runs at a full 8Mhz instead of the horrid 4.77Mhz that you would have to suffer through otherwise. Screen output is much faster because of this, so if you are a speed freak you probably should give in and buy the whole thing.

Check out the Slicer ad in this issue for details and pricing.

CCP/M

By now, you are probably thinking that there is no Concurrent CP/M for the Slicer, that it is just a figment of my overworked, half-crazed imagination. I admit I am overworked and half-crazed and I have one heck of an imagination, but CCP/M really does exist.

It hasn't been released, however (as of Dec. 8). The software is done now, but the manuals have to be completed and the legalities of licensing need to be taken care of (a real nightmare, I hear).

I have had an evaluation copy of CCP/M for a while now, and it really is incredible. Even at 9600 baud, it updates the windows in a reasonable amount of time. I have found only two problems with it: 256k simply is not enough room to get anything done, and an 80 by 24 screen is just too small for more than two or three good sized windows.

The memory problem is easily solved by getting an Expansion Board. With 256k I couldn't even run PIP and Turbo Pascal at the same time, but 512k should be enough to run at least four hefty jobs at once. Having the Expansion Board will also give you more ports for all those extra terminals you've been wanting to hook up.

Wyse Up

The other day, I found what may be a great solution to my screen size problem. I have been reading about the Wyse-50 terminal for more than a year, itching to get my hands on one all the while. I finally got my chance when I met another student at the university who has one.

It didn't take much persuading to get my Slicer into his house and connected to his terminal, and what I saw was phenomenal. Most terminals that advertise 19.2k baud will barely make it at 9600. The Wyse-50 will run at 38.4k baud (!!) and never drop a character. It also has a large, 15 inch screen and a 132 column mode that should make it ideal for windowing applications. The best thing about the Wyse-50 is the price: $500, if you shop around.

Unfortunately, my pre-release copy of CCP/M does not have the section of the SU (SetUp) program that allows setting of obscure cursor control commands, so I didn't get to try CCP/M with the Wyse in 132 column mode. The necessary selections have since been added to the SU program and, although it hasn't been tested yet, there should be no problems with using the Wyse-50 in 132 column mode.

A SASI Printer (Or "How To")

I mentioned in the last issue that I would have some ideas about adding extra ports to the Slicer. However, the most feasible idea I found does not involve adding a port, but rather taking advantage of a port that, in a lot of systems, is unused.

Unless you have a winchester drive, the SASI port sits unused at one end of the Slicer. The Slicer Manual mentions that the SASI port could be used for a printer, but no full explanation is given. My explanation is by no means complete either (I have not actually tried it myself), but it should give you enough information to have the thing working in a few hours.

The SASI is just like any other parallel port, except it has a few extra control signals that must behave in very specific manners. A parallel printer usually requires nothing more than a strobe line, a ready line, and eight data lines. These can all be easily derived from SASI signals.

During the following discussion, please refer to page 3 of the Slicer schematics, page "Connectors 2," and pages "Theory 5" and "Theory 7."

SASI Hardware

The data lines are already well defined, as is the ready line. The strobe can be manufactured using the /SEL signal and a software timing loop. We must also connect the SASI I/O input to some output on the Slicer so we can control whether the parallel port is an input or an output port (this function is usually controlled by the device at the other end). We will use the SASI /RST signal to control the function of the port. The /RST output will be wired back to the I/O input.

This gives us a pinout on the 50 pin SASI connector that looks something like what you see in Figure 1 (see "connectors 2" in Slicer manual):

This configuration may be a problem if your printer actually uses the Centronics /RESET signal. If this is the case, there are two alternatives. The first is to construct an RC circuit to slowly bring the /RESET line on the Centronics port from 0 to 5 volts at power up. The second alternative is to use the SASI /RST for the

centronics /RESET, use /SEL for setting I/O, and use the /ACK signal for the Centronics /STROBE.

The /ACK signal is automatically strobed whenever an OUT is done to port 180h, so no software timing loop is needed to turn the signal on and off. The strobe will probably be too short for most printers, though, so the number of wait states on the I/O lines will have to be reprogrammed (see page "Theory 5" of the Slicer manual).

SASI Software

You now need to write three routines to control this port you have created First, you need an initialization routine to set up the mode (I/O)—second, a routine to output a single character to the port—and third, a routine to check the status of the port. If you want to use the port for input, you'll need another routine, but that is left as an exercise for the reader. (It sure is fun to say that after three months of textbooks.)

Assuming you are not crazy and have decided not to use the /ACK line for the strobe signal, the following routines should do the trick.

The initialization is simple. All you must do is assert the SASI /RST line low, which pulls the I/O line low (output mode). The /RST signal is accessed at bit 0 of I/O address 102h (see Theory 7). This routine will be called during the BIOS's Cold Boot procedure. The routine in Figure 1 sets our parallel port to output mode.

Now we must have a routine to output a single character. To do this, we wait until the printer is ready, output the character to the SASI data port (184h), then toggle the strobe on and off with the /SEL line (bit 0 of port 100h). Our routine will replace the existing BLSTOUT (BIOS List Output) routine in SLIBIOS.A86. The character to output is assumed to be in register CL (see Figure 2).

You may have to alter the number of repetitions of the PAUSE loop, depending on your printer. Some of you may not need any pause at all.

The final routine needed is one to check the status of the parallel port (you will notice we used this routine in BLSTOUT). The ready/not-ready status of the port is indicated by the /BUSY status bit (bit 3) in the byte input from SASI+1 (185h). /BUSY is active low, so a 0 in this bit indicates the printer is busy. BLSTST (BIOS List Status) returns AL=0 and Z flag set if the printer is not ready, AL=1 and Z flag reset if printer is ready. See Figure 3.

That's all the software you need. Just

(continued on page 37)

Figure 1 - Setting the Parallel Port for Output

```
LSTINT: MOV     AL,0    ;bit 0 = 0 is output mode, 1 is input mode
        MOV     DX,102h
        OUT     DX,AL
        RET
```

Figure 2 - Output Character Routine

```
BLSTOUT:
        PUSH    DX
LST1:   CALL    BLSTST          ;wait until ready
        JZ      LST1            ;defined momentarily
        MOV     AL,CL           ;char into AL
        MOV     DX,184h
        OUT     DX,AL           ;output to SASI port
        MOV     DX,100h         ;/SEL used for strobe
        MOV     AL,0
        OUT     DX,AL           ;activate strobe
        CALL    PAUSE           ;wait a little
        MOV     AL,1
        OUT     DX,AL           ;deactivate strobe
        POP     DX
        RET

PAUSE:  MOV     AX,100          ;a short delay
PA1:    DEC     AX
        JNZ     PA1
        RET
```

Figure 3 - Port Status Check

```
BLSTST: PUSH    DX
        MOV     DX,185h
        IN      AL,DX           ;read SASI status
        AND     AL,1000B        ;mask out /BUSY
        JZ      LSTS1           ;not ready if /BUSY low
        MOV     AL,1
LSTS1:  RET
```

Figure 4 - Pin Functions (a slash '/' indicates signal is inverted)

```
pin #   SASI function   Our function
-----   -------------   ------------
  2     /data0          /data0 on centronics
  4     /data1          /data1 on centronics
  6     /data2          /data2 on centronics
  8     /data3          /data3 on centronics
 10     /data4          /data4 on centronics
 12     /data5          /data5 on centronics
 14     /data6          /data6 on centronics
 16     /data7          /data7 on centronics

 36     /BUSY           /BUSY  on centronics
 40     /RST            connect to I/O (pin 50) on SASI -->----
 44     /SEL            /STROBE on centronics                 !
                                                              v
 50     I/O             connect to /RST (pin 40) <-----<-------
```

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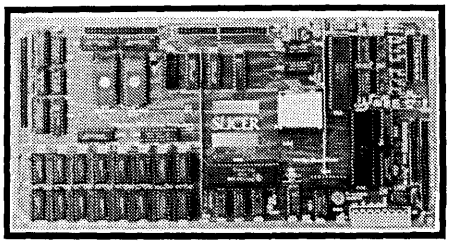

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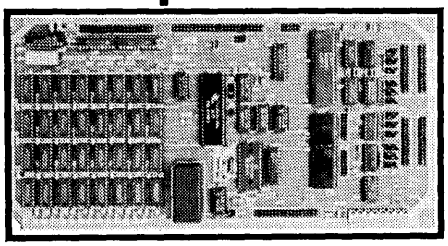

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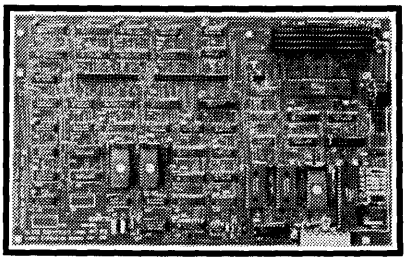

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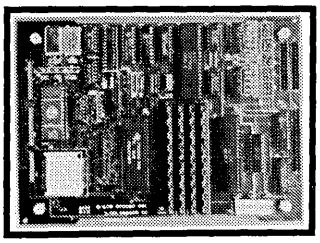

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incorporate the three preceding routines into SLIBIOS.A86, reassemble and merge with CPM.SYS. You'll need to build an adapter that follows the pinout diagram above, and plug in your printer. As I said though, I haven't actually done this; it's just an hypothesis (although a thoroughly researched one). If you find any problems with it, let me know.

The Case Of The Unwilling Wini

Last June I bought a surplus ST506 winchester drive for $100 (that's right—$100, but the supply ran out months ago). It was a forlorn hunk of metal without even a front panel. Figuring I had just lost $100, I let my "new" wini sit for a month under the workbench. But the optimist in me prevailed and when I finally hooked it up to the Slicer, IT WORKED! You ask yourself, "Why do you label it unwilling then?" My story has not yet ended. Don't interrupt.

The wini worked fine for the remainder of the summer, but when I left Bend to return to Montana for my last year of college, I had to leave behind the Xebec controller card I had been using. I ordered a new Western Digital 1002-SHD (or so I thought) controller card from a distributor in Portland.

The new controller arrived two days before I left Bend, leaving me just enough time to hook it up and discover that it didn't work. I called Slicer, gave them a description of the controller, and discovered the revision I had received was too old to use. It was serial #000272 with no rev. number at all. The controllers Slicer used for testing were about #073000 or so, and were all rev. Y0. It seems this distributor doesn't do a very high volume in Western Digital parts, and the card had been gathering dust on some back shelf for several months.

Back To The Phone (Again)

The distributor agreed to send a later revision of the controller card immediately, so I returned the original and left town pointed east.

A month and a half and several phone calls later, I received what was supposed to be a WD1002-SHD revision Y0. The packing even said that. I opened the box and found instead a WD1002-H8! This is the controller used in the Kaypro 10. It doesn't even have a 50 pin SASI connector, just a 40 pin generic parallel bus (with all the wrong pins in all the wrong places).

By this time, I was getting frustrated. I called the distributor and told them I was sending the controller back, and then ordered another card from a different source.

The Moral

I now finally have the correct controller, after three months and two false starts. Here is the moral of the story: If you cannot buy a controller card locally, order it from a reputable distributor that sells a high volume of Western Digital equipment. Also, be sure to specify the EXACT model and revision (WD1002-SHD, rev. Y0 or greater). Finally: don't move to a wilderness area (I live in Montana) if you want support.

Aftermath

The drive still doesn't work! The new controller was tested on a Slicer before it was shipped to me, though. I am now sure that something happened to the drive during its 1200 mile journey across the country. (A fourth moral: once your wini works, NEVER move it for ANYTHING!)

Turbo

Just so I can end on a positive note, I recently bought a copy of Turbo Toolbox for CP/M-86. I haven't done much with it besides running the sample database program included on the disk, but I can say just from reading the manual that it is an incredible deal. The Turbo Access portion of the package uses B-tree index files. Each data file can have as many index files as you like, and all index files, other than the primary index, can have duplicate records. I already have two or three projects in mind for it.

Next Time

There are still a few options available for adding I/O ports. I may have some ideas on a different approach. Also, expect a bit of in-depth information on the SC2681 UART chip, especially accessing it directly from Turbo Pascal (I have this idea for an incredible modem program written in Turbo so it could be compiled on MSDOS and CP/M without modification.) Until then, Happy Valentine's Day, and may the farce be with you.

■ ■ ■

OOPS ! - Correction to Slicer Column in issue #21

A line was inadvertently left out of the BIOS call example in issue 21. The corrected routine is given below:

```
        CSEG
SEEK:   MOV     DX, offset SEEKDESC     ;BIOS call descriptor
        MOV     CL,50                   ;CP/M BIOS call function
        INT     224                     ;call BDOS
        RET
```

The original routine did not load register CL with 50 to indicate the function desired of BDOS. Without this, the routine is virtually useless at best and could be wildly catastrophic if allowed to roam free.

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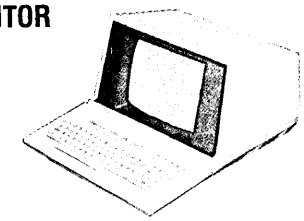

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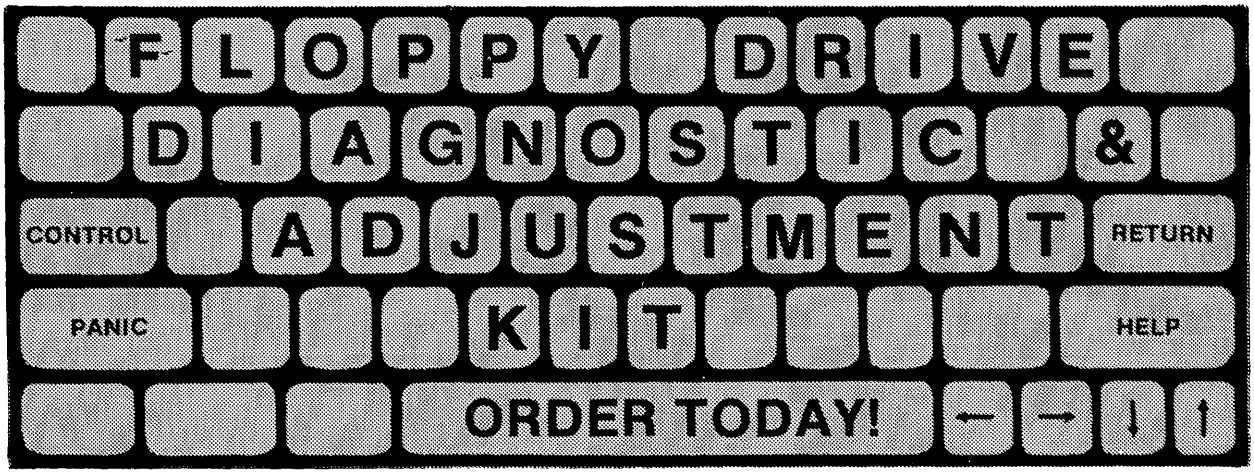

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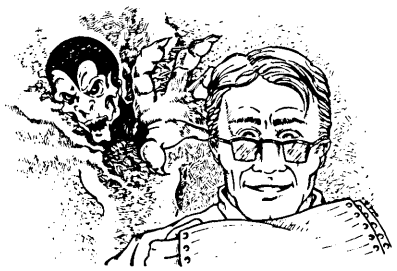

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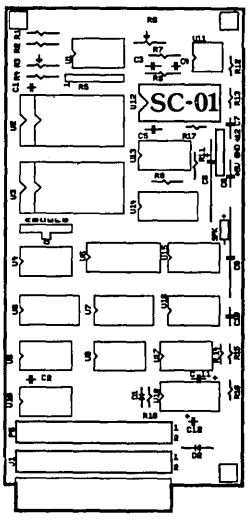

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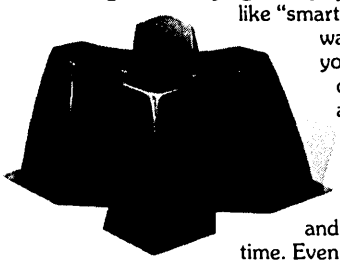

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The Kaypro Column

By David Thompson

Those of you who have asked for more product reviews in Micro C should look closely at the following. (Those of you who want beef should go to Wendy's.)

It just turned out that this column is a collection of all the bits and pieces that I thought you should know. Of course, the big thing is the K16 (no matter which side of the MSDOS vrs CP/M 80 fence you're on). As goes the K16 and the soon-to-be announced 8088 lap portable, so goes Kaypro. (At least it appears that way—see the economic section later in this column).

K16 Keyboard

The Kaypro 16, A Cursory Look

The Kaypro 16 is at once classic Kaypro and unclassic Kaypro. At first glance, it could be any of their other systems, but inside, it is definitely unique. Where the 2, 4, and 10 have lots of spare space the 16 is packed.

The main board on the original Kaypros has been replaced by a large motherboard which primarily holds the dynamic RAM and 4 IBM expansion sockets. There is room on the motherboard for 512K (with parity), and 256K is installed at the factory.

When you remove the top of the 16, the first thing you see is the underside of the motherboard. To fit everything into the stock cabinet, Kaypro turned the motherboard upside down so that the plug-in boards hang just inside the back of the cabinet. The power supply is now tucked between the winchester and the video monitor.

The Kaypro 16 comes with three boards. The first is the processor board with an 8088, an empty socket for an 8087 math chip, a clock (generates 4.77 MHz), and a bunch of address and data buffers.

The Monitor

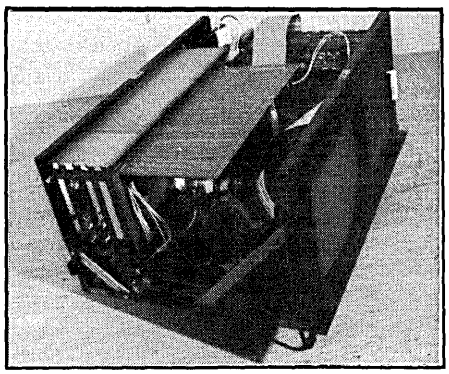
The monitor was written by an individual who had never seen the source of the IBM monitor. He was given a specification which he coded. Then they (an outfit named Phoenix) tested the ROM by running IBM specific programs. As the programs pointed out problems, they tightened up their specifications for the monitor. At this point, Kaypro is saying that the the 16 will run most IBM software, but as far as they know, there isn't anything that won't run.

Flight Simulator

Of the benchmark software there are two that everyone asks about. The first is 123 (because of its popularity) and the second is flight simulator. Why on earth would so many folks care about a pilot training program? Because it has become the standard test for IBM compatibility.

I'm told, for instance, that flight simulator knows that IBM's 4.77 MHz system clock is a precise multiple of the dot frequency on a color monitor. Using that fact, flight simulator knows precisely when to turn on and off the video to light the correct color dots on a color video screen even though the IBM (or Kaypro) thinks it is talking to a B&W monitor. Voila! Color on an IBM without buying a color card. Of course, the Kaypro comes with a color card but that doesn't keep flight simulator from doing it the hard way.

In fact, for this pseudo-color trick to work, the 4.77 MHz clock must be within 400 Hz, so Kaypro has added a small variable capacitor across the master crystal. They can simply tweak the clock until flight simulator generates color. If you are holding your breath for a fully compatible system that runs faster than the PC or XT, you're going to be waiting a long time. It's not compatible while it's running faster.



Naked Kaypro 16

Keyboard

The keyboard (Kayboard) is IBM, right down to the lousy return key. Sorry, but you asked for compatibility and you got compatibility, compatibility, compatibility, compatibility.

I/O Board

The second board plugged into the motherboard handles the disk control, serial, and parallel interfaces as well as providing space for another 128K of RAM (there are sockets for 640K total). The serial connector is a nine-pin db-9 and the parallel connector is a standard db-25, the type that is used for the serial interfaces on the Z80 Kaypros. (Confused? It appears that they chose these connectors in order to save space.)

Video Board

The video board is a real bonus. You get full color graphics with both composite and RGB (Red-Green-Blue) color output to an external monitor. The internal monitor displays the standard B&W graphics.

The board is capable of twice the resolution of the standard IBM but alas, they chose compatibility.

Anyway, IBM reserved memory space for both B&W and color graphics. Kay-

pro is using the color space for both. On the B&W monitor they display the color as 16 shades of grey.

There are 256 characters in the character ROM. The first 32 are described as the IBM "funny characters." From there through 127 is the standard ASCII set and from 128 to 255 the ROM contains a full European character set (accents etc.), some simple line graphics, and a Greek set.

The graphics board contains the character ROM, a whole scad of TTL, and a 6845 video controller.

Servicing

One of the real selling points of the original Kaypros (both to dealers and civilians) was ease of service. The processor board just stood right up there staring at you, and you could fire it up and probe and prod at will with no one even suspecting that you'd never done it before.

Well, with the K16, all that has changed. As it comes from the factory, you can't run the system unless it is installed in the cabinet (the cables are too short)—and when the boards are installed in the cabinet, you only have access to the underside of the memory/motherboard. Even if you could run the system with the motherboard turned right-side-up you'd find it next to impossible to get at the parts on the plug-in boards because they're enclosed in a cage.

This system is not going to get any points from repair folks. Plus, the mere installation of a plug-in board will send many users back to their dealer. It's not a particularly difficult project, but it's a lot more involved than it should be.

Heat

Kaypro has finally installed a quality fan in a system. In this case, it's absolutely necessary. All the heat from all the memory, LSI processors, and TTL is trapped in the little card cage and under the upside down memory board (heat rises, you know). They even added a baffle to direct the air where it is most needed and they are moving quite a lot of it. You definitely know it when the K16 is running.

I found the noise much more irritating than the sounds of the toy fans they put on the 4s and 10s but then I really believe that computers should be seen, not heard.

Cabinets And Systems

The culprit which caused all this servicing and heat trouble is the decision to put the K16 into the K10 cabinet. The word is that they won't change the cabinet for THIS model. I leave you to your own conclusions about what that statement really says, but several people within Kaypro (beginning with David Kay) have told me that the company has recently purchased several IBM ATs to look at and they are planning introduction of a lap portable (IBM with LCD display) sometime in the near future (possibly the first quarter of 1985). Somehow we'll get a new box, but not for this model.

Software

The K16 comes with the complete MicroPro package. The editor, the spreadsheet, the data filer, and some other odds and ends.

Product Conclusion

For $3295, this XT clone is a good $1000 cheaper than anything else on the market and it's portable. You only have one free plug-in slot but most of the accessories you'd want to add to an IBM are already installed on the Kaypro.

The easy access to the working parts (the fun stuff) is pretty much gone. I don't know how much effect that will have on most prospective customers but it's significant to me and it should be significant to dealers.

Heat probably won't be much of a problem if they stay with the high-velocity fans but the noise may force them to compromise on their cooling and then reliability could suffer. It's not a very comfortable tradeoff.

They haven't really begun advertising the product since they are just putting together a few (about 1,000 were backordered as of early December). They are gearing up to manufacture the boards themselves, but meanwhile they are buying them from the designer, Personal Computer Products Inc.

On-Board Dip Switches

There are a number of on-board dip switches which are, so far, undocumented. The following is not guaranteed to be perfectly accurate (I haven't had a chance to verify everything) but it should be close.

Processor Board SW1

1—8087 numeric processor, on = not installed.

2,3—Both on, no video board. 2 on, 3 off, 40X25 color video installed. 2 off, 3 on, 80X25 video installed. Both off, B&W video board.

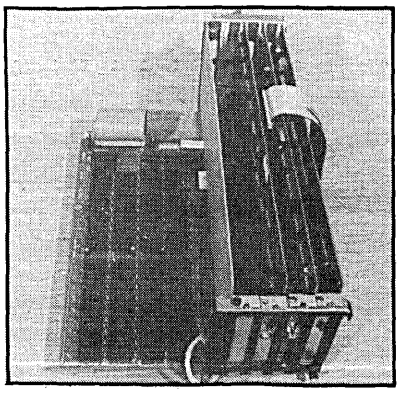
4,5—Both on, one floppy drive. 4 on, 5 off, two floppy drives. 4 off, 5 on, three floppy drives. Both off is four floppies.

Floppy Board SW1

The floppy board can contain up to 128K of dynamic RAM. This 128K in addition to the 512K on the motherboard total 640K, the maximum memory you can stuff into an IBM (and, of course, the K16) without overlapping the monitor. Thus, you are limited to adding two banks of 64K chips on this board.

You will need to add a 74LS409 (U28) and a 74LS280 (U54) to this board before you can add the RAM. The 409 handles address decoding and refresh, the 280 does the parity checking.

1,2,3,4—These first four bits control the start address of RAM on the floppy



K16 Motherboard and PC Cards

(continued next page)

board (in 10K increments). When all the switches are on, it means that the board starts at 0K. It comes set at off,on,on,on from the factory (80K).

5,6,7—These three bits tell the 74LS409 which type of RAM is plugged into the board. For 64K chips, set 5 on, 6 off, and 7 on.

8—This is the parity selection. When on, parity check is enabled and the system stops if there is an error.

Floppy Board SW2

This switch determines where the serial and parallel ports appear on the system.

1,2—Both off, serial port disabled. 1 on, 2 off, serial port is COM2. Both on means serial port is COM1. 1 off, 2 on, serial port disabled. (COM1 lies at 3F8 hex, COM2 lies at 2F8 hex.)

3,4—Both off, parallel port disabled. 4 on, 3 off, parallel port is addressed at 278 hex. 3 on, 4 off, parallel port is addressed at 378 hex. Both on, parallel port is addressed at 3BC hex.

Floppy Cable

The floppy cable has a twist which swaps lines 10,12,14, and 16. If you install a drive data connector before the twist and one after the twist you can configure both drives as drive B and they will work as A and B. (What manufacturers will go through to keep the user, or dealer, from having to move a drive select jumper.)

K16 User Feedback

Thomas Benjey called to say that he has been pushing and prodding on his own K16. He has tried the system with 123 and flight simulator and they both work.

He feels that AutoCad II is one of the best tests of a system (this is a $2000 drafting, graphics, and circuit board layout package). AutoCad II reportedly takes advantage of everything that IBM offers graphically. This package can also drive a Hercules high-res monochrome graphics card, so he plugged in one and fired it up. He noticed that the Kaypro's and Hercules' video boards seemed to interfere with each other (he said that his Columbia had the same problem). Anyway, he unplugged the Kaypro's graphics card and the Hercules high-res video worked just fine.

Bits And Pieces

The MicroSphere 64K add-on which I mentioned in the Letters column in issue #17, probably won't be produced. 128K RAM chips are getting cheap enough that real 512K RAM disks are quite reasonable (and significantly faster than the track buffers). In fact, they have a fully stuffed 1 meg board for about $1200. (One meg? That's bigger than a quad drive!) I understand that it works nicely with the PRO-8.

One of the cheapest ways to get a pair of legs for your Kaypro is available at your local camera store. Ask for two plastic film cans (normally used for 35mm) with lids. Then just remove the two rubber feet from the front of the Kaypro and replace them with the film cans. The screw which held the Kaypro's original front paws in place will hold the cans nicely.

The First Osborne Group is trying to entice Kaypro owners to join them by setting up an RBBS for Kaypro users. (You'd think they'd notice that Kaypro owners have already discovered how to do their own RBBS.) You must register with FOG at 415-755-4140 before dialing up the bulletin board at 415-285-2687 (300-1200 baud, 24 hrs).

Robie Recalls (But Not Well)

We are getting reports that Kaypro is recalling the Robies that wander back to dealers because of bad drives. What initially appeared to be disk problems are turning out to be problems with the disks, the drives, and the Kaypro.

I've heard that Kaypro is letting folks trade in their flaky Robies for Kaypro 10s. You give them your Robie and $100 and they give you a 10. That's not a bad deal. (I understand that Drivetec has gotten back a whole slew of units from Kaypro.)

Kaypro thinks it has straightened out the problems with the Robie and they are beginning to release a few with new drives, new media, and modified boards. But even if they work flawlessly, I think people will be a little reluctant to purchase a system that requires special preformatted disks which retail for $11 each. If the drives aren't very popular, where are folks going to get the disks?

Meanwhile In the Drive World

Teac, Mitsubishi, and Epson are producing 1.2 Mbyte 5.25" drives. Depending on the rpm they are running, they look like 5.25" or 8". At 300 rpm the floppy controller can read and write 200K, 400K, and 800K disks formatted on standard 5.25" drives. In this mode, the data transfer rate is 250K bps.

At 360 rpm they appear to be 8" drives because the data transfer rate doubles to 500K bps.

Physically, the new drives (at least the Epsons I saw) look just like standard 5 inchers and unlike the DriveTecs, they have a single stepper motor. The word I got was that they are available for $110 each in OEM quantities, half as much as the Drivetecs.

My guess is that the reason quad density (800K) drives have become so cheap is that these new 1.2M drives are taking over the high capacity market. IBM is now installing them on their hard disk systems to make backup easier.

New Kaypro 2

Kaypro has done its best to confuse prospective customers by introducing a "New 2." This new system has the standard 84 board like the 2-84 but it has one 390K drive rather than two 191K units. Retail price is $995. My guess is that this system will be particularly popular with schools and other institutions that currently purchase large numbers of Apples. The only software packages included with the system are WordStar, MBASIC, and a single-drive copy program.

Also, I've gotten reports that the New 2 has CP/M in ROM. That's good because you don't need to put CP/M on your disks. That's bad because we may not be able to sell ROM upgrades for them (at least not without including a license for CP/M with each).

Kaypro is offering a junior business package that includes the New 2, and the

Kaypro letter quality (actually a Juki) printer for $1495. Kaypro also has a New 2 upgrade kit that includes a 390K drive with CalcStar, InfoStar, and ProfitPlan. The kit retails for $495.

Cheap Upgrades

If you don't need the software from the upgrade kit, you can simply purchase a Shugart or Mitsubishi double sided drive and plug it into the New 2. The power and data connectors are already installed. You just remove the cabinet top and the little drive cover and slide the new drive in. So, you could effectively have a Kaypro 2X (minus a little software) for $995 plus about $135 for an additional drive.

Or, you can purchase the New 2 and then add MicroSphere's RAM disk as the second drive. That'll give you the advantages of two drives and the advantages of a RAM disk for little more than the price of a standard Kaypro 2. Such a deal.

Kaypro Declares Loss For Fourth Quarter

Something interesting happens when you go public. You go very public. Everyone wants to know, and gets to know, every time the company, or the chief executive officer, sneezes. Well, Kaypro has sneezed. (Rumors are that sneezes inevitably lead to pneumonia, we'll just have to wait and see.)

Kaypro has made some very big changes in its management. John Coulter is one person I've had a chance to get know and John has recently been hired to straighten out quality control. Hooray!

Kaypro's strength has been the long-term reliability of the original II and 4. Though the screens twitched when the drives fired up (from an over-rated power supply) and the original character set was ugly (sorry, that was my fault), they worked on and on. In fact, when I advertised for old broken down Kaypro IIs for practice surgery, all the units offered were reportedly in perfect running condition.

I purchased one, serial number 2000 and something. It's got the twitches all right but it is screaming along at 5 MHz like nobody's business.

Kaypro Bulletin Boards

If you get the urge for an evening out, try the following phone numbers. I don't have the particulars on these but they are supposedly aimed at Kaypro and I would assume that they are 300/1200 baud, 24 hrs, 8 bits, no parity. As far as passwords etc. you'll just have to log on and find out.

The Kaywest Users Group in Newport Beach: 714-646-3060.

The MVKug, in Mission Viejo: 714-581-1556.

The Torrance Kaypro Users Group: 213-618-0151.

The Resource Board (not just Kaypro) in Garden Grove: 714-539-9418.

Kaypro Looks At Dimension Boards

David Kay confirmed that the company had considered using the Dimension Computer board in their K16. The Dimension is a 68000 based system that lets you plug in Z80, 8088, and 6502 coprocessors.

The system runs multi-user Unix and Idris as well as single-user CP/M 80, TRS-DOS, AppleSoft, and MS-DOS. It is supposed to be 95% compatible with the PC and 100% compatible with the TRS-80 and Apple as well as CP/M 80 hardware. You can even move a file between, say, an Apple disk and a Radio Shack disk, or between a CP/M 68K disk and an MS-DOS disk.

David said one reason they didn't choose the Dimension is that Kaypro has a reputation for inexpensive systems rather than for bells and whistles.

Co-Power Adds 123

Lynn Bailey sent in a clipping about one of SWP's new products. The SWP folks have put together a utility that lets you run 123 on a Co-Power board installed in a Kaypro 10 or 4/84 (123 doesn't run on the Big Board and Xerox versions of the Co-Power). The utility is available for $29.95.

SWP has also brought up a 1 Meg version of the Co-Power. I haven't seen a price yet, but their 256K version is about $800.

■■■

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Circle test	10 seconds	3 seconds	22 seconds
PolySpiral1	17	4	11
PolySpiral2	out of stack	7	out of stack
Square Test	27	10	41
Four Bugs (req. 4 turtles)	78	6	N/A

Times provided by The Lisp Company . . . (note: out of stack indicates inadequate implementation of "tail recursion") DR LOGO is copyright Digital Research Company, Apple Logo is copyright Apple Computer Company, and TLC Logo is copyright the Lisp Company.

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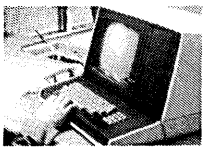

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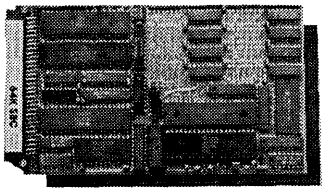

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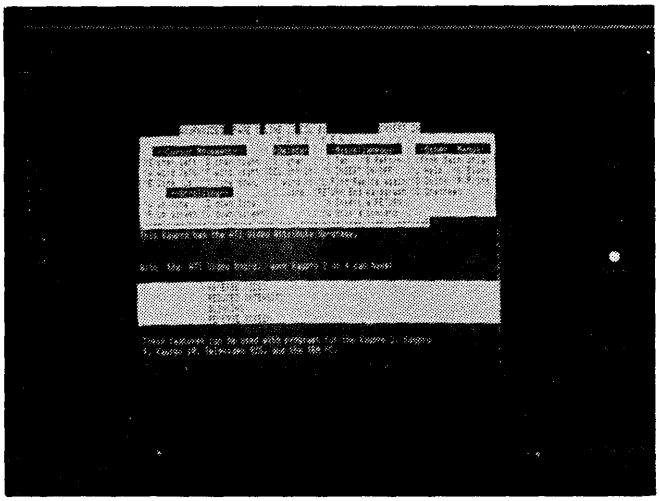

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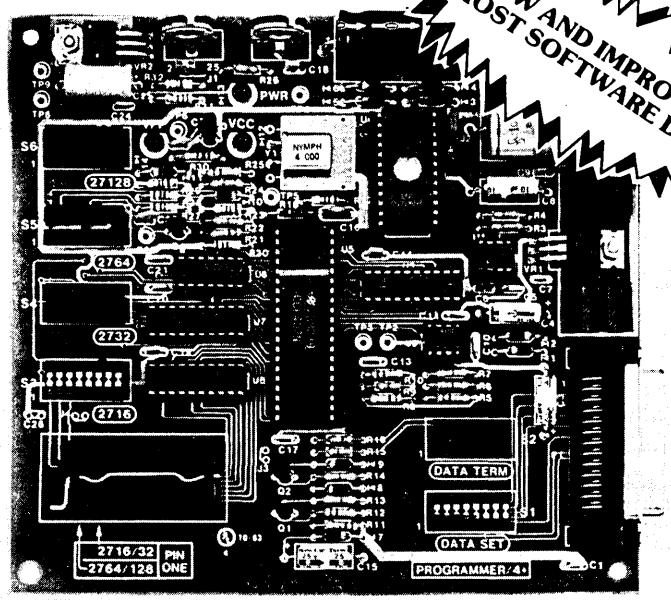

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Kaypro Composite Video Output

By Richard Bugg

2703 NW 20
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For less than $5 in parts, you can be using an external CRT on your Kaypro. All you have to do is build a simple composite video generator.

Inside your Kaypro, the signals that drive the CRT are separate. (There was no reason for Kaypro to combine them to run six inches down to the video subassembly, since they would have to be separated again anyway). CRT video displays require a vertical sync signal (60Hz), a horizontal sync signal, (15.75KHz), and video info (the light and dark dots). When you combine these into a single signal it's called composite video.

The Circuit

Those of you who are Don Lancaster fans will recognize the heart of my design (see Figure 1). (Novice circuit hackers ought to read at least the CMOS Cookbook.) I've added a delay circuit, IC2, to position the horizontal sync, and a buffered video output, Q1. Trim pot R6 controls the delay of the horizontal sync signal. Trim pot R4 sets the brightness of the display.

You can build this on a small piece of perf board, or do a printed circuit board. (If enough people are interested, I'll customize a batch of boards. The cost would be $3.25 each including shipping and handling.)

It's important that the switch sections be used as defined. If you lay out your own printed circuit board, use the pin assignments I've given to avoid problems with crosstalk in the chip. The 4066 must be a first grade component, or you'll get groups of dots of different brightness. The other parts can be hobby grade or worse, and the circuit will function.

Assembly

Experienced hardware hackers already know to unplug the power cord before removing the cover. Interesting voltages are present even when the power is off. The CRT acts as a capacitor, and can store several thousand volts for days. So watch out for the thick wire coming from the lump in the middle of the video board—it can bite! (Editor's note: The CRT will just sting you since there is almost no current, but it's not pleasant. The 110V on the rear switch can really hurt you.)

Locate the solder pads labeled E1 through E6 near the parallel connector at the back of your main board. We'll use the following pads:

```
E1 GROUND
E2 HORIZONTAL SYNC.
E5 VIDEO
E6 +5 volts
```

The vertical sync signal comes from J1 (pin 4). J1 is located in the left rear of the board, the side opposite the drives.

A 5 conductor piece of ribbon cable or some #24 AWG hookup wire works well for tacking on the PCB. Mount the card in the lower left rear of the Kaypro. Wire length and routing aren't critical, but make certain you avoid the high voltage transformer in the middle of the video board. Just stay next to the case walls, and you'll be OK.

Tack solder onto the pads. If you're careful, you can solder from the top side of the board. If you're not careful, please don't work on your machine. The contacts for Jack J1 are held in place by small barbs visible from the outside of the plastic housing. If you prefer, press gently on the barb for contact 4, and slide it out. You can then connect the lead for vertical sync along with the existing wire, and slide the contact back into its housing.

Parts List

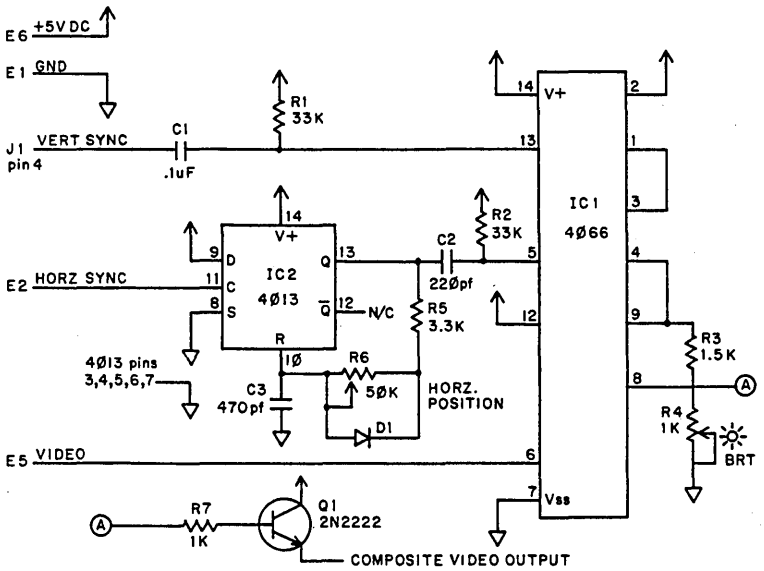
```
C1   .1  mfd cer. disk
C2   220 pfd cer. disk
C3   470 pfd cer. disk

D1   small signal diode like a 1N914

IC1  4066 CMOS quad analog switch
IC2  4013 CMOS dual flip-flop

Q1   NPN transistor 2N2222

R1   33K ohm 1/4 watt resistor
R2   33K ohm 1/4 watt resistor
R3   1.5K ohn 1/4 watt resistor
R4   1K ohm TRIM POT
R5   3.3K ohm 1/4 watt resistor
R6   50K ohm TRIM POT
R7   1K ohm 1/4 watt resistor
```

The alternative is to solder the lead at the base of J1 (pin 4).

You have two options for mounting the output jack for the composite video output. If you don't need to make regular adjustments to the brightness control, or if you don't want to drill a hole in the case, remove the brightness control from the rear panel and mount it inside the case using double-sticky foam tape. Then use the existing hole for the composite video jack.

Otherwise, drill a 1/4" hole in the rear panel 1/2" below the brightness knob.

Figure 1 - Composite Video Output



Mount a Switchcraft 3501 FP jack, or connector of your choice. Label the connector "composite video output."

Use double-sticky foam tape to attach the Video PCB to the lower rear of the main case, just below your new composite video output jack.

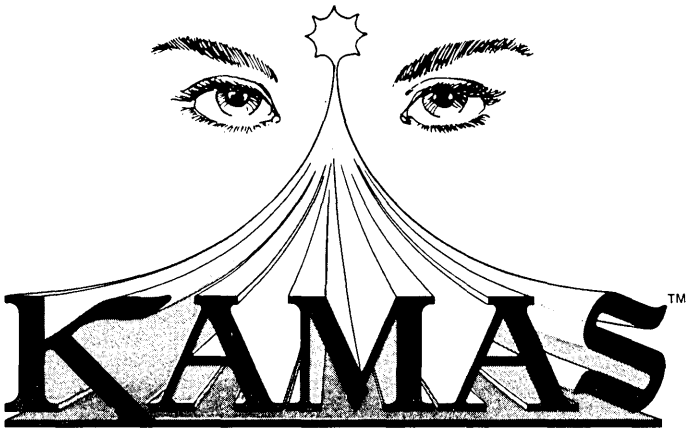
Adjustments

Using appropriate precautions for testing live electronic devices, power up and run a program that uses the full video display. (MBMENU is an example, from the Games disk shipped with the Kaypro).

Trim pot R4 controls the brightness, and trim pot R6 sets the horizontal position of the external video display.

Happy viewing!

■ ■ ■



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Pascal Procedures

By John P. Jones

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St. Louis MO 63130
314-645-1596

One of the places where standard Pascal has significant shortcomings is in text output formatting. There are no equivalents to BASIC's PRINT USING procedure or TAB(##) function. The only output formatting facilities built in to Pascal are right justification and for real (floating point) numbers, decimal alignment.

Pascal lets you do right justification by appending a colon (:) and a field width to each item in an output list. For real numbers, the number of places to the right of the decimal point can be specified with an additional colon and width.

```
WRITELN (str1:12, real_num:14:3, int4:6, chr3:x);
```

If an output item is wider than the specified width, it will be output anyway, creating problems with any desired column alignment. The routine I'll present here is a simple method to allow left or right justification or centering of data in specified output field widths.

Numeric Conversion

Those of you who have Turbo Pascal can tune out for a few paragraphs since the number to string routines in Figure 1 perform the same function as the built-in procedure STR.

The procedure intstr is used to convert integers to character strings. Two parameters are required: the number to be converted is passed by value, and the target string is passed by reference. Two special conditions must be tested in the procedure—zero and negative. For zero values, the conversion need not be executed, and a prefixed minus sign is required for negative values. The actual conversion uses a recursive procedure to generate the decimal digits for concatenation into the string.

The real to string conversion is more complex. If no real numbers could be larger than the largest integer, the integer conversion routine could be used for the whole part and, after scaling, for the fractional part of the number. Cvtreal requires three parameters: the number, the target string and a number of places to the right of the decimal point.

After checking for zero and minus, the procedure decimal shifts the number by

(continued next page)

Figure 1 - Number to Strings Routine

```
TYPE
  anystr = STRING [255];

VAR
  i : integer;
  str : anystr;

{$A-}     (* Allow recursion *)

PROCEDURE cvt_integer (i : integer; VAR str : anystr);

{ Digit is the recursive procedure to generate ASCII characters
for each digit in an integer.  A character representing the low
order digit of the number is created, then the number is shifted
right one digit by integer division.  If the number is > 0, digit
is recursively called to generate the next lower order character.
The characters are generated in reverse order and as the
procedure climbs out of its recursive well the characters are
added to the output string in the opposite order to which they
were generated. }

PROCEDURE digit (i : integer; VAR str : anystr);

VAR
  ch : char;
BEGIN
  ch := chr(i MOD 10 +48);  { generate low order char }
  i := i DIV 10;            { strip off low order digit }
  IF i > 0                  { finished? }
    THEN digit(i,str);      { if not finished, repeat }
  str := concat(str,ch);    { tack on the char }
END;

BEGIN
  IF i = 0                  { number = 0? }
    THEN str := '0'         { if yes, result is known }
    ELSE BEGIN
           IF i < 0         { test for minus }
             THEN BEGIN
                    str := '-';  { if minus, prefix '-' }
                    i := abs(i); { and change sign of # }
                  END
             ELSE str := ''; { else just clear output }
           digit(i,str);     { do the conversion }
      END;
END;
{$A+}     (* Turn off recursion again *)

VAR
  r : real;
  dp : integer;

PROCEDURE cvt_real (r:real; dp: integer; VAR str:anystr);

VAR
  i, ctr : integer;

BEGIN
  IF r = 0.0                        { test for zero }
    THEN
      BEGIN
        str := '0.';                { if zero, result is easy }
        FOR i := 1 TO dp DO
          str := concat(str,'0');   { pad to needed fract. width}
      END
```

(listing continued)

multiplication so that the fractional part required is to the left of the decimal point, and rounds it off. The number of digits needed to represent the number is then determined by repeated division and the final string is built. If it were not for the variable fractional field width, a recursive algorithm could have been used.

(Figure 1 continued)

```
        ELSE BEGIN
               IF r < 0.0              { check for minus }
                 THEN
                   BEGIN
                     str := '-';       { prefix - }
                     r := abs(r);      { and make it positive }
                   END
                 ELSE str := '';       { clear output string }

               FOR i := 1 TO dp DO     { decimal shift left }
                 r := r * 10.0;
               r := r + 0.5;           { round off }

               ctr := 0;               { det'n # digits needed }
               REPEAT
                 r := r / 10.0;        { by decimal shift right }
                 ctr := succ(ctr);
               UNTIL r < 1.0;

               FOR i := 1 TO ctr DO    { convert each digit by }
                 BEGIN                 { decimal left shift/conv. }
                   r := r * 10.0;
                   str := concat(str, chr(trunc(r)+48));
                   r := r - trunc(r);  { strip off high order digit }
                   IF  ctr -i = dp     {insert decimal where needed }
                     THEN str := concat(str,'.');
                 END;

           END;
    END;
```

Output Formatter

Once the numeric values have been converted to character strings, the output formatting routine becomes almost trivial. Figure 2 is the routine to output a string to a text file (or device) with left justification, right justification, or centered in a parameter specified field width. The parameters needed are output file, justification, field width, output string and a flag which signifies that the field is numeric. Non-numeric strings wider than the output field are truncated, while over-width numerics are flagged in the output file with # characters.

The output string is first checked for width and if it does not fit, appropriate action is taken. Strings which fit in the specified width are handled by a simple case statement.

Program Documentation

Although most readers are not writing Pascal programs for publication, at least minimal documentation of the programs you write is critical. Without documentation, the software may be totally incomprehensible when you go back to it after a few weeks or months.

Minimal documentation includes: meaningful procedure and variable names, lots of comments in the source, a formatted source listing, and optionally, a symbol cross reference. If the program is not prompt or menu driven, brief instructions are critical.

Pretty Print

The easiest way to get a readable, well formatted source listing is to use one of the several "pretty print" programs available both commercially and in the public domain. The best of these I've used is the program PP written by Peter Grogono (author of the text, "Programming in Pascal," Addison-Wesley, 1980). The program was released to the public domain as part of Pascal/Z users group disk #17, and was also released as SIG/M Vol. 81. PP is written in Pascal/Z, and an executable .COM file is included on the disk for those without Ithaca Intersystem's compiler.

The program takes a free form Pascal source file and outputs a formatted file with Pascal keywords capitalized, one statement per line, inserted blank lines to isolate procedures, and all nested coded indented. PP is smart enough to ignore symbols in comments and literals and does not get confused if the program has syntax errors. It will occasionally, however, insert unneeded white space if run on a previously pretty printed file. Writing a program like this is not a trivial exercise, since many of the functions of a compiler are required. Running your source through PP has the additional advantage of helping to spot unbalanced BEGIN-END pairs and can help you follow the logic of nested 'if' statements.

Three other programs are distributed with PP. XREF is a companion to the source formatter and generates a cross reference to all user symbols in a file processed by PP.

PRINT can be used to generate hard copies of pretty printed files, and if the line number option is used, the numbers will match those generated by XREF. Although PRINT was written specifically for an IDS printer, the author has isolated the printer dependent code to make it easier to customize for other printers. In its basic mode, no printer capabilities are necessary other than ability to perform a carriage return without a line feed.

Text Processor

Although not related to source code maintenance, the final program on the disk, TP, is of interest. TP is a text processor which uses embedded formatting commands to generate a document file. Its functions are a subset of commercial text formatters. PRINT also understands files processed by TP and has some functions related specifically to document printing.

Taken together, the four programs on this public domain disk add up to a very useful and powerful program documentation package. Since source is provided for all the programs, you can expand and modify the utilities to meet your specific needs. For many applications, the combination of a minimal inexpensive editor (or even the editor that is part of Turbo Pascal) and TP is more than sufficient.

I plan to translate the programs to Turbo Pascal real soon and expect to see some improvement in throughput. I have sent a copy of the Pascal-Z disk to Micro Cornucopia, and if there is enough interest it may be added to the user disk library.

■ ■ ■

Figure 2 - Outputting a String to a Text File

```
TYPE
  justification = (left, right, center);
  anystr = STRING[255];

VAR
  i : integer;
  r : real;
  str1 : anystr;

PROCEDURE print_justified (VAR f:text; just_type : justification;
                           field_width : integer; str1 : anystr;
                           numeric : boolean);

VAR i : integer;
BEGIN
  IF length(str1) > field_width    { will it fit? }
    THEN                           { no, take appropriate action}
      IF NOT(numeric)
        { truncate if string }
        THEN write(f, copy(str1,1,field_width))
        { if numeric, fill field with ## }
        ELSE FOR i := 1 TO field_width DO
               write (f,'#')
    ELSE
      CASE just_type OF

        left : BEGIN          { for left, output string, then }
                 write(f,str1);          {fill rest with spaces}
                 FOR i := length(str1) +1 TO field_width DO
                   write (f,' ');
               END;

        right : write(f,str1:field_width); { the easy one }

        { for centering, alternately add spaces to beginning
          or end of string until desired width gotten }

        center : BEGIN
                   WHILE length(str1) < field_width DO
                     IF odd(length(str1))
                       THEN str1 := concat(str1,' ')
                       ELSE str1 := concat(' ',str1);
                   write(f,str1);
                   END;
      END;
END;
```


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MUCHTEXT.CMD/A86: Counts words and lines in a text file.
ERQ.CMD/A86: Selective file erase program. Displays all selected files and then asks you one at a time for a Y/N.
INUSE.CMD/A86: Prints "In Use" on your terminal and asks for a password. It will not release the console until you enter the password.
FINDBAD.CMD/A867. Finds and collects bad sectors on a disk. If there are no bad sectors, information on the disk is unaltered.

Disk 86-2 — DU and Modem Programs

DU-V75.CMD/A86/DOC: This is the popular disk utility from CP/M 80. It lets you read, write, and modify disk sectors.
MODEM4.CMD/A86: This is a modem program set up for the Slicer. This program includes a built-in help file.
MODEM7SL.CMD/A86/DOC: No modem disk would be complete without this standard. This is modem7 set up for the Slicer. It displays a menu when it is called.

Disk 86-3 — Small C

C86.CMD: This is the original Small C compiler which appeared in Dr Dobbs Journal in 1980. It runs under CPM-86 and generates 8086 source for the ASM86 assembler.
C86. COM: This is the C86 compiler which runs under CPM-80. This 8080 program produces 8086 assembly language.
C86LIB.A86: This is the C86 I/O library.
SMALLC86.DOC: Documentation on Small C.
C?????.C: Source of the C86 compiler.

DISK 86-4 — IBM Mainframe Interchange/ RESOURCE 8086

XBIOS.A86: A new BIOS that supports a real time clock.
RES86.CMD: A disk management program for transfering files between CP/M-86 and IBM 374X mainframe environments.
SDI86.CMD: An 8086 version of the RESOURCE disassembler.

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Forthwords

By Arne A. Henden

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New Carrollton MD 20784
301-552-1295

I'm devoting a major part of this column to another utility. Still no word on how the FORTH conferences went, but maybe next time there will be more to report.

Arne's Forthcast

I don't think a day goes by without a group of us discussing the merits of current computers and the future of micros and languages. So I'm going to predict from my ivory tower where we go from here.

Eight-inch disk drives are a vanishing breed. No manufacturer has introduced a new one in years. Whether 5¼" or 3½" drives will dominate the market in a few years is a toss-up, though I tend to prefer the 3½" drives. Smaller always seems better as long as the storage capacity remains high.

The demand for hardware will continue strong. I love playing with hardware, and it is obvious that I'm not alone. There remains a small but loyal market for such systems as the Big Board or the Slicer. I don't see this demand decreasing as long as it remains profitable for small companies to produce boards and kits.

I think it is obvious that IBM compatibility drives the small computer business. I see more systems using the 80286 as the workhorse. It has all of the power needed for any conceivable home or business application. The PC/AT is the most computer for the money that I have ever seen, and when the clones hit the market, look out! For scientific or multiuser systems, the 68000 will dominate. The Z80 will remain strong in OEM applications but may disappear from the home market. What intrigues me is the possibility of a commercial FORTH computer based on bit-slice technology or at least microprogramming. Such a system could run circles around the PC/AT and could make it big in scientific or industrial applications.

I like MSDOS much better than CP/M. However, Microsoft doesn't seem to have any interest in moving it to the Z80, 68000, or any other processor. If they would, I think they could pull the rug out from underneath Digital Research. Multitasking systems are the only way to go in the future, but they require an 80286 or equivalent horsepower. Fancy systems such as UNIX have no use in the single-user environment, and have too many drawbacks in business use. It will be a long time before XENIX or the other clones make much of a dent.

FORTH still seems to grow in popularity. Brodie's books help tremendously, as well as the public domain availability of the language. But for now, it remains in the hacker's domain, with little inroad into the OEM and software-house markets.

Part of FORTH's problem is that it is

(continued next page)

FORTH Screens

```
SCR # 1
  0 ( *** The UNIFORTH Virtual Typewriter Utility ***  111784AAH)
  1 VARIABLE BOLDMODE   ( boldface toggle)
  2 VARIABLE UNDERMODE  ( underline toggle)
  3 VARIABLE DOUBLMODE  ( doublewidth toggle)
  4 VARIABLE ENHANMODE  ( enhanced toggle)
  5 VARIABLE CHARPOS    ( current visible character position)
  6 VARIABLE #CHARS     ( #characters in buffer)
  7 VARIABLE #LINES     ( #lines printed on current page)
  8 VARIABLE FORMLEN    ( length of form)
  9 VARIABLE HORPITCH   ( horizontal pitch)
 10 VARIABLE LMARGIN    ( left margin position)
 11 VARIABLE RMARGIN    ( right margin position)
 12 -->
 13
 14
 15

SCR # 2
  0 ( Toggle entries                      111784AAH)  OCTAL
  1 : INCPOS  ( -- indicate new position in buffer)
  2    CHARPOS 1+! RMARGIN @ 5 - CHARPOS @ - 0= IF BELL THEN ;
  3 : !HIDE  ( char -- ..store in buffer)
  4    PAD #CHARS @+ C! #CHARS 1+! ;
  5 : !CHAR  ( char -- ..store in buffer, update counter)
  6    DUP EMIT !HIDE INCPOS ;
  7 : PADCSI  ( store control sequence introducer in buffer)
  8    33 !HIDE 133 !HIDE ;
  9 : BOLD  ( set boldface)
 10    PADCSI 61 !HIDE 155 !HIDE 1 BOLDMODE ! ;
 11 : NOBOLD  ( reset boldface)
 12    PADCSI 62 !HIDE 62 !HIDE 155 !HIDE 0 BOLDMODE ! ;
 13 DECIMAL -->
 14
 15

SCR # 3
  0 ( More toggle entries                 111784AAH)  OCTAL
  1 : UNDER  ( set underline)
  2    PADCSI 64 !HIDE 155 !HIDE 1 UNDERMODE ! ;
  3 : NOUNDER  ( reset underline)
  4    PADCSI 62 !HIDE 64 !HIDE 155 !HIDE 0 UNDERMODE ! ;
  5 : ENHAN  ( set enhanced printing)
  6    PADCSI 62 !HIDE 42 !HIDE 172 !HIDE 1 ENHANMODE ! ;
  7 : NOENHAN  ( reset enhanced printing)
  8    PADCSI 60 !HIDE 42 !HIDE 172 !HIDE 0 ENHANMODE ! ;
  9 : DOUBLE  ( set double width mode)
 10    PADCSI HORPITCH @ 4+ !HIDE 167 !HIDE 1 DOUBLMODE ! ;
 11 : SINGLE  ( reset double width mode)
 12    PADCSI HORPITCH @ !HIDE 167 !HIDE 0 DOUBLMODE ! ;
 13 DECIMAL -->
 14
 15
```

(listing continued)

free. Vendors find it hard to compete with freeware, and yet the documentation and support supplied by the vendor is what commercial customers look for before they will use a language for a large project. Look for more vendors to offer: FORTH-83 compatibility, floating point, multitasking, and built-in database and graphics.

As for other languages, I feel BASIC will remain dominant because it's easy to learn and comes with every computer. People have to be dissatisfied to spend money on another language! Professionals will use C and Pascal (or Pascal look-alikes) for most commercial software. The scientists will stick with FORTRAN as long as any computer system offers it.

The UNIFORTH Virtual Typewriter

I'm a great believer in the future of microcomputers both in the home and in business. However, I haven't seen many applications that are of real use to the homeowner.

Some educational programs, perhaps a word processor, a couple of games, and a tax preparation program are pretty much all that a home user has to select from. The first person who comes up with the program that everyone needs will make a killing.

While I was at a customer's site late one night, I ran into a sticky situation. Here I was, sitting in front of a $15,000 computer, and in dire need of a typewriter to fill out an expense account and an invoice. Have you ever tried to locate a typewriter after working hours? Most offices are locked up tight. And here was a solid minicomputer with good dot matrix printers and nothing but UNIFORTH running on it.

To make a long story short, I spent the rest of the evening (before my plane departed) writing a Virtual Typewriter utility in FORTH. It is configured for an LA50 printer, but with a little tailoring you can make it work for any printer. The object of the game is to enter a line on the terminal, with full backspace and printer control functions. When you hit the carriage return, the line gets sent to the printer. (Editor's note: This is the easiest way to generate one-liners.)

This utility is a combination of editor, printer interface, and word processor.

```
SCR # 4
  0 ( Report, tabs and pages                    111784AAH)
  1 : REPORT  ( print report)     EDITOR 0 23 GOTOXY
  2    BOLDMODE @  IF 66 ELSE BL THEN EMIT
  3    UNDERMODE @ IF 85 ELSE BL THEN EMIT
  4    DOUBLMODE @ IF 68 ELSE BL THEN EMIT
  5    ENHANMODE @ IF 69 ELSE BL THEN EMIT
  6    BL EMIT KEY DROP 0 23 GOTOXY PAD 5 TYPE
  7    CHARPOS @ 23 GOTOXY FORTH ;
  8 : TABSTOP  ( find next tab stop)
  9    CHARPOS @ DUP 6 + SWAP 1+ DO BL !CHAR I 5 MOD
 10    0= IF LEAVE THEN LOOP ;
 11 : SETLEFT  ( blank fill to start of typed line)
 12    LMARGIN @ 0 DO BL !CHAR LOOP ;
 13 : NEWPAGE  ( move to next page)
 14    0 #LINES ! PRINTER FORM TERMINAL ;
 15 -->

SCR # 5
  0 ( Newline, backspace, delline               111784AAH)
  1 : ZEROCOUNTERS  ( zero the counters)
  2    0 CHARPOS ! 0 #CHARS ! ;
  3 : SENDLINE  ( send the current line to the printer)
  4    PRINTER PAD #CHARS @ TYPE CR TERMINAL ZEROCOUNTERS ;
  5 : NEWLINE  ( send line, blank fill)
  6    SENDLINE #LINES 1+! #LINES @ FORMLEN @ =
  7    IF NEWPAGE ELSE CR THEN SETLEFT ;
  8 : BACKSPACE  ( take care of backspaces)
  9    CHARPOS @ LMARGIN @ = IF BELL ELSE CHARPOS 1-!
 10    #CHARS 1-! BS BL EMIT BS ELSE BELL THEN ;
 11 : DELLINE  ( clear current line)
 12    EDITOR 0 23 GOTOXY 80 SPACES 0 23 GOTOXY FORTH
 13    ZEROCOUNTERS SETLEFT ;
 14 -->
 15

SCR # 6
  0 ( The Big Case                          111784AAH)
  1 : CHECK_CHAR  ( char -- endflag ..send or exec command)
  2    CASE   2 =:  BOLDMODE  @ IF NOBOLD  ELSE BOLD   THEN 0  ;;
  3           4 =:  DOUBLMODE @ IF SINGLE  ELSE DOUBLE THEN 0  ;;
  4           5 =:  ENHANMODE @ IF NOENHAN ELSE ENHAN  THEN 0  ;;
  5           9 =:  TABSTOP 0  ;;
  6          11 =:  DELLINE 0  ;;
  7          13 =:  NEWLINE 0  ;;
  8          16 =:  NEWPAGE 0  ;;
  9          18 =:  REPORT  0  ;;
 10          20 =:          1  ;;
 11          21 =:  UNDERMODE @ IF NOUNDER ELSE UNDER  THEN 0  ;;
 12         127 =:  BACKSPACE 0  ;;
 13         !CHAR 0 0
 14    CASEND ;
 15 -->
```

The accompanying screens show how this version is put together. It is not particularly well-written FORTH code, but it is a good starting point for anyone with a computer but without a decent typewriter.

My approach to programming is to place all variables and constants at the beginning of an application. Then come any system-specific words, the user shell, and finally the main functions. Others of you may prefer to place local constants and variables in the screens where they are used.

There are four toggled modes: boldface, underlined, double-width, and enhanced print. A flag is allocated to each mode and is set or reset by a pair of words. A report word is included to list the current state of the toggles by wiping

out the first five characters of the current line, listing a single character for each mode, and then restoring the line when you have finished examining the report.

I've also added several "extras." You can set left and right margins complete with a bell that rings when you get within five spaces of the right margin. You can set the page length, with FORTH issuing a form feed when the limit is exceeded. Tabs are set every five spaces. You can delete characters or an entire line before sending it to the printer. Finally, you can set the default type size.

Minuses

Now, let me hit the weaknesses. As I mentioned, this was quick and dirty programming.

For commercial resale, I would make the utility's system-specific stuff much more general. One or two blocks would be sufficient to hold the printer command words.

Many of the comments (such as on ZEROCOUNTERS) are useless and just serve as placeholders. It has no centering command. The tab stops are hard coded to every five spaces—a variable would be a far better approach. There is a lot of duplicated code (such as in REPORT) that could have been recoded to save space and be more elegant. I wrote the left margin function incorrectly. It spaces on the screen as well as the printer, thereby wasting ten or more spaces on the screen. The line width assumes single-width characters; any double-width characters will push the text off the right edge of the paper.

Use this utility as a plastic form, and stretch it to match your printer and your needs. It demonstrates the ease of programming in FORTH.

Next Column

I've finished reading *Thinking Forth*, Leo Brodie's latest book, and will give you a review. My advance advice is to run, not walk, to the nearest store and demand a copy. There is no other language that has as readable a spokesman as Brodie.

■ ■ ■

```
SCR # 7
  0 ( Setup words                                  111784AAH)
  1 : DEFAULT  ( n1 -- n2 ..input number, leave default n1)
  2    GETNUM PRECIS @ 0>= IF SWAP DROP THEN ;
  3 : MARGINS  ( set up the margins)
  4    CR ." Left margin (0-84) [10]: " 10 DEFAULT LMARGIN !
  5    CR ." Right margin (0-84) [75]: " 75 DEFAULT RMARGIN ! ;
  6 : PRSIZE  ( set up the print size)
  7    CR ." Print size..."
  8    CR ." Pica (10char/in)       = 1"
  9    CR ." Elite (12char/in)      = 2"
 10    CR ." Condensed (16char/in)  = 4"
 11    CR ." Your choice? (1-4) [1]: " 1 DEFAULT 48 + HORPITCH ! ;
 12 : PAGELEN  ( set up the page length)
 13    CR ." Page length in lines (1-66) [66]: " 66 DEFAULT
 14    FORMLEN ! ;
 15 -->

SCR # 8
  0 ( Final word of typewriter                111784AAH)
  1 : INITWRITER  ( set up initial conditions)
  2    MARGINS PRSIZE PAGELEN EDITOR PAGE 0 23 GOTOXY FORTH
  3    0 BOLDMODE ! 0 ENHANMODE ! 0 UNDERMODE ! 0 DOUBLMODE ! ;
  4 : WRITER  ( the main word)
  5    INITWRITER ZEROCOUNTERS SETLEFT
  6    BEGIN KEY CHECK_CHAR UNTIL ;
  7 ;S
  8
  9
 10
 11
 12
 13
 14
 15
```

End Of Listing

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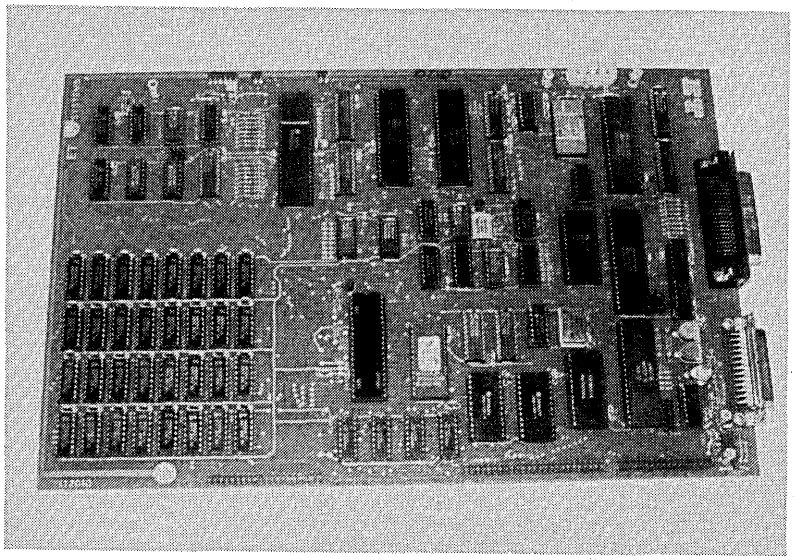

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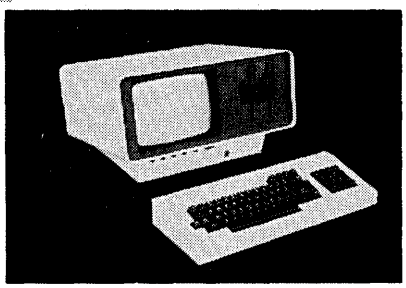

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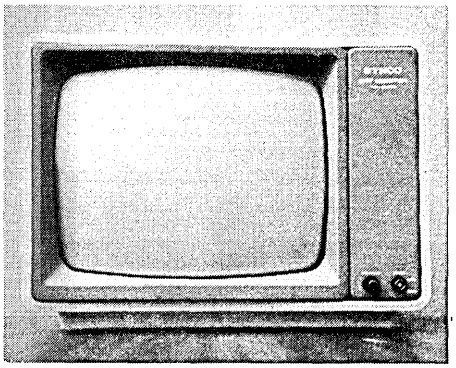

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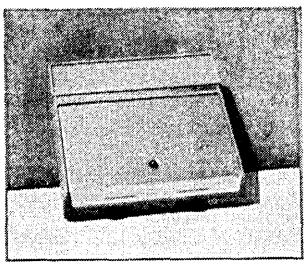

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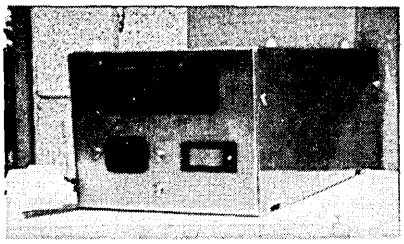

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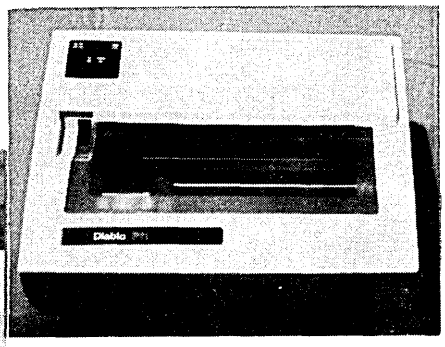

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Sound Generator For The STD Bus

By Mark A. Matthews

540 Blue Ridge Drive
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Do you enjoy the sound of phasor bolts vaporizing your force field? Do you have a soft spot in your heart for sirens screaming in the night or are yowling cats just the thing for a noisy neighbor? Do you own a BBII with STD Bus interface (or, with modification, a similar bus)? If you can answer "yes" to any one of these questions (well, at least the last one) then read on.

Sounds Good

The Programmable Sound Generator board I've designed creates complex audio waveforms such as special effects and musical sounds using two LSI devices that contain clock dividers, counter registers, digital mixers, and envelope generators.

The board is Z80 STD Bus compatible, meaning it will work on any Z80 STD Bus system, not just the BBII. It occupies four addresses in the Z80 I/O address space. The output is made up of 6 audio parts, separated into two main channels with three sub-channels each. These outputs are to feed a stereo audio amplifier.

Of Bits and Pieces

At the heart of the board are two General Instruments AY-3-8910 Programmable Sound Generators (PSGs, U3 & U4) which contain the components for complex audio waveform synthesis. The remaining TTL parts handle the interface between the PSGs and the STD Bus. The passive components interface the PSGs to the analog world.

The clock for the PSGs is 2 MHz. This is created by dividing down the STD CLOCK/line (which is running at 4 MHz) using 1/2 of a 74LS74 D-type flip-flop (U7).

The I/O addresses are decoded by two 74LS85 Quad Comparators (U5, U6) cascaded to form an 8-bit comparator. The B inputs to the comparators can be jumpered to decode any 4 consecutive locations in the Z80A I/O address space, i.e. a base address can be 00H, 04H, 08H, 0CH, up to FCH. (The BBII uses I/O addresses above 80H, so it would be best to select some value at or below 7CH.) Once the base is set, you access the PSGs at the following locations:

Address	PSG#	Function
BASE	0	DATA
BASE+1	0	REGISTER SELECT
BASE+2	1	DATA
BASE+3	1	REGISTER SELECT

The PSGs were originally designed for use with the General Instrument CP1600 series of microprocessors. The CP1600 uses a multiplexed address/data bus. Control for the bus is provided by control lines BC1, BC2, and BDIR. The state of these lines determines the direction (in/out) and function (address/data) of the bus. Note that timing information for data transfers is implied by the change in state of the control lines and not by the input clock.

The Z80A STD BUS does not have similar bus control lines. However, the same information is there and can be converted to the appropriate signals through logical use of the RD/, WR/, IOREQ/, A0, and A1 lines.

First the desired states of the PSGs control lines must be determined. The following truth table shows the possible states of the control lines and the resulting function:

BDIR	BC2	BC1	PSG Function
0	0	0	Bus Inactive
0	0	1	Latch Address
0	1	0	Bus Inactive
0	1	1	Read from PSG
1	0	0	Latch Address
1	0	1	Inactive
1	1	0	Write to PSG
1	1	1	Latch Address

Note that there are a number of redundancies in the table. This can be used to our advantage by making BC2 always true, reducing the table to the following functions:

BDIR	BC2	BC1	PSG Function
0	1	0	Inactive
0	1	1	Read from PSG
1	1	0	Write to PSG
1	1	1	Latch Address

The latch address function causes the PSG to latch the data on its address/data bus into an internal 8 bit register which from the STD Bus. The following table shows the decoding scheme.

addresses one of the 16 internal registers. Subsequent writes and reads to/from the PSG will pass data to and from this register. It works in much the same way as selecting registers in the 6845 CRT controller, or the Z80 SIO chip.

The control signals to the PSGs are created by decoding the control signals

STD Bus SEL	RD/	WR/	A0	PSG BDIR	BC1	
0	X	X	X	0	0	Inactive
1	0	1	0	0	1	Read PSG
1	0	1	1	0	0	Inactive
1	1	0	0	1	0	Write PSG
1	1	0	1	1	1	Latch Addr

SEL is made up of IOREQ/ ANDed with an address match. It is true whenever one of the I/O addresses (BASE..BASE+3) is valid and IOREQ/ is low.

Musical Math

I used Boolean Algebra (I will spare you the agonizing details) to come up with equations to represent the above table, which shows that BDIR and BC1 can be expressed in the following way:

```
BDIR = SEL * RD/
BC1 = SELECT * [(WR/ * NOT(A0))
               + (RD/ * A0)]
```

Note that an asterisk is an 'and', the plus is an 'or' and the '/' means the signal is active low.

I translated the table into U12, U8, and U11 (see Figure 1).

Sustain

A big problem of interfacing the PSGs with the Z80A running at 4 MHz is that the I/O read/write cycles and the data bus hold times are not long enough to meet the GI specifications. What this means is that when the Z80 is doing I/O, the PSGs either, Don't see the data long enough or can't supply the data fast enough. The term "data hold time" refers to the amount of time the data bus retains valid data after the end of a machine cycle. For the Z80A, this is about 70 nS. The PSGs expect it to be 200 nS!

To make the I/O cycle longer is simple

(continued on page 65)

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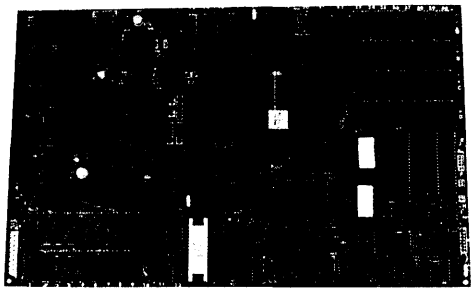

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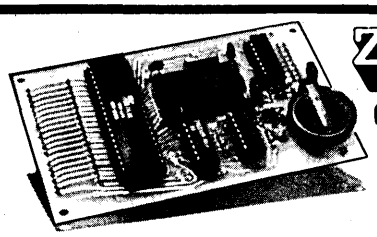

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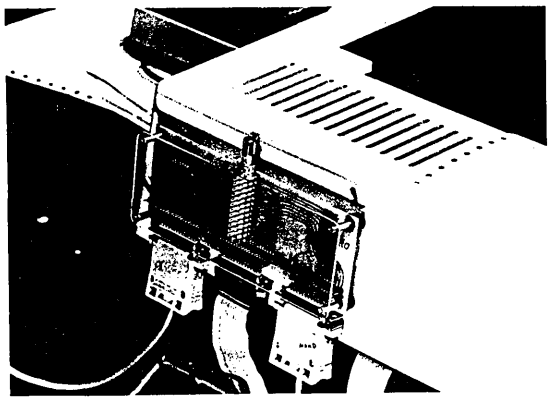

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enough: the 74LS74 (U9) inserts one extra wait state when the board is selected. The data-hold problem is somewhat more difficult.

When writing to the PSGs the data-hold time must be extended. When the Z80A I/O cycle has completed (indicated by the rising edge of IORQ/), U2 latches the value of the data bus and holds it for one extra clock cycle. This gives the PSGs time to read the data. Then the 74LS74 (U7) changes U2's outputs to high impedance so that the PSGs can pass data back to the Z80 via the same data lines.

Address line A0 determines which PSG is selected. If A0 is high, then PSG 0 is selected; if low, then PSG 1 is selected.

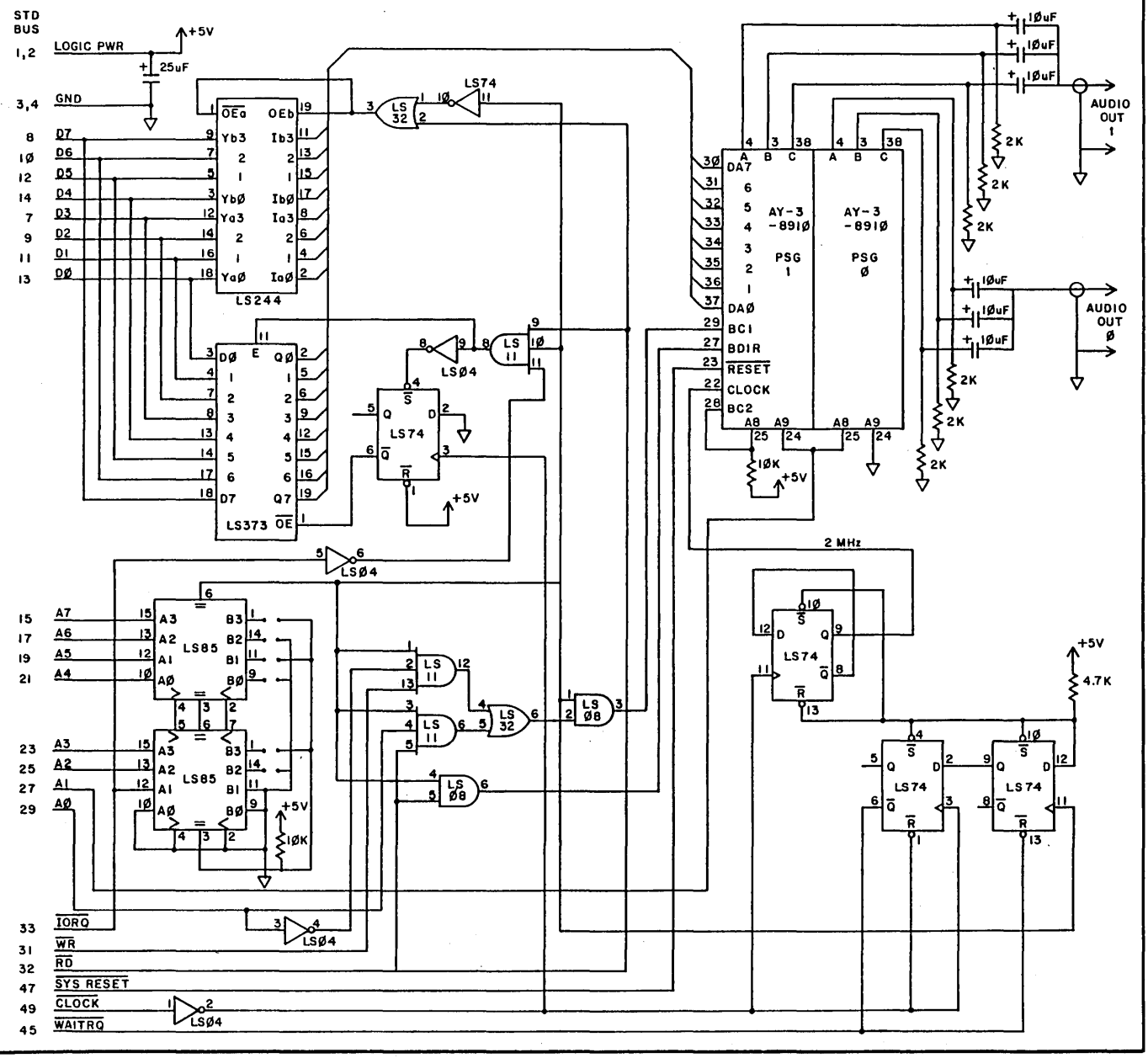
In theory, you should be able to plug in the sound board and listen to it hum, or whine, or whistle. But since we don't live in theory (we live in California) we're bound to encounter problems (especially in California).

Too Long A Hold

One such problem is the on-board wait-state generator that I discovered on my BBII. It does not show up in the figures in this article but seems to be constructed around U25 and U26. The rea-

(continued on page 67)

Figure 1 - Sound Generator Schematic



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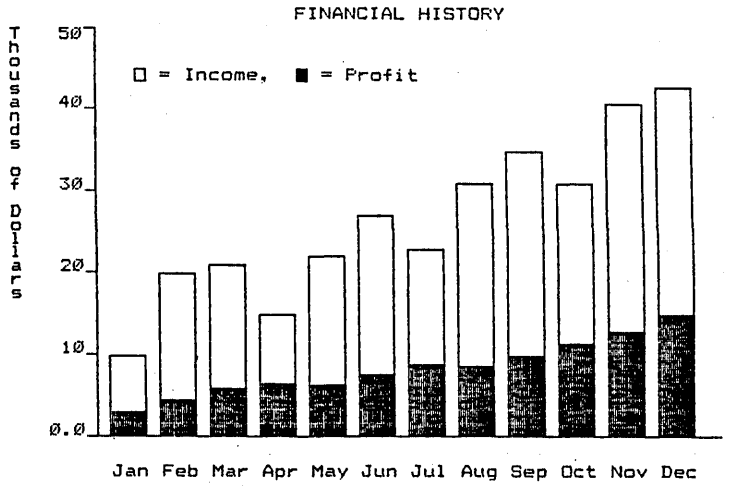

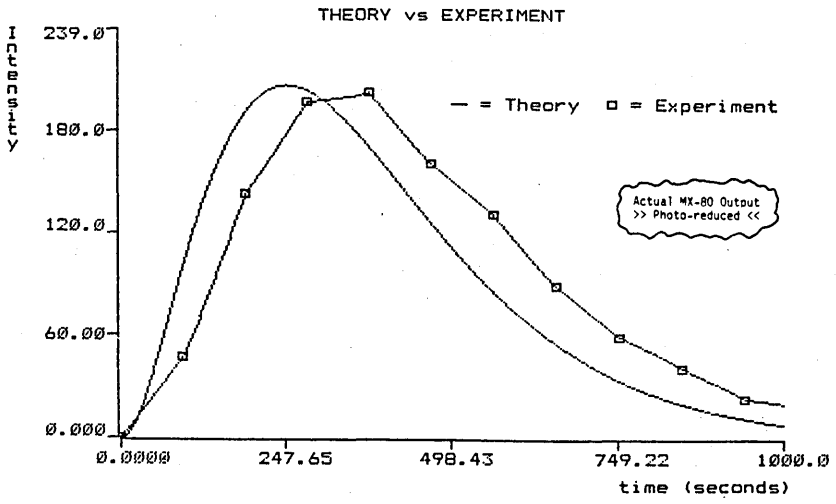

System Requirements Z80 CPU with 60k (or greater) CP/M 2.2 driving one of the following printers (or any printer fully compatible with one on this list): Epson MX-80 with GRAFTRAX, Epson RX-80, Epson FX-80, IBM Graphics Printer, Gemini 10X, C. Itoh ProWriter, or any OkiData dot-matrix printer having the OkiData Plug 'n' Play chips installed. (Unmodified OkiData printers are NOT supported!)

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son the wait-state generator exists is so that slower (450 nS) monitor ROMs can be used. (Which suggests another mod: Why not burn the BBII monitor into a faster part and disable the on-board wait states?) If you have such an animal on your board then some modifications will be in order. If not, then you can ignore this section.

First, cut the trace leading from pin 45 (WAITRQ/) of the STD Bus connector. Follow out the trace from pin 24 of U-39 (Z80) out to a convenient feed-through and cut this trace between the feed-through and the Z80.

Now, add a 14-pin socket to the breadboard area and wire up 5 volts to pin 14 and ground to pin 7. To find ground and 5 volts in the breadboard area, look closely at the holes right around the edge of the board. Notice that alternate holes are hooked to the large traces that run around the edge of the board. Holes connected to the top trace are +5V; holes connected to the bottom are ground. (You get the benefits of learning at my expense here; I didn't discover this "feature" until after I had put a 14 pin socket in the edge rows and fried an IC.)

Run a jumper (blue wire, of course) from pin 45 of the STD bus all the way across to pin 12 of the new socket. Run a jumper from the feed-through where you made the other cut to pin 13 of the socket. Then run a jumper back to pin 24 of U39. Finally, stuff a 74LS08 into the new socket.

Power up your board and make sure it still runs. Now you can use the WAITRQ/ line out on the STD Bus without interfering with the ROM wait-state operation. Alternatively, you could find an unused AND gate on the board so you wouldn't have to add the extra part.

Picking Up After Measure 40

Those of you who don't have the on-board wait-state generator can pick up again here. Construction of the PSG board is straightforward, so you can follow my layout in the figures shown or rearrange to taste. Be sure to use enough bypass capacitors, one across each PSG power and ground, and one across power and ground near every other TTL.

(continued on page 69)

Figure 2 - Example Program For PSG

```
BASE    EQU  010H          ; The base address of the PSG board.
DAT1    EQU  BASE+0        ; Data port of PSG 1
CMD1    EQU  BASE+1        ; Register address port of PSG 1

DAT0    EQU  BASE+2        ; Data port of PSG 0
CMD0    EQU  BASE+3        ; Register address port of PSG 0

; Sample write to PSG 0

        LD      A, REGVAL       ; Output the register desired
        OUT     (CMD0), A

        LD      A, DATVAL       ; Then output the data
        OUT     (CMD0), A

; Sample read from PSG 1

        LD      A, REGVAL       ; Output the register desired
        OUT     (CMD1), A

        LD      A, DATVAL       ; Then read the data
        IN      A, (CMD1)
```

Figure 3 - Sound Generator Block Diagram

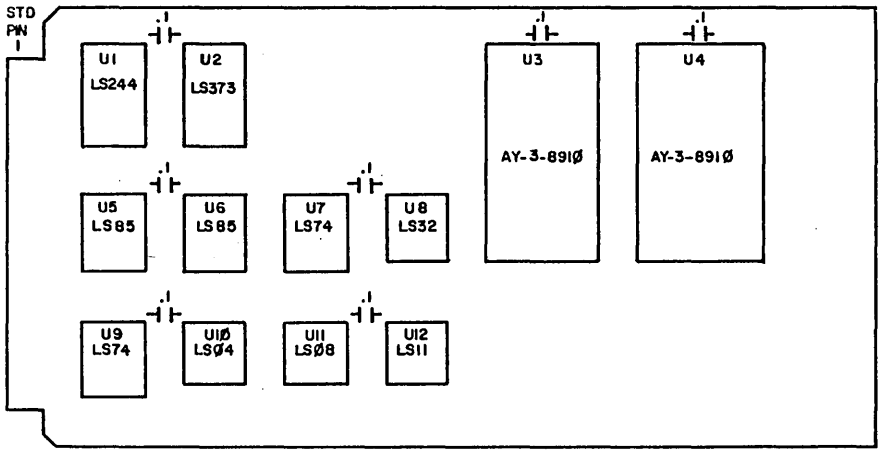
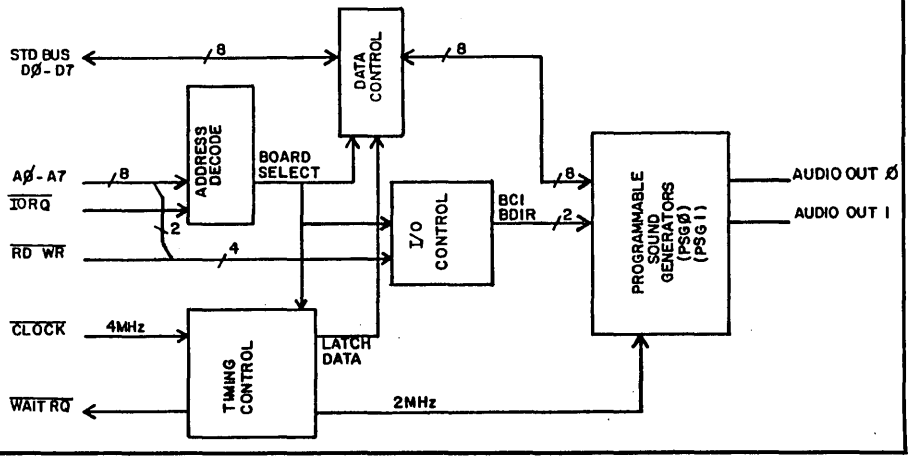


Figure 4 - STD BOARD IC Layout



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Refer to Micro Cornucopia Review; October 1983, Page 7.

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Writing The Score

Now that you have your PSG board constructed and all the small fires extinguished, it's time to begin the software. The low level I/O interface must accomplish the following: First, set up the internal register address in the PSG. Then read or write the data to or from the selected register. Figure 2 shows an example program.

Sondlan

I have written a set of routines in Pascal to facilitate sound effects programming. It is a well documented piece of code (especially for me) and is included, along with several other routines like COMPOSER, on Micro C's new 8" user disk #29.

Composer

To generate music on the PSGs, I converted a program called Composer (found on SIG/M disk #120) to operate on the BBII. It was originally written for the Heathkit H-89 by Chuck Chatham.

Converting the program for BBII only requires changing the source so that the BBII's one millisecond interrupt vector is routed first through the Composer program before going on to the system interrupt service routine.

The Composer program claims to be able to operate as many as 6 PSGs. However, there is a bug hiding in the code somewhere that won't let it properly handle more than one. I haven't been able to find the problem, so I guess I haven't looked far enough yet! (Have you ever realized that you always find something in the last place you look? Think about it.) But even with only one PSG it sounds good.

Phone Company Duet

If simply having the ultimate noise-maker or super-programmable organ is not "useful" enough for you, how about making it a dual tone autodialer? It is simple enough to use two channels on one of the PSGs, load them up with the appropriate tones, then turn them on for the proper amount of time, feed the signal through your modem or telephone and presto, you have a tone dialer capable of remembering as many phone numbers as you care to put into it.

A Final Note

Audio is not all you can do with these PSGs. Absolutely free with every PSG come two, yes two, 8 bit I/O ports. You can use these for adding other accessories (toys) to your BBII. One thing I'm planning to add to mine is Radio Shack's speech synthesizer.

■ ■ ■

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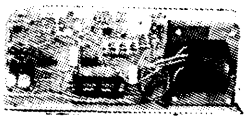

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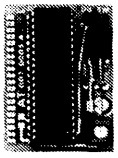

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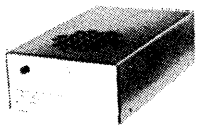

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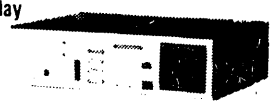

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On Your Own

By Eric J. Torney, Architect

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While working in architects' offices over the last eight or ten years, I have been watching for an opportunity to start a business of my own. Last year, California passed laws intended to make new residences much more energy efficient. Since I've always been interested in details and calculations, this looked like an opportunity.

Editor's note: My understanding is that the law requires houses to meet certain insulation and structural requirements or have their whole design documented for energy use. Documenting energy use is a complex process, but is one which can produce substantial savings on total construction costs because builders can often use cheaper (or fewer) materials to meet the requirements.

The New Laws

Long before the energy conservation laws became effective, there were numerous seminars to familiarize the industry with the requirements. At one of the first seminars I attended, I learned of some low cost, state issued computer programs to evaluate buildings for energy efficiency. At the time, I knew little about computers, but realized I would need to buy and learn how to use one to stay current in my field.

Getting Started

I began studying all the magazines and books I could find about computers, and one which proved useful was Peter McWilliams' "The Personal Computer Book." I also looked up some friends who used computers in their businesses.

Eventually, I decided on a Kaypro II because of its price, capabilities, portability, etc. Once the Kaypro arrived, I learned a lot. I learned how imperfect Perfect Writer and Perfect Filer were, but I managed to use Perfect Filer to organize a list of prospective customers from the phone book and from local builders' organizations.

A friend showed me his Wordstar and I liked it so much I got a copy and learned how to use it. All this took two to three months, during which time I watched the progress of the state's energy software called Micropas (it had not yet been released).

Moving It Over

Eventually, the program was released but I wasn't really out of the woods yet. To start with, Micropas was issued only on 8" SSSD disks. As we all know, Kaypro II runs 5¼" disks. (Scissors were not included for the conversion.)

So I located an 8" system and tried to transfer the software via its RS-232 port. Unfortunately my serial port didn't work at first and even with a great deal of help from some very technical friends, the problem was a beast to find. Anyway, I finally got the port working and was able to move the Micropas program onto Kaypro disks.

Free But Not Easy

Since Micropas was free if you sent in your own disks, and the manual cost only $30 (for reproduction, shipping and handling) I figured I was quickly (and cheaply) on my way to having my own business. Wrong. A special program, BRUN.COM, is necessary to run the public domain software. The State didn't compile the program and they weren't licensed to distribute the run-time interpreter, so I had to locate a copy.

As it turns out, BRUN.COM comes with MBASIC compiler, and the compiler sells for $400. That seemed a bit steep, so I contacted Microsoft and they sent me a copy of the licensing agreement and told me I needed to find someone who had the MBASIC 80 Compiler.

Finally I found a friendly programmer who was licensed to distribute BRUN-.COM with his programs and I purchased a copy from him for a more reasonable fee.

Definitely Not Easy

My problems are over, you say. Wrong. Even though I had BRUN.COM I found that the program did not run when set up according to the manual. All the parts of the program didn't fit into a 191K disk so it had trouble locating all the files. (The error messages gave no clue to the problem.)

After calling the State several times, I got the source code, which is also public domain. Once I had that, I had the program up and running in 20 minutes flat.

By this time I had spent about two months selecting my computer, three months learning how to use it, six weeks getting the RS-232 to work, and about three months getting the program debugged and running.

Also, I was practically on a first name basis with the people at the State, and when they heard I had the program running, they wanted a copy. I arranged to trade a copy of my reconfiguration for some new energy conservation manuals.

Keep in mind that this was all preparation to go on my own. I was still working at another architect's office but I persuaded my employer to let me do energy use documentation with Micropas for a custom home he was designing. I charged a fee, of course, but I had no idea how long it would take, so I worked at home in the evenings.

Little did I know what I was getting into! The project was extremely complicated and overloaded all the input variables of Micropas. Talk about baptism by fire. But that first project really taught me how to use the program. The second project I did was a breeze compared to the first.

After that first project, I attended another seminar on the energy conservation laws. As I listened to the experts it soon dawned on me that I knew more than they did. And when they found out that I had gotten the State public domain version of Micropas running, they were stunned.

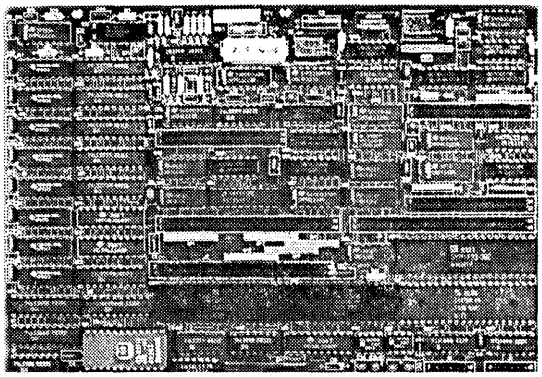
Later in the seminar, the local utility company offered $400 to anyone who used Micropas both to design a house and meet strict levels of energy efficiency. The following Monday I gave one month's notice to my employer.

On My Own

The first thing I did was send out letters to everyone on my mailing list and I telephoned local architects. At first there was no response for energy use documentation, but then I landed a large architectural project which gave me some basic bread and butter money.

Soon, another architect, discovering how much better my service was than the other more simplified methods for documenting energy use, had me work on every project in his office. A third hired me to redo the energy use documentation on a building that was already half completed. My results reduced the remaining construction costs about $3,000.

Mini Z80B



- 6 MEGAHERTZ Z80B CPU — No Wait States
- 5.75" x 8" mounts directly to Minifloppy
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- 64K 150 NS DRAM; Expandable
- SASI Bus Controls 10 Meg Winchester
- Expansion Bus-Z80 Terms Plus Additional Signals
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- In Stock — **$389** CP/M add **$70** Visa M/C COD
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Once word got around about the advantages of my service, I didn't have to do much selling. However, an architect may work for months on plans for a house, whereas I can do the energy use documentation in about a day. That means I constantly have to increase my clientele in order to stay busy.

I also have to give Micro Cornucopia credit for helping my business. Originally, the program took 30 to 60 minutes to run, with an average of 12 of these runs necessary to evaluate a building. The 5MHz speedup cut this time in half. The few dollars spent on the parts and the hassle involved finding slow chips was well worth it.

Another problem I had was that the program was so large, it used up too much disk space to operate conveniently. I was frequently switching disks and PIPing data about. Then Micro C came out with 784K per drive for the Kaypro. This modification completely eliminated the disk swapping. I have nothing but praise for Micro C for providing the opportunity, parts, support, and information.

Investment

I got into business with an initial investment of $2,500 for the Kaypro II, a printer, disks, and cables. I paid for a third of it before I was really on my own, and it's paid for itself many times since. Modifications, including disk drives, cables and parts, cost another $600, but have been so worthwhile I don't even consider them an expense because they paid for themselves the first few days of operation. Now I can easily make $250, sometimes $300, a day.

Since my trusty Kaypro is tied up making calculations most of the time, I'm contemplating buying another computer to handle my writing. But I need a few more jobs first, since I'm still having slow periods when I can catch up on my other work.

Expansion

There are many ways to expand in this field. The current energy conservation laws are for housing only, but new laws will cover commercial buildings as well. Because commercial buildings are so much more difficult to analyze for energy efficiency, I am now developing a program specifically for this application.

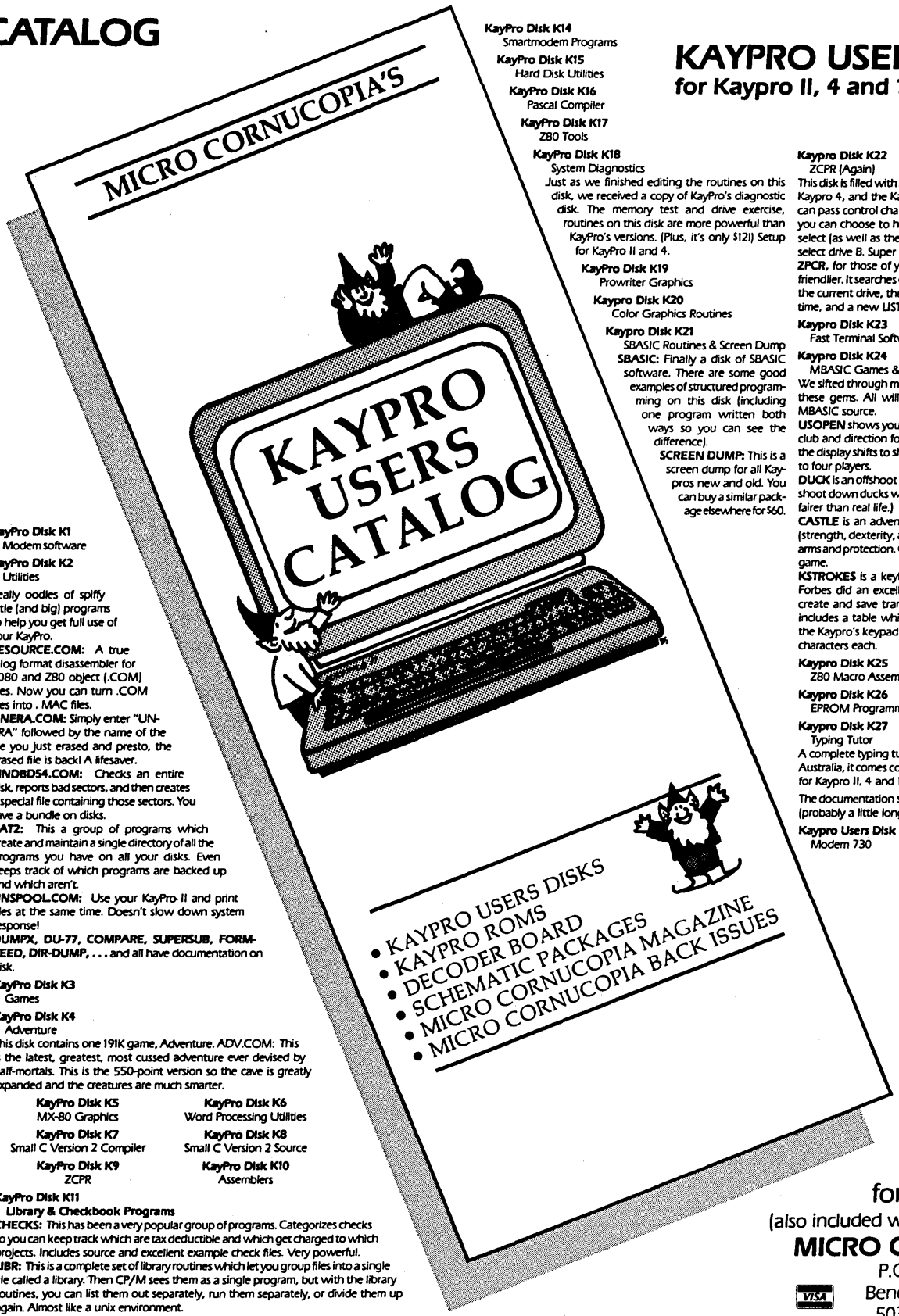
Conclusion

First I had to have a service to offer. Then I had to let people know about it. That meant talking at parties and gatherings to make myself known. Mail advertising was not effective. It's a very short distance from the mail box to the trash can, and mail lacks the personal contact that gets things going.

Word of mouth is slow, but as long as the service I provide is good, my business will grow. Getting out on my own has been lots of hard work and many nights of banging on the keyboard. But as long as things keep up, I wouldn't trade this for a 9-to-5'er. I would, however, change my Kaypro from 2.5MHz to 5MHz and from a 2 to an 8 anytime!

■ ■ ■

FREE CATALOG



KAYPRO USERS DISKS
for Kaypro II, 4 and 10 $12.00 each

KayPro Disk K1
Modem software

KayPro Disk K2
Utilities

Really oodles of spiffy little (and big) programs to help you get full use of your KayPro.

ZESOURCE.COM: A true Zilog format disassembler for 8080 and Z80 object (.COM) files. Now you can turn .COM files into . MAC files.

UNERA.COM: Simply enter "UNERA" followed by the name of the file you just erased and presto, the erased file is back! A lifesaver.

FINDBD54.COM: Checks an entire disk, reports bad sectors, and then creates a special file containing those sectors. You save a bundle on disks.

CAT2: This a group of programs which create and maintain a single directory of all the programs you have on all your disks. Even keeps track of which programs are backed up and which aren't.

UNSPOOL.COM: Use your KayPro II and print files at the same time. Doesn't slow down system response!

DUMPX, DU-77, COMPARE, SUPERSUB, FORMFEED, DIR-DUMP, ... and all have documentation on disk.

KayPro Disk K3
Games

KayPro Disk K4
Adventure

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

KayPro Disk K5
MX-80 Graphics

KayPro Disk K6
Word Processing Utilities

KayPro Disk K7
Small C Version 2 Compiler

KayPro Disk K8
Small C Version 2 Source

KayPro Disk K9
ZCPR

KayPro Disk K10
Assemblers

KayPro Disk K11
Library & Checkbook Programs

CHECKS: This has been a very popular group of programs. Categorizes checks so you can keep track which are tax deductible and which get charged to which projects. Includes source and excellent example check files. Very powerful.

LIBR: This is a complete set of library routines which let you group files into a single file called a library. Then CP/M sees them as a single program, but with the library routines, you can list them out separately, run them separately, or divide them up again. Almost like a unix environment.

DISPLAY, VLIST, PGLST: Additional screen and print utilities.

KayPro Disk K12
FORTH

KayPro Disk K13
Source of fig-FORTH

KayPro Disk K14
Smartmodem Programs

KayPro Disk K15
Hard Disk Utilities

KayPro Disk K16
Pascal Compiler

KayPro Disk K17
Z80 Tools

KayPro Disk K18
System Diagnostics

Just as we finished editing the routines on this disk, we received a copy of KayPro's diagnostic disk. The memory test and drive exercise, routines on this disk are more powerful than KayPro's versions. (Plus, it's only $12!) Setup for KayPro II and 4.

KayPro Disk K19
Prowriter Graphics

Kaypro Disk K20
Color Graphics Routines

Kaypro Disk K21
SBASIC Routines & Screen Dump

SBASIC: Finally a disk of SBASIC software. There are some good examples of structured programming on this disk (including one program written both ways so you can see the difference).

SCREEN DUMP: This is a screen dump for all Kaypros new and old. You can buy a similar package elsewhere for $60.

Kaypro Disk K22
ZCPR (Again)

This disk is filled with ZPCR files. You get ZPCR for the Kaypro II, Kaypro 4, and the Kaypro 10. This version is fixed so that you can pass control characters (such as cntl-P) to the system and you can choose to have it recognize the semi-colon for drive select (as well as the colon). So you can enter "B;" or "B:" to select drive B. Super neat!

ZPCR, for those of you who don't know, makes CP/M a lot friendlier. It searches drive A for any .COM file it doesn't find on the current drive, the TYPE command scrolls text 24 lines at a time, and a new LIST command outputs a file to the printer.

Kaypro Disk K23
Fast Terminal Software & New BYE

Kaypro Disk K24
MBASIC Games & Keyboard Translator

We sifted through many, many games before coming up with these gems. All will work on any Kaypro and all come in MBASIC source.

USOPEN shows you the fairway on the screen. You select the club and direction for each stroke. After you reach the green the display shifts to show details of the green and flag. For one to four players.

DUCK is an offshoot of aliens (pardon the pun). Hunter tries to shoot down ducks while ducks try to bomb the hunter. (Much fairer than real life.)

CASTLE is an adventure in which you select your attributes (strength, dexterity, and intelligence) and you get to purchase arms and protection. Great documentation and very interesting game.

KSTROKES is a keyboard translator similar to Smartkey. Bill Forbes did an excellent job creating this program. You can create and save translation files on disk. The program even includes a table which generates WordStar commands from the Kaypro's keypad! You can define 8 keystrokes at up to 63 characters each.

Kaypro Disk K25
Z80 Macro Assembler

Kaypro Disk K26
EPROM Programmer & Character Editor

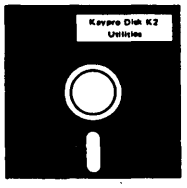
Kaypro Disk K27
Typing Tutor

A complete typing tutor for beginners and experts. Written in Australia, it comes complete with source. This was customized for Kaypro II, 4 and 10 by Barry Cole of WLAKUG.

The documentation says you can learn to touch type in 8 hours (probably a little longer for mortals).

Kaypro Users Disk K28
Modem 730

DISK $12.00 ea.
postage paid



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UPGRADES

Schematic Packages

Finally, a complete schematic for your portable Kaypro, logically laid out on a single 24" by 36" sheet, plus a very complete illustrated Theory of Operation that's keyed to the schematic. You'll get detail information on your processor board that's available nowhere else.

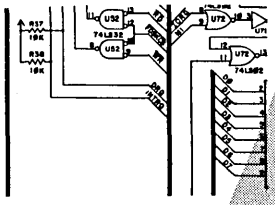
For instance, those of you with the 10 and new 84 systems get a thorough rundown on your video section complete with sample video control programs in assembly language and Pascal. Of course, all packages contain serial and parallel port details and programming examples as well as complete coverage of the processor, clock, I/O, and disk controller (information that is not even available in Kaypro's own Dealer Service Manual).

Kaypro Schematic Packages

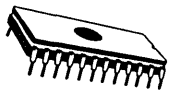
Kaypro II & 4 (pre-84) $20
Kaypro 10 (pre-84) $20
Kaypro 84 series (II & 4) $20
All prices include postage.

Special Offer!

Your First Schematic Package (If you also order subscription) $10



ROM'S from Micro Cornucopia



There are two ROMs in each Kaypro, a monitor ROM and a character ROM. The Monitor ROM supplies information for the Z80 processor on such things as how to get information from the disk drives, and which character to use as a cursor. The character ROM works entirely in the video circuit and it determines what the characters look like on the screen (for instance, does the "f" have a high, small cross bar, or a lower, longer one of the Micro C character ROM). When you speed up your Kaypro, you are speeding up the processor clock so you have to use a monitor ROM that will also run at the higher speed. You are not changing the video clock when you speed up the Kaypro so you don't need to change the character ROM (unless you want the nicer looking character set). Since the monitor ROM tells the processor how to do disk accesses you are going to have to change that ROM in order to upgrade to larger drives.

Pro-Monitor II for Kaypro II

1. This ROM is a fast part so you can run 4 or 5 MHz with your Kaypro II.
2. It gives you a non-blinking block cursor (much less irritating), though you can specify a standard blinking underline if you prefer it.
3. It does faster disk accesses (even if you don't speed up your system).
4. It throws away null characters (those little asterisks that sometimes garbage the screen during data communications).
5. Includes complete printed instructions for simple plug-in installation (takes 5 minutes).

Pro-Monitor 4 for Kaypro 4

This ROM does everything the Pro-Monitor II does, only it's for a Kaypro 4. Though the ROM that comes in your Kaypro 4 will run 4 or 5 MHz (unlike the ROM that comes in the II), this ROM also gives you:

1. Non-blinking block cursor.
2. Faster disk accesses.
3. Throws away null characters.
4. Complete printed instructions simple plug-in installation (takes 5 min).

Pro-Monitor 8 package for Kaypro 4

This ROM package does everything the Pro-Monitor II and 4 do (it will run at 5 MHz, ignores nulls, has the fast disk accesses). In fact, even if you will be using your original 191K or 390K drives for now, you can use this ROM package. The Pro-Monitor 8 features include:

1. You get 784K per disk with quad density (96 tpi, double sided) Tandon 100-4 (or equivalent) drives.
2. You can use any combination of Tandon 100-1 (Kaypro II), 100-2 (Kaypro 4), or 100-4 drives as drives A and B.
3. You can boot from any disk with normal system tracks (Kaypro II, Kaypro 4, or Kaypro 8). The disk needs no modification.
4. You can choose any character (including space) as a cursor and you can choose to make the character blink or not blink. Plus, you can change the cursor at will.
5. You get a disk which contains a new copy routine for copying and formatting 784K disks, and a drive diagnostic routine for checking out the quad density drives.
6. You get complete printed instructions for installation of ROM and drives (takes 10 to 15 minutes, including drives).
7. The installation requires no cuts or jumpers, everything simply plugs into a Kaypro 4. (If you have a Kaypro II, see the modification article in Micro C issue 15 to turn your II into a 4.)

Pro-Character ROM (for Kaypro II and 4)

The character ROM gives you a nicer looking character set. Kaypros have come with two different character ROMs, the early character ROMs had a rotten g, y, q, f, and t as well as commas and semi-colons that were hard to tell from periods and colons. On the newer systems (manufactured since Sept 83) half of the characters (notably the g) have been improved, but they haven't gone all the way.

Also, many of the older character ROMs were poor quality parts so they generated snow as information scrolled up the screen. This white flecky snow disappears when you install a Pro-Character ROM.

The character ROM comes in two flavors:

1. The standard Greek Pro-Character has the nicer character set plus the standard Kaypro Greek characters.
2. The Clean Pro-Character has the nicer character set but no Greek characters. This is the ROM for people who get strange Greek characters on the screen when interfacing with Mainframe systems.
3. Complete printed instructions for simple plug-in installation (takes 5 minutes).

Note: These ROMs will not work in the Kaypro 10 or the latest Kaypro 4 with graphics (it contains the Kaypro 10 board). We are working on new ROMs for these systems.

Prices:

Pro-Monitor II	29.95
Pro-Monitor 4	29.95
Pro-Monitor 8 (package)	49.95
Pro-Character (either Greek or Clean)	29.95
Pro-Set II (Pro-Monitor II & Pro-Character)	55.00
Pro-Set 4 (Pro-Monitor 4 & Pro-Character)	55.00
Pro-Set 8 (Pro-Monitor 8 package & Pro-Character)	70.00

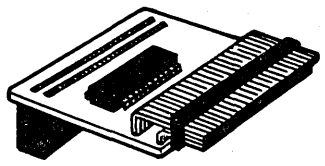
PLUS-4 Decoder Board

With this nifty little plug-in board, your Pro-8 ROM can access up to four 5¼" drives. You just plug a four-drive 34-pin cable into this board and you can add up to two additional drives.

Now you can run any mix of 191K, 390K, and 784K drives as drives A, B, C, and D. You can run your original drives as A and B then add 380K or 784K drives outboard as C and D. You can even run four half-wides inside your original Kaypro!

The Plus-4 Decorder Board for only $39.95

Watch for 4-84 and 10-84 compatible ROMs coming soon.



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VISA

More Goodies From Micro Cornucopia

BB I, BB II, and XEROX 820 USERS DISKS

The following are full 8" disks of software. Each program has a .DOC (documentation) file and many come with source.

8" Users Disks $15.00 each

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

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

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

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

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

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

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

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

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

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

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

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

USERS DISK #13 - General Utilities, BB 1
1-ZZSOURCE, disassembles to real Zilog mnemonics
2-EX14, superset of submit or supersub
3-MOVPATCH, lets you use MOVECPM on other copies of CP/M
4-XMON, 3K expanded BB I monitor, use in ROM or as overlay .
5-CURSOR, prompts you for cursor char you want
6-UMPIRE, very fancy RAM test
7-ZSIDFIX, display improvement for ZSID
8-PIPPAT, modify PIP so you can reset system from within PIP
9-@, Lets you use the BB as a calculator, including HEX
10-SORT, sort package written in C80.

USERS DISK #14 - BB II Software
1-PRO32, latest 2732 reader & programmer
2-SMODEM2, lets BB II talk to Hayes Smartmodem
3-GRAFDEMO, demonstrates BB II graphics (in BASIC)
4-ATTRTEST, demonstrates BB II graphics (in JRT Pascal)
5-INITSIO, initializes port B for 300 or 1200 baud
6-MENU, displays menu of .COM files, enter number to run file
7-SETCLK, sets realtime clock built into BB II
8-PRINT2, modified print which accesses BB II clock
9-BOX, draws a thin line box on screen determined by HL and BC
10-ALIENS, space invaders arcade game
11-LISTSET, printer interface, auto-enables RTS, ignores DCD.

USERS DISK #15 - Word Processing
1-EDIT, very fancy line editor similar to EX (Unix). Includes help menu, programmable key, and full manual on disk.
2-TED, simple minded line editor, easy to learn & use. Very fast.
3-TTYPE, typing training program written in BASIC
4-TINYPLAN, very simple-minded spreadsheet. Whets your appetite for a fancy one.
5-C80 Text Utilities
6-CHOP, cuts off file after N bytes
7-ENTAB, replace spaces with tabs where possible
8-MS, double or triple spaces a file to output
9-RTW, removes trailing spaces from file
10-TRUNC, truncates each line to specified length
11-WRAP, wraps at column 80, plus pretty pretty printing, page #s . . .

USERS DISK #16 - BB I Modem Software
1-RCPM27, list of U.S. bulletin boards
2-SMODEM, interfaces BB I with Hayes Smartmodem
3-PLINK66, easy to use with non-CP/M host, for port A
4-BBPAT, menu selection of BAUD rate, bits/char, parity, & stop bits
5-MODEM 7+, Modem 7 plus BBPAT, lets you talk to anything from port A

USERS DISK #17 - Small C version 2
SMALLC2, this substantially expanded version of Small C now includes for, goto, label, switch (case); external declarations; new preprocessor commands; expanded I/O includes redirection; initializers; plus 12 new expressions. The I/O and runtime libraries have been greatly expanded (including printf). Source & documentation on one full disk.

USERS DISK #18 - FORTH
IFORTH, this is Idaho FORTH which can be burned into ROM or loaded from disk. It replaces the PFM monitor & handles all the monitor functions. See issue #11 FORTH column for more info about IFORTH and this disk.

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

USERS DISK #20 - Assemblers
CROWEASM: This is the Crowe assembler modified so that it runs on any CP/M system (including the BB I, BB II, Xerox . . .). Includes .COM .Z80 and .DOC files.
LASM: This assembler is similar to the ASM that comes with CP/M except that it can link files at assembly time.
PRINTPRN: Print routine for CROWEASM .PRN files.
LIBRARY: Utilities which let you combine many files into one, then you can run, type, or extrace any file within the larger system.

USERS DISK #21 - Winchester Utilities
BACKUP: Helps you back-up the winchester onto multiple floppies. Creates a catalog of the files on each disk and includes the date of the latest backup. Will not back-up an unchanged file more than once. Plus many more super features.
FLOPCOPY: Lets you make floppy copies (with only one floppy drive) by using the winchester as a buffer.
BIGBURST: Backs up a very large winchester file onto multiple floppies. Joins the copies to recreate the original file.
MULTCOPY: Use this like PIP but it prompts you to change disks. Accepts ambiguous file names.
MDIR: Displays files in all user areas on selected drive. Many features.
MAKE, MOVE: PIP-like utilities that make it easy to move files between user areas.
SWEEP: The famous disk cleanup and transfer routine that does just about everything you can do with TYPE, ERA, DIR, and PIP.
UNSQ: This is the latest, greatest file unsqueezer. Enter UNSQ *.* and it will check every file on the disk. All squeezed files will be unsqueezed.

USERS DISK #22 - Pascal Compiler
This is a real Pascal compiler. It supports only a subset of the language (no records, pointers, booleans, reals or complex) but it generates a real .COM file. Everything is on this disk: the compiler, its source, example programs and documentation.

USERS DISK #23 - Xerox Utilities
This disk contains Xerox specific utilities including a screen dump fromWayne Sugai(with source); modifications for the SWP package including ZCPR, a new monitor, and a clock/calendar from Mitch Mlinar; and Jim Mayhugh's new monitor (see issue 19). A very special disk for Xeroxers.

USERS DISK #24 - Prowriter Graphics
This is a complete Prowriter printer graphics package written by the same Micro C subscriber who wrote the MX-80 graphics package. Plot points, lines, circles, boxes, and more. Examples, documentation.

USERS DISK #25 - Z80 Macro Assembler
This is a real Z80 macro assembler! Syntax closely follows RMAC and MAC. Also includes pseudo-ops to support conditional assembly etc. No phase or relocatable code.

USERS DISK #26 - BBII CP/M 3.0 Banked BIOS/ Winchester Support
CP/M 3.0 Banked BIOS implementation for the BBI. Roy Epperson's software to support the Adaptec ACB-4000 SCSI and the Rodime R204 5" Winchester on the BBII (see issue #19). Plus more Winchester programs.

USERS DISK #27 - BYE Remote CP/M System
BYE programs to run your BBI, BBII, or XEROX 820-I as a remote CP/M system using a Hayes Smartmodem compatible modem. Includes programs to allow restricted access.

USERS DISK #28 - VFILER and Extended Single Density
VFILER is a screen-oriented file manipulation utility, similar to SWEEP, CLEAN, and DISK. Also, Larry Blunk's documentation and software for implementing extended single density (334K) on eight inch disks.

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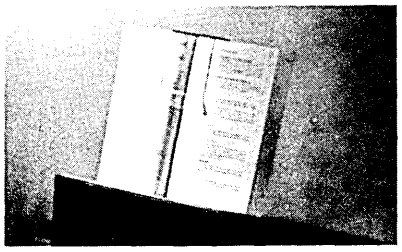

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in a column that it's almost impossible to turn off and get some sleep. It used to take an hour or two just coming down before I would even think of hitting the sack for a few hours of tossing and turning.

I discovered a solution to the problem while taking a series of classes on massage. One of the most important things you learn in massage is how to relax thoroughly, and the instructor brought in some special music and sound effect tapes to help us get into the mood. Then I got to thinking that the same sounds might help me relax when I'm writing and programming.

So, I bought a cassette player with lightweight headphones and I purchased some tapes. Two of my favorites are "Dawn" by Steve Halpern and "The Ultimate Thunderstorm" by Syntonic Research, Inc. Halpern has created many beautiful tunes for relaxation and meditation and the sounds of rain drops and the heavy roll of thunder make me feel very snug in my small basement office.

Anyway, now when I finish up at night, I'm much more relaxed and ready to hit the sack.

If you are interested in these kinds of tapes, check with your local library or bookstore. Both should also have books on relaxation techniques. Try the tapes and techniques (or even a class on massage)—you'll feel better.

Copy Protection For CP/M

It appears that some publishers are copy protecting their CP/M software. They create a disk with one bad sector (the CRC doesn't come out right) and that bad sector (on one of the early tracks) keeps track-copy routines from working.

Of course, you can get around the bad sector by PIPing the program onto another disk, but the first thing the program does when you try to run it is read the bad sector, expecting to get an error. If there is no error, the program just dumps you back to the operating system.

If you feel a really strong need to back up your software (or want to run it on a winchester) then you need to get into the program and look for a direct track read. When you find the conditional jump (on error condition) that follows the read, change it to a non-conditional jump and the program will run anywhere. (I suspect that these laser "signatures" they use for copy protecting just do the same sort of sector mashing.)

Please, however, don't use this as a way to steal copies of the programs. People use copy-protection schemes to stem the mass (free) distribution of their software. If you don't want to encourage copy-protection then don't pass around copies of commercial software (especially the unprotected ones).

Cheap 5" Drives

Priority One has Remex double sided 48 tpi drives (2/3 height with full height bezel) for $59.95 in single quantity, $49.95 in 2-9 quantity and $45.00 each for 10 or more. Bob Carol called me about these and he says he is delighted with his. He says that they are top quality and Tandon compatible. (They are cheap because of the strange size.)

Anyway, this is a very cheap way for you to upgrade a Kaypro II to a 4. You can contact Priority One at 800-423-5922 (and tell them they need to advertise in Micro C so we can hear about these deals first-hand).

A dBASE'd Weekend

It's Sunday and I'm sitting in the mail room trying to get the labels dumped out for Issue 21. What a pit. Each evening after Jennifer and Erin go to bed I head for my hole (in the basement) to work on my mailing list and receipt program in Turbo Pascal. I'm trying convert the dBASE code over to Pascal before dBASE goes completely flako on me (I've been listening to a lot of relaxing music rather than getting a lot of relaxing sleep).

Just recently, in fact, dBASE has developed a strange habit of dropping out of applications programs (back into the dBASE interpreter) at random (and sometimes not so random) intervals. When you are trying to print out 7,000 labels (4-up) and the labels have to be right or you leave out someone, well, a machine problem can be very irritating. Look, if I printed in Micro C what I said about dBASE today, your eyes would be burning.

I have two versions of dBASE—1.37 and 1.40. Version 1.37 had so many little inconsistancies (bugs) that I purchased 1.40. But 1.40 is now consistently bailing out of the label printing program after about 200 records. At first I suspected that my database or index file had been polluted so I reindexed everything and checked the data file (it all seemed to be there and I didn't have trouble accessing the records that shut down my application).

Then, on a lark (desperation), I dug out a copy of version 1.37 and tried that. The old version printed more than 1000 labels before quitting. I ran the old program a few more times and it quit after printing anywhere from 12 to 3500 labels.

Tony came down and we both took a close look at the program and at the hardware. No luck. We copied the entire database onto the Slicer and then ran the programs under our CP/M 86 version of dBASE (also version 1.40). Well, it ran almost as slowly and it died after the same 200 labels (so much for the hardware theory). I have copied the big database into 6 separate files on the assumption that perhaps 7,000 records are too many (dBase says it can handle 65,000). It's still dying.

We've also been seeing this dropout problem while running other routines under dBASE, and these are routines that ran for a year or more without complaint. It's too bad these problems didn't start hollering at me before Comdex—I could have messed up somebody's breakfast.

Ashton-Tate Feeds Me (Bull, You Say)

At a very fancy press breakfast (during Comdex) Ashton-Tate announced version 1.43 of dBase II. They said that they were releasing the new version because of its faster indexing routine. I did a little asking around and found that they had rewritten the indexing code from scratch because it was slow, it was impossible to maintain, and because it didn't generate very good indexes (I'm not sure what that means exactly, but I can believe it).

As far as I'm concerned, they can work on their SORT next. It took slightly under 9 hours to juggle my 7000 records on a 6 MHz Slicer and a winchester. I know it is a bubble sort, but that is ridiculous.

Champion was once trumpeting the fact that its accounting package was written in dBASE. Now it is actively looking for another compiler or inter-

preter. I talked to Champion president Rusty Fraser at Comdex and it was refreshing to find someone so knowledgeable about his product (and about dBASE).

A dBASE Bug Fix

Rusty mentioned that if the header on your dBASE file shows fewer records than you really have, you can recover the "lost" records by SKIPing to the real end of the file and then APPENDing a blank record. The APPEND updates the header.

By the way, Rusty and company appear to have worked around all of dBASE's bugs (though they find the process very frustrating). Sandy is using their accounting package and it has been excellent though it gets a little slow as files get large. Even when the old Kaypro 10 gets flaky and shuts down in the middle of a session (a critical test for any accounting software), the Champion manages to rebalance the books so she can get back in where she left off. It is also the most complete and friendly accounting system she's seen so far.

Be aware, however, that you need a 10 meg winchester if you have very many transactions.

Expensive Substitutions

There were several dBASE substitutes at Comdex and more are showing up all the time. I haven't looked too closely at any of them because they are more expensive than dBASE II which is way overpriced as far as I'm concerned. But then I've got to get the labels to the printer tomorrow and I still don't know how I'm going to get through this mailing list. If your label on Issue 21 was handwritten, you'll know the weekend didn't go very well.

Technical Help

In small companies like Micro C, all technical help comes from the technical staff. If we were to answer the increasing number of technical calls all day long, we wouldn't finish any new designs and we wouldn't get a chance to write or edit technical articles.

So, we are taking technical calls between 9:00 a.m. and 12:00 noon Pacific Time, Monday through Friday. Alice, Tracey, Dorcas, and Cary do their best to answer questions you have about our products, but if you need a definitive answer about a burning question, try us in the mornings. (Please note that though our answers may be definitive, that's no guarantee they are correct.)

Renewal Forms

Those of you who have received one of our yellow renewal forms know that we ask you to tell us what you think. I can't write a personal reply to everyone and still have time to do a magazine (and print labels) but I read the order forms. All of them. (I read them while waiting for dBASE.)

As for a few replies: "No, I'm not an incarnation of Bennett Cerf. No, the Micro C staff does not take off Saturday night to produce the Prairie Home Companion (although Tony is an ardent fan). We've found no way to clone Dana (or Laine). And, we are not interested in finding more monkeys to write the editorial." (Though if they wanted to print labels . . .)

A number of you have asked if there is a PC compatible computer that you can build (try the Heath H-150, it is supposed to be excellent). Others of you are very interested in the Motorola line (68008, 68000, and 68020).

Quite a few of you have S-100 systems, and very few have been able to stop with just one. Many Big Board people have Xeroxes or Kaypros and a respectable number of Kaypro owners are interested in building either a BB or an 820.

Many of you have suggested articles, thank you very much. Others have offered to write something or have listed projects that make my mouth water. In fact, almost everyone jotted down something (the comments followed by asterisks were the most common).

General Comments or Suggestions.

- Stay small.
- Don't grow too fast and forget the little guy.
- Don't change the plain brown wrapper.
- Get big enough to be around for a while.
- Don't go to glossy paper.*
- 3-hole punch the mag.
- Go monthly.*
- Keep the articles technical.

(continued next page)

Z80 System Owners Join The 16/32 Bit Revolution Through Evolution

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- Make the articles more technical.
- Add a novice column.*
- Do some tutorials on hardware theory and practice.*
- Introduce readers to servicing techniques.
- Go monthly.*
- Run tutorials on assembly language (and C, and Pascal)*.
- Add in-depth pieces on CP/M (or CP/M 86, or MS DOS).
- Ignore MS DOS and the PC.*
- Add 8088 and PC/DOS while keeping Z80 and CP/M80.
- Go monthly.* (Look, I heard you already.)
- Do more on the BBI (or BBII, or Kaypro, or Xerox . . .).
- The documentation on the disks stinks.*
- The documentation on the disks is great.*
- The user disks are a terrific bargain.*
- Don't be all things to all people.
- Run more information on the Ampro Little Board.
- Use bigger return envelopes or smaller order forms.*
- Get a real job, go monthly.*
- I don't understand half of your mag but enjoy it greatly!*
- More software like SpellSys.
- More ads.*
- Fewer ads.
- Do an SBASIC to Turbo translator.
- Forget SBASIC, do more Pascal.*
- Micro C is the only hacker's magazine left.*
- Quit putting "You see" in the articles (You see, I do it so you won't notice all my "So's." So there!)
- Do an article on the mysteries of the Z80 SIO (might sell movie rights).
- Go monthly!*
- Cover more single-board systems.*
- Don't get too general.*
- How about a column or open forum on Z80 and 8080 assembly language?
- Use good grammar on user disk documentation. (First, we gonna' clean up the grammar in the mag.)
- I sold my 820 but I'm keeping Micro C, since you're the Mother Earth News of Computers.
- Don't forget the BBI. Kaypro is OK, but we started it all.
- I love the letters.*
- Great T-shirt.
- See you at the SOG.*
- Could you modify my Kaypro? (No, but a good technician who wants to do PRO-8s and speedups for folks should drop us a card.)
- Bring back the "Bug" cartoons.
- Satisfied with everything but Small-C.
- The more I reread the back issues the more I learn.*
- How about features on what people are doing with their systems?
- Cover the Zenith 151. It's an excellent machine and they provide super support.
- I love ZCPR!*
- Good mix of humor and information.*
- You guys should loosen up a bit, not so serious. (Where has this guy been?)
- Beware of review-itis: many mags are no longer interesting.
- I Need IBM compatibility.

What Are You Currently Working On?

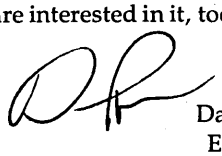
- A Lite Beer.
- This renewal form.
- My first million.
- A redhead.
- A sure cure for baldness.
- A sense of humor.
- The floor.
- Staying generally employed.
- My attitude.
- The semiconductor course from Heathkit. (This respondent obviously didn't understand the question.)

What New Products Would You Like To See From Micro C?

- $29.95 100 Mbyte hard disk.
- Larger envelope for the renewal form.

(As soon as we finish up the cheap hard disk, we'll see if technology has reached the envelope stage.)

The "What are you currently working on" category is particularly important. It is the source of many articles and it gives me a feeling for what you are really interested in. If you are interested enough to put some effort into a project, then we are interested in it, too.



David J. Thompson
Editor & Publisher

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- Number of columns
- Top row number (0 or 1)
- Left column number
- Scroll at bottom?
- Cursor addressing:
  - Lead-in sequence
  - Row or column first
  - Form of data
  - Row offset
  - Column offset
  - Separator sequence
  - End sequence
- Sample addressing
- Delay after positioning
- Cursor home
- Erasure:
  - Entire screen
  - Cursor-end of screen
  - Home to cursor
  - Cursor-end of line
- Beg. of line-cursor
- Entire cursor line
- Erasure delays
- Video attributes:
  - Blinking
  - Reverse video
  - Underline
  - High intensity
  - Half intensity
  - Occupy position?
  - Cumulative?
  - All attributes off
- Cursor control keys
  - Up
  - Down
  - Right
  - Left
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- Conform to ANSI X3.64?
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LETTERS

(continued from page 3)

Dear Editor:

When you mention a company in a column, please include the full address. Some of us overseas would love to get in on those disk drive steals but have no inexpensive access to toll free numbers.

Also, how about a yearly index? Then again, maybe not until you go monthly.

Third, any possibility of interacting for your overseas subscribers in getting parts and equipment (taking a percentage for your troubles?) My problem is that, so far, three companies have refused to ship disk drives overseas by U.S. mail (even to APO).

CPT. Stanley B. Clinard
HHC 1 BN 54 Infantry
APO NY 09139

Editor's note:

You certainly aren't the only overseas person who has found that it's almost impossible to get all those necessary parts that are only a phone call and credit card number away.

People think of Central Oregon as a technological backwater (mudpuddle) but I've received letters from folks who have had to travel outside their own countries to purchase common ICs.

On the other hand, exporters face some very interesting legal problems both within the U.S. and from foreign countries, so exporters often specialize in trade with one or two countries. Just getting $5.00 worth of parts through Canadian customs can be a 2-month nightmare if you don't send it correctly. (Sending something to an APO address is like sending it within the U.S. Unfortunately, some shipping departments must not know this.)

If someone out there has a suggestion, yell. I'd love to help you with parts, but I'd be very unpopular with everyone here at Micro C if I took on one more project.

Dear Editor,

My friends and I are working on a "cables and connectors" adventure. This project is basically for our own experience. We have good experience in hardware and firmware design and we are now trying to find out what people need. We are willing to do custom designs.

Kin Hung Ng
539 Merioneth Dr
Exton, PA 19341

Dear Editor,

Contrary to what Tony Ozrelic espouses in his C'ing Clearly column, I have found Small-C version 2.1 easy to use, reliable, and well documented, but only if you invest in "The Small-C Handbook" by James E. Hendrix. Published by Reston Publishing Co., this book (and "Small-C Version 2.1") is available for $14.95 from the author at P.O. Box 8378, University, MS 38677-8378, or at some local bookstores. Hendrix also sells 8" SSSD disks for $25.

I really enjoy reading Micro C and look forward to its arrival in the mail.

Judd Ellmers
266 Washington Ave.
Pleasantville NY 10570

Dear Editor,

I am chairman of the first Kaypro Users Group in Saudi Arabia. We have members of all levels of experience from all over the world, and have every model and version of the Kaypro except the Robie. We would be happy to exchange information on disk from our public domain collection with anyone interested. We would welcome any disk format readable by Uniform.

We also need a tutoring disk for our latest project of learning C language. Please contact us if you can help.

One more thing: In the file KAYTERM-.DOC on your K14 disk, the statements about cursor positioning have an error. The cursor offset is 32 DECIMAL which corresponds with 20 HEX. This value plus the actual screen location will help get the cursor where you want it.

Dave Schubert - JEDKUG
Saudia Airlines CC999
P.O. Box 167
Jeddah Saudi Arabia 21231

Dear Editor,

As suggested by D. H. Durland (Micro C #15, p.6), I replaced the 16 MHz video dot clock on my BBII with 18 MHz. I can now see all 80 columns of all 23 lines and still have a VSYNC signal which marches sedately across an oscilloscope triggered on line. Delightful!

However, the display was scintillating. Specifically, the right edges of characters were fuzzy and unstable. Sometimes a zero would be almost solid inside. Since my oscilloscope huffs and puffs to get up to 18 MHz, and since I couldn't pry an 8002 spec sheet out of SMC, I fussed with it a bit. What worked best was a 1.2K pullup resistor from pin 4 of U43 to +5 V. It made sense, and I found convenient holes to solder it in, so I did it.

Now everything is fine, except that if I fill the screen with "F" and turn the intensity down, the vertical lines drop out before the horizontal. That rang a bell, so I scurried through the stack of MC's and eventually dug out Chevalier's note (Micro C 12, p. 2). I'll try his cure for poor rise time as soon as I get the parts, but meanwhile, he also gives a cure for scintillation (since he preceded Durland's idea, I suppose he scintillated at 16 MHz).

Anyway, his cure is quite different from mine. Can you find somebody out there who has a good oscilloscope and spec sheets on 8002 who can look at the problem logically and propose a "best" solution? We all might learn something.

R. W. Hartung
408 Orchard
East Lansing MI 48823

Dear Editor,

I've have just read your complaint about readers pestering you and your staff at the magazine with calls for technical assistance. I am a teacher and when this happens in the classroom it usually means I've done a bad job of explaining something. Instead of belaboring your readership with inspirational sermons about the value of self-reliance and self-help, why don't you just own up and take the rap; you did a lousy job of explaining the Pro-8 upgrade.

You think nothing of devoting six pages to an esoteric and fundamentally frivolous peripheral such as a speech synthesizer, or using limited space in the correspondence department for letters so silly they wouldn't be included in a high school newspaper, but when it comes to explaining an important and complicated enhancement such as an 800K disk drive, a few columns and two skimpy diagrams are thought to be adequate. This for an upgrade that involves an investment of several hundred dollars and at least six different connections on the circuit board alone.

And you wonder why the phone is ringing off the wall?

I think it's about time you were disabused of the notion that you are writing a precious esoteric journal dedicated to a handful of electronics technicians and engineers. If that were the case you would go broke tomorrow. The bulk of your subscribers are users or programmers with little of no electronics experience, or certainly not enough to tackle an involved project like the Pro-8 upgrade without considerably more information

(continued next page)

LETTERS

(continued)

than you are supplying.

It is regrettable that, having designed a much-needed improvement to the Kaypro-II, you have taken such a casual attitude regarding documentation that only a chosen few will have the expertise to implement it; when with only a little more effort, and a little more attention to detail, it could have been made accessible to a much wider spectrum of users.

William Fankboner
1363 E. Ramsey St.
Banning CA 92220

Editor's note:

Bill, you have a style which encourages more reaction than communication, but I will try to deal with your letter on a point by point rather than on a toe to toe basis.

You are absolutely correct, we haven't properly documented some of the Kaypro modifications. Our experience has been with the Big Board group (that "handful" of engineers and technicians which has kept us alive and growing for over three years) and so we are used to dealing with people who are already comfortable with the language and with our schematics (when we get them right). In fact, if it weren't for these engineers and technicians, there wouldn't be any Kaypros to modify.

As I have mentioned in earlier issues, we haven't tried to teach tender loving soldering or trace-cutting techniques in the magazine. ICs and circuit boards are delicate beasts, especially when the parts are soldered in. So when newcomers like yourself tackle even a small wiring project like the PRO-8, we encourage you to get together the parts and a good technician (from your local Kaypro or CP/M users group) before you do the actual installation. Once you have had a little supervised practice and have struggled through a couple of years of Micro C, you should be on pretty firm ground.

As for "letters so silly they wouldn't be included in a high school newspaper," I guess I must have missed them. (Even your letter has some redeeming value.)

Dear Editor,

I represent a non-profit medical organization helping people here in Yemen. We are considering purchasing a Kaypro to help in our administration, but have some questions. How are the models 2/84, 4/84 and 2x different from the 2, 4, 10 and 4+88? Also, since much of our paperwork must be done in Arabic, can a Kaypro be interfaced with one of the Epson Arabic printers? Third, can a Kaypro be Arabized? (The Arabic Epsons are available from Appropriate Technology, Ltd., 2/4 Canfield Place, London, England NW6 3BT.)

We would appreciate any help you or any Kaypro users out there could give us.

Dan Gibson
Worldwide Services
Box 2168 Sanaa
Yemen Arab Republic

Editor's note:

All the 2s and 4s manufactured since early 1984 have the 84 boards in them. The 84 boards run at 4 MHz, have half-wide drives, and have graphics like the Kaypro 10. On the new Kaypro 4, they've also added parts for the real-time clock and a 300 baud modem. (Those parts are left off the 2.) The Kaypro 10 does not yet have the clock or modem.

The new 2 and 4 boards also have SASI (winchester) interfaces built in so I keep expecting to see them show up in the Kaypro 10s. In terms of Arabic, I'm out of my field. However, Arabic is written right to left while computer hardware (and text editors) automatically move the cursor from left to right. Also, there is the problem of displaying the Arabic characters. (Are there enough pixels for instance?)

Dear Editor:

As a lawyer making extensive use of Kaypros in my practice, I am interested in hearing from others in my field using Kaypros. I suspect that I'm like many lawyers in that I'm not very technically oriented.

Thanks to an ad in Micro C, I purchased an outline-processing program called KAMAS which is proving invaluable in preparing outlines for my trials. I had earlier used a data-base program called Citation for this purpose, and while it is an excellent program and proved much better than my old manual methods, it was more cumbersome than KAMAS.

As soon as finances will permit, I plan to buy a modem and hook up to a legal database called Westlaw.

Stephen C. Scott
11 N. 7th Street
Columbia MO 65201

Dear Editor,

I have just finished speeding up my Kaypro II to 4 MHz, and now I have a machine that really SCREAMS. I installed your Pro Monitor 8 ROM, and your standard Greek Pro Character ROM. I have also replaced Drive B with

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two Teac 55B drives. I tried to use your 4Disktst program to test my two new drives (B & C), but I could not test drive C with the program as you supplied it. I searched through the code and located the following areas that needed change.

Group XX:01 Byte 79
Change 02 to 03 (for 3 drives or 04 for 4 drives)

Group XX + 1:03 Byte 52
Change 42 to 43 (for 3 drives or 04 for 4 drives)

Disk Utility DU.COM should be used to MAP the disk for the starting group number. The Display command will show the code as referrenced above.)

Larry D. Kraemer
Rt. 2 Box 190
Jackson MO 63755

Dear Editor:

There appears to be a problem on the Kaypro 4-84 Config program that comes on the new CPM Master. I have the 83 style and I also have an Oki-82A printer that I drive from the serial port.

If I use my 4-83 printer and cable on a 4-84 and run the new version of Config, it doesn't work. Yet it works fine if I run the old Config program and make the changes on the 4-84 diskette, and restart.

After trying the new Config, if I give it a STAT LST:=TTY: then it will pick up. But that is the Stat program working, not the Config. What gives?

Glen Tatum
#1 Eastlawn
Kearney NE 68847

Editor's note:

You don't say which version of CP/M you received from Kaypro but we've seen so many (there are at least 2 versions of 2.2G) that nothing surprises me anymore. For years, STAT.COM has been the standard program for changing port configuration, but very few Kaypro folks even know it exists.

Dear Editor:

After hours of studying issue #15, "Great Eight Kaypro," and issue #18, Greg DeHoogh's letter to the editor, I started to make the modifications to prepare my Kaypro II for the 2732A monitor ROM chip and double-sided drives. Greg DeHoogh's suggestion of bending pin 1 of U60 and jumpering it to pin 8 seems a lot easier than hooking up to the additional gate in U80.

However, could you please clarify one thing. If I use this alternate method of selecting the second half of the 2732A, does the ALL line on the 2732 ROM (pin 21, U47) still have to be jumpered to U59, pin 2? Or, is this step also bypassed (DeHoogh says, "This method eliminates the need to add in an extra gate and the accompanying jumpers.")?

I've previously followed your suggestion of using a 24-pin dip socket. On certain jumper schemes, I use 2 dip sockets stacked one-upon-the-other, with the original IC installed on top of this little "hi-rise." While this method may take longer to put together and test out (before plugging in), it at least prevents irrevocable damage to the main circuit board.

With this in mind, my solution for the floppy side select was to bend out pin 5 (U73) on a dip socket, solder wire-wrap wire to this bent out pin, and run the wire-wrap wire to the PIO (U72). After carefully removing the 40-pin PIO, the insulated stripped end of the wire was inserted into the U72, pin 13 socket, after which the PIO was reinserted.

Wire-wrap wire was carefully wrapped and soldered to pin 6 of the IC socket. After pulling out the dip header for the floppy drives, the other end of this wire was wrapped to pin 32 on J6, and the header reinserted. This dip socket was inserted into U73 with the new IC, a 74S04, inserted instead, or the original 74LS04.

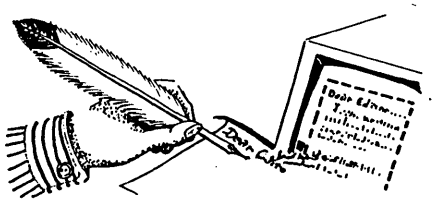
This method eliminated removing the board from its mounts, and allowed the modifications to be easily removed.

Brian Tanaka
3479 Pinao Place
Honolulu HI 96822

Editor's note:

Even with DeHoogh's modification you still have to jumper pin 21 of the monitor ROM to U59 pin 2. Also, good suggestion on the mods. Be sure to use high-reliability sockets. The Augat brand sockets have been quite good.

■■■



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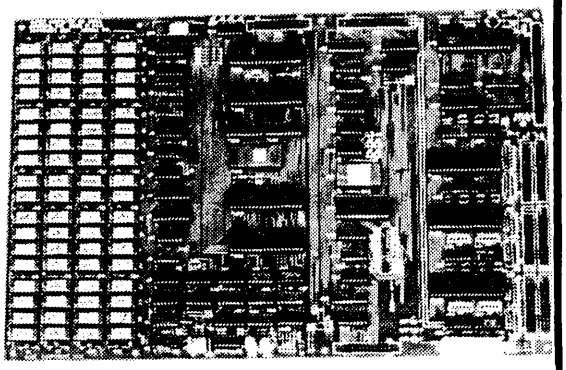

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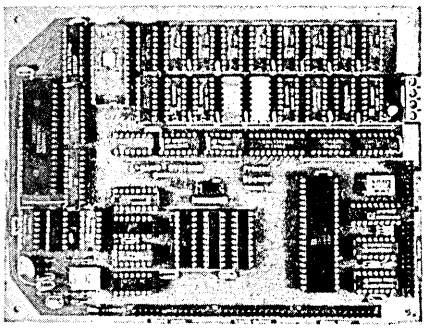

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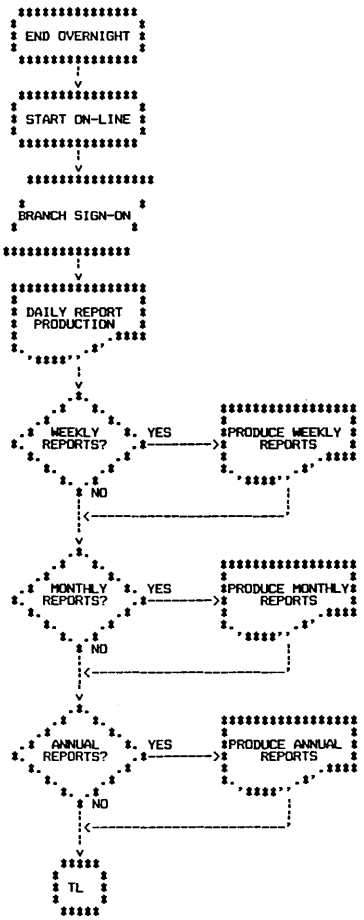
FLOWCHARTER



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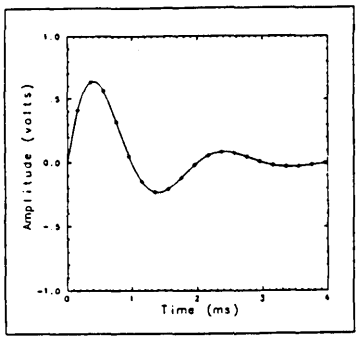

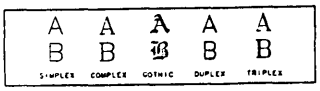

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TECHNICAL TIPS

Debugging The MODEMPAT

The MODEMPAT program on Kaypro disk K1 has a bug. As its documentation states: "This program sets up the SIO (serial port) for whatever baud rate, bits per character, stop bits, and parity you need." It performs all this flawlessly, except when you ask for 6 data bits you actually get 7, and vice versa (in transmission only—in reception you get the right number).

The bug is caused by a typographical error in MODEMPAT.ASM on line 303, where the label BITS$TBL1 appears, followed by four data bytes written in binary notation. The second and third of these, 11001000B (C8h) and 10101000B (A8h), are given in reversed order. You can fix this by transposing the two bytes in the .ASM file with your editor, then reassembling and reloading. But it's even easier to use DDT to patch the .COM file directly. The same patch should also be performed on MODEM7+.COM.

```
A0>ddt modempat.com
DDT VERS 2.2
NEXT    PC
3000    0100
-s2fd8
2FD8  C8  A8
2FD9  A8  C8
2FDA  88  .
-^C
Warm Boot
A0>save 48 modempat.com
```

Oliver LeBlanc
1173 Phoenix Avenue
Schenectady NY 12308

BBI Terminal Sign-On At 6MHz

Blunk's 6MHz mod (Issue #19) worked great; but I still needed the option to sign on with a terminal.

The code that determines the baud rate of the terminal between 0F080H and 0F088H is excuted twice as fast as it was at 2.5MHz—a problem. Therefore, the count in the accumulator must be divided by two.

One solution is to change the position of the starting address of the baud table RATES:. Change the byte at 0F08BH from 0CAH to 0CBH. This works, but only allows baud rates between 600 and 19.2K baud.

To get the full range, add an instruction to the source INIT.ASM and reassemble the monitor. Insert the instruction RRCA in the line above the BAUD3: label (after line 122 in the ROM.PRN listing). This mod allows 300 to 19.2K baud terminals to sign on to port B.

I've verified this mod at 300 and 9600 baud, and the first approach at 9600. I believe both mods will work on systems running at 5MHz.

Below is a loader program to put the contents of ROM into RAM. After assembling this program and ROM.ASM, I linked them with a starting address of 0EFF1H. I was able, then, to burn the hex image without modifying it.

To get the CTC back on track with 1 second interrupts at 6MHz, change the byte at 0F115H from 69H to 0FCH (252D).

```
; LOADER ROUTINE
        DI
        LD      HL,000FH
        LD      DE,0F000H
        LD      BC,0800H
        LDIR
        JP      0F000H
        END
```

David Simmons
8926 Curry Ford Rd.
Orlando FL 32825

Slicer DISKNAME Error

There's a minor error in the August 1984 Slicer column program listing DISKNAME. The utility GENCMD requires that stack and data segments be zero byte terminated. The figure below shows changes which allow successful implementation of the program.

I found that assigning A: to my disk in the BIOS did not give the hard disk subsystem time to spin up. This caused a BDOS error 80H, presumably disk not ready since the error did not occur when booting from the monitor with the hardware spun up and stable. I tried setting the timeout period on the hard disk to 255 X 20 milliseconds using the SETUP program, but this still did not provide enough time.

Paul Wolfson
2031 Robin Hill Lane
Carrollton TX 75007-1612

```
; CCP command line trailer
        DSEG
        ORG     80H
CMDLINE RW      1
        DB      0 ; Needed by GENCMD (new)

;SELDISK location in jump table.
        SSEG
        ORG     251BH
SELDISK RW      1
        DB      0 ; Needed by GENCMD (new)

Perform system reset following disk reassignment.

        ; insert this code to force CP/M-86 to log the disks.
        ;
        ; MOV   [BP+SI], AL
        ;
                jmp     report  ; show translated table
                mov     c1,0h   ; set BDOS reset
                mov     d1,0h   ; prohibit restart
                int     224     ; call BDOS
        ;
        ; Display current drive name translation table on CRT.
          REPORT:
```

TECHNICAL TIPS

Dyna Disk On The Xerox 820-1

Here are some tips on getting your Dyna Disk up and running on the Xerox 820-1:

1. U100 and U114 are the two ICs that are replaced by jumper blocks U90 and U92 in the Dyna Disk manual.

2. J11 is the Xerox equivalent of JB3 in the manual, and the pins connecting on J11 are as follows:

3 to 4
5 to 6
7 to 8
13 to 14
15 to 16

3. The HEXOUT routine is available through location F030H in the Xerox monitor. All references to HEXOUT should be made at that jump address.

4. The Xerox Monitor Program currently uses the memory area in which the Dyna Disk software attempts to relocate. If you don't intend to use the Xerox monitor routines (memory dump, I/O read and write, etc.), then you won't have to make any changes. But if you really want to be safe, then reassemble the software to relocate above the monitor (mine resides at FC00H).

One final note: I haven't had time to really check into it, but on my system the DCOPY program takes much longer to do a sector-by-sector copy of my A drive to the Dyna Disk. My guess is that the way the Xerox handles the drive functions is causing the delay. I've found it faster to use SYSGEN and SWEEP to copy the programs I want to keep on the Dyna Disk.

If anyone comes up with a fix for that, please let me, or better still, Tony and the folks at Micro C, know.

Jim Mayhugh
8 Lincoln Ave.
Erial NJ 08081

Short Cut To Line Printing On The BBII

If you want to set up a parallel printer output, and don't want to build the transistor circuit (see "Installing The BBII" by William L. King, Micro C Issue #14), you can make the following changes on your BBII to get an active low data strobe.

1. Cut trace between U105 (74LS74), Pin 9, and J11-17.
2. Jumper J11-17 to U105, Pin 8.
3. Follow cabling diagram and software changes listed in "Installing The BBII."

Mark A. Matthews
California State University, Sacramento
6006 J Street #310A
Sacramento CA 95819-2634

Cheap Anti-Glare For The Kaypro II

We all know about the glare problem with the screen of the Kaypro II. (This also applies to most other computers.) We also are aware that the anti-glare screens are anything but cheap. How they can charge $50 for an eight inch square of nylon mesh?

Well, there's a cheap and easy way to make your own. For $1 I bought enough black crepe (it's very sheer and can be found at most fabric stores) to make screens for three Kaypros.

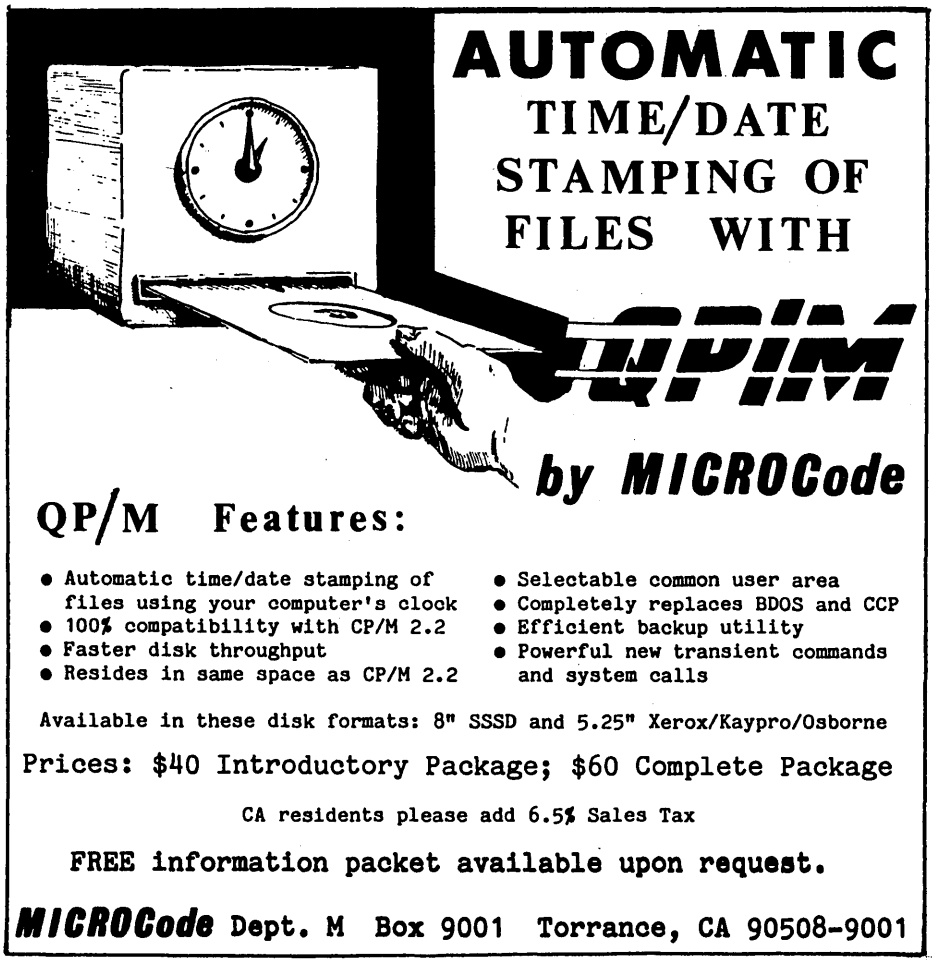
I removed the bezel (from around the screen), cut the crepe to size, and glued it to the back of the bezel. (I used a sanding disc adhesive from Sears, but contact cement would also work.)

Then, to make it easier to clean (instead of just screwing it back in place), I cut the heads off four brass screws of the proper size, soldered brass tubing over them, screwed these into the bezel, and then slipped the bezel in place.

It holds securely, but can be slipped out without removing the cover.

Gary Lynn Wooster
24335 Second St PO Box 261
Grand Rapids Ohio 43522

■■■



The Culture Corner

Digiterata

Go placidly amid the bytes & bits, and remember what peace there may be in a power failure. As far as possible without surrender, modify your software until it works the way the software house advertised it would. Speak your truth quietly & clearly; and listen to others, even FORTH programmers and members of other sects; they too have their story. Avoid RPG and FORTRAN hackers, they're a vexation to the spirit. If you compare your code with that of other programmers, you may become vain or bitter; for always there will be greater and lesser than yourself. Enjoy your BBII as well as your BBI. Keep the faith with your Z80 system, however humble; it is a real antique in the ever changing technologies. Exercise caution when booting your system, for the floppy disk is full of trickery. But let this not blind you to what virtue there is; even Unix gurus strive for high ideals; and though their quest is futile, their life is full of heroism. Be honest, your computer knows the truth. Especially do not run emulators, for even an 8 MHz Z-80 can't impersonate a Cray. Neither be cynical about MS-DOS; for in the face of all time it is but a butterfly. Take kindly the counsel of the S-100 buffs, surrendering their knowledge of superior systems. They, too, run CP/M. Retain backups to shield you during the rains of winter. But do not distress yourself with imaginings of power failures yet to come. When they hit, accept them kindly and kick neither the cat, the child, nor the spouse. They may all kick back. You are a child of the computer revolution, unlike Morrow and Wozniak; you have no right to be here. And whether or not it's clear to you, Apple and IBM will be overcome as they should. Therefore be at peace with your Single Board, whatever you conceive it to be: BBI, II, Kaypro, Ampro, or Slicer. In the end you will trade it for a terminal, modem, and access to a mainframe channel. With all its drudgery & broken dreams, the Z8000 is still a beautiful chip. Comment your code. Read Micro Cornucopia.

By Tony Dowden
780 El Solyo Heights Dr.
Felton, CA 95018

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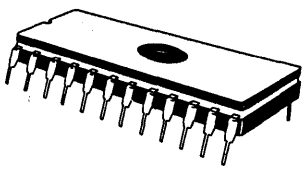

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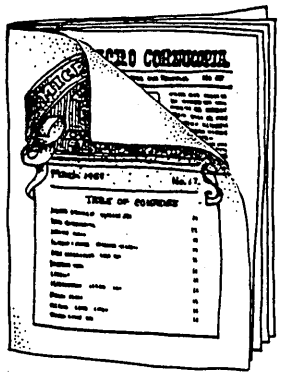

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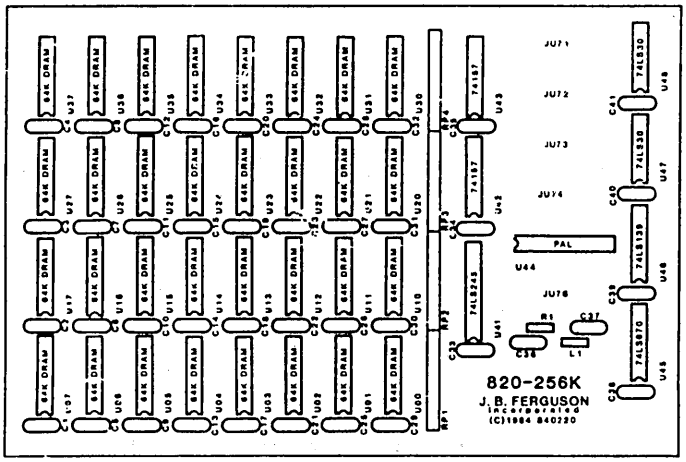

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