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MICRO CORNUCOPIA

THE SINGLE BOARD SYSTEMS JOURNAL

April 1984 No. 17

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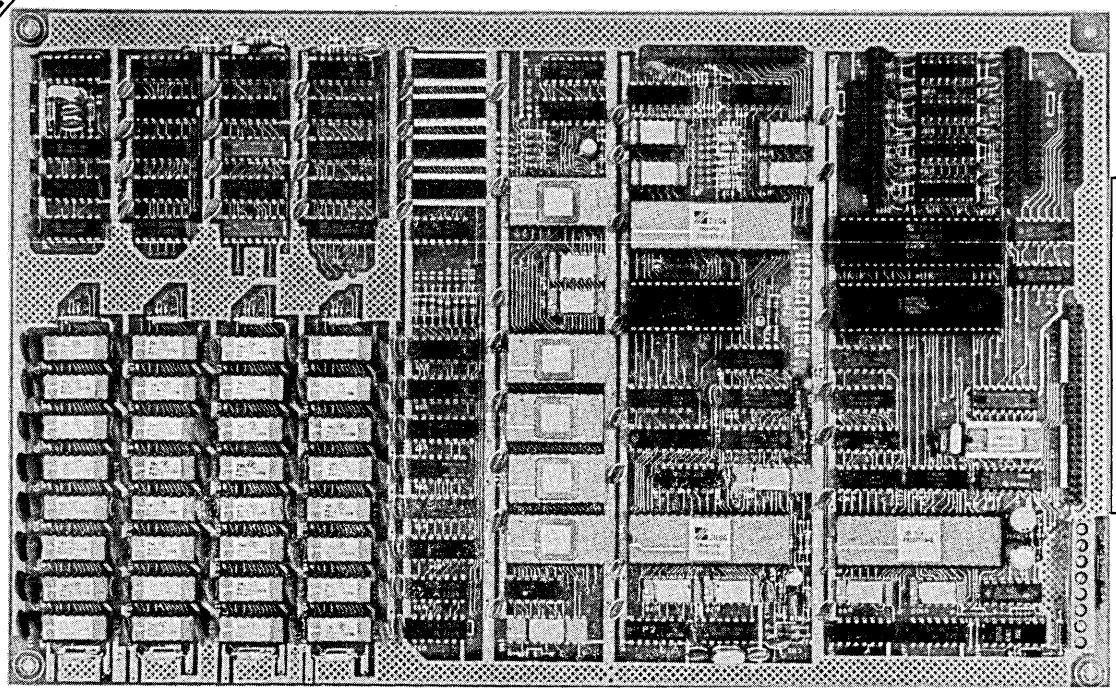

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MICRO CORNUCOPIA

April 1984 **The Single Board Systems Journal** **No. 17**

Read A Good CP/M Book Lately?

You may have noticed that the editorial is often a collection of things that probably should have been put elsewhere in Micro C, but I just didn't get around to prettying them up enough for a formal presentation. This editorial is no exception for herein is a book review and a plea for help (a little self-help, that is).

Book

I purchased a book called *A Programmer's Notebook* by David Cortesi at my local bookstore. This is a bit unusual for me because publishers are constantly offering to send me every imaginable (and unimaginable) kind of book, free. I should have saved some of the more "interesting" titles such as *A Review of Business Programs for the VIC 20.* (I'm sorry, that was a bit facetious.)

Anyway, I bought the book and, with it, an 8" disk containing the programs developed in the book, and I'm delighted with it. Cortesi is a first rate programmer and writer. You get to participate as he works his way through the designing, coding, and debugging of a number of complete CP/M utilities in 8080 code.

You'll learn really good assembly language programming methods, you'll learn a lot about interfacing with CP/M, and you'll feel like you've gotten to know a very interesting person.

You'll need to have some programming experience first, for he notes at the beginning, "If you are a complete novice at programming you might enjoy reading this book, but you will learn little from it. It will probably seem that we are continually leaping from problem to conclusion without any intermediate steps. The programs will seem to grow up of their own volition, like plants. If you have some experience with programming, perhaps in BASIC or Pascal, things will make more sense."

The only complaint I have about the book is that Cortesi is writing in 8080 assembly language rather than Z80. I mean, who has an 8080? Of course anything written for the 8080 will run on the Z80 but Z80 nmemonics are much easier to learn and the Z80 instruction set is more powerful. However, with my trusty little 8080-Z80 translator, I can change all those source files into something more intelligible.

Meanwhile, this is a super book and Cortesi has another book called *System Programming Under CP/M-80* which sounds very interesting. After all, *The Programmer's Notebook* is better reading than most novels.

A Programmer's Notebook
David Cortesi
Reston Publishing Company
Reston Virginia
$16.95 (without disk)

Self-Help Anyone?

Support has turned into a real problem here at Micro C. You see, Dana and I have been scrambling to keep systems running, build new systems (the Little Board and the Latest Slicer), modify our present systems (the Big Board, the Big Board II, the new Kaypro 4, and old Kaypro II), and try out all those software and hardware packages (the PROM programming packages for the BB II, for instance) that people send us and plead with us to review.

Meanwhile, we are spending well over half of our working hours answering calls for help. Mondays and Fridays are the worst with Tuesday, Wednesday, and Thursday a little lighter (usually).

Some people have suggested that we set specific hours when we will handle technical calls, say, afternoons on Tuesdays and Thursdays. Others have suggested that we limit each call to 3 minutes.

I don't like either of these options. Micro C is at its best when it helps people

(continued on page 52)

LETTERS

Dear Editor,

With a few minor problems I got my BB I running.

First, there weren't any display sync. signals, vertical or horizontal. A 74S04 for U11 got the 14.318mhz oscillator running, instead of a 74LS04. Still no sync.

I found the C external pins on the 74LS123 one shots grounded. Even on the schematic it showed this. Most applications I found didn't ground them. After cutting away the Pc ground path, the display took right off.

My ORBIS 76 Disk drive wanted to see 10ms step rate. So I had to change location FF6A from 00 to 02.

When interfacing the centronics 700 printer to channel a PIO, a oneshot had to be added on the "Ready out Line." It seems the 700 wanted to see the positive going trailing edge, before it would send back the ACK or strobe.

Chris Gentile
3256 Roxborough Ave. N.
Clearwater FL 33520

Dear Editor,

I noticed in issue #15, page 2, editor's note to Chris Paulson, the installation of the IFORTH monitor (user disk #18) was not in the recommendation. Everyone I know who has used this monitor has considered it a big improvement over PFM so why was it not included in the list?

I have considered sending in some improvements to IFORTH but I have seen little feedback on it in recent issues of Micro C so I wonder if it is worth my time?

Raymond L. Buvel
Box 3071
Moscow ID 83843
208-885-8818

Editor's note:

Sorry, Ray. I guess we are as guilty of no feedback as anyone. Yes there has been a lot of interest in IFORTH. We have been recommending it to many BB owners. You should take a look at making it available on the 820. I think that would be very popular. Especially since you are offering inexpensive ROM programming for folks.

Since I don't program in FORTH I haven't put it on my system though it is a very nice extension to the PFM monitor.

Dear Editor,

Wow! the gang at Micro C is making the humble little Kaypro into one hot machine. First 5MHz and now 800K per drive. Those PC clones better watch out!

There is one modification that many of us would love to see on the Kaypro—a 256K RAM disk. It ought to make PW swap files and TW work like a dream.

Why not get together with Tony Ozrelic of LA Software and produce a DynaDisk for the Kaypro at a reasonable price. I'm sure you'd have a lot of interest—especially those of us who can't afford (and see little need for) a full blown coprocessor.

One question . . . will the Pro-Monitor ROM's (II, 4 and 8) work with the Uniform software and still enable the Kaypro to read and write disks formatted for other machines?

Mike Perry
6035 40th Ave NE
Seattle WA 98115

Editor's note:

Check with MicroSphere for an inexpensive RAM disk for the Kaypro.

Uniform (as shipped by Kaypro) requires that both A and B drives be correct for that version of Uniform. Since we are also supporting two additional drives, you can make C and D be 96 trackers and still have full use of Uniform.

Also, the CO-power board expects to see Kaypro II or 4 drives as A and B. So by putting 96 track drives on C and D you will still be totally compatible with these add-ons.

Dear Editor,

My sons and I are at an impasse with Adventure. We can accumulate 262 points, but have not learned to kill the ogre or to avoid paying an onerous tax to the troll.

Since there aren't any user groups in our town, we saw your note in Micro C and thought you might be willing to exchange some hints. The advice on what to with the food is in the last paragraph in case you wouldn't want to sully the purity of your one man Adventure.

There can be many saved games, not just one, as your column indicated. Just type "SAVE OGRE", or any other four letter name, and the name will be appended to the ADVD.SAV file, making it ADVDOGRE.SAV.

As you recommended, that file can be made durable by PIPing it under a new name to the same or different disk to be re-PIPed as needed.

Anyway, we're stuck and getting frustrated after running out of ideas of what to try. Of course, the solution will seem obvious, and we'll wonder why we never thought of it.

(The food is for quieting the fierce cave bear. Be sure to bring the keys along. Have you wondered why the emerald is the size of a "plover's" egg? Don't be afraid of whirlpools. WD-40 is nice, but oil still works.)

David A. Satchell
Manitowoc Surgical Association
600 York Street Suites 5 and 6
Manitowoc WI 54220

Editor's note:

I've been trying to tread the fine line between saying too much and not saying anything about Adventure. For some people the goal is the struggle, for others, the goal is 550 points.

I'm tempted to include hints (such as yours) in Micro C and mark them plainly so that people can avoid them if they wish. You need the sword to get past the ogre, by the way.

I'd like to know what to do with the broken up skiff.

Dear Editor,

I dropped you this note just to let you know that I am happy to renew my subscription to Micro C.

I have installed the 256K RAM on my BB I as described in issue #12 and it works fine.

At the same time, I installed the 4 MHz modification described in issue #1. It works fine too.

One thing readers should know about the 256K mod. is that you must install all 256K RAM chips in order to run just as before. It took me awhile to realize this. One 64K segment is spread over the 4 rows.

R. Warichet
Av. de la Jeunesse 4
1030 Bruxelles
Belgium

Dear Editor,

I would like to correct some information in the letter from Charles Woodard published in issue #15.

Yes, I can supply parts and information on MFE 8" floppies. However, the correct daytime phone is 603-893-1921. The evening phone (preferred calling time) is 603-329-5838. Please see my Want Ad in this issue.

Richard H. Breinlinger
51 Wash Pond Rd.
Hampstead NH 03841

Dear Editor,

I have been salivating at the possibility of having a 5 MHz Hotrod-Kaypro since I received the issue of Micro C (June 1983) with your column describing the speed-up modification.

First, let me say that since performing the speed-up operation two weeks ago, I have been much happier with my computer. The performance at 4 MHz with all my programs has been substantially improved. But I would sill like to increase the speed to 5 MHz if possible.

However, I was not able to increase the speed to 5 MHz. When I switched the toggle to the 5 MHz position, garbage characters filled the screen and the system would neither boot nor would keyboard commands have any effect. I assumed that although I checked the connections and wires that I added, I had made an error in following the instructions.

At this month's user's meeting, I met another gentleman that had also followed the instructions in your column and likewise was not able to get beyond 4 MHz. So I am writing to you.

I purchased an 'SGS' brand Z80B and 'SGS' brand monitor ROM. I inserted the Z80B into the socket at U63 and the ROM at U43.

Next, rather than soldering to the pins on U66 (as I was advised not to by a good friend who is also an electronics tech. and the half-willing overseer of the job) I cut the leads in the board to pins 4 and 5, and ran trace wires to the destination pins.

As I noted above, the 4 MHz speed-up is great. I cannot imagine doing anything on my computer at the slower speed. Also I have been very pleased that I have not found a single program that would not work at the faster speed. Even without 5 MHz I am a much happier Kaypro owner.

Matthew Kesner
6345 Lochmoor Drive
San Diego CA 92120

Editor's note:

Some SGS parts have been slow, especially the ROMs. Get a 250 ns 2732 and burn the ROM data into the top half. Then plug that in place of the 2716-1–that's what we are doing and it has solved the ROM problem completely.

Also, some sources of SGS Z80Bs have been shipping poor quality parts. I haven't tracked down the culprits but some of the SGS's people are getting won't run 5 MHz.

Dear Editor,

I am impressed. I expected the usual 4 to 6 week waiting period between the time when you order a magazine and when you receive the first issue and was really surprised, as well as pleased, when I received my first issue within two weeks.

It came yesterday and I have already read it once. I am assuming this is a statement of the quality of services you strive to provide to your subscribers. Keep up the good work.

I am a newcomer to the computer world and am basically an illiterate with lots of questions. What is an EPROM? Is it edible? *It's OK with tabasco sauce if you watch out for the legs.*

After reading what my manuals had to say about HEX I felt as though I had been hexed. Is a Slicer any good for cutting tough tomato skins? *Yes, and it is fast.*

One reader, in your letters column in issue #15, talked about stepping in and stepping out at 3ms on a 1771 while forcefully interrupting. Is that a new dance where you try to make more noise than the band?

Is a MONOSTABLE a place where they keep one legged horses?

Seriously, I realize that these things will become clearer as I go along but I can also appreciate why some people are put off by the bewildering array of strange items, jargon and concepts that they are confronted with when they peek into this field.

I would like to know where I can get some good resource material that is comprehensible to the lay person? I would appreciate any contacts from Kaypro users in my area.

What are the advantages of turning my Kaypro 4 into an 8? If I purchase your Pro-set 4 (or 8) do I need to upgrade my machine first? What needs to be done? How is it done? How much will it cost?

Larry D. Ruddell
214 E. Euclid
Spokane WA 99207

Editor's note:

You can pop our PRO-8 monitor into your Kaypro 4 without making any changes. You will get faster disk accesses and the setable cursor. You can, of course, also do the speed up to 5 MHz. You will need a copy of issue #12, a Z80B, some wire-wrap type wire and a switch.

With the PRO-8 monitor you can go to the quad density drives if you wish but you certainly don't have to.

(Letters continued on page 50)

Big Voice For The BB I

By James R. Thompson

9910 Leawood Blvd.
Houston TX 77099

Communications with the computer—touch sensitive screens, high resolution crt's and graphics printers, voice pattern recognition, speech synthesis, etc.—are the predominant push in the computer industry these days. Along with these come a trend to reduce the peripheral control burden on the CPU and memory and offload it onto the peripheral.

Big Voice

One peripheral for the Big Board that retains most of its control and storage in hardware (thus freeing the CPU and memory for more important work) is the Big Voice speech synthesizer.

The board, based on the Votrax (R)SC-01 phoneme speech synthesizer, contains approximately 1400 English words plus the 64 basic phonemes all in a compressed data format in two 32k EPROMS with expansion capability to two 64k EPROMS (up to about 2800 words). Each spoken word or phoneme requires a two byte code to specify the word and its pitch.

The synthesizer module stacks on top of the Big Board and plugs into its general purpose parallel port. The forty-pin plug is extended above the board for those using the GPI/O for printers or whatever. The only restriction is that the Port A handshake not be used. Port A may be used in Mode 3 and Port B may be used in any mode.

Even though the speech synthesizer was designed primarily for the Big Board, it could easily be interfaced to any microcomputer with an eight-bit parallel output port and handshake signals.

Software

Speech can be initiated in two ways: word-at-a-time (Word Mode) or phoneme-at-a-time (Phoneme Mode). From the standpoint of communications to the module, these two modes differ only in data rate and address. The following are the protocols for each mode.

1) low byte of the word or phoneme is sent to Port A

2) voice module loads low byte and returns handshake

3) GPIO interrupts CPU requesting high byte

4) CPU responds by sending high byte to Port A

5) module starts speaking

6) upon completion, module returns handshake

7) GPIO again interrupts CPU signaling end of speech

8) Repeat 1-7 for each word or phoneme

One hardware requirement that the software must recognize is that the ready signal must load the high byte within 40 milliseconds after loading the low byte or the chip will do an internal RESET.

Since the module uses only Port A to load successive bytes, some means of automatic reset must be built into the chip to keep the phoneme generator and the computer from getting out of sync.

Word Mode

The word mode data rate averages about 3.5 bytes per second (1.7 words per second). Word Mode data (i.e., the pitch and starting address of the word in the module's EPROM) is shown in Figure 1.

Phoneme Mode

Phoneme mode data rate averages about 23 bytes per second (11.5 phonemes per second). Phoneme Mode data (i.e., the pitch and address of the phoneme in the module's EPROM) is shown in Figure 2.

The two programs labeled SPEAK.Z80 and BSPEAK.Z80 are combination driver and interrupt service routines. They are written in assembly language.

The first is used to setup the Big Board for word or phoneme speech with assembly language programs. The second is used with BASIC when speaking phonemes. Even BASIC at 5 MHz can't feed phoneme data fast enough to keep the speech from sounding strung out, so words are POKEd into memory by BASIC and then spoken by CALLing the driver. BASIC is easily fast enough for continuous WORD speech.

SPEAK, when assembled and executed, programs the GPI/O Port A in the output mode, moves the driver and interrupt service routines into memory at FA40H (above PFM), resets the SC-01 and speaks the word "ready." To use this driver routine, load the HL register pair with the address of the word or phoneme to be spoken (formats described above) then CALL FA40H. See Figure 3.

The program DEMO.COM demonstrates the driver SPEAK when used with an assembly language program (see Figure 4).

BSPEAK (see Figure 5) performs essentially the same way as SPEAK except that phoneme codes are loaded into memory in sequence starting at FA7AH (up to 127 phonemes) and terminating the sequence with 40H. A CALL to FA40H will initiate speech. A byte POKEd at FA79H sets the pitch for the entire sequences as shown:

```
3FH = low pitch
7FH = medium low
BFH = medium high
FFH = high pitch
```

(continued on page 6)

Figure 1 - Word Mode Data

```
                high byte      low byte
          msb                                lsb
            M M A A A A A A   A A A A A A A A
where,
       M = 00 (low pitch) through 11 (high pitch)
       A = 0 through 3FBF hex (word starting address)
```

Figure 2 - Phoneme Mode Data

```
          msb                                lsb
            M M 1 1 1 1 1 1   1 1 P P P P P P

where,
       M = 00 (low pitch) through 11 (high pitch)
       P = 0 through 3F hex (phoneme code)
```

Figure 3 - Big Voice Interrupt Routine

```
; INTERRUPT FLAG IN MEMORY IS LOCATED AT FA78H
        ORG     100H
;PROGRAM THE BIG BOARD GP I/O PORT A
        LD      A,0FH           ; PROGRAM THE GP I/O PORT A
        OUT     (09),A          ; IN THE OUTPUT MODE
        LD      A,1EH           ; LOAD THE PORT A
        OUT     (09),A          ; INTERRUPT VECTOR
        LD      A,87H           ; INITIALIZE INTERRUPTS
        OUT     (09),A          ; ON PORT A
;PUT INTERRUPT SERVICE ROUTINE ADDRESS IN PFM
        LD      HL,INT-SPK+0FA40H ;ADDRESS FOR INTERRUPT ROUTINE
        LD      (0FF1EH),HL     ; PORT A INTERRUPT ADDRESS IN PFM
        LD      A,0FFH          ; ANY NON ZERO TO A
        LD      (INTPND),A      ; DECLARE NO INTERRUPTS PENDING
; MOVE ROUTINE TO FA40H
        LD      HL,SPK          ; MOVE THE DRIVER AND THE
        LD      DE,0FA40H       ; INTERRUPT SERVICE ROUTINE
        LD      BC,END-SPK      ; TO FA40H
        DI
        LDIR
        EI
;RESET THE SC-01 AND SAY "READY"
        LD      HL,3FFEH        ; SEND OUT ANY CODE (STOP CODE) TO
        CALL    SPK             ; START THE SC-01 CLOCK
DELAY   LD      A,80H           ; 84 MS TIME DELAY WITH 5 MZ CLOCK
D1      LD      B,0FFH          ; TO RESET THE SPEECH SYNTHESIZER
D2      DJNZ    D2
        DEC     A
        JR      NZ,D1
        LD      HL,3FFFH        ; SEND OUT A STOP CODE JUST
        CALL    SPK             ; IN CASE THE SC-01 COMES UP TALKING
        LD      HL,0C17H        ; EPROM CODE ADDRESS FOR "READY"
        CALL    SPK
        JP      0               ; RETURN TO CP/M
; TO USE DRIVER ROUTINE EPROM ADDRESS MUST BE IN THE HL REGISTER PAIR
SPK     PUSH    AF              ; SAVE THE AF REGISTERS
SP1     LD      A,(INTPND)      ; CHECK FOR INTERRUPT
        OR      A               ; JUMP BACK IF INTERRUPT
        JR      Z,SP1           ; FLAG IS SET
        XOR     A               ; ZERO TO A REGISTER
        LD      (INTPND),A      ; SET INTERRUPT FLAG
        LD      A,L             ; SEND LEAST SIGNIFICANT ADDRESS BYTE
        OUT     (08),A          ; TO SPEECH SYNTHESIZER
SP2     LD      A,(INTPND)      ; CHECK INTERRUPT FLAG
        OR      A               ; JUMP BACK IF INTERRUPT
        JR      Z,SP2           ; FLAG IS SET
        XOR     A               ; ZERO IN A
        LD      (INTPND),A      ; SET INTERRUPT FLAG
        LD      A,H             ; SEND MOST SIGNIFICANT ADDRESS BYTE
        OUT     (08),A          ; TO SPEECH SYNTHESIZER
        POP     AF              ; RESTORE THE AF REGISTERS
        RET
; INTERRUPT SERVICE ROUTINE
INT     PUSH    AF              ; SAVE THE AF REGISTERS
        LD      A,0FFH          ; NON ZERO IN A
        LD      (INTPND),A      ; CLEAR INTERRUPT FLAG
        POP     AF              ; RESTORE AF REGISTERS
        EI                      ; INABLE INTERRUPTS
        RETI                    ; RETURN FROM INTERRUPT
;
INTPND  EQU     0FA7AH          ; MEMORY ADDRESS FOR INTERRUPT FLAG
END     END     100H
```

Figure 4 - Example Speech Routine

```
;DEMONSTRATION PROGRAM TO MAKE THE SPEECH SYNTHESIZER SAY
;"HELLO MY NAME IS WILBER I AM A TALKING COMPUTER"
;THE 3FFEH AND THE 3FFFH EPROM ADDRESSES ARE 185 AND 47 MS TIME DELAYS
SPEEK   EQU     0FA40H          ;ADDRESS FOR THE SPEECH SYNTHESIZER
        ORG     100H            ;DRIVER ROUTINE
        LD      IX,DATA         ;LOAD IX WITH EPROM DATA ADDRESS
LOOP    LD      A,(IX)          ;LOAD A WITH EPROM ADDRESS LOW BYTE
        CP      40H             ;TEST TO SEE IF LAST BYTE
        JR      Z,END           ;END IF STOP BYTE
        LD      L,A             ;PUT LOW BYTE IN REGISTER L
        INC     IX              ;INCREMENT COUNT
        LD      H,(IX)          ;LOAD H WITH EPROM ADDRESS HIGH BYTE
        INC     IX              ;INCREMENT COUNT
        CALL    SPEEK           ;CALL DRIVER ROUTINE
        JR      LOOP            ;GET NEXT BYTE
END     JP      0
;
DATA    DEFW    073EH,3FFEH,0A1DH,0A25H,083FH
        DEFW    0F3DH,3FFEH,0788H,0076H
        DEFW    0000,3FFFH,0D9AH,02E0H
        DEFB    40H
;
        END
```

Figure 5 - BSPEAK Program

```
;THE INTERRUPT FLAG BYTE IN MEMORY IS LOCATED AT FA78H
        ORG     100H
; PROGRAM THE GPI/O PORT A FOR SPEECH SYNTHESIZER
        LD      A,0FH           ;PROGRAM THE GP I/O PORT A
        OUT     (09),A          ;IN THE OUTPUT MODE (MODE 0)
        LD      A,1EH           ;LOAD THE PI/O PORT A
        OUT     (09),A          ;INTERRUPT VECTOR
        LD      A,87H           ;INITIALIZE INTERRUPTS
        OUT     (09),A          ;ON PORT A
;PUT INTERRUPT SERVICE ROUTINE ADDRESS IN PFM
        LD      HL,INT-SPK+0FA40H ;ADDRESS FOR INT.SERVICE ROUTINE
        LD      (0FF1EH),HL     ;INTERRUPT VECTOR ADDRESS IN PFM
; MOVE ROUTINE TO FA40H
        LD      HL,SPK          ;MOVE THE DRIVER AND THE
        LD      DE,0FA40H       ;INTERRUPT SERVICE ROUTINE
        LD      BC,END-SPK      ;TO ADDRESS FA40H
        DI
        LDIR
        EI
        LD      A,0FFH          ;NONE ZERO TO A
        LD      (INTPND),A      ;DECLARE NO INTERRUPTS PENDING
        LD      A,3FH           ;LOAD THE EPROM MOST SIGNIFICANT
        LD      (PITCH),A       ;BYTE TO MEMORY LOCATION PITCH
;RESET THE SC-01 AND SAY "READY"
        LD      HL,DATA         ;LOAD MEMORY LOCATION DATA
        LD      A,0FEH          ;WITH A STOP CODE PHONEME
        LD      (HL),A          ;AND A 40H STOP BYTE
        INC     HL
        LD      A,40H
        LD      (HL),A
        CALL    SPK             ;START SC-01 CLOCK
DELAY   LD      A,80H           ;85 MS TIME DELAY WITH 5 MZ CLOCK TO
D1      LD      B,0FFH          ;ALLOW THE SPEECH SYNTHESIZER TO RESET
D2      DJNZ    D2
        DEC     A
        JR      NZ,D1
        LD      HL,DATA         ;LOAD MEMORY LOCATION DATA
        LD      A,0FFH          ;WITH A STOP PHONEME AND
        LD      (HL),A          ;A STOP BYTE
        INC     HL
        LD      A,40H
        LD      (HL),A
        CALL    SPK             ;SEND THE STOP PHONEME TO SC-01
        LD      HL,DATA1        ;MOVE THE PHONEME CODE TO SAY READY
        LD      DE,DATA         ;TO MEMORY LOCATION "DATA"
        LD      BC,7
        DI
        LDIR
        EI
        CALL    SPK             ;SAY "READY"
        JP      0
; DRIVER ROUTINE LOCATED AT MEMORY ADDRESS FA40H
SPK     PUSH    AF              ;SAVE THE AF REGISTER PAIR
        PUSH    HL              ;SAVE THE HL REGISTER PAIR
        LD      HL,DATA         ;ADDRESS OF SINGLE PHONEME DATA
SP1     LD      A,(INTPND)      ;TEST THE INTERRUPT FLAG
        OR      A               ;IF <> ZERO DATA CAN GO OUT
        JR      Z,SP1           ;LOOP BACK IF ZERO
        LD      A,(HL)
        CP      40H             ;CHECK FOR LAST PHONEME CODE
        JR      Z,ENDIT         ;IF NO MORE CODE END
        XOR     A               ;ZERO IN REGISTER A
        LD      (INTPND),A      ;SET INTERRUP FLAG
        LD      A,(HL)          ;IF NOT END GET PHONEME CODE BACK IN A
        OR      A,0C0H          ;ADD OFFSET FOR EPROM ADDRESS
        OUT     (08),A          ;SEND LOW BYTE TO SPEECH SYNTHESIZER
        INC     HL              ;INCREMENT INDEX REGISTER
SP2     LD      A,(INTPND)      ;SEE IF HIGH BYTE CAN GO OUT
        OR      A               ;SEE IF ZERO
        JR      Z,SP2           ;LOOP BACK IF ZERO
        XOR     A               ;GET ZERO IN A REGISTER
        LD      (INTPND),A      ;SET INTERRUT FLAG
        LD      A,(PITCH)       ;GET HIGH BYTE ADDRESS FOR SINGLE PHONEME
        OUT     (08),A          ;SEND HIGH BYTE ADDRESS TO SYNTHESIZER
        JR      SP1             ;GET NEXT PHONEME CODE
ENDIT   POP     HL              ;RESTORE THE HL REGISTER PAIR
        POP     AF              ;RESTORE THE AF REGISTER PAIR
        RET
; INTERRUPT SERVICE ROUTINE FOR SPEECH SYNTHESIZER
INT     PUSH    AF              ;SAVE THE AF REGISTER PAIR
        LD      A,0FFH          ;NON ZERO IN A REGISTER
        LD      (INTPND),A      ;CLEAR THE MEMORY INTERRUPT FLAG
        POP     AF              ;RESTORE AF
        EI                      ;ENABLE INTERRUPTS
        RETI                    ;RETURN FROM INTERRUPT
;
INTPND  EQU     $+0FA40H-SPK    ;MEMORY INTERRUPT FLAG LOCATION
PITCH   EQU     INTPND+1        ;MEMORY LOCATION FOR SC-01 PITCH CONTROL
DATA    EQU     PITCH+1         ;ADDRESS FOR PHONEME CODE
DATA1   DEFB    2BH,02,00,1EH,29H,3FH,40H ;PHONEME DATA "READY"
END     END     100H
```

(continued)

The program DEMO1.BAS demonstrates the use of BSPEAK to handle phoneme speech from BASIC. This program uses the BASIC CALL statement found in Microsoft BASIC Revision 5.xx and above. The program may be modified to use the USR statement in earlier versions of BASIC. See Figure 6.

DEMO2.BAS demonstrates the use of the module in Word Mode. The interrupt service from SPEAK must be loaded into memory prior to using DEMO2 (see Figure 7).

The figure 8 table lists the phonemes in alphabetical order, their code, duration, and an example word. (The list in Figure 8 was extracted from the Votrax data manual.)

Hardware

In order to fit 1400 English words into 8K bytes of EPROM, I used data compression to store 4 six-bit phoneme codes in only 3 bytes of the EPROM. This increases the storage capacity by about 30% over the technique of storing 6 bits per byte. This is done by storing the 6 bits of every fourth phoneme in the 2 otherwise unused bits of the first three phonemes.

For example, take the word "COMMUNICATE." Broken down into phonetic speech the word looks like this.

```
K UH2 M Y1 IU U1 N I3 K A1 Y T Stop
```

Once converted to the six bit code required for the Votrax:

```
19 31 0C 22 36 37 0D 09 19 06 29 2A 3F
         *        *        *
```

This code is then compressed by taking the codes tagged with an asterisk and shoving them into the previous 3 codes.

```
99 31 8C  76 B7 0D  99 86 A9  3F
```

This technique does not yield a full 33% improvement due to word boundaries (a loss of 0 to 6 bits per word) and due to the hardware not counting across 256 byte boundaries (an average loss of 3 bytes per 256 bytes).

Hardware Description

When the low byte of the data shows up at the phoneme counter, a Ready signal triggers the 500 ns one-shot U18a. The leading edge of the one-shot issues a Strobe handshake and triggers the 50 ms

auto-reset one-shot. The trailing edge increments the load pointer U8a so the system is ready for the high data byte.

Before the 50 ms one-shot can time out, the high byte data from the port must be stable and a second ready signal must be received; otherwise, the load pointer will be reset to low byte.

This second ready triggers the 500 ns one-shot again. The leading edge of the one-shot's output resets all flip/flops and clears the accumulator. The trailing edge then sets the Start flip/flop.

The Start flip/flop issues a STB signal to the SC-01. Once the SC-01 has accepted the data, an ACK is returned. STB is then removed, the phoneme counter is advanced, the accumulator shifts in the most significant two bits of the current EPROM byte, and the accumulator shift counter is incremented. The controller then waits for the SC-01 to return RDY to indicate the completion of the current phoneme.

This process will repeat until a 3FH (STOP phoneme code) is detected by U1. This will set the Stop flip/flop U15b which will issue a Reset pulse to the Start flip/flop U8b.

If the word is longer than three phonemes, the accumulator shift counter U5a,h will be set to 3 (counting sequence is Grey code: 0-1-3-2) indicating that the fourth phoneme is to come from the accumulator, not from the EPROM.

The phoneme counter is disabled by the SWAP signal. When ACK is returned during the third byte, U15a will be set, disabling the EPROM output and enabling the accumulator dump gate U14.

In the single phoneme mode, U4 forces the system to stop after each phoneme and wait for another phoneme and handshake from the port. In this mode, each word or phrase must be followed by an explicit Stop code (phoneme 3FH) or the SC-01 will continue to repeat the previous phoneme.

Package Available

You can get a complete phoneme package from the author for $70 postpaid. This package includes the printed circuit board, two 2532 EPROMS containing approximately 1400 words, an 8" SSSD floppy containing utilities and the source of the word file and documentation.

(Schematics follow on pages 8 & 9)

■ ■ ■

Figure 6 - DEMO1.BAS

```
10 'DEMO1
20 'THIS PROGRAM DEMONSTRATES THE USE OF SINGLE PHONEME CODE
30 'FROM BASIC
40 A=0
50 B=&HFA7A
60 SPEEK=&HFA40
70 FOR I=0 TO 63
80 READ A
90 POKE B+I,A
100 NEXT I
110 CALL SPEEK (A,A,A)
120 'HELLO
130 DATA 27,02,35,24,35,53,55,63,63
140 'MY
150 DATA 12,21,0,9,41,63
160 'NAME
170 DATA 13,06,33,41,12,63
180 'IS
190 DATA 11,9,18,63
200 'WILBER
210 DATA 45,11,9,24,14,58,63,63
220 'I
230 DATA 21,0,9,41,63
240 'AM
250 DATA 47,0,12,63,62
260 'A
270 DATA 6,33,41,63
280 'TALKING
290 DATA 42,61,25,10,20,63
300 'COMPUTER
310 DATA 25,50,12,37,34,54,55,42,58,63,64
```

Figure 7 - DEMO2.BAS

```
 10 'DEMO2
 20 'THIS PROGRAM DEMONSTRATES THE USE OF PHONEME CODE FROM EPROM
 30 'WITHOUT USING THE DRIVER ROUTINE. MEMORY LOCATION FA78H IS THE
 40 'MEMORY INTERRUPT FLAG.
 50 READ A
 60 READ B
 70 OUT 8,B
 80 POKE &HFA78,0
 90 OUT 8,A
100 C=PEEK (&HFA78)
110 IF C=0 THEN GOTO 100
120 GOTO 50
130 DATA 7,62,63,254,10,29,10,37,8,63
140 DATA 15,61,63,254,7,136,0,118,0,0
150 DATA 13,154,63,254,9,197,2,224
```

Figure 8 - Phoneme Table

Phoneme Symbol	Phoneme Hex Code	Duration (MS)	Example Word	Phoneme Symbol	Phoneme Hex Code	Duration (MS)	Example Word
A	20	185	day	K	19	80	trick
A1	06	103	made	L	18	103	land
A2	05	71	made	M	0C	103	mat
AE	2E	185	dad	N	0D	80	sun
AE1	2F	103	after	NG	14	121	thing
AH	24	250	mop	O	26	185	cold
AH1	15	146	father	O1	35	121	aboard
AH2	08	71	honest	O2	34	80	for
AW	3D	250	call	OO	17	185	book
AW1	13	146	lawful	OO1	16	103	looking
AW2	30	90	salty	P	25	103	past
AY	21	65	day	PA0	03	47	no sound
B	0E	71	bag	PA1	3E	185	no sound
CH	10	71	chip	R	2B	90	red
D	1E	55	paid	S	1F	90	pass
DT	04	47	butter	SH	11	121	shop
E	2C	185	meet	STOP	3F	47	no sound
E1	3C	121	be	T	2A	71	tap
EH	3B	185	get	TH	39	71	thin
EH1	02	121	heavy	THV	38	80	the
EH2	01	71	enlist	U	28	185	move
EH3	00	59	jacket	U1	37	90	you
ER	3A	146	bird	UH	33	185	cup
F	1D	103	fast	UH1	32	103	uncle
G	1C	71	get	UH2	31	71	about
H	1B	71	hello	UH3	23	47	mission
I	27	185	pin	V	0F	71	van
I1	0B	121	inhibit	W	2D	80	win
I2	0A	80	inhibit	Y	29	103	any
I3	09	55	inhibit	Y1	22	80	yard
IU	36	59	you	Z	12	71	zoo
J	1A	47	judge	ZH	07	90	apzure

Big Voice Schematics

Figure 9 - Big Voice Phoneme Section

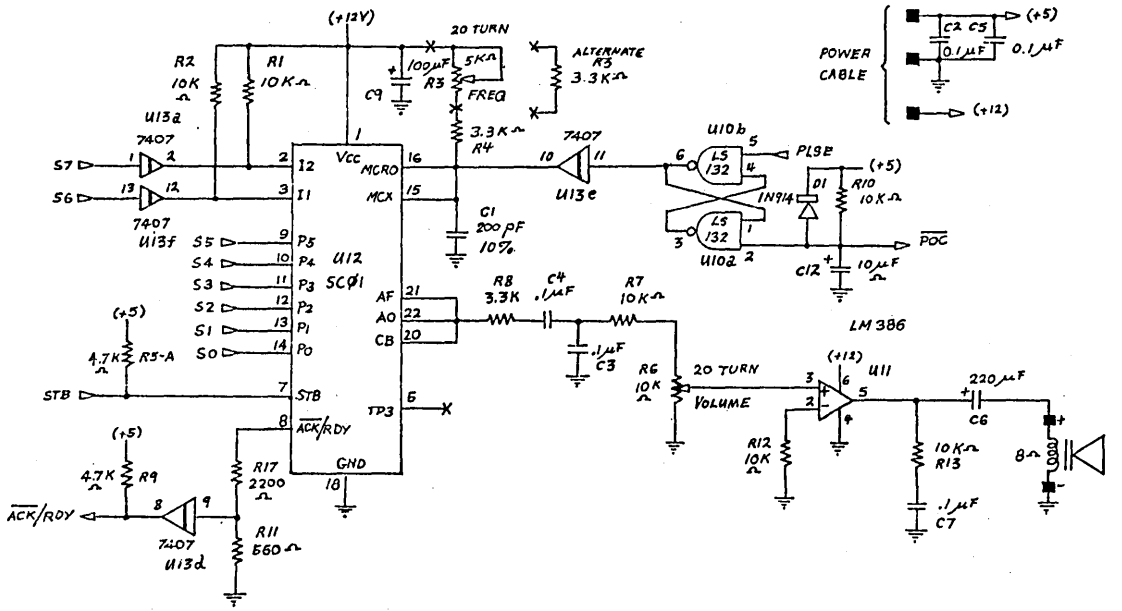


Figure 10 - Big Voice Data Section

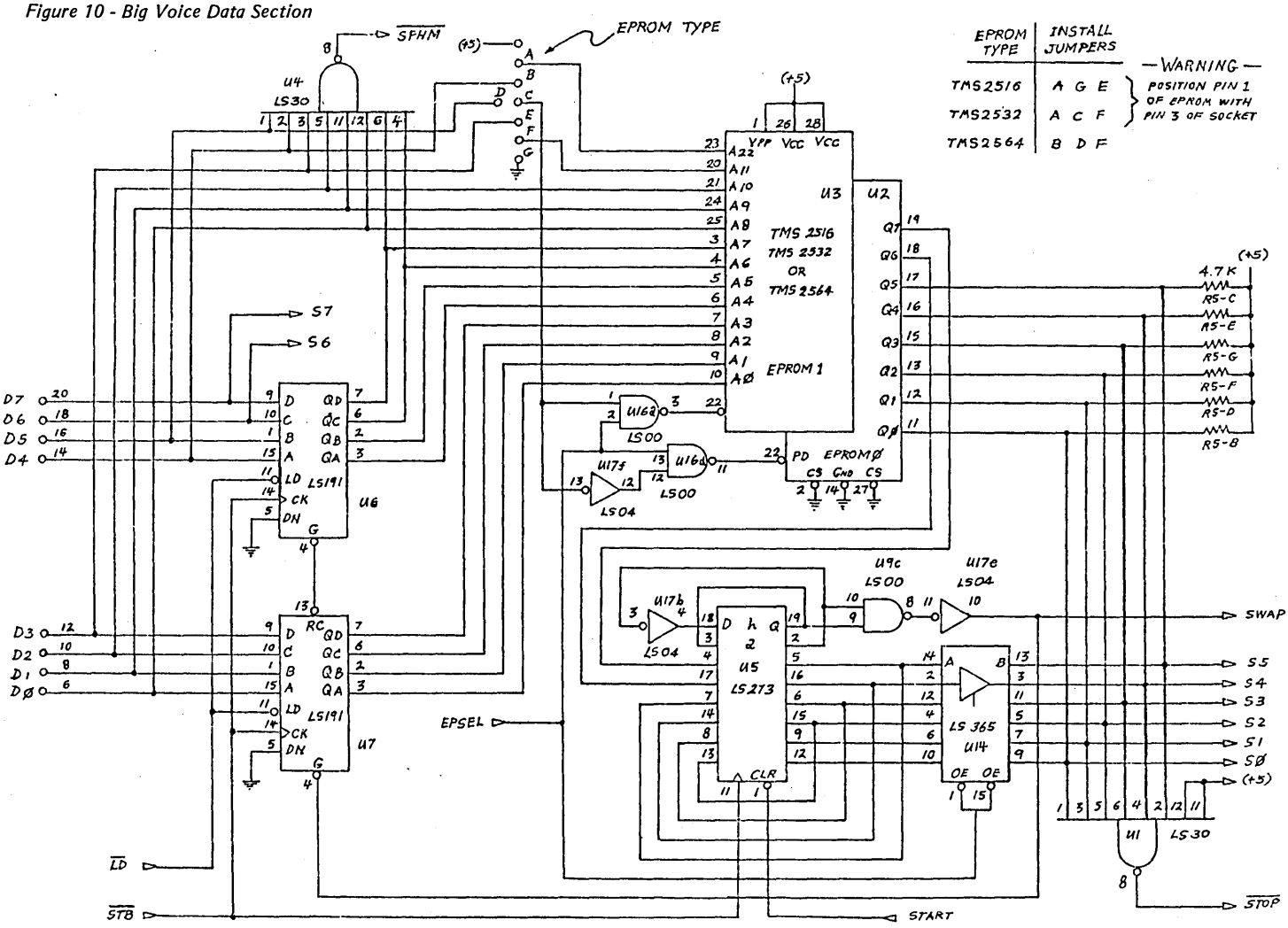
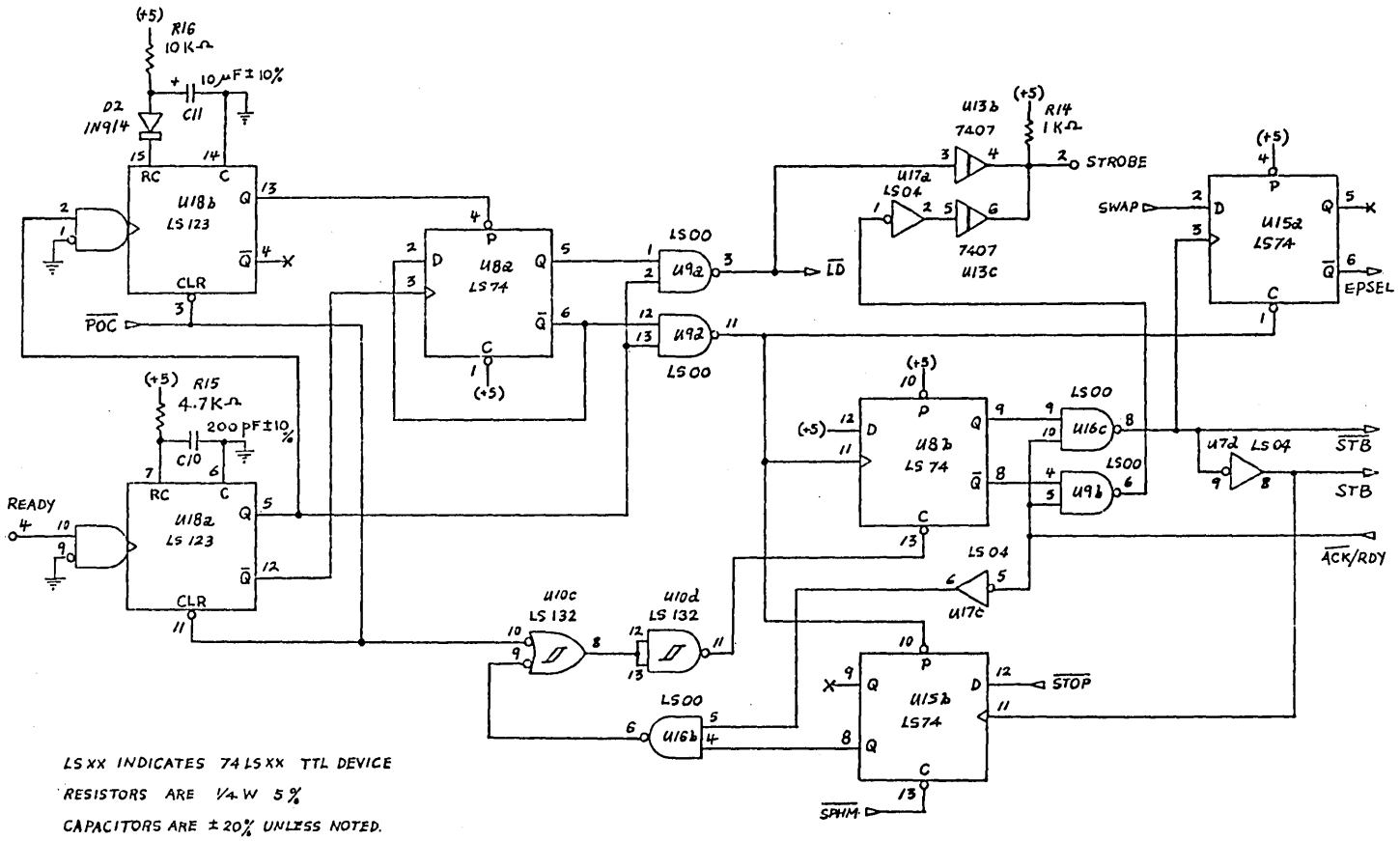


Figure 11 - Big Voice Timing Section



Parts List

Integrated Circuits

U1, U4	74LS30
U2, U3	TMS2516 or TMS2532 or TMS 2564
U5	74LS273
U6, U7	74LS191
U8, U15	74LS74
U9, U16	74LS00
U10	74LS132
U11	LM386
U12	Votrax SC-01 Speech Synthesizer chip
U13	7407
U14	74LS365 or 74LS367
U17	74LS04
U18	74LS123

Resistors

R1, R2, R7, R10	
R12, R13, R16	10K Ohm 1/4W 5%
R3	5K Ohm 20 turn trim pot
R4, R8	3.3K Ohm 1/4W 5%
R5	7 x 4.7K Ohm sip resistor pack (8 pins)
R6	10K Ohm 20 turn trim pot
R9, R15	4.7K Ohm 1/4W 5%
R11	560 Ohm 1/4W 5%
R14	1K Ohm 1/4W 5%
R17	2.2K Ohm 1/4W 5%

Capacitors

C1, C10	200 PF 5% Silver Mica
C2, C3, C4, C5, C7	0.1 UF 50V Ceramic disc
C6	220 UF 20V 20% Tantalum
C8	deleted from circuit
C9	100 UF 20V 20% Tantalum
C11, C12	10 UF 16V 10% Electrolytic

Diodes

D1, D2	1N914 or equivalent

Sockets

for U2, U3	28 pin 600 mil low profile side wipe
for U12	22 pin 400 mil low profile side wipe

Plugs, Jacks, and Pins

J1	2 x 20 .025" sq. pin male .1" x .1" spacing
P1	2 x 20 female plug for .025" sq. pins
jumpers (8ea.)	.025" sq. gold wirewrap posts

Cables

Power cable	15" x 3 cond. #26 cable
Speaker cable	2 cond. #26 cable (length as required)

The Xerox 820-II and the Dynadisk

By Clarence Peckham

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After owning a Xerox 820-II for over a year, I was ready for some form of mass storage other than floppy disks. The problem was not one of storage capacity, I'm using 8 inch double density drives, but one of performance. One obvious solution was to add a winchester subsystem.

However, the winchester was out due to the high cost. The next solution was a solid state disk. A solid state disk is a medium-cost storage system with performance in the 125 KB/sec range and zero access time. It seemed ideal!

Most of the solid state disk systems available in the marketplace are designed for S100 applications. The one unit I found which was usable was the Dynadisk from LA Software. Tony Ozrelic is the designer of the Dynadisk and after a short telephone conversation, I ordered the documentation and software with the intent to wirewrap a breadboard version of the Dynadisk.

I don't recommend this approach. Tony now has a printed circuit board available at a very reasonable price. I spent a lot of time checking my wiring when the problem was really an error in the software.

Dynadisk

The Dynadisk is a 256 KB RAM array with the necessary TTL logic to provide an interface to the spare parallel interface on the BB I. This is the problem. The Dynadisk was designed to operate with the BB I and wasn't tested for use with the Xerox 820-II. Although the hardware interface is the same, the software is not.

Fortunately, the 820-II still maintains a strong link to it's BB I heritage. The CBIOS for the BB I works fine with both the 820 and the 820-II. This allowed me to use a version of CP/M set up for the BB I on my system for testing purposes. So, armed with Dynadisk and a version of CP/M for the BB I, I proceeded to convert the Dynadisk software to work with the 820-II CBIOS.

Hardware Modifications

No software project is complete without hardware mods. Fortunately, the hardware mods are minimal and only effect the 820-II motherboard. No changes on the Dynadisk board are required.

The first change required is to remove the two IC's from the 820-II motherboard. Remove U90 and U91 and replace them with jumper blocks as described in the Dynadisk Operating Manual. U90 and U91 are 74LS243 bidirectional buffers and are not required for the Dynadisk.

The next step is to make the necessary jumper connections in the J11 jumper block on the 820-II motherboard. The necessary connections are as follows:

```
3 - 4
5 - 6
7 - 8
13-14
15-16
```

Once these changes are made, the last step is to connect the cable to the Dynadisk. This connection is made using con-

Figure 1 - CBIOS Patch To Use Dynadisk on the Xerox 820

```
                                title   RAMDSK - Dynadisk I/O patcher
                        ;
                        ;       Based on ddyna - dynadisk i/o patcher
                        ;       by Tony Ozrelic
                        ;       Copyright (c) 1982
                        ;
                        ;       This version Copyright (c) 1983
                        ;       by Clarence Peckham
                        ;
                        ;       i/o ports
                        ;
0008                    ddata   equ     8       ;data port
0009                    actl    equ     9       ;pio control A
000A                    dcsr    equ     10      ;control/status port
000B                    bctl    equ     11      ;pio control B
                        ;
                        ; Output Bit patterns
                        ;
0000                    tld     equ     00000000B       ;Track load
0001                    sld     equ     00000001B       ;Sector load
0002                    ref     equ     00000010B       ;Refresh on bit
0004                    data    equ     00000100B       ;Data selection
0008                    rw      equ     00001000B       ;R/W bit
                        ;
0008                    dtrack  equ     tld + rw
0009                    dsect   equ     sld + rw
000C                    dread   equ     data + rw
0004                    dwrite  equ     data
000A                    drfsh   equ     ref + rw
                        ;
                        ;       Memory addresses in 820-II monitor
                        ;
F368                    seltab  equ     0f360h + 8
F384                    dvrtab  equ     0f380h + 4
F800                    dyna    equ     0f800h  ;Start of ram driver code
                        ;
                        ;
                        ;       Here We go!
                        ;
                                .z80
0000'                           aseg
                                org 100h
                        ;
                        ;       load,patch and set up pio
                        ;
0100    21 012C         ddyna:  ld      hl,begdyn       ;start of code
0103    11 F800                 ld      de,dyna         ;Destination
0106    01 0149                 ld      bc,enddyn-begdyn        ;length
0109    ED B0                   ldir                    ;go to it!
                        ;
010B    3E 02                   ld      a,02    ;Select disk driver two
010D    32 F368                 ld      (seltab),a      ;Store in table
                        ;
0110    01 F800                 ld      bc,ramdvr       ;start of driver
0113    ED 43 F384              ld      (dvrtab),bc     ;Go stuff it
                        ;
                        ;       Set up pio
                        ;
0117    3E 8F                   ld      a,8fh   ;A side for r/w
0119    D3 09                   out     (actl),a
```

nector J8 on the 820-II motherboard and the pinout is the same as J5 on the BB I.

Software

Since I used a version of CP/M for the BB I, I was able to use all of the utility software that came with the Dynadisk. Along with the necessary driver, the Dynadisk comes with a format routine and an extensive test routine. I had an early version of the Dynadisk driver routine, so several changes were required before the driver software would work correctly. Tony has since corrected and released a new version of the software.

The format program must be patched in order to work with the 820-II. The HEXOUT routine used by the format program is located in a different location in the 820-II monitor than in the BB I. Change locations in DFORMAT.COM with DDT.

014D CDF3D2 should be CDFC1B
01F3 CDF3D2 should be CDFC1B

This is the only change required to use the software distributed with the Dynadisk. But in order to use the CBIOS that comes with the 820-II the next step was to write a driver routine for the Dynadisk which would work with the 820-II software. Two problems had to be resolved.

First the 820-II uses drives A-D for the two floppy disks so I chose drive E for the Dynadisk instead of drive D used by the standard BB I Dynadisk software.

The second problem was the 820-II monitor. There is no listing available for the ROM monitor used in the 820-II and it is radically different from the monitor used in either the BB I or the 820-I. The only solution was to disassemble the monitor which was a slow and tedious process.

The 820-II monitor uses the loadable disk drivers and a standardized command block to communicate with all disk drivers. Two tables in RAM are used to reference the correct driver for each drive. The standard 820-II has two disk drivers built in. One for the floppies and one for the SASI interface option. At boot time the correct driver is configured

(continued on page 12)

```
011B   3E CF          ld      a,0cfh  ;B side 4 out 4 in
011D   D3 0B          out     (bctl),a
011F   3E F0          ld      a,0f0h
0121   D3 0B          out     (bctl),a
                ;
0123   3E 0A          ld      a,drfsh ;turn on refresh
0125   D3 0A          out     (dcsr),a
0127   DB 08          in      a,(ddata)       ;clear ready line
                ;
0129   C3 0000        jp      0       ;GO TO CPM!!
                ;
                ;       Here is the disk handler;
                ;
                ;       On entry HL points to a command block wit
                ;       following information.
                ;
                ;       HL -> defb command      -1=select,1=read,
                ;             defb logicalunit
                ;             defb physicalunit
                ;             defw track
                ;             defw sector
                ;             defw address buffer
                ;
012C            begdyn  equ     $
                        .phase  dyna
                ;
F800   7E       ramdvr: ld      a,(hl)  ;get command
F801   3C               inc     a
F802   28 50            jr      z,select
                ;
                ;       Not select so set up for read/write
                ;
F804   E5               push    hl      ;address of cmd block
F805   23               inc     hl
F806   23               inc     hl
F807   23               inc     hl
F808   5E               ld      e,(hl)  ;track number to DE
F809   23               inc     hl
F80A   56               ld      d,(hl)
F80B   23               inc     hl
F80C   7E               ld      a,(hl)  ;A = sector
F80D   23               inc     hl
F80E   23               inc     hl
F80F   E5               push    hl      ;pointer to buffer add.
F810   3D               dec     a       ;sector is 0-25
F811   EB               ex      de,hl   ;hl = Track
                ;
                ;       hl = track
                ;       a = sector-1
                ;       Compute ramadd = 26*trk + (sector - 1)
                ;
F812   29               add     hl,hl   ;2*trk
F813   E5               push    hl
F814   D1               pop     de
F815   29               add     hl,hl   ;4*trk
F816   29               add     hl,hl   ;8*trk
F817   E5               push    hl
F818   C1               pop     bc
F819   29               add     hl,hl   ;16*trk
F81A   09               add     hl,bc   ; + 8*trk
F81B   19               add     hl,de   ; + 2*trk = 26*trk
F81C   4F               ld      c,a
F81D   06 00            ld      b,0     ;bc= sector-1
F81F   09               add     hl,bc   ;hl= 26*trk + sector-1
                ;
                ;       output to ramdsk
                ;
                ;       l = sector
                ;       h = track
                ;
F820   3E 08            ld      a,dtrack        ;trk register
F822   D3 0A            out     (dcsr),a
F824   7C               ld      a,h     ;get track value
F825   D3 08            out     (ddata),a
                ;
F827   3E 09            ld      a,dsect         ;sector register
F829   D3 0A            out     (dcsr),a
F82B   7D               ld      a,l     ;get sector value
F82C   D3 08            out     (ddata),a
                ;
                ;       now get buffer address and set up for r/w
                ;
F82E   E1               pop hl
F82F   5E               ld      e,(hl)
F830   23               inc     hl
F831   56               ld      d,(hl)  ;de = address
F832   E1               pop     hl      ;hl = address of cmd
```

(Listing continued on page 12)

(continued)

into the monitor depending on which interface is installed in the 820-II.

Adding a disk driver for the Dynadisk turned out to be an easier task than I expected (if you overlook the two months spent disassembling the monitor). Each driver has a single entry point and is required to handle three requests; select, read, and write. The read and write requests read or write one sector of information from the track and sector contained in the command block. The select request has to do nothing except return the address of the CP/M disk descriptor block.

The listing contains the complete driver code required to support the Dynadisk as drive E on an 820-II. Note that the sector translate routine is not required by the Dynadisk but it is required by the warm boot routine in the 820-II CBIOS.

Usage

The best way to use the Dynadisk is to bring the system up using a floppy and then copy any compilers and editors you will be using to the Dynadisk and swap the A and E drives using the swap program which is an 820-II utility (SWAP A=E). Then all of the disk accesses will be done using the Dynadisk as the logged in A drive. The A floppy drive can be accessed an drive E.

One thing to remember is that when the power goes off all of the data which was on the Dynadisk goes into the bit bucket. So save all your work before you shut off the power!

Is it worth it? Yes, the performance increase is excellent. Warm boots occur in the blink of an eye and assemblies and compiles are blindingly fast.

I want to thank Tony Ozrelic for designing an excellent product and for being so helpful over the telephone.

■ ■ ■

CBIOS PATCH LISTING (continued)

```
F833    06 80               ld      b,128   ;sector length
F835    7E                  ld      a,(hl)  ;r/w = 1/0
F836    0E 08               ld      c,ddata ;c = data port
F838    EB                  ex      de,hl   ;hl = buffer address
F839    3D                  dec     a
F83A    28 0B               jr      z,read
                        ;
                        ;       Write request
                        ;
F83C    3E 04               ld      a,dwrite        ;ramdsk to write
F83E    D3 0A               out     (dcsr),a
F840    ED B3               otir                    ;do write
F842    CD F859             call    rfshon          ;turn refresh on
F845    AF                  xor     a               ;no error allowed
F846    C9                  ret
                        ;
                        ;       read request
                        ;
F847    3E 0C           read:   ld      a,dread
F849    D3 0A               out     (dcsr),a
F84B    ED B2               inir
F84D    CD F859             call    rfshon
F850    DB 08               in      a,(ddata)       ;clear ready line
F852    AF                  xor     a
F853    C9                  ret
                        ;
                        ;       select ramdisk
                        ;
F854    21 F889         select: ld      hl,dph  ;disk parameter block
F857    AF                  xor     a       ;no error allowed
F858    C9                  ret
F859    3E 0A           rfshon: ld      a,drfsh
F85B    D3 0A               out     (dcsr),a
F85D    C9                  ret
                        ;
F85E    001A            dpblk:  defw    26      ;sector/track
F860    03                  defb    3       ;block shift constant
F861    07                  defb    7       ;block mask constant
F862    00                  defb    0       ;extent mask constant
F863    00F2                defw    242     ;max block number
F865    003F                defw    63      ;max dir. entries
F867    C0                  defb 11000000b  ;allocation
F868    00                  defb    0       ;mask
F869    0010                defw    16      ;check size
F86B    0002                defw    2       ;reserved tracks
F86D    0000                defw    0
                        ;
                        ;       Sector translate table for single density
                        ;
F86F    01 07 0D 13     sectab: defb    1,7,13,19
F873    19 05 0B 11             defb    25,5,11,17
F877    17 03 09 0F             defb    23,3,9,15
F87B    15 02 08 0E             defb    21,2,8,14
F87F    14 1A 06 0C             defb    20,26,6,12
F883    12 18 04 0A             defb    18,24,4,10
F887    10 16                   defb    16,22
                        ;
F889    F86F            dph:    defw    sectab
F88B    0000 0000               defw    0,0,0
F88F    0000
F891    F899 F85E               defw    dirbuf,dpblk
F895    F939 F919               defw    chk,all
                        ;
F899                    dirbuf: defs    128
F919                    all:    defs    32
F939                    chk:    defs    16
                                .dephase
0275                    enddyn  equ     $
                                end     ddyna
```

```
Macros:

Symbols:
0009    ACTL            F919    ALL             000B    BCTL
012C    BEGDYN          F939    CHK             0004    DATA
000A    DCSR            0008    DDATA           0100    DDYNA
F899    DIRBUF          F85E    DPBLK           F889    DPH
000C    DREAD           000A    DRFSH           0009    DSECT
0008    DTRACK          F384    DVRTAB          0004    DWRITE
F800    DYNA            0275    ENDDYN          F800    RAMDVR
F847    READ            0002    REF             F859    RFSHON
0008    RW              F86F    SECTAB          F854    SELECT
F368    SELTAB          0001    SLD             0000    TLD

No Fatal error(s)
```

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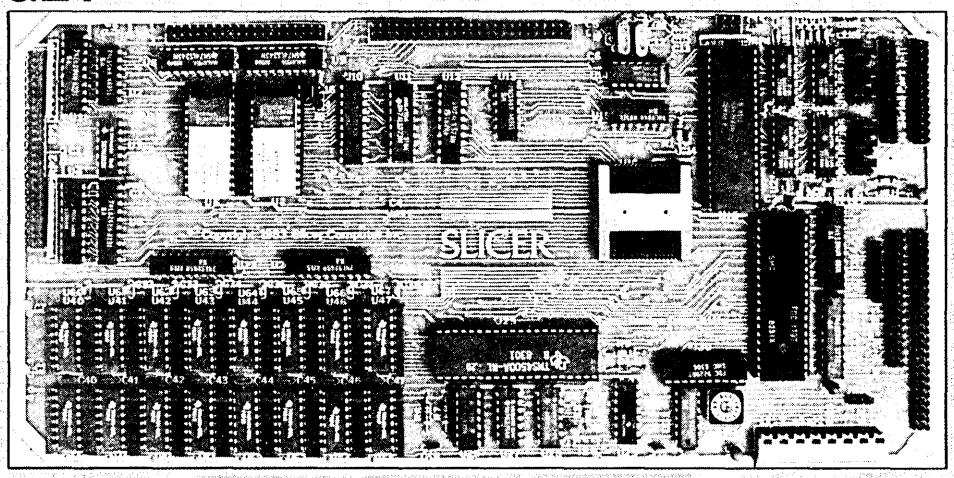

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Pascal Procedures

John P. Jones

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The first step in programming in any language should be a precise definition of the problem at hand and an outline of its solution. In many cases, this step will be the most time consuming and difficult portion of the entire project.

Program Development

Recently I needed a routine to interpret a message from another computer and perform a series of processes based on the message data and imbedded control codes. The first step was to get a definition of the input message in all of its possible forms.

1. Data in ASCII?
2. Enumeration of all possible fields.

3a. All fields in fixed positions?

3b. Fields delimited by a special character?

4. Enumeration of all possible actions.
5. Enumeration of all codes for 4.

Now the procedures to attack the problem can be logically outlined or flow charted. If the data is in ASCII (it was) the input message can be most conveniently handled as a STRING, since the built in STRING handling procedures can then be used. The first outline would be for a routine to copy the input data to a Pascal STRING variable.

If fields are not in fixed positions, a routine for scanning the data to determine field positions should then be blocked out, followed by a functional definition for a 'command interpreter.'

Finally, the repertoire of actions to be performed under control of the command interpreter should be outlined.

Start Your Coding

The actual coding can begin at this point. My method is to sequentially develop the routines for a 'test case' and then modify/expand to cover all cases. In my example, the STRING conversion routine is written and debugged using constant input data and a simple calling program before going on to live input data.

In like manner, the field extraction routine is developed first for fixed input, then for variable.

The command interpreter development is only slightly more complex. The routines for each action can be written and tested independently for fixed and variable input. These routines are later integrated into the main program by another independently written module which selects the proper function based on the control code imbedded in the field.

To interpret the input data, the main program needs only to call the STRING initializer, followed by the field extraction routine and command interpreter for each field.

Although this example may not be of specific value to many readers it does point out the method of modular programming. First, define the problem and solution in detail and break it up into small, easily coded routines. Fully test each routine as it is written, then use these modular building blocks to construct the final program.

Variant Records

One of the more difficult data structures to understand in Pascal is the variant record. As you may recall from an earlier column, a record is a structured data type which allows the programmer to access logically related data elements as a group.

In some cases, it may be more convenient to access the person's name as a whole, rather than as last name, first name and middle initial. Rather than copying the data from the record fields into a single char array, a variant record makes this possible in a more convenient way.

The case selector, called a tag field, must be a scalar value (boolean, integer, char, enumerated) and is another field which can be manipulated within the record. The variable 'american' can be

Figure 1 - Pascal Examples

example 1

```
type
    person_name = record
      last_name : array[1..20] of char;
     first_name : array[1..20] of char;
        initial : char;
end;
```

example 2

```
type
    person_name = record
     case whole : boolean of
           true : (entire_name : array[1..41] of char);
          false :   (last_name : array[1..20] of char;
                    first_name : array[1..20] of char;
                       initial : char);
end;

var
  american, gallifreyan, lower_slobovian : person_name;
```

example 3

```
type
    selector = (this, that, another);

      strange_record = record
          recordname : string[23];
          case which : selector of
                this : (number : real);
                that : (yes_or_no : boolean);
             another : (nest : record
                             a : integer;
                             b : real;
                             c : string[12];
                                 end;)
  end;
```

example 4

```
type
       ptr_trick = record
  case data_type : char of
             'I' : (int : integer);
             'P' : (ptr : ^integer);   {or ^whatever}
end;

var ptr_var : ptr_trick;
```

accessed as either a single character array or as two smaller arrays and a char depending on the value of the field 'whole.' Maintenance and use of the tag field is the responsibility of the programmer, NOT the compiler.

In my example 2, even if american.whole = true, the variable american.initial can be modified without restriction. The tag field should be used by the programmer in IF or CASE statements to control proper access to the record's variant fields.

Variant fields do not have to be the same length, but the compiler will allocate variable space for the longest variant. The variant fields can be of entirely unrelated types.

The variant record part must be the last field in the record but since records can be fields of records, variants can be nested. Again, since the variant part must be last, the 'end' terminating the record definition suffices to terminate the variant case statement.

For many Pascal compilers, pointer types cannot be manipulated as integers even though at the binary level they are both 16 bit values. The variant record type in example 4 allows manipulation of the pointer's value as ptr_var.int and use of it as ptr_var.ptr.

To sum up for variant records, it's all in how you look at the data.

Turbo Tips

Those of you who have seen the review of Borland International's Turbo Pascal in Micro C, issue 16, will know that I have a very high opinion of this new native code Pascal system. Because of the product's reasonable price, standard syntax, and superb performance (and the uncertainty of support for the other low priced Pascal compilers), I will be presenting most of my examples in Turbo Pascal. As I come up with bits and suggestions on how to use Turbo effectively they will be included in this section of the column.

Turbo allocates storage for static variables (globals and locals for non-recursive procedures) at compile time. Because of this, a Turbo generated .COM file will not run on another machine with a smaller transient program area or on the same machine if part of the TPA is used by another program like SUBMIT or DDT.

To get around this problem, compile the program under Turbo with the other program loaded. For example, if you want to debug an application program with DDT, use the steps:

```
A>DDT TURBO.COM ;load ddt, then turbo
-G              ;ddt prompt, execute Turbo
```

At this point, the Turbo compiler can be run normally. Select the Com option to generate a .COM file of your program. To debug the program, enter:

```
A>DDT PROGRAM.COM
```

You can then use all the DDT commands to examine the code, set breakpoints, trace etc. Since the compiler was executed with DDT resident, all variables were allocated in available memory.

When running the terminal installation program, TINST.COM, if you wish to delete a function (such as insert line) enter a minus sign '-' and TINST will reply 'nothing.' Under these circumstances, the Turbo editor will perform the required function in software rather than using a terminal function code.

For any Pascal, the statements:

```
i := i + 1;
i := succ(i);
```

have the same effect but the second will be much more efficient. The first statement will generate code to execute an integer add routine, while the second will result in a simple increment.

■ ■ ■

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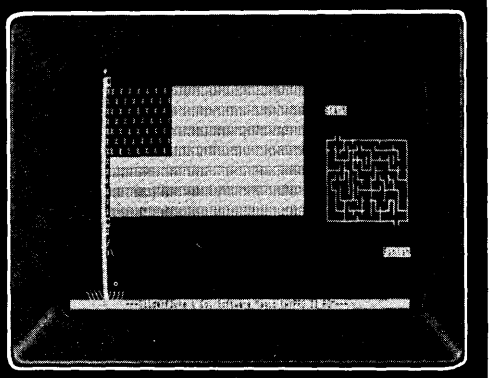

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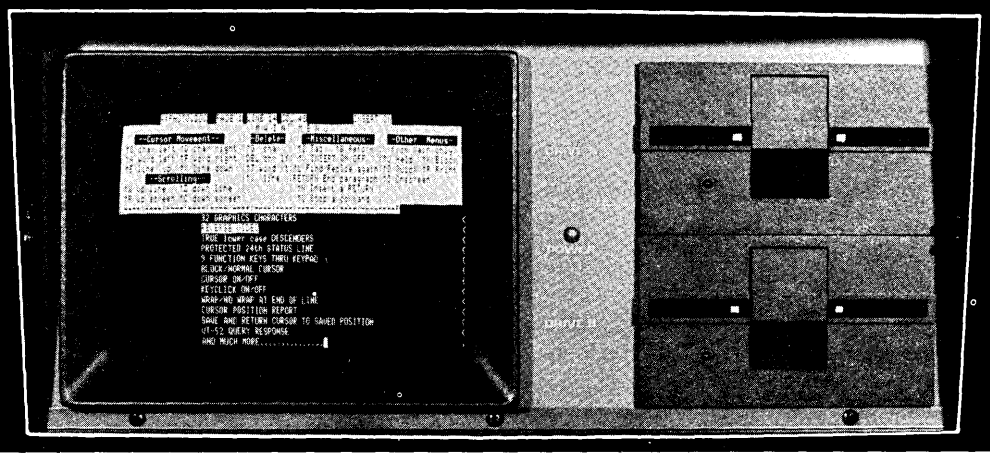

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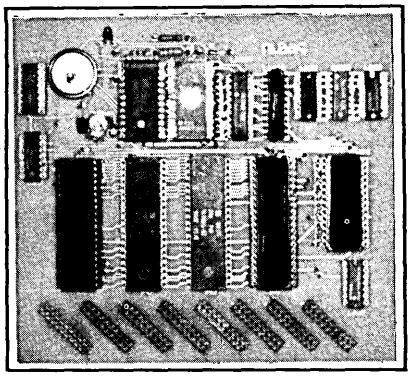

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The Kaypro Column

By David Thompson

Kaypro is distributing an update package for the early Kaypro 10 (the one with the Tandon drives) that lets you boot off the floppy.

All systems are supposed to automatically boot off the floppy if there is a disk in the drive but only the more recent systems can do it. Format and Sysgen a floppy with your 10, then hit the reset button with the new disk in place and see if the system will boot off the floppy (the winchester light will not come on). If yours will not boot off the floppy, then you need to get the free upgrade kit from your dealer.

The update package includes a new monitor ROM and a disk of new software. However, the ROM they send is a 250ns part (2732A-25) while the ROM that came in the 10 was rated at 200ns (2732A-20). The first replacement ROM that I got wouldn't run at all, so I swapped it for another and the second one seemed to work fine.

After I put the lid on the system and started using it, it got flaky. It would lock up sometimes, ignoring the keyboard—other times it would just reboot with no warning.

So I erased the ROM that had come in my 10 and burned in information from the new (slower) ROM. This cured the flakiness.

So, if you are having random problems with a Kaypro 10, check the monitor ROM, U42. If it is a 250ns part, you should see about getting a faster part. Note that the monitor ROM is a little hard to find since it is tucked under the drive cable. In fact, the cable may well be contributing to the heat problem so if you are desperate, you might prop the cable up away from the ROM temporarily while you're getting a new part.

This ROM problem makes me suspect that there are some hardware timing problems on the Kaypro 10. A select line or a data buffer may be slow, causing critical timing problems.

We've found that IIs and 4s will be absolutely reliable at 5 MHz with the 250 ns ROMs but the 10s will not work at 4 MHz with the same parts.

Sponge

All of you with fans on your Kaypros (and bells on your toes) should remember to check the little sponge filter behind the fan. That little filter doesn't look like it would filter much, but it sure can clog up. When it does, you get the noise but no action.

Just pull off the little plastic cover and rinse out the sponge. That's all there is to it.

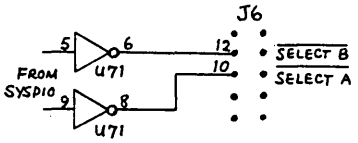

Figure 1 - Original Kaypro Drive Select

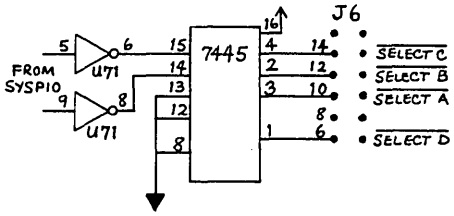

Figure 2 - Select Circuit to Access 4 Drives with Pro-8+

KIPS

I received a "newsletter" from Custom Electronics of Fresno, California. The "newsletter" is called KIPS (Kaypro Information Peripherals and Software) and for $14.95 per year, you are supposed to get: "Periodical mailings of Hardware and Software tips from users nationwide." You are also supposed to be able to purchase all kinds of Kaypro products at "KIPS DISCOUNT PRICES."

Well, KIPS is really just a 36 page catalog with 3 pages of tips. In these three pages they cover the latest from Kaypro, such as:

The Kaypro 10 has a built-in 10 Meg hard disk. The Kaypro 4 is a Kaypro II with "double sided double density disks." (No mention of the drives.) And that when you have a Kaypro, you have "the ability to dedicate the computer to any language you might want to learn."

After all this, they review JRT Pascal and benchmark it against SBASIC. No indication of the programs they ran, though they called them "time trails." (Yep, trails, which may mean it was a foot race.)

So, we turn to the other 33 pages in this "mag." Here you can purchase at "discount" a Gemini 10X that they say retails for $499 (retail is really $399) and which they will sell for $339.95. (The usually mail order price for this printer is between $269.95 and $299.95.) It also appears that they are selling a public domain accounting package for $199.95 (without manuals). For another $149.95, they'll send you the documentation!

They also sell a Kaypro II monitor ROM with a custom sign-on. You get 23 characters on the first line and 17 on the second. This is very interesting since I designed a custom monitor ROM for the Kaypro II with 23 characters on the first line and 17 on the second. (When you design something in this business, you never know who will wind up selling it!)

The KIPS people included an advertising cover letter, just in case we might want to put our ad in their "magazine." The letter noted that they would be glad to run any editorial material we wrote about ourselves, if we bought advertising. I may be old fashioned, but that's definitely not my idea of ethical journalism.

PRO-8

Dana and I have gotten some calls from people who are trying to use the PRO-8 copy programs to copy one format disk (say a Kaypro II disk) to another format (say Kaypro 4 or 8). These track copy programs will only copy between two disks of the same format.

So, if you want to format and copy to a disk that is different from the source disk, do the following: Choose the correct version of COPY, select the "O" option and then either "F" to format in B: or "X" to format drive A:. After you have formatted the disk(s), exit the COPY routine and use SYSGEN.COM (comes with CP/M) to put system tracks onto the disk (don't use the "SYSGEN" built into the copy program, it wipes out the system tracks if the disks are formatted differently). Then use PIP.COM to transfer the files.

There is also one small bug in the "2on8" routine. If you put an 80-track drive in A:, this program will not properly format a Kaypro II disk in A:. The following will fix the problem.

```
A>ddt 2on8.com
DDT VERS 2.2
NEXT PC
1F80 0100
-s732
0732 FC f8
0733 F5 .
-cntl-C
A>save 30 New2on8.com
```

In other words, changing the byte at 732 (hex) from FC (hex) to F8 (hex) makes everything work properly.

Tandon 101-4

Tandon has begun shipping a new drive called the 101-4. We've had problem reports from users who have this drive. We borrowed a 101-4 long enough to bring it up on our Kaypro II.

The most remarkable thing about this drive is that it is practically silent. I mean, that little stepper just doesn't realize what steppers are supposed to sound like. It is great. Anyway, check out the following if you have one of these.

1. Be sure that only one drive is terminated (two terminators will overwhelm the driver). The terminators look like blue ICs.

2. Set up the jumpers as follows: W9 open, W19 closed, Jumper on W13 for 6 ms step rate. W10, W11, W12, and W14 should be left open.

3. Drive select is done by W1-W4. If this will be drive A: then jumper W1, if B: jumper W2. The rest of the board should be jumpered correctly as shipped.

4. Be sure you power down the system after setting the jumpers. The onboard processor only checks the jumpers at power-up.

5. You may have to hit the reset button a few seconds after you power-up since these drives take a while to check themselves out.

6. Remember the COPY programs will usually only run at 2.5 MHz.

So far, however, the older Tandon 100-4, as well as the TEAC, and CDC quad density units have been flawless and we've gotten no reports of problems with any of the double and single sided 48 tpi drives.

TEAC

The TEAC drives have the ribbon connectors mounted upside down from other drives so you might wind up finding that your drive data cable is too short if you have one TEAC drive and one Tandon. If they are both TEACs, then you are OK.

CDC

On these drives, be sure to jumper "M." Also jumper the drive number, 1 for drive A:, 2 for drive B: and so on.

Four Drives on the 4

All of the PRO-8 monitor ROMs we've shipped in the last 2 months support 4 drives as well as 2 (see, there is such a thing as a free lunch). That means that you will be able to use two outboard drives as C: and D: if you add a simple drive decoder circuit and the necessary data and power cables. If you get the TEAC half-wide drives you can mount all four drives inside the cabinet and run the whole thing off the built-in supply since the TEACs use only half the power (as well as half the space) of the Tandons. The Tandon and CDC drives will require separate power supplies. The ROMs that support four drives have +'s around the

(continued on next page)

ROM sign-on message (so we call them PRO-8+ ROMs).

We will have a complete Plus-2 package for the PRO-8+. The package will include the decoder board and a disk with the additional formatting and system utilities that you will need for four drives. We're also getting prices on complete cables so if you don't want to build your own we'll have them. More information on these in issue #18.

Note that this will be the genuine Micro C decoder board. You'll be the envy of all the Kaypro users on your block when you show them your very own Micro C decoder. We're waiting for Batman and Robin to order their own copy of this beauty.

Anyway, this way you can leave your original drives in place, if you wish, and add two more of any type (191K, 380K, or 784K) outboard or you can replace your present drives with up to four half-wides (of any persuasion) and not have anything hanging out.

Kaypro II Version A

During the Spring of 83, Kaypro spent several months trying to clean up a disk error problem. During this period they went through three new versions of their monitor ROM. The monitor ROMs (U47) were marked (on the paper stuck on the ROM) with an 'A', 'B', or 'C' suffix. Kaypro shipped a few 'A' versions and almost none of the 'B' versions (I understand they had a bad bug), before they went to the 'C' versions which they are still shipping.

I hadn't been able to find anyone who could tell me what they changed from version to version, but now, thanks to a letter from Terry Kingrey, I have a pretty good clue.

Terry tried installing one of our PRO-monitor ROMs on his system but it didn't work (he hadn't told us that he had one of the 'A' ROMs). So he tried substituting parts on his Kaypro to see if he had a defective chip (we would have told him not to bother). He didn't have a 1797 floppy disk controller to swap with the one on his board so he substituted a 1793 from a friend's Kaypro. After he substituted in the 1793 he found that his system worked just fine with our PRO-monitor ROM.

That news sent Dana and I to the Western Digital book to see what the differences were between the 1793 and the 1797. The 1797 does side select and the 1793 doesn't, but Kaypro isn't using that line. However, the 1797 requires a sector size bit, the 1793 doesn't. That could be the difference.

Anyway, if you are one of the select few with an 'A' version of the Kaypro, it looks like you can upgrade to one of the PRO-monitors (II, 4, or 8) if you will replace your 1797 with a 1793 disk controller. 1793s cost about $25.00 each. You can order them from Unicorn Electronics 213-341-8833.

If you have a ROM with no suffix or with a 'C' suffix you are just fine. You have the 1793 disk controller already.

Oh, and thanks a bunch, Terry, for the letter. We couldn't have done it without you.

Close Look at the New Kaypro 4

I had heard that the new Kaypro 4 had a Kaypro 10 board, two 390K drives, plus a battery backed-up timer and modem. Whee!

It turns out that the new 4 board is more than just the 10 board with two additions. It contains two new 40-pin ICs that replace a lot of standard ttl chips.

One of them is dedicated to the video section and it looks like the graphics department just got a lot smarter and easier to use (is someone planning 1,2,3 for the Kaypro?).

All the Kaypros will soon contain this new board and meanwhile they've just dropped the price of the Kaypro II to $1295 (and the board is running 4MHz besides!).

Advantages

Kaypro has added a lot of the features that independent suppliers have been selling (which is unusual for a large manufacturer). Obviously Kaypro has been listening to users.

Also, if Kaypro can resist making changes for a while, you'll see a lot of hardware and software coming out for this board. After all, people will only have to design a product once and it will work on all the new Kaypros.

Disadvantage

However, a lot of present upgrades will not now work on the new board. Dana will be working on new monitor ROMs but, of course, those new ROMs aren't done yet. So those of you with a Kaypro 4 with graphics and two half-wide drives will have to wait a while before making your system distinctive.

And, those of you planning to purchase a Kaypro 10 might want to wait a month or so and then make sure you will be getting a system with the built-in modem.

The MODEM

The built-in modem is a very simple 300 baud direct connect unit. It is locked at 300 baud for now because its UART (asynchronous serial chip) is tied to the same half of the 8116 baud rate generator as the keyboard SIO. Since the keyboard communicates at 300 baud it's obvious that Kaypro figured it could save the price of another baud rate generator by using the same clock twice.

However, until we come up with something sneaky (and if it's sneaky, it's right down our alley) you'll lose use of your keyboard if you try running the modem at, say, 450 baud.

Support For Fat Jack

As a technical journal, we've considered ourselves above the jungle of Kaypro add-ons such as legs (a 1 by 2 board mounted underneath the front gives it a great "pair" of legs), stands (I can't stand them) and reading racks (if God had meant for me to have a reading rack he would have taught me how to read).

However, the Twist people sent us one of the Fat Jack reading racks and a pageclip (which holds books open when they are on the rack). The rack easily hooks to the top of the Kaypro and holds books or papers at just the right level.

Then Sandy spied the rack and started using it. She loved it. In fact, she wouldn't even let me borrow it.

Well, anyone who puts out a product that Sandy won't loan me, and then supports it like this, has earned a mention in Micro C.

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■ ■ ■

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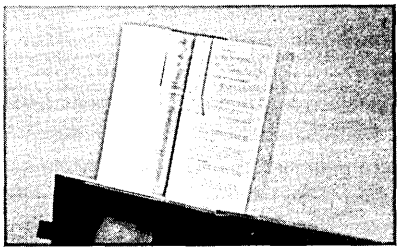

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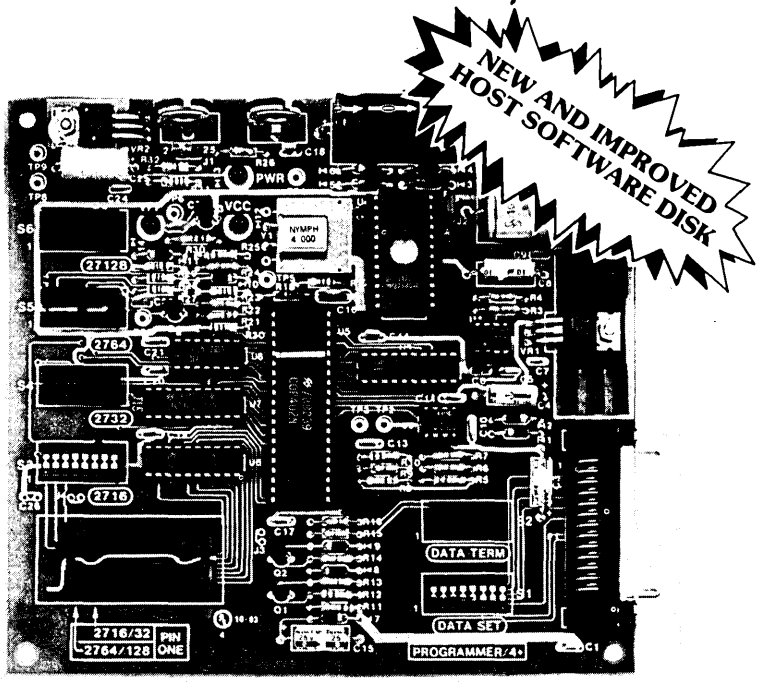

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SBASIC Column

By Jack Rodenhi

1317 W. College Ave.
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Think how rough it would be if every time you wanted to go somewhere, you had to re-invent your car. Likewise, a good programmer will have a library of programming tools for tasks he performs frequently.

In upcoming issues of Micro C, we will put together several tools in SBASIC. The overall game plan is to eventually come up with a program that will demonstrate the desirability of developing software tools, and at the same time, develop a program that will do something useful, like creating a checkbook database program.

Input.bas

The first part of the program involves data input. The classiest kind of input routine is the type used by dBASE II in it's full screen editing mode. So let's do that kind.

One of the nice things about a structured language like SBASIC is that if you don't like the words it comes with, you can make up your own. We are going to invent the input routine called input4 to go along with the other input statements provided by SBASIC.

Declarations and definitions

The first two sections of code in our input tool are variable declarations and constant definitions. Because global variables make more work when we chain programs and they represent permanent space allocation, we will keep these to a minimum.

Speed is very important in this routine, however, and we will save a good deal of time by not reinitializing these variables on every pass through this routine. Turning off line number generation with the compiler directive "$lines" will also save time and space.

Cursor commands

Next comes the cursor procedure. With this procedure, we don't have to type "print chr(26)", etc. every time we want to clear the screen, etc. We just say cursor "up", cursor "down", cursor "erase", cursor "roll over" and so on. You may have to change some of the print commands if you don't have a Kaypro.

Cursor positioning

To position the cursor on the screen, the programmer just enters the row and column and the @ procedure will take care of the rest. Do that a few times without this routine and you'll really grow to appreciate the power of structured programming. Again, this works for the Kaypro and may need modification for use elsewhere.

String search

The "in" function is something I sort of stole from Pascal. Pascal has a neat set operator called "in" and a few predefined sets.

However, in SBASIC we'll have to define our own sets of characters as strings and use this string search function to determine if our test character is in the set. Notice that this function returns a 't' or an 'f'.

In SBASIC these characters are taken for boolean results. This means that we don't have to say "if in(format_set) = 't' ", we can just say "if in(format_set)". We defined the sets at the beginning of the program and the next procedure uses these sets to test input characters.

A Test of Character

The test procedure compares a key to one of our defined sets. Which set to compare to is accomplished by the case statement and the "picture_char."

The comparison is assumed to yield a false and then if the comparison works, it is changed to true. We have given ourselves only four choices here, but this list can be expanded to whatever extent is convenient. A boolean picture_char would probably be very useful.

Get some character

Now, let's look at the routine getkey which is the workhorse for our input tool. This routine was inspired by the book *Advanced Pascal Programming Techniques* by Paul A. Sand and published by Osborne/McGraw-Hill. This excellent

(Column continued on page 25)

Figure 1 - SBASIC Tools

```
$lines
var numbers, boolean_set = string : 12;
var control_set,small_letters, cap_letters = string:27;
var letters = string : 53
var format_set = string : 5
var ch, control = char

control_set = chr(13)+chr(05)+chr(24)+chr(25)+chr(08)+chr(04)
numbers = "0123456789.-"
cap_letters   = "ABCDEFGHIJKLMNOPQRSTUVWXYZ "
small_letters = "abcdefghijklmnopqrstuvwxyz"
letters = small_letters + cap_letters + ":;?<>@&"
boolean_set = "YyNnTtFf"
format_set = "9ABX!"

procedure cursor(command = string)
    case command of
       "erase": print chr$(26);
        "beep": print chr$(7);
        "left": print chr$(8);
        "down": print chr$(10);
          "up": print chr$(11);
       "right": print chr$(12);
    "cleareos": print chr$(23);
    "clearеol": print chr$(24);
    end
end

procedure @(row, column = integer)
    print chr$(27)+"="+chr$(row+32)+chr$(column+32);
end

function in(test_set = string : 60; subject = char) = char
    var result = char
    result = 'f'
    if instr(1,test_set,subject) <> 0 then result = 't'
end = result

function test(key = string :1; picture_char = char) = char
    var ok = char
    ok = 'f'
    if in (control_set,key) then ok = 't' else
    begin
        case picture_char of
            '9' : if in(numbers,key) then ok = 't'
            'A' : if in(letters,key) then ok = 't'
            'B' : if in(boolean_set,key) then ok = 't'
            'X' : ok = 't'
            '!' : if in(cap_letters,key) then ok = 't'
        end
    end
end = ok

function getkey (picture_char = char) = char
    var key, ok = char
    repeat
    begin
        echo off
        input3 key
        echo on

        if picture_char = '!' and in(small_letters,key)\
           then key = chr(asc(key)-32)
        ok = test(key,picture_char)
        if not ok then
        begin
            cursor "beep"
        end
    end
    until ok
    ch = key
end = key

function mask(model = string :80) = string
    var mask = string : 82
    var position = integer
    mask = space$(len(model))
    for position = 1 to len(model)
        if in(format_set,mid(model,position,1)) then\
        mid$(mask,position,1) = '_'\
        else mid$(mask,position,1) = mid(model,position,1)
    next
    mask = ':' + mask + ':'
end = mask

function input4(row, col = byte; picture, default = string) = string
    var position, done = byte
    var max_length = integer
    var input_line,response = string :82

    control.c.trap off
    max_length = len(picture)

    done = 'f'
    response = default + space$(max_length-len(default))
    input_line = mask(picture)
    @ row,col
    print input_line
    position = 1
    @ row,col+position
    print default;
    @ row,col+position
    repeat
    begin
        if in(format_set,mid(picture,position,1)) then begin
            case getkey(mid(picture,position,1)) of
              chr(13) :  done = 't'
              chr(05) :   begin
                            done = 't'
                            control = 'e'
                          end
              chr(24) :  begin
                            done = 't'
                            control = 'x'
                         end
              chr(25) :  begin
                            response = ' '
                            @ row,col
                            print input_line
                            position = 1
                            @ row, col+position

                         end
              chr(08) : begin
                        if position > 1 then position = position - 1
                        while not in(format_set,mid(picture,position,1))\
                         and position > 1 do begin
                            position = position - 1
                        end
                        mid$(response,position,1)=' '
                        @ row,col+position
                        print '_'
                        @ row,col+position
                        end
              chr(04) : position = position + 1
              ch      : begin
                                mid$(response,position,1) = ch
                                @ row,col+position
                                print ch;
                                position = position + 1
                        end
            end
        end
        else begin
            while not in(format_set,mid(picture,position,1))\
              and position <= max_length do position = position + 1
        end
        @ row,col+position
    if position > max_length then done = 't'
    end
until done
end = response

remark : the main application  begins here
var x,y = integer
var format,autoanswer,answer = string : 80
var again = char

repeat begin
    cursor "erase"
    input2 "Please enter screen coordinates as 'row,column' ";x,y
    print "Please enter input mask using 9's,A's,B's,X's and !'s "
    input2 format
    print "Please enter default response "
    input2 autoanswer
    answer = input4(x,y,format,autoanswer)
    @ x+1,y
    print answer
    print  "Do you want to do it again?"
    again = input4(x+3,y,"B","Y")
end
until not again
```

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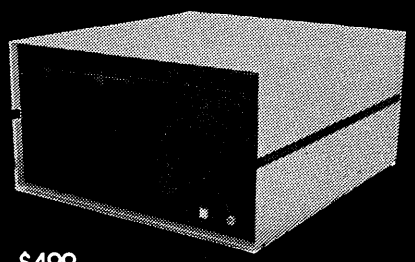

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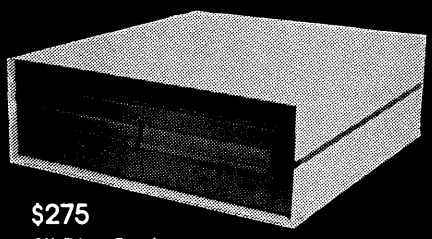

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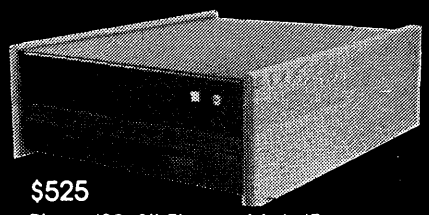

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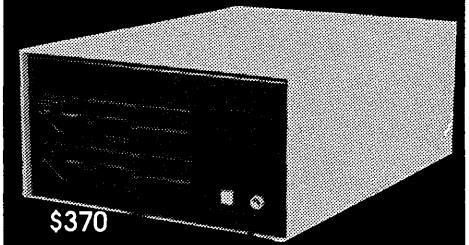

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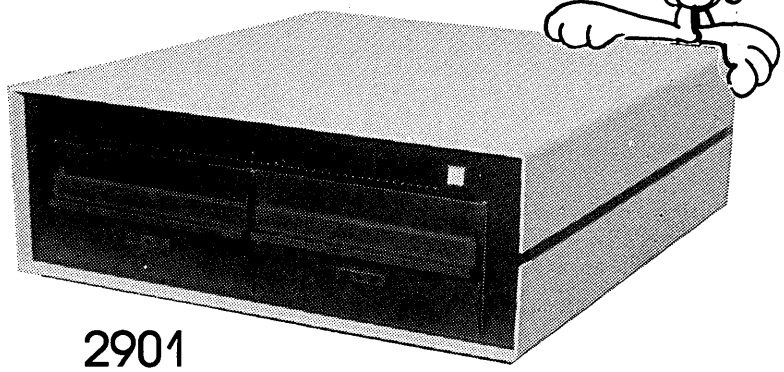

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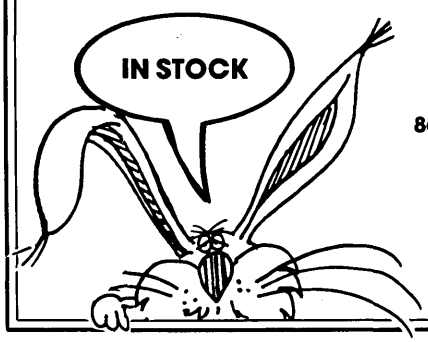

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(SBASIC Column continued)

book will be the source of many useful SBASIC routines if you take the time to do the minimal translation necessary.

With the above routines, the getkey function is easy to accomplish. Getkey simply accepts a key and tests it.

Before the test, getkey will change small letters to capitals if desired. The ASCII codes for small letters are 32 greater than the ASCII codes for their corresponding capital characters.

If the key tests OK then getkey returns to the calling routine. Getkey also sets the global variable "ch" equal to the result of getkey. This allows the calling routine to use the value later.

Role Model

The last thing we want to do before we jump into input4 is provide an input line for the operator to see when entering data. The mask function will build an input line called a mask from the "model" sent to it as a parameter. It builds the mask character by character, substituting underlines for positions occupied by members of the format_set and printing all other characters in their respective positions.

Ready, Input!

On to input4. Input4 is declared as a function rather than a procedure to facilitate later code writing. To use input4, you pass it four parameters. That is, you have to tell it where you want the input to appear on the screen (row and col), what characters will be acceptable in what positions, and what answer should be taken as the default.

We turn the cntl-C trap off because we want everything done under program control. We are going to repeatedly get one key and add it to our "response" until done. Optionally, we can, if certain control keys are pressed, erase the entire line, go to the next or the prior entry or whatever else might be desirable and useful to program in.

How will we know when we are done? If the response is as many characters as were requested or if the operator presses the return key, we will be done.

We initially set the variable "done" to "f". Then we let response equal the default until we know better. Because the string insertion routine needs a string to insert into, we pad the default with spaces to the length of the picture passed to input4. We make a variable called input_line equal to a mask based on the picture. Then we print the default over that.

Now the screen is formatted and the program is ready to accept input. We only want to look for input at those positions in the picture that input is appropriate. So if the character at the current position in the picture is in the format_○ set, we will accept input. Otherwise, we go past the case structure entirely and skip over picture characters until we find another in the format_set or we reach the end of the picture.

If we are accepting input, the character input can be any one of the members of the control_set or any other character that will pass by getkey's test step. The case structure oversees execution of the operation for each of the members of the control set that may come through.

The last case is one of getkey returning a value of ch. Getkey always equals ch so this is our "else" statement and this is where characters are added to response.

The last part of the listing is an actual application of this set of tools. Study the application, use it and then use the routine in your programs. After a little use and fine tuning, this tool may become one of your favorites.

■ ■ ■

CP/M-86: A Close Look

By Dana Cotant

The amount of CP/M-86 software contributed to Micro Cornucopia has not increased since we put out the three Slicer disks about 6 months ago. After speaking with some of you I have the impression that many programmers are uneasy with the prospect of starting anew in this 16 bit environment.

I can certainly understand your apprehension about abandoning your bag of CP/M-80 tricks, but you don't have to start over from the beginning. Actually, the CP/M-86 environment frees you from a lot of the routines you developed for CP/M-80 because of the incredible capabilities of the 8088, 8086 and 80186 microprocessors (hereafter called the 86).

The Documentation

CP/M-86 comes with three separate manuals. The User Guide explains PIP, ED, and the basic operating system commands. The Programmer's Guide covers ASM86 and DDT86 in considerably more detail than the CP/M-80 documentation.

Technical information on the CP/M-86 operating system is in the System Guide, which covers system generation, system interface, and memory management. This manual is not much better than the CP/M 2.2 interface and alteration guides but it provides most of the needed information (if you are already familiar with CP/M-80).

The CP/M-86 assembler

Probably the greatest concern is the assembler. ASM certainly left a lot to be desired which is probably why most CP/M-80 assembly language programmers bought MicroSoft's M80 assembler. ASM86 is a definite improvement but it's no M80.

There is no provision for linking assembled modules though the assembler has an include directive for loading source files from the disk. You can even use an underscore in an identifier to make it more readable.

86 assembly language

The 86 instruction set is a vast improvement over the 8080 set. The 86 instructions are more general, depending on the operands to determine the type of manipulation. The same mnemonic is used to perform a register to register data move as a data to register move.

Most instructions follow the general form OPERATEON (destination), (source) where (destination) and (source) can be any of the usual operands without requiring a change in the instruction mnemonic itself. This improvement provides a comfortable environment for the Z80 programmer who hates the illogical 8080 instructions.

There are enough new instructions available in the 86 set to entice even high-level language programmers. Most noticeable are the string manipulation instructions including compare and scan string operations. Multiplication and division are also done with single instructions.

Z80 programmers will appreciate the repeat and loop instructions but unfortunately the bit-wise operators found in the Z80 instruction set were not included in the 86 set. You will have to go back to OR, XOR, AND, and the rotate instructions to set and test individual bits.

Addressing

The incredible addressing capabilities of the 86 sets it apart from the 8 bit microprocessors. The 86 has a 20 bit address bus which gives it a 1 megabyte addressing capability. Rather than having to use two 16-bit registers to hold a single address and the resulting code bulk, addresses are described by a 16 bit number. Sixteen bits can address 64K bytes of memory (which is called a memory segment).

The location of a 64K segment in the 1 megabyte memory range is described by a segment register. In this way a program can be run any where in memory without changing a single address. All you have to do is change the segment register.

This addressing scheme allows a program to load and execute another program in another memory segment. At first glance this seems like concurrence but since there are no provisions for detaching from a program to run another program, it is not a true concurrent operation.

Still it allows programs like DDT-86 to test a program without relocating. DDT-86 loads into one memory segment and loads the program under test into another. By controlling the segment registers DDT-86 can run the test program or return to its own routines.

In 86 programs the data, code and stack usually lie in different memory segments. There is a segment register for each, and each may be up to 64K. There is also a segment called an "extra segment" if extra data space is needed. These four segment registers are contained in the CPU.

Addresses, either for the program counter or for program addressing are generated using the segment registers and a second operand. The operand can be an offset from another register, an absolute offset, index to a memory location from another register, or a relative address. There are seven addressing modes not counting the operand combinations. I believe this is what scares off most 8-bit programmers but it need not be a problem.

The 8080 Model

CP/M-86 has provisions for accepting programs which have code and data intermixed in a single 64K segment. This is called the 8080 model and was intended to make it easy for CP/M-80 programmers to move their programs over to the 16 bit operations with a minimum of rewriting. CP/M-86 itself was written using the 8080 model. For this reason the CP/M-86 BIOS is nearly identical to the CP/M-80 BIOS.

So, if you are going to move a program from 8080 to 86, you'll need to translate the source to 86 mnemonics and you'll have to modify slightly the way that BDOS is called (for the ASM-86 assembler). After the program is assembled, it is loaded with GENCMD (with the 8080 option set).

This way, you can ignore the complex addressing problems. The program will load at the code segment register + 100h and can expect the usual addresses in the base page for dma, file control block, and memory sizing.

GENCMD also has provisions for loading programs at absolute memory locations. The absolute address for each of the four memory segments can be specified with parameters in the command line when GENCMD is invoked. Absolute addressing is not recommend-

ed since CP/M-86 cannot be sure the requested memory is free. Some of the CP/M-86 programs on our Slicer user disks require an absolute load and the GENCMD parameters are described in the opening comments of the assembly language source.

Calling BDOS

The call to memory location 5 is missing. For this reason the operating system can be located anywhere in memory without providing both an address and an offset. BDOS is called, instead, with a 244 type interrupt.

There are 256 interrupt vectors located at the base of memory in an 86 system. The first 5 are reserved for processor operations. A software interrupt is generated by the instruction INT followed by the interrupt type. The interrupt type is multiplied by 4 to create the address to find the 32-bit interrupt vector.

When the CPU sees the INT instruction and generates the address with the operand, it then pushes the flags, the code segment register and the program counter on the stack. The code segment register and the program counter are then loaded with the interrupt vector so that the next operation will be the instruction pointed to by the vector.

All the BDOS functions in CP/M-80 have the same function numbers and parameter registers in CP/M-86. For example, to output a character to the printer, register CL (was C in CP/M-80) is loaded with the function number (05 for LST: output) and the character is loaded in DL (was E in CP/M-80). Then BDOS is called by interrupt type 244. Since the current program counter is pushed on the stack, the interrupt normally returns to the calling routine with a RETI (return from interrupt) which pops the return address off the stack and restores the flag register. This interrupt processing makes software interrupts more like a call than an interrupt and in some respects easier to use.

As a matter of fact, most CP/M functions are supported in MS-DOS by the same function numbers. The main difference is that in MS-DOS, the DOS interrupt type is 21. Thus a program written in assembly language for CP/M-86 will be transportable to MS-DOS with very few modifications.

Getting Started

It is hard to get your feet wet in a new programming environment. For me, the easiest way was to modify existing code. When you are working on different ways to make a program leaner or more elegant, it is really easy to learn the new instructions one at a time and understand their effects.

You might also try translating your favorite CP/M-80 utility to work under CP/M-86. This method provides the incentive (if the utility is really worthwhile) to get you over the "new processor" hump. High level language compilers can also be used to generate models for assembly language programming. You can compile a small program using the Small C 86 compiler and then take a close look at the assembly language output.

If the speed, improved instruction set and generous memory capacity of the 86 is not enough to entice you to try your 16-bit wings, consider the future. You may not agree that the 8-bit machine is dead (as some will tell you) but one thing is for sure, the 16-bit machines are here to stay.

■ ■ ■

FORTHwords

By Arne Henden

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In this column, I would like to repeat the good news about the FORTH Interest Group, mention some new software and hardware releases, and end with a discussion of operating system interfacing.

FORTH Interest Group

I mentioned this important organization back in one of the early columns, but it is time to refresh your memory. FIG started as a northern California club and has since expanded to provide a worldwide FORTH User Group. Dues are $15 U.S., $27 foreign and include a subscription to FORTH Dimensions (FD), the leading FORTH journal. I definitely recommend joining FIG if you are at all interested in FORTH. Their address is: FORTH Interest Group, P. O. Box 1105, San Carlos, CA 94070.

The latest issue of FD (v.5 n.5) includes articles on calculating fixed-point logarithms, a quick sort routine, Laxon's second installment on multitasking, and a review of the 1983 FORML meeting. Many more articles are in the issue—surely some would interest you!

FIG is considering the operation of a Software Exchange, to distribute public domain FORTH application software. More on this when plans are finalized.

Ever order anything by charge card from FIG? You will notice that Mountain View Press is the vendor mentioned on the charge. FIG is a low-volume organization and uses MVP for a lot of their services. Both are good groups to know and patronize.

The FIG Z-80 Listing

FIG produces fig-FORTH listings for just about every micro in existence. Tens of thousands of these listings have been sold, making fig-FORTH a familiar dialect of FORTH. Most vendors start with fig-FORTH and then customize to FORTH-79, FORTH-83, etc., adding their own enhancements. Each listing costs $15, either from FIG or from MVP.

One of the latest listings is for the Z-80. Dennis Wilson has taken 8080 fig-FORTH and translated it into Z-80 mnemonics. The port store and fetch words were modified to use the register C indirect form. The Zilog 2-byte relative jump was inserted wherever possible to replace the Intel 3-byte absolute jump. The CP/M interface has been extended, but still uses BIOS calls and direct sector I/O.

Figure 1 - BDOS Calls Through FORTH

```
CODE FDOS   ( p1 p2 fcn --- HL A ...call CP/M )
     BC POP,        ( get fcn into C)
                    ( NOTE: doesn't work on FIG systems)
     HL POP,        ( first param to HL)
     DE POP,        ( second param to DE)
     BDOS CALL,     ( execute the fcn)
     HL PUSH,       ( put one returned arg on stk)
     A L LD,        ( move other to 16-bit register)
     0 H LD,        ( clear top half)
     HL PUSH,       ( and put it on stack)
     NEXT, END-CODE
```

If you have a Z80 system and a Z80 assembler, I would recommend buying the Z80 rather than the 8080 listing. However, I'm disappointed in the lack of customization. For example, the 16-bit subtract instruction wasn't used, CMOVE doesn't use LDIR, and many other common changes were neglected.

No Visible Support Software

As mentioned in an earlier column, Mike Perry and Henry Laxon distribute their public domain FORTH-83 software through this company. I purchased the 8080 CP/M-80 and the 8086 MS-DOS versions ($25 each) and must say that I was impressed! The packaging was nonexistent, but the software is first-rate.

Each version comes on two unlabelled disks: one contains the .COM files and the other is a complete metacompiler with source code to create the .COM files. The systems are FORTH-83 standard, and include an assembler, simple multitasking, editors, a nice decompiler, and much more. You get no documentation and no support, but if you don't mind a few false starts, the price can't be beat.

The Laxon-Perry model has a good chance of being adopted by FIG as their long-awaited next standard system.

Z8000 FORTH

Volume 150 of the SIG/M CP/M User's Group (Box 97, Iselin NJ 08830) is Lou Odette's Z8000 FORTH, originally published in Dr. Dobb's Journal (Sept. 82 p 48). A few bugs have been fixed, minor changes were made to use a different assembler, and polled terminal I/O using the Z80 SIO were added. If you are in need of a Z8000 FORTH, read the original article first to see if Odette's nonstandard FORTH will serve your purpose. If so, the $14 cost of the disk is a lot easier to part with than the time necessary to key in this long listing!

The only two other Z8000 FORTHs that I know of are the cross-compiled source from Inner Access, and UNIFORTH hosted on the SBS single board computer. These two latter systems are both vendor-supported, and may be better choices for businesses.

Hardware News

The March issue of Byte ran an ad on page 510 for Cyber Robotics America. They are introducing the CYBER 310, a $1200 robot arm controlled by FORTH software. I was wondering how long it would take for a commercial robotics firm to discover FORTH. I've wanted to put FORTH on the Heathkit Hero since its introduction, but just never had the time.

Proa Corp. has introduced (FD v.5 n.5) their Proatrol Single Board Computer using the Rockwell FORTH chip. This $495 board is 5" by 8", and contains an RS232 serial port, 16K bytes of memory, 8 channels of A/D, and several other I/O ports. If someone ever gets hold of one of the development systems using the Rockwell chip, I would be interested in receiving timings on the benchmarks published in one of the earlier FORTHwords columns.

The Slicer

Intel's 8086 family is not really suited to FORTH because of its lack of stacks and proper addressing modes. However, the 80186 is an enhanced CPU that has a separate address calculation section and an optimized multiply/divide circuit, executing the basic 8086 instruction set at significantly increased speed at the same clock rate. The fast clock rates available (8MHz) and the execution enhancements make the 80186 a much better FORTH chip.

A pair of the 10 instructions added by the 80186 are of interest to multitasking/multiuser FORTH systems. The "push all" and "pop all" instructions quickly save and restore all of the major registers on the hardware stack.

Otto Baude has been nice enough to loan me a Slicer for a few months to finish the development of a stand-alone UNIFORTH for this board. It's really a top-notch computer and I recommend it highly. The monitor and CP/M-86 implementation are excellent.

I think an interesting project for some enterprising engineer would be to package the Slicer and the Digital Research Computer video board into a portable computer. KayPro II's are cheap enough that you could almost buy the computer and replace the Z80 board.

BDOS Calls Through FORTH

There are over 30 functions that a user program can obtain from a CP/M-80 operating system. If you are programming in a conventional language such as FORTRAN or PASCAL, you can only use those functions that are included in your vendor's implementation.

One of the advantages of FORTH is its extensibility. If a particular BDOS function is missing from your system, it is easy to add it. Once compiled, any later FORTH word can use the new function. Try that in BASIC! However, each added function must be written in assembly language to be able to "call" CP/M and request service.

There are three basic approaches to providing BDOS support in a FORTH system: the vendor can implement a useful subset, and let the user code any missing functions that he needs (this approach is used by UNIFORTH); the vendor can implement each and every function; or the vendor can provide a general-purpose BDOS calling word so that you can implement new functions from high-level FORTH. The first method is straightforward, but requires short assembly language routines, which many FORTH programmers try to avoid. The second approach is impractical, as 30+ words would be defined and would take up unnecessary memory space.

By examining the CP/M documentation, you will find that CP/M passes arguments in DE and HL registers, and returns parameters in HL and A. Therefore, a general-purpose BDOS calling word might always have two arguments on the stack which would be popped into DE and HL before CP/M was called. Then HL and A would be left on the stack upon exit. One version of this word is given below, written in UNIFORTH's Z80 assembler. (See Figure 1.)

The big problem with this word is that it always looks for two input parameters, and always returns two parameters. If the particular function you are coding has fewer arguments than this, you will have to include dummy arguments or drop returned arguments, wasting time and code.

A very interesting article by David Cornell in Dr. Dobb's Journal (Jan 1984 page 44) describes a utility for a fig-FORTH system that provides a convenient access to system functions from high-level FORTH. Written for MS-DOS interfacing, the utility is a set of macros that create a BDOS call from high-level FORTH. An example is the 'open-file' call, which would be written in his utility as shown:

```
CALL: OPEN-FILE
      PASS( DX )
        15 DOS-FCN
      RET( AL )  ;
```

CALL: defines a machine-language (CODE) word, in this case called OPEN-FILE. The word "PASS(" will create pop instructions for each register mentioned. DOS-FCN implements the actual BDOS call. "RET(" creates push instructions for each register mentioned.

This novel approach provides assembly language interface with the operating system, yet the user needs to know absolutely nothing about assembly language, just listing the parameters mentioned in the system call description.

Cornell provides examples of just about all available MS-DOS calls. In all, it is highly recommended reading and should not be difficult to modify for a CP/M-80 interface.

Next Column

If you've been following the benchmark escapades in earlier columns, I will be giving you some more systems for comparison (at least including the 80186 and the Z8000). I promise to devote most of the column to menus and forms generation, a subject that was pushed aside because of the wealth of other subjects this time. Enjoy your Spring, but don't neglect your computer!

■ ■ ■

C'ing Clearly

Column by Tony Ozrelic

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I have always been nuts about computer graphics. Accordingly, I have been reading and saving articles these many years.

Recently, I came across one from my college days which gives some cookbook algorithms for drawing lines and circles. I have rewritten them in C and present them to you now with a bit of explanation.

GRAPH.C

This simple program turns your display into a drawing board. With it, you can draw lines and circles. It could stand improvement, but then can't we all!

GRAPH begins by clearing the screen and using CP/M's BDOS call to look at the keyboard. This way I can move the cursor around without depositing characters on the screen. See Figure 1 for GRAPH's command set.

Figure 1 - GRAPH's Command Set

```
Com.  Description

b     draw concentric circles
c     draw circle with set coordinates
i     move cursor up
j     cursor left
k     cursor right
l     draw line using specified coords
m     cursor down
s     draw a star
q     quit and return to CP/M
space store loc. of cursor on stack
```

Commands b and s show what the circle and line drawing algorithms can do when driven by the computer. To draw your own lines and circles, use the i,j,k,m keys to move the cursor to a point on the screen and hit the spacebar.

This pushes the current row, column coordinates onto a small stack (stk[]) and bumps the stack pointer (sp). Move to a new location and hit the spacebar again; this pushes a second set of coordinates onto the stack.

You are now ready to draw. Hit the l key and the coordinates will be popped off the stack and given to line(), which will then draw the line using asterisks (*) as the plot symbols. Hit the c key instead and you get a circle.

What could be simpler? Hitting any other key than the ones in the command set blanks the screen.

(continued on page 32)

Figure 2 - Graphics Routines in C

```
/*      graph - simple graphics algorithms                      */

#include        "qstdio.h"

#define YES     1
#define NO      0

#define CLEAR   26              /* ctl - z to clear screen      */
#define ESC     27              /*escape char for cursor addressing     */

#define PLTCHAR '*'             /*char used for plotting        */
#define DEPTH   24              /*height of display             */
#define WIDTH   80              /*width of display              */

int row,col,sp,stk[100];
int negx,negy,swap;

main()
        {
        char c;
        int x0,y0,x1,y1;
        int dx,dy,r;

        /* clear to home and wait for command */
        putchar(CLEAR);
        row=col=sp=0;

        while(1) {
        /* look at keyboard and decode keystroke */
                switch(c=bdos(6,0xFF)) {

                        case '\0':              /* no key hit */
                                continue;

                        case 'b':               /* draw concentric circles */
                                bullseye();
                                break;

                        case 'c':               /* draw circle */
                                while(sp!=0) {
                                        x0=pop();       /*load coordinates */
                                        y0=pop();
                                        x1=pop();
                                        y1=pop();
                                        /*get radius by simple approximation*/
                                        dx=abs(x1-x0);
                                        dy=abs(y1-y0);
                                        r=dx+dy/2;
                                        circle(x0,y0,r);
                                        }
                                break;

                        case 'i':               /* cursor up */
                                if(row>0) row--;
                                break;

                        case 'j':               /* left */
                                if(col>0) col--;
                                break;

                        case 'k':               /* right */
                                if(col<WIDTH-1) col++;
                                break;

                        case 'l':               /* draw line */
                                while(sp!=0) {
                                        x0=pop();       /*load coordinates*/
                                        y0=pop();
                                        x1=pop();
                                        y1=pop();
                                        line(x0,y0,x1,y1);
                                        }
                                break;

                        case 'm':               /* cursor down */
                                if(row<DEPTH-1) row++;
                                break;
```

```
                        case 's':               /* draw star */
                                star();
                                break;

                        case 'q':
                                exit();

                        case ' ':
                                push(row,col);
                                break;

                        default:
                                putchar(CLEAR);
                        }
                moveto(row,col);
                }
        }

/*      push - push current coordinates onto stack              */

push(y,x)
int y,x;
        {
        stk[sp++]=y;
        stk[sp++]=x;
        }

/*      pop - pop a coord off the stack. pop zero if stack empty        */

pop()
        {
        sp--;
        if(sp>=0) return stk[sp];
        else {
                sp=0;
                return 0;
                }
        }

/*      star - draw a star on the screen                                */

star()
        {
        int x,y;

        for(x=0;x<WIDTH;x+=3) {
                line(x,0,WIDTH-1-x,DEPTH-1);
                }
        for(y=0;y<DEPTH;y+=2) {
                line(0,y,WIDTH-1,DEPTH-1-y);
                }
        }

/*      bullseye - draw concentric circles at center of screen          */

bullseye()
        {
        int r;

        for(r=1;r<12;r+=2) circle(WIDTH/2,DEPTH/2,r);

        }

/*      line - draw a line from x0,y0 to x1,y1                          */

line(x0,y0,x1,y1)
int x0,y0,x1,y1;
        {
        int a,b,t;

        /* first, "normalize" line to positive, from/to coordinates */
        a=x1-x0;
        b=y1-y0;
        negx=negy=swap=NO;
        if(a<0) {               /* make a positive */
                a*=-1;
                negx=YES;       /* set this so's we can change back later */
                }
        if(b<0) {               /* same for b */
                b*=-1;
                negy=YES;
                }
        if(a<b) {               /* swap 'em to get from/to direction */
                t=a;
                a=b;
                b=t;
                swap=YES;       /* set this for later */
                }
        vector(a,b,x0,y0);      /* now draw line from a to b using xy offset*/
        }
```

(Listing continued on page 32)

Drawing Lines

Drawing a line begins with a call to draw(). This function takes the xy coordinates given and tweaks them into an 'ideal' set of coordinates for vector(), which then draws the line. plot() untweaks the ideal coordinates and plots the line dot by dot.

Line() makes an ideal line out of the coordinates given by turning (if necessary) the distances a and b into positive numbers and remembering which ones got turned by setting negx and negy true. If a is smaller than b, they are swapped and note of this is made in swap. These normalized distances are then given to vector().

Vector() plots a line starting at zero and ending at a. The variable s accumulates error; as we increment x, b is added to it until it becomes positive which is a signal that y needs to be bumped and s needs to be corrected.

The overall effect is that we plot points that come close to the real line, which we can't get to because the resolution of the display isn't fine enough. So we bounce around the real line, guided by s.

Plot() takes care of turning our line back into the the type of coordinates we started out with originally, plus adding limits on how far the plotting goes so we don't overshoot the screen or start making it scroll, which will happen if we plot a point in the lower righthand corner of the screen.

Drawing Circles

Circle() is much the same as line() in that we come close to the real line guided by an approximation in sector(). This function is invoked eight times for each circle, the idea being that we can plot an eighth of the circle given and then mirror-image the plot by changing signs and swapping coordinates.

Comments, Questions, and References

You will have to play with these algorithms to get a feel for what they do. Don't expect to understand them just by studying them. Those of you who do play will see some problems which need correcting, like scaling x and y axes so that the circles are less egg-shaped.

GRAPH could use some improvement too. There's no way to erase a line, or undo a stored coordinate. How about

(continued on next page)

Graphics Routines continued

```
/*      vector - draw vector                                            */

vector(a,b,x0,y0)
int a,b,x0,y0;
        {
        int x,y,s;

        x=y=0;                  /* start off at zero */
        s= -a/2;                /* as we sweep x, s tells us when to bump y*/
                                /* it is updated when we've overstepped our */
                                /* boundaries */
        while(x<=a) {
                plot(x,y,x0,y0);
                s+=b;
                x++;
                if(s>0) {
                        s-=a;
                        y++;
                        }
                }
        }

/*      circle - draw a circle on the screen                            */

circle(x0,y0,r)
int x0,y0,r;
        {
        /*
        all this does is go thru each octant of the circle and draw a sector.
        */
        for(negx=0;negx<2;negx++) {
                for(negy=0;negy<2;negy++) {
                        for(swap=0;swap<2;swap++) {
                                sector(r,x0,y0);
                                }
                        }
                }
        }

/*      sector - plot 1/8 th of circle                                  */

sector(r,x0,y0)
int r,x0,y0;
        {
        int x,y,s;
        /*
        this is similar to vector() except that we are plotting
        part of a circle. S does the same job, that is, it accumulates
        error until it gets too big (positive), and we reduce x accordingly
        to keep the circumference of the circle within the radius, r
        */
        x=r;
        y=0;
        s= -r;
        while(y<x) {
                plot(x,y,x0,y0);
                s+=2*y+1;
                y++;
                if(s>0) {
                        s-=2*x+2;
                        x--;
                        }
                }
        }

/*      plot - move cursor to coords and put a char there               */

plot(x,y,xs,ys)
int x,y,xs,ys;
        {
        int t;

        /* ignore out of bounds coordinates */
        if(x<0 || x>79 || y<0 || y>23) return;
        /* don't plot lower righthand corner - it makes the screen scroll */
        if(x==79 && y==23) return;
```

(Listing continued on next page)

(C'ing Clearly continued)

dotted lines? printouts? Can GRAPH be adapted to Microsphere's color graphics board? How about altering circle() so it generates conics? Have fun! Let us know what you've done and how you did it.

If GRAPH piques your interest, you might try looking at *Principles of Interactive Computer Graphics* by Newman and Sproull (McGraw-Hill). This is an excellent book since it ranges from simple line drawing stuff like GRAPH to three-dimensional color modeling of shaded surfaces.

The algorithms in line() and circle() were lifted from an article in *Computer Graphics and Image Processing* 5, pp. 280-288 (1976).

The spiffy approximation for the radius of a circle was lifted from Dave Cortesi's *Doctor Dobb's Clinic* column in DDJ, issue 55, May 1981.

One of these days I'm gonna do a graphics terminal that will support these functions. I did a prototype using an 8748 as the controller, but it was too slow and small to do the job right. Next pass, maybe an 8 Mhz 68000 with lotsa memory and a really high-resolution display. Now let's see, where did I put that mouse . . . ■ ■ ■

Graphics Routines continued

```
        /* now undo all the "normalizing" done to the coordinates */
        if(swap) {
                t=x;
                x=y;
                y=t;
                }
        if(negy) y*=-1;
        if(negx) x*=-1;
        moveto(y+ys,x+xs);
        putchar(PLTCHAR);
        }

/*      moveto - move cursor                                    */

moveto(row,col)
int row,col;
        {
        /*
        this is standard stuff for the bigboard and the Kaypro. The
        sequence is ESC, =, row address+32, column address plus 32.
        */
        printf("%c=%c%c",ESC,row+32,col+32);
        }

/*      abs - return absolute value of a                        */

abs(a)
int a;
        {
        return (a<0) ? -a : a;
        }
```

END

Xerox 820 and Up

By Jay Jaeckel

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While at a private show for a major midwestern university, I talked with the local XEROX demonstration person. During the conversation, this person said that XEROX had quit manufacturing the entire 16/8 820-II family of products in favor of a newer machine coming out of XEROX R&D.

Is this rumor or fact? Only time will tell, but I sure hope they ship my upgrade(s) before they do whatever they decide to do.

Many readers may have noticed the proliferation of inexpensive eight inch, double sided disk drives that seem to be advertised everywhere. This can be a major benefit for those who own a Xerox 820-II single sided, eight inch system.

The double sided disk drive upgrade for your 820-II is a snap. Doing the same thing on the 820 is just a little more difficult because a BIOS change is required for the operating system to acknowledge that the new double sided drives are "different."

Ingredients

1 or 2 Double-Sided, Eight-Inch Shugart 850 or 851 Disk Drives

2 AMP 1-480700 (connectors for AC power to drive)

1 AMP extraction tool (a small screwdriver can be used with care)

1 pair of needle-nose pliers

1 OHM meter or continuity tester

1 BIOS patch (820 only)

Procedure

The first thing you should do is configure the circuit boards on the disk drives. There are two types of configuration jumpers on the 850 and 851. They both have a dip shunt (fancy language for dual-inline-package jumpers), which looks like an IC with metal straps across the top.

Some of the metal straps may be "punched" or cut. You'll know when you have found the right part because the dip shunt package will have identification letters or abbreviations for the various functions each of the metal straps controls. Both the 850 and the 851 dip shunts should be configured the same according to the 820 and 820-II service manual. See Figure 1.

You're almost done with the drive. Now all you have to do is pull all of the little black two header pin shunts from the board and replace the following as shown in Figure 2.

Replace the drives in the enclosure. Now on to the cable modification. The first cable to modify is the AC power to the drives.

Take the old plastic connector off by using the AMP tool PN#305183 to slide over the connectors inside and gently remove them. This tool is just a metal tube that bends the little ears on the connector inward so you can slide the metal connector out of its plastic shell.

I have had a fair amount of success bending the ears of the metal connectors

Figure 3 - Xerox 820 Disk Parameter Code

```
;       FROM XEROX 820 CBIOS.MAC
        IF      DSKTY8          ;8 INCH DISK
;
;
;       SECTOR TRANSLATE TABLE FOR STANDARD
;       1 IN 6 INTERLEAVE FACTOR
;
SECTAB: DEFB    1,7,13,19
        DEFB    25,5,11,17
        DEFB    23,3,9,15
        DEFB    21,2,8,14
        DEFB    20,26,6,12
        DEFB    18,24,4,10
        DEFB    16,22
;
;
;       DISK PARAMETER BLOCK FOR STANDARD 8" FLOPPY
;
DPBLK:  DEFW    26              ;SECTORS PER TRACK
        DEFB    3               ;BLOCK SHIFT CONST.
        DEFB    7               ;BLOCK MASK CONST.
        DEFB    0               ;EXTENT MASK CONST.
        DEFW    242             ;MAX BLOCK#
        DEFW    63              ;MAX DIRECTORY ENTRY#
        DEFB    11000000B       ;ALLOCATION MASK MSB
        DEFB    00000000B       ;'              ' LSB
        DEFW    16              ;CHECK SIZE
        DEFW    2               ;RESERVED TRACKS
;
;
;       DISK PARAMETER HEADERS FOR A 2 DISK SYSTEM
;       THE LAST TWO REMOVED FOR SPACE.
;
DPHTAB: DEFW    SECTAB,0000H    ;DPH FOR UNIT 0
        DEFW    0000H,0000H
        DEFW    DIRBUF,DPBLK
        DEFW    CHK0,ALL0
        DEFW    SECTAB,0000H    ;DPH FOR UNIT 1
        DEFW    0000H,0000H
        DEFW    DIRBUF,DPBLK
        DEFW    CHK1,ALL1
        ENDIF                   ;END OF 8 INCH SECTION
;
```

Figure 1 - Shugart 850, 851 Shunt Configuration

```
Z  (In use from drive select)          shorted*
HL (Stepper power from Head Load)      open
A  (Radial Head Load)                  shorted
B  (Radial Head Load)                  shorted
X  (Radial Head Load)                  open
I  (Index Output)                      shorted
R  (Option for ready Output)           shorted
S  (Sector Output)                     shorted

(Yes, shorted means connected with the two points touching.)
```

Figure 2 - Shugart 850, 851 Jumpers

```
DC (disk change option)
2S (2 sided output status)
850 (there are three pins here plug between the
     two 850 for sector option dis-able)
IW (three pins again; plug between IW for
    inhibit write when disk-write protected)
C  (Alternate head input load)
DS (Stepper power from drive select)
RS (XEROX says plug it)
S2 (four pins here for S1, S2, S3 the center
    being common - S2 standard side select)
E  (XEROX says plug it)
IT (XEROX says plug it)
TS (true separation)
FM (851 only)
AF (850 only)
MFM (851 only)
```

inward with a tiny screwdriver, sliding the metal connectors out of the shell, and then bending the ears back to their proper positions. Install the metal connectors into the new shells and plug the cables into the drive.

Cable number two is the signal cable (the big one that plugs into the Display/Processor from the disk drive cabinet). Start by removing the large metal AMP shell from the DB-37 connector. Then, with your needle-nose pliers, push any two of the pins (I used #27 & #28) on the bottom row of the DB-37 (they are all ground lines), and put them in holes #7 and #8.

These pins are fragile (be careful), and they push out hard but push in and lock very easy. Now using the continuity tester on pin 7 find the small metal connector at the other end (the large edge card connector) and using a tiny screwdriver to release the lug, pull it out and move it to the other side to position "H".

If you look closely, you'll see that one side of the connector is numbered and the other side is lettered. Now do the same thing for pin #8 on the DB-37 and move that respective connector to position "K". All done.

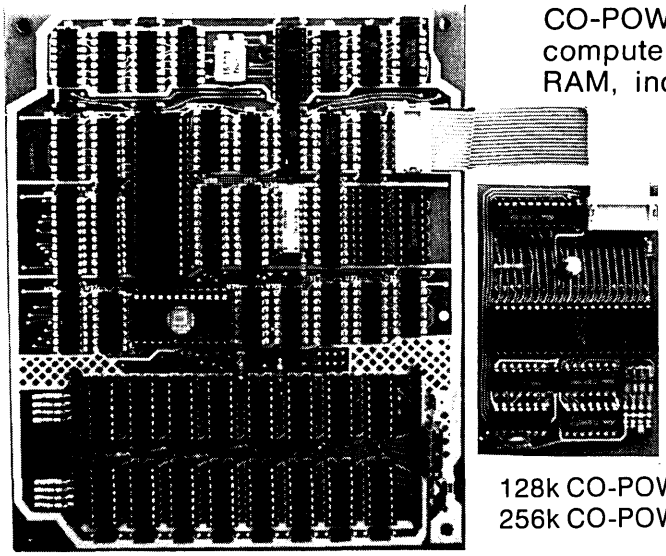
Plug in the drives, enjoy, and be grateful that Xerox provided you with an initialization program that already allows you to do double sided disks. To test your efforts, try to initialize a double sided disk. If it works, you're home free. If you're especially suspicious, PIP over enough files to file your gloriously 980K disk.

If you have the 820-II, you are done. The operating system will automatically recognize your double-sided disks when you use them.

If you have an 820, all that remains is the BIOS patch for your double sided disk parameters. Everyone tells me this is easy. However, my knowledge of assembler isn't the greatest, but I'll include the general area in the CBIOS here for reference. Perhaps some assembler expert out there can be of further help to us all. Drop me a note.

■ ■ ■

SWP's CO-POWER-88 makes Z80, CP/M microcomputers IBM-PC compatible!



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 CP/M-86 and MSDOS, complete with IBM-PC compatibility. A facility for transferring data files between CP/M and MSDOS is included.

Simple commands move system control between the Z80 and 8088 processors. CO-POWER-88's RAM can be used in CP/M as a RAM drive! Currently available for Kaypro, Bigboard, Zorba, Xerox, Access Matrix, Osborne, and ATR8000 computers.

Now available for Kaypro 10 and 4/84 computers.

128k CO-POWER-88 and MSDOS.....$400.00
256k CO-POWER-88 and MSDOS.....$500.00

ATR8000: SWP's $499.95 CP/M Computer

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 inferfaces 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 comptuers. The ATR8000 can be upgraded to also run CP/M-86 and MSDOS by adding CO-POWER-88.

Bigboard Dual Density

We've just released a new version!

Hardware

- **A daughter board that plugs into the 1771 socket. With this board the system employs automatic density select.**
- **Instructions tell how to run 5¼" drives. A 50-34 pin disk drive adapter board is included with 5¼" disk orders.**

Price: $149.95

Software V#061983

- **One 8" version includes the code to make a 60k double density CP/M for:**
  8" SS 2.5 MHz 8" DS 2.5 MHz
  8" SS 4 MHz 8" DS 4 MHz
  5¼" SS 2.5 MHz
- **Printer drivers are built-in, selectable in the IOBYTE.**
- **Easy to change port parameters.**
- **8" SSDD disk storage is 674k; DS is twice as much! 5¼" is 183k.**
- **Includes DDINIT for SD and DD initializing and DDSYSGEN for DD sysgening.**
- **Special features have been added including a deluxe pause, screen print and clock.**
- **Source code is available for $25 after you sign a disclosure agreement.**

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817/469-1181

(We used to be Software Publishers, Inc.)

BB I Dual Density: New Version

Jan Korrubel

"ORYX"
Welbeloond Rd.
Constantia 7800 South Africa.

In the October issue of Micro C my attention was drawn to the advertisement of SWP microcomputer products, offering their new version of the Big Board Dual Density.

The price, $150, was the same as for the previous version which already had had a good write-up in Micro C of June, 1982.

I ordered the hardware and software early in December, 1983, and to my surprise, the parcel was delivered in the second week of January. Previous orders I had placed in the U.S.A. (at different firms), usually took much longer for delivery.

Damage

The big disappointment was that the parcel was extensively damaged, sort of folded double, and pins of the enclosed daughter board had pierced the 8 inch disk containing the necessary software.

In trying to straighten the folded pins, two pins broke off!

The excellent 27 page instruction manual accompanying the daughter board gave me the idea that it was possible to stack the board with a 40 pin socket, in order to raise it high enough above the Big-Board to clear the crystal and condensors.

I now used this marvelous idea to solder bridges between the broken pins and the corresponding pins of the stacked socket.

One obstacle had been overcome, and on reading the damaged disk, it became clear that all damage had occurred in the unused part near the center. All files could be transferred to a back-up disk.

Removing the floppy disk controller I.C. and installing the daughter board in its place was no problem at all and my Big Board booted normally as always on single density. By following the clear and precise instructions of the manual I had in no time a double density disk that contained various enhancements to the BIOS.

New BIOS

First, it has a printer driver that I can change from serial (either port) to parallel and can modify as well. This was something I had wanted for a long time.

Secondly, four special function keys appeared on my keyboard (apart from a host of others): the screen dump to my printer, the clock toggle, displaying the time of day in the top righthand corner of the screen, the abort key that displays the value of the program counter in the lower righthand corner, and the scroll key that automatically scrolls through 24 linefeeds when in TYPE mode and then generates a pause.

Six escape sequences, identical to the newer terminals, not only make your Wordstar and Supercalc react faster to your commands, but allow you to set bit 7 of the screen memory. Now it becomes possible to add the hardware to do video highlighting, like reverse video or half intensity.

My 8 inch flippy disks, formatted with double density, have more than one Mbyte of user storage and are almost impossible to fill. That is, until I get used to it having so much space.

There are problems, however. The new BIOS generates an audible key-click which I find very annoying. Unfortunately, there is no mention of a key-click toggle in the manual.

The Set Clock program that I obtained from users disk one will not set the clock properly. The program translates the time to a hexadecimal clock display which I find very difficult to read. Hopefully, someone will publish an update to SETCLK.COM so my clock will tell normal time again.

Conclusion

Overall, this is an excellent product which does all (and more) that is promised in the advertisement.

I only wish for better packaging as my nerves fray easily at the sight of folded and pierced disks. Broken pins I do know how to repair now.

This method of stacking the board on a socket may work equally well for that expensive I.C. with the broken pin(s). If the remaining material is enough to solder to and you are quick in soldering, it is worth a try.

Do not forget to glue the socket to the I.C. as otherwise the two will part next time you extract the I.C. from its socket on the printed circuit board.

■ ■ ■

A Very Calculating BB II

By Per Wallander

Ljungstigen 9
S-144 00 RONNINGE, SWEDEN

In order to increase the mathematical throughput of my BB II, I have added an arithmetic processing unit (APU). Is it necessary to increase the speed of the BB II? Yes, if you want to calculate antenna radiation patterns with millions of trigonometric operations in any kind of reasonable time.

Speedup

I have tested a simple loop of sine calculations, first on the ABC 80, a Swedish microcomputer with a Z-80 running 4 MHz with an 8K BASIC. Every turn in the loop takes 40 ms. On the BBII with MBASIC, every loop takes 15 ms. With Pascal MT+ every loop takes 15 ms. With Pascal MT+ and 8231 APU, every loop takes 2.4 ms., an increase in speed of about 6 times.

Hardware Details

The APU is addressed as an I/O device and I started using the two parallel ports at addresses DA and DB. The system didn't work, however, until I removed U99 and U104 from their sockets. They were in parallel with the APU and kept the data lines at zero.

I then moved the APU to another address to make the parallel ports free for other uses. On the BB II the decoding of the address bus in I/O operations is incomplete. As you can see on the circuit diagram, U27 does not read BA5. Therefore, I could address the APU both at addresses DH-DB and at FA-FB. I compiled the test program for these new addresses and it worked fine.

To make the BB II I/O decoding read DA5, I bent out pin 4 on U27 and connected it to BA5 (19) on the STD bus. With U99 and U104 back in their sockets, the parallel ports are at DA and DB, and the APU is at FA and FB.

I have made two small circuit boards. The first holds the 8231A and 7432 and is located on the modification area on the BB II board (close to U104). The second board is bolted to a connector which fits into the STD bus. This second board carries the 74154, 7400 and 7409.

The data bus, IOD0-7, is taken from U104. I have removed U104, inserted a pin plug in socket U104, and made the connections to the pin plug to avoid soldering on the BB II board. On top of the pin plug, I have added a socket for the original 74LS373 (piggy back).

The RD and WR signals are taken from U97 (soldered on the board). Together with BIORQ from the STD bus (combined in the 7432), they make the RD and WR signals for 8231A.

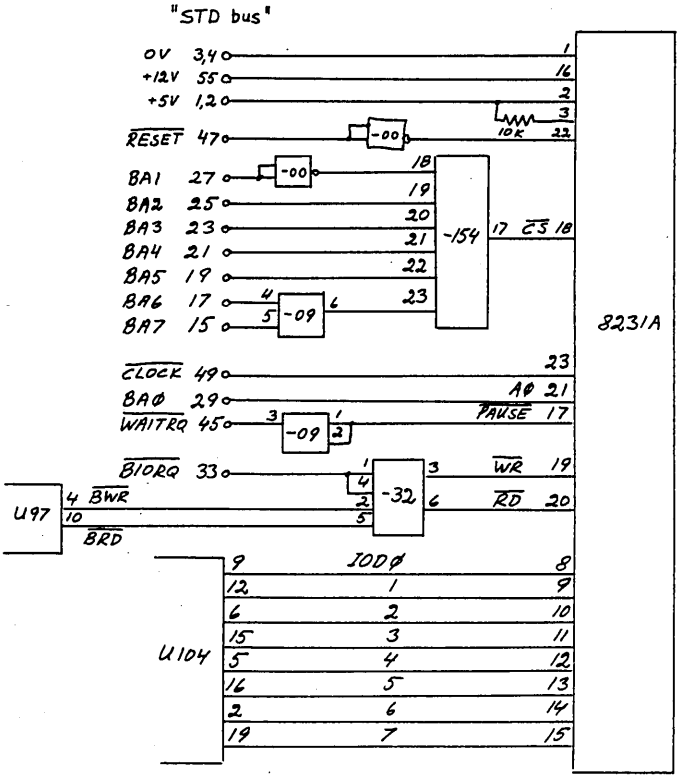
BA0 and CLOCK are connected directly from the STD bus to 82312A. RESET is inverted in the 7400. The address bus is decoded by the 74154, the inversion of BA1 in the 7400, and the combination of two address lines in 7409. All this is necessary since there are not enough inputs in the 74154.

The PAUSE output from the 8231A is connected to WAITRQ on the STD bus. I have used the 7409 as a buffer, though it is not necessary.

The Intel 8231A I used is a 4 MHz version of AMD9511. It should be possible to use a 3 MHz version if you add a separate clock or divide the BB II clock by two.

There are languages other than Pascal MT+ that can use this APU directly. In the documentation from AMD, you will find assembler routines if you prefer to roll your own. ■ ■ ■

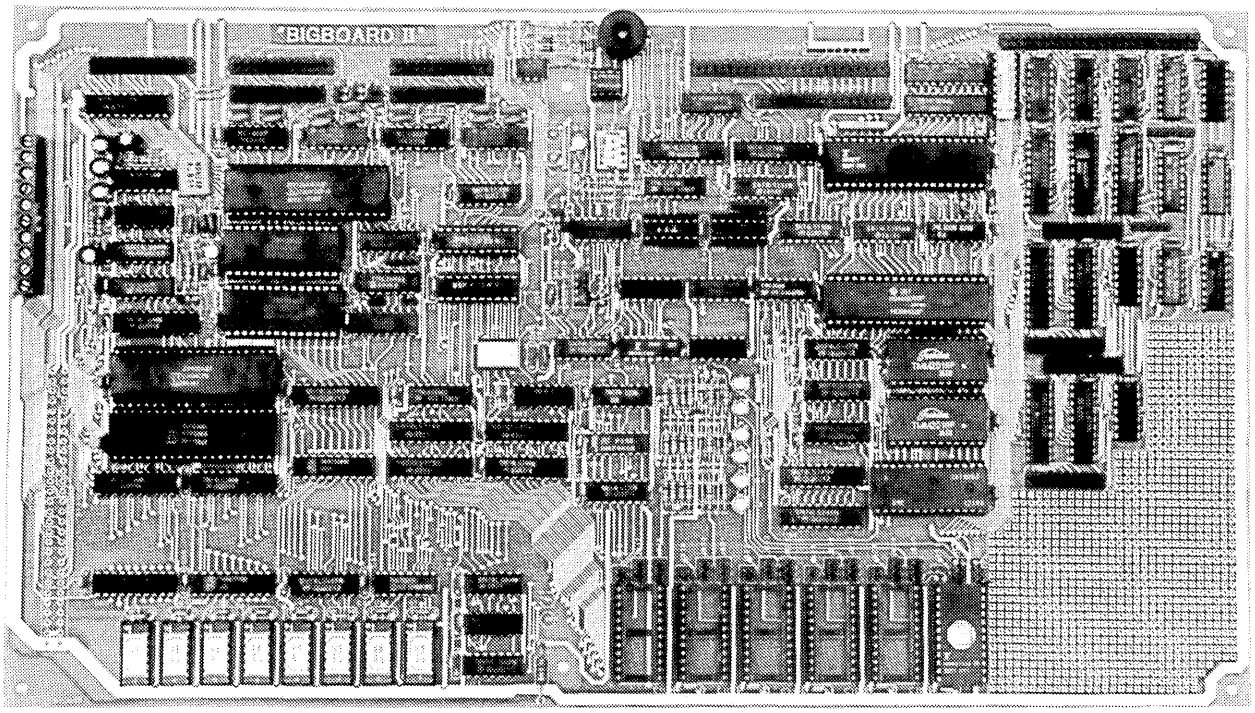
Figure 1 -
Big Board II APU Circuit



NEW LOWER PRICES! ***NOW IN "UNKIT"* FORM TOO!***

"BIG BOARD II"

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



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

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

■ 4 MHz Z80-A CPU and Peripheral Chips

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

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

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

■ Multiple-Density Controller for SS/DS Floppy Disks

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

■ Vastly Improved CRT Display

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

■ STD Bus

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

■ DMA

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

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

■ "SASI" Interface for Winchester Disks

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

■ Two Synchronous/Asynchronous Serial Ports

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

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

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

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

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

■ PROM Programming Circuitry

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

■ CP/M 2.2**

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

---

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

***CP/M is a registered trademark of Digital Research*

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Terms: Orders paid for with a cashier's check or bank card will be shipped within three working days. Orders paid for with a personal check will be shipped within three weeks. Add $5 for packing & shipping in North America.

Morse Code Interface For The Kaypro

By James E. Shaffer

445 Los Robles #307
Pasadena CA 91101

It doesn't take an expensive or complicated interface to make the Kaypro II receive and transmit international morse code. Plus, a license isn't required to receive Amateur Radio Morse Code, only to transmit it. So, here is a way for the non-amateur radio computer hacker to have some fun watching the dit-dah-dits magically appear on the Kaypro screen in English.

The Cheap and Dirty CW Interface

The following cheap and dirty interface and software will also enable experienced Hams to send and receive CW (continuous wave) at incredible speeds.

Cheap Hardware

The hardware has only 13 components and receives its power from the Kaypro. All connections are to the parallel printer port.

The LM567 tone detector converts audio from the speaker jack of any shortwave receiver to digital pulses. These CW pulses are sent to Kaypro via pin 11.

The Kaypro outputs CW on pin 9 of the printer port to a 4N33 optoisolator which will key most modern transceivers.

I used pin 30 for ground, and pin 18 for +5 volts. I understand that earlier models of Kaypro II did not have +5 volts on pin 18. So if you have an old II, you may have to go inside to get power for the cheap and dirty.

Dirty Software

The software is MBASIC so everyone can understand and modify it to suit their needs. It has lots of GOTO's, so I guess the PASCAL folks will call it dirty.

The program starts out in the receive mode. The cursor keys are used to control the program.

```
Up arrow    = Transmit Mode
Down arrow  = Receive Mode
Left arrow  = Dec. xmit speed 2 wpm
Right arrow = Inc. xmit speed 2 wpm
```

The software is adjusted to run with a 4 MHz clock. If you have a 2.5 MHz version change the S+4's to S in lines 230, 240 and 250.

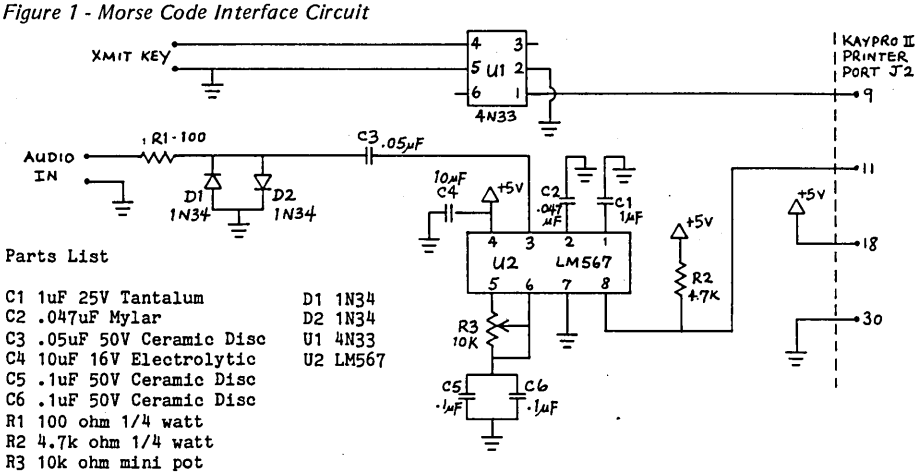
Speak English, please!

To calibrate the cheap and dirty interface, tune in a clear CW signal, then adjust R3 until you see the dit-dah-dits converted to English on the screen. Sometimes Amateur Radio operators use so many abbreviations it's hard to recognize that the message is English.

Have fun with the cheap and dirty. I have been using it for over a year now without any problems. It performs like an expensive and complicated interface.

■ ■ ■

Figure 1 - Morse Code Interface Circuit



Parts List

C1 1uF 25V Tantalum	D1 1N34
C2 .047uF Mylar	D2 1N34
C3 .05uF 50V Ceramic Disc	U1 4N33
C4 10uF 16V Electrolytic	U2 LM567
C5 .1uF 50V Ceramic Disc	
C6 .1uF 50V Ceramic Disc	
R1 100 ohm 1/4 watt	
R2 4.7k ohm 1/4 watt	
R3 10k ohm mini pot	

Figure 2 - Morse Code Program

MBASIC Program

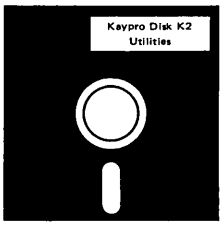
```
10 ,**********RECEIVE AND XMIT MORSE CODE********
20 ,
30 ,
40 ,
50 CLEAR 100:DEFINT A-Z:DIM Y$(6,63):PRINT CHR$(26):B=7:TR=1
60 DIM X(47,6):S=9:SI=400/S-5:FOR I=1 TO 47:FOR J=1 TO 6:READ X(I,J)
:NEXT J,I
70 Y$="ETINAMSDRGUKWOHBLZFCP VX Q YJ 56>7   8 /-    94=      3   2 10"
80 N=0:FOR I=1 TO 5:FOR J=0 TO 2^I-1:N=N+1:Y$(I,J)=MID$(Y$,N,1):NEXT J:NEXT I
90 Y$(5,13)="KN":FOR J=1 TO 63:Y$(6,J)="  ":NEXT J:Y$(6,7)=":"
100 Y$(6,12)="?":Y$(6,21)=";":Y$(6,40)="<":Y$(6,42)=".":Y$(6,51)=","
110 FOR I=0 TO 6:J(I)=2^I:NEXT I:PRINT "RECEIVE MODE"
120 I=0:J=0
130 IF INP(28)<70 THEN N=N+1:IF N<(2*B) THEN 130
140 N=0:IF INP(28)<70 THEN GOSUB 290:PRINT "  ";:GOTO 130
150 N=N+1:IF INP(28)>70 THEN 150
160 IF N>=B THEN J=J+J(I):B=(9*B+2*N+6)/12 ELSE B=(3*B+2*N+2)/4
170 N=0:I=I+1:IF I>6 THEN GOSUB 290:PRINT " ";:GOTO 210
180 IF INP(28)<70 THEN N=N+1:IF (2*N)<B THEN 180 ELSE 200
190 IF INP(28)>70 THEN N=0:GOTO 130
200 GOSUB 290:PRINT Y$(I,J);:N=N+1
210 X$=INKEY$:IF X$="" THEN IF TR=1 THEN 120 ELSE 210
220 I=ASC(X$)-43:IF I=-33 THEN TR=1:PRINT "( RECEIVE MODE )":GOTO 120
230 IF I=-32 THEN TR=0:PRINT "( XMIT MODE";S+4;" )":GOTO 210
240 IF I=-31 THEN S=S+2:SI=400/S-5:PRINT "( SPEED";S+4;" )";
250 IF I=-35 AND S>8 THEN S=S-2:SI=400/S-5:PRINT "( SPEED";S+4;" )";
260 IF I<1 OR I>47 THEN PRINT " ";:FOR J=14 TO 7*SI:NEXT:GOTO 210 ELSE
PRINT X$;
270 FOR J=1 TO 6:IF X(I,J) THEN FOR K=2 TO SI*X(I,J):OUT 8,
128:NEXT:OUT 8,0:FOR K=2 TO SI:NEXT
280 NEXT:FOR J=6 TOK 3*SI:NEXT:GOTO 210
290 IF POS(3)=80 THEN PRINT CHR$(13)
300 RETURN
310 DATA 3,3,1,1,3,3,1,3,1,3,1,0,1,3,1,3,1,3,3,1,1,3,1,0,3,3,3,3,3,
0,1,3,3,3,3,0,1,1,3,3,3,0,1,1,1,3,3,0,1,1,1,1,3,0,1,1,1,1,1,0,3,1,1,
1,1,0,3,3,1,1,1,0,3,3,3,1,1,0,3,3,3,3,1,0,3,3,3,1,1,1,3,1,3,1,3,1,1,
3,1,1,1,0,3,1,1,1,3,0
320 DATA 1,1,1,3,1,3,1,1,3,3,1,1,0,0,0,0,0,0,1,3,0,0,0,0,3,1,1,1,0,
0,3,1,3,1,0,0,3,1,1,0,0,0,1,0,0,0,0,0,1,1,3,1,0,0,3,3,1,0,0,0,1,1,1,
1,0,0,1,1,0,0,0,0,1,3,3,3,0,0,3,1,3,0,0,0,1,3,1,1,0,0,3,3,0,0,0,0,3,
1,0,0,0,0,3,3,3,0,0,0,1,3,3,1,0,0
330 DATA 3,3,1,3,0,0,1,3,1,0,0,0,1,1,1,0,0,0,3,0,0,0,0,0,1,1,3,0,0,
0,1,1,1,3,0,0,1,3,3,0,0,0,3,1,1,3,0,0,3,1,3,3,0,0,3,3,1,1,0,0
```

Micro Cornucopia . .

KAYPRO USERS DISKS
for KayPro II, 4 and 10

$12.00 each

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



KayPro Disk K1
Modem software

This disk is absolutely priceless if you will be using a modem to communicate with bulletin boards, other micros or mainframes.
MODEMPAT. COM: Menu selection of baud rate, bits/character, stop bits, & parity for serial port.
MODEM7.COM: Very popular MODEM 7 configured for KayPro.
MODEM7+.COM: This is MODEM7 & MODEMPAT combined - you can communicate with anything!
KMDM795.COM: Super-version of MODEM7 set up for KayPro.
TERM.MAC: Commented disassembly of the TERM program you get with your KayPro so you can configure it for any interface.
SQ/USQ.COM: Programs to squeeze and unsqueeze files for faster transfer.

KayPro Disk K2
Utilities

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

PACMAN.COM: Despite the KayPro's lack of graphics, this one looks and plays amazingly like the real thing! Keep it hidden.
ZCHESS.COM: Chess with a 1-6 level look ahead.
OTHELLO.COM: You learn it in minutes, master it in years.
BIO.COM: Generates custom graphic biorhythm.
MM.COM: Master Mind.
WUMPUS.COM: Classic wumpus hunting.

KayPro Disk K4
Adventure

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

KayPro Disk K5
MX-80 Graphics

A complete MX-80 graphics package including example files.

KayPro Disk K6
Word Processing Utilities

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

KayPro Disk K7
Small C Version 2 Compiler

This is a greatly extended version of Ron Cain's Small C compiler. Version 2 has more expressions and larger library, true subset of Unix C. Disk contains compiler, documentation, and library — everything you need.

KayPro Disk K8
Small C Version 2 Source

This disk contains the source (written in Small C) of the Small C version 2 compiler. Get K8 if you want to try extending the compiler. (You must have K7.)

KayPro Disk K9
ZCPR

ZCPR: The big news on this disk is the self-installing version ZCPR available only from Micro C. Once you have ZCPR in your CP/M, you'll never go back to straight CP/M! For instance, ZCPR searches drive A for any program not found on drive B, so, even an empty disk in drive B appears to contain every program on A. It's great for text editors, compilers, etc. Works on KayPro II and 4.
PASWORD: Lets you encrypt and decrypt your precious files. Includes source.
EX14: a super replacement for SUBMIT.
Plus many more: **TREK, FIX, FIND, SNOOPY ALIENS and DIF2.**

KayPro Disk K10
Assemblers

We've received a lot of requests for a Z80 assembler. So Dana put in some long hours getting the Crowe Z80 assembler to run on the KayPro (and every other Z80 machine).
CROWECPM: This is a first class Z80 assembler. We use this assembler daily (and we included its source). Takes standard Zilog mnemonics.
LASM: This is a more powerful version of the ASM assembler you received with the KayPro. This will link multiple programs together at assembly time.
PRINTPRN: This program makes it easy to print the listing files generated by the Crowe assembler.

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

Yep, this is FORTH, one of the most unique, most extendable languages known, and for a paltry $12.00. This disk contains not just one FORTH, but two, along with an editor, decompiler and 8080 assembler! The editor even uses the cursor control keys.
FORTH: This is true fig-FORTH.
KFORTH: A very nicely extended version of fig-FORTH.
PLUS, all the rest of the FORTH goodies. (Forth Heaven!)

KayPro Disk K13
Source of fig-FORTH

All this disk contains is the 40K ASM source of fig-FORTH with the hooks in place for the KayPro. This disk is for FORTH hackers who just can't leave anything alone. (Look, you probably have faults, too.) The source of FORTH is here because there isn't room on K12. This is the only disk that isn't stuffed.

KayPro Disk K14
Smartmodem Programs

This is the disk for you if you have a Smartmodem compatible modem.
SMODEMK: Smartmodem program set up for the KayPro (and source).
XMODEM: Lets you remotely control your KayPro from a distant computer.
KAYTERM: This is the information you need to run or write modem software on the KayPro.

KayPro Disk K15
Hard Disk Utilities

This disk is for the KayPro 10 or any KayPro with a Winchester drive. With these routines you can not only backup files (with printed directories of the backup disks), you can also break up large files. The backed-up files are not encoded (as they are with KayPro's backup routine) so you can access them on any system.

KayPro Disk K16
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.

KayPro Disk K17
Z80 Tools

This is for those of you who are into Z80 assembly language.
XLATE.COM: A very good 8080 to Z80 translation routine.
DASM.COM: An easier to use version of ZZSOURCE (the Z80 disassembler). This full disk includes source and documentation for both routines.

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, drive exercise, and drive alignment 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

This is a complete Prowriter 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, and more.

NEW!

Kaypro Disk K20
Color Graphics Routines

PACMAN.COM: This is a deluxe version of pacman for MicroSphere's color graphics board.
PIE.COM: Pie chart generator.
SKETCH.COM: An easy way to sketch color graphic designs. You can even use a joystick with this software (see Micro C issue #15 for joystick interface).

NEW!

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 the Kaypro II and older 4 (any system without graphics). You can buy a similar package elsewhere for $60.

NEW!

Kaypro Disk K22
Fancy ZCPR

This ZCPR lets you pass any control characters to your system (they aren't trapped like the old version). Also, this version comes with installation routines for every Kaypro now on the market (including the 4-84 and the 10).

We have something special for your Kaypro!

ROMs 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 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 for simple plug-in installation (takes 5 minutes).

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 insturctions 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.

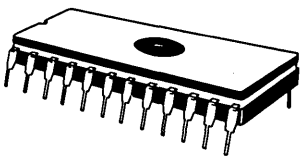
The character ROM comes in two flavors:

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



Pro-8 ROM Package

The PRO-8 package from Micro Cornucopia upgrades your KayPro 4 to a KayPro 8 with 784K bytes (96 directory entries) per Tandon 100-4 (or equivalent) quad-density drive. Plus, you can select your own cursor character (and change it at will).

The package includes the new PRO-8 monitor ROM, a disk of formatters and copiers, and printed instructions. (We even tell you how to turn your KayPro II into a KayPro 4.) All you add is one or two double-sided double-density (390K), or double-sided quad-density (784K) drives. You get over 1.5 Megabytes on a two-drive quad-density system!

This new system can read, write, and format KayPro II and KayPro 4 disks as well as KayPro 8 disks. And it recognizes each disk type automatically!

All this for only **$49.95!**

Watch Micro Cornucopia for more KayPro compatibles.

Call or write for information on the other KayPro II and 4 ROMS from Micro Cornucopia.

KayPro II Schematic Package

This is a complete schematic of the KayPro, logically laid out on a single 24" x 36" sheet — no more searching to see where a signal goes or comes from. Even the unused gates are shown.

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

$20.00

Micro Cornucopia

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Bend, OR 97709

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Monday-Friday

On Your Own

By David Thompson

This is a definite departure from previous columns. The idea for this "On Your Own" was triggered by a letter I received from Ralph Freshour of 7 Silver Eagle Road, Rolling Hills Estates, CA 90274. In that letter, he mentioned that he had been publishing a newsletter for NEC 8001A's and then he mentioned that he was going to be terminating the newsletter. Of course I had give him a call.

What follows are Ralph's comments about what happened. I've taken the liberty of doing some organizing and editing but then that's my job.

NEC newsletter

A year ago, I started a newsletter for the NEC PC-8001A computer. The computer is Z80 based and has two operating systems, NECDOS and CP/M-80.

It seemed like a natural system to support since there were over 18,000 users in the U.S. and since there was very little technical support from the manufacturer.

When I bought the NEC, I was very strapped for dollars so I bought it in modules. I mean, here was a machine I could buy as I could afford to, plus it was reliable and CP/M-80 compatible.

The newsletter was the same thing, a low investment thing I could build slowly. I invested $300 at the start for materials and a classified ad. I sent releases to Byte, Creative Computing, Personal Computing and a few others. I purchased a classified ad in Computer Shopper (it wasn't a display ad, just a bit of text announcing the newsletter). By far, the best response was from the ad in Computer Shopper. Plus, the ad was cheap.

However, in March of this year I mailed out issue #7. This issue marked both the first anniversary of the publication and the end of the publication. Circulation was 150.

Marketing

It's hard to know why there were so few readers, but it's probably because most owners of the system never found out that the newsletter existed.

I started on a shoestring and spent just enough to have a classified ad in computer shopper. People who saw our ad and contacted us said they were pleased to know someone was doing it. Most were computer professionals—most felt alone and most felt that they weren't getting much help from NEC.

The magazine continued to grow at about 6 subscribers a month even after I stopped advertising which indicates that there has been some word-of-mouth advertising.

Production

It took me a while to get the printing costs down. I was having only 150 printed but I was paying $250 per printing. You see, I was having so few printed that most of the cost was for making the plates and putting them on the press. I looked for a long time for someone cheaper and then, by accident I found a printer who was willing to do it for half as much. That helped a lot. The magazine was running 10-12 pages (5-6 sheets printed on both sides).

I was charging $20 per year for a subscription so I wasn't exactly getting rich on the deal, but if I didn't count my time, I wasn't losing any either. (If I counted my time, I just got depressed.)

Time

I'm sure I spent 60 hours per issue, much more than I anticipated. In the beginning I did all the typing myself, then I had it typed by a professional. However, the original writing took a lot more time than I expected and product reviews often took weeks.

In fact, it was this demand on my time that really killed the magazine. If it had been financially more worthwhile, I would have stayed with it. But my other business, writing software packages in dBASE II, has really taken off so ending the newsletter is giving me that 60 hours to devote to this more profitable project.

Contents

The magazine contained mostly reviews of CP/M software that would run on the NEC.

In the process I reviewed the products of my advertisers and I lost some advertisers because I was critical of their products. However, they had to understand that I wore two different hats. One was advertising sales and the other was reviewer. The two didn't cross.

I wanted to be able to get inside my system like Micro C gets inside the Kaypro and Big Board, but I don't have the technical knowledge to do that. Not being able to come up with nice system expansions was a real handicap because that would have made the publication unique and would have really helped sell it.

You really need a mix of software reviews and hardware mods to have a balanced publication.

Support from NEC

My relationship with NEC was very standoffish. They acknowledged my existence and referred a few people to me but the introduction of the new PC-6000 and PC-8800 meant they were really rushed and didn't want to bother with me. So I couldn't get the kind of information I needed from their customer support.

However, don't worry about factory support when you consider getting into the publication business. If you base your publication on the factory support then you are in a very difficult position. You are at the mercy of the whims of some big business. You need to remain independent so if something is a piece of junk, you can say so without fear of repercussions.

But, it would really have helped if NEC could have sent out my literature with their systems. That would have been great and I would have respected them more if they had done it. I don't think that would have tied me too closely to them. The only thing they did along that line was they mentioned me in their dealer newsletter, just my name and address.

Would I Do It Again?

I would definitely start another magazine. This small newsletter really kept me in tune with what is going on in the industry. If you are strong technically, you can really do a service to the reader by fielding technical questions.

Sharing is what the publication business is all about. It makes the computing more personal because you become isolated when you are off programming by yourself. I really enjoy that part of it.

Be sure to pick a popular computer

with a popular operating system. If there are too many magazines already trying the water then maybe you shouldn't launch yours, but definitely look for a large audience.

Feedback, the Important Bonus

I was trying to create something that would meet the needs of my readers but I had very little feedback. A few people would write several times but most of them I never heard from.

That human connection is very important. I remember, when Arne Henden mentioned that in Micro C's FORTH column. People need to see that someone else is having the same problems and working on the same solutions that they are so they don't feel alone. Readers sign up for a publication so they can have contact with an editor who is using the same system or the same language. Of course, the editor needs contact too.

Though it was meager, this feedback was the most important bonus I got for producing the newsletter. I'll miss that.

■ ■ ■

TECHNICAL TIPS

Parallel Pulse Stretcher

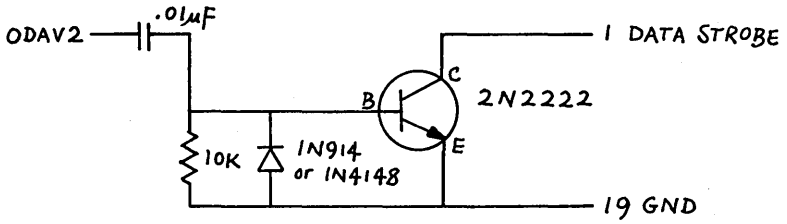
When implementing King's parallel printer interface in issue #14, I did not have the ECG-220 FET. A local parts house had the item stocked, but at a price of $4.50 each!

It seemed to me that a 2N2222 transistor should work in the circuit. The lower input resistance could be compensated for by using a larger capacitor. I substituted a .01 for the 470pf capacitor and a 2N2222 for the FET. I also used a 1N4148 (1N914) for the diode because it's what I had.

The circuit gives a strobe pulse of about 5ms and works fine with my Prowriter printer. I didn't make any attempt to optimize the capacitor value. The capacitor value may not be correct for all printers, but it seems fine in my system.

Cliff Nunnery
313 Vaughn St.
Fort Walton Beach FL 32548

Figure 1 - Parallel Pulse Stretcher



Diablo 620 Proportional Spacing

The Diablo 620 printer is less than perfect when using the proportional spacing feature of Perfect Writer. To achieve perfection, make sure you have the 10 pitch pica wheel on the Diablo when you turn it on. Then while the unsuspecting printer awaits its mission, quickly slip on the proportional spacing wheel. It seems that when the Diablo is initialized with the proportional wheel, it is incompatible with the proportional writing of Perfect Writer.

John Beckett
Computer Service Department
Southern College
Collegedale TN 37315

■ ■ ■

Especially for the Big Board
From Micro Cornucopia

REMEMBER
FREE Users Disks in exchange
for submitted software or articles

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BB II DRIVE INTERFACE
For 5¼" and 8" Drives
Andy Bakkers is making this special software package available through Micro C. Complete source, HEX, & documentation files on an 8" SS SD disk. Also outlines on disk the hardware changes needed.
$29.95

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.

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.

8" Users Disks

$15.00 each

OTHER GOODIES

Screen Editor in Small C $39.00
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M68K Single Board Computer

By Raymond L. Buvel

Box 3071
Moscow ID 83843

About a year ago I needed a computer based on the Motorola MC68000 microprocessor, but I didn't want to spend a fortune on it. I already had a Big Board up and running with lots of nice software and didn't want to buy another complete system.

What I had in mind was a slave co-processor with its own memory that could run independently of the Big Board. The M68K single board computer from EMS (Educational Microcomputer Systems) fit the bill nicely. It cost me about $600 to build (I think it can be done for $500 at today's chip prices) and has been running reliably since I brought it up.

Strengths

The M68K computer can run at 10MHz with the MC68000 chip from EMS and 250ns RAM and EPROM chips since there is a 200ns wait state built in. There is 20K of static RAM (10 6116's) and 16K of EPROM (2 2764's) on the board. The machine also has two RS-232 serial channels and a 16-bit bidirectional parallel port for the built-in I/O.

There are also five 16-bit counter/timers provided by the AM9513 System Timing Controller (which is also the baud rate generator for the serial channels).

The timer chip is wired up to one of the vectored interrupts on the board (there are 7). There are two separate memory expansion busses, so you can add up to 384K of RAM and EPROM to the system. I/O expansion is provided through an MC6800 compatible 8-bit peripheral expansion bus with address space for 1024 ports.

The monitor is almost identical to the Motorola MACSBUG monitor. It has built in execution and trace features usually found only in a debugger like CP/M's DDT. The monitor takes up 8K of the 16K EPROM space (two 2764s).

If you are building this computer, I recommend that you purchase the monitor (even though it is overpriced in my opinion). Then you will have a convenient way to test out the hardware.

I plan on writing a very simple resident operating system for M68K that will allow me to produce programs on the Big Board and send them over to the M68K through the parallel port (it is currently attached to my Big Board through a serial channel). There should be plenty of room for this while still allowing the monitor to be resident for debugging.

Weaknesses

The documentation supplied with the M68K is terrible (but adequate for people who know what they are doing). I would not recommend constructing this computer unless you have built a Big Board or some other computer of equivalent complexity.

When I brought up the M68K, I had to wire pins 12 (BGACK*) and 13 (BR*) on the MC68000 chip to +5V to get the computer to run. These lines are not used in this design and EMS just let them float. As it turned out, they floated to the wrong state and locked up the CPU.

I also had trouble locating a crystal oscillator module until someone pointed out that Jameco sold them. I wrote to EMS but they didn't even bother to tell me where to find the module.

One other complaint I have with the board concerns the 16-bit bidirectional port. The port is buffered but not latched so it is a lot more trouble to use than the parallel ports on the Big Board. Also, the handshaking on the port is not nearly as nice as that on the Big Board PIO.

The most serious problem with this machine is the lack of software. I have partially solved this problem by writing my own cross compiler that runs on my Big Board under Z80-FORTH. (It will hopefully be available on a user disk soon.)

With this compiler and a cross assembler, I can write the software I need. I use the M68K for doing high speed numeric calculations so I don't need a fancy operating system or a lot of utilities. The Big Board is perfect for that task.

For those who need a cross assembler to run under CP/M, EMS offers one, but I don't know how good it is. There is also a public domain cross assembler written in FORTRAN that may be available from some user group. I have also seen several ads in BYTE and Dr. Dobbs Journal for 68000 cross assemblers that run under CP/M.

Conclusion

I have used the M68K computer for about a year and I am satisfied with it. This is definitely the least expensive MC68000 computer I have found.

For use as a co-processor, the M68K is a nice machine. However, anyone who needs an MC68000 based microcomputer in their business should look elsewhere.

Prices

The bare board with documentation is $99.95, the debugging monitor in 2764s is $120, and the CPU and memory map ROM is $115.

M68K Single Board Computer
Educational Microcomputer Systems
(EMS)
PO Box 16115
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■ ■ ■

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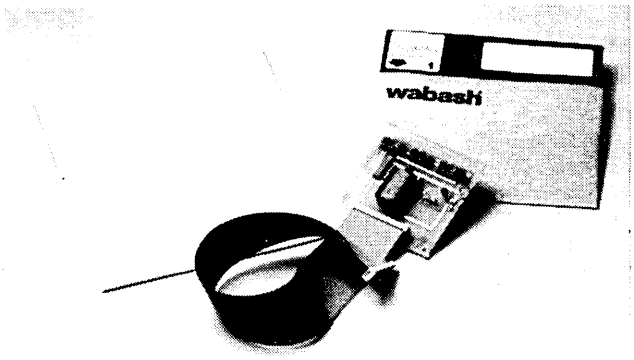

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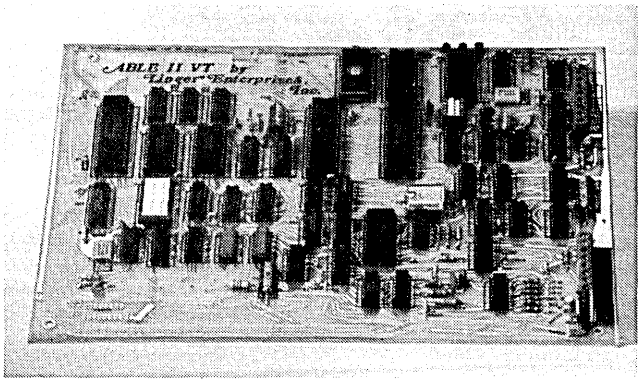

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LETTERS

Dear Editor,

The recent Micro C answered a question I had about why the Kaypro II CRT displays go belly-up above 2400 baud (in serial input > CRT). I thought it was only juggling 1 ball; but with 1920 in the air, I see why one more is too much.

Software scroll seemed like a dumb idea until I read about screen-dump calculations on hardware scroll.

Al Paarmann
368 El Gaucho Road
Santa Barbara CA 93111

Editor's note:

Actually, the very early Kaypro IIs had the hardware scroll circuit installed. They didn't use it because Gilbert Ohysnty couldn't figure out how to do the hardware scroll calculations in the monitor. Later, they removed the 3 ICs because they weren't using them.

Dear Editor,

In the installation of ZCPR to CP/M, I SYSGENed a blank disk, PIPed the six programs (3 from CP/M and 3 from ZCPR), and entered EX14 INSTALL (cr).

The program just gets rolling when the message, 'Synchronization Error' appears, and the program locks up. RESET is the only way out.

Since you have my interest whetted with ZCPR, I hope you can get me 'synched'!

J. Karl Jones
220 Wilson Hall
Kansas Wesleyan
Salina KS 67401

Editor's note:

Yep, I can get you synched. You see, MOVCPM is part of the installation routine in INSTALL. MOVCPM looks at the serial number on the system tracks and at its own serial number before starting to work. If the serial numbers are different, it displays a synchronization error and locks up. That's Digital Research's method of encouraging people to purchase their own copies of CP/M.

So, you need to get out your original CP/M distribution disk. It has the system tracks and MOVCPM that match. Copy the system tracks (use SYSGEN.COM) onto a blank, formatted disk and then copy MOVCPM.COM. Then add the other programs you need to create the ZCPR disk.

Dear Editor,

I received your K2 disk yesterday and am very happy with all of the programs as I have been with your other disks.

However, my main reason for ordering the disk was to get a copy of the UN.COM and UN.DOC for getting back to the source on protected MicroSoft BASIC files.

As far as I can determine the programs are not on the disk although your advertising and the disk directory indicates that they are.

Charles Clark
689 N. 800 W. St.
Provo UT 84601

Editor's note:

Sorry, those utilities are not on the disk. UN.COM doesn't work on MicroSoft BASIC any longer (MicroSoft obviously made some changes to defeat UN) so we took them off the disk. Unfortunately, our ad brochures still show the files.

Dear Editor,

I am looking for a good, well debugged version of Kermit so I can talk to a person who doesn't have MODEM7 configuration yet for his system.

Steve Schick
4244 Cheeney St.
Santa Clara CA 95054

Editor's note:

Yep, we have Kermit configured for the Kaypro. It's on two full disks and costs $24. Just ask for Kermit.

Dear Editor,

I've had some problems using the keypad when running ZCPR. Any suggestions?

Also if you could consolidate all of the Kaypro modifications that you have discussed, and write them in a fashion similiar to your reply to Chris Paulsen in issue #15, it would be a big help.

Charles Dugan
3834 136th Ave SE
Bellevue WA 98006

Editor's note:

See the Kaypro column in issue #15 for the ZCPR patch.

As far as the Kaypro II is concerned, I'd do the following.

I'd do the Kaypro II to Kaypro 4 mod first, and then get the PRO-8 set. After installing the new monitor ROM (and Z80B) I'd speed the system up to 5 MHz (definitely include the switch so you can go back to 2.5 MHz).

Then I'd purchase a copy of Uniform for the Kaypro 4 from the Uniform folks (supports about 25 formats) and install two half-wide Kaypro 4 drives (the double sided TEACs) as drives A and B and two half-wide quad density TEACs as drives C and D.

I'd also get a copy of Plu-Perfect for the Kaypro 4 and ZCPR. Plu-Perfect is great if you use Perfect writer and want to custom configure the keypad.

I would put ZCPR on all but my Plu-Perfect disks.

Once you are finished with all this, you can add the Co-Power board if you wish or the Delphi winchester system (we're using it with the PRO-8 now and it's great).

Of the stuff coming up, I'm really interested in the MicroSphere 64K add-on which gives you a 128K Kaypro. The additional 64K will act as a track buffer which makes disk accesses really scream. They are doing Logo for their color graphics board which has my two grade-schoolers very excited.

Dear Editor,

I have a few questions about the Kaypro end of Micro C. Regarding user disks, do you know if the Epson MX-80 is enough like the Gemini 10X that I would have any use for disk K5 (MX-80 Graphics Software)?

Also, I know that ZCPR is usually available as an ASM file, so that some options can be modified. Will you be making it available on Kaypro format?

Incidentally, as to why more people don't use SBASIC, in my case the answer is that like many compiled high-level languages, it doesn't generate very compact programs.

For example, the little program in the Kaypro User's Guide to turn off the keyboard beeper compiles to a little less than 2K (780H).

A routine in assembly language to do the same thing occupies only four bytes: (MVI A,8 ! OUT 5). This is because SBASIC puts portions of its library files into each program.

So far I have used SBASIC to test concepts, but I have used assembly language for the final effort.

Philip E. Bond
27 Sharon Drive
Spring Valley NY 10977

Editor's note:

Yes, Philip, disk K5 does work on the Gemini 10X. Also, you can send for Kaypro disk K22 which has a newly updated version of ZCPR which works on the Kaypro II, 4, and 10 and it's complete with source.

■ ■ ■

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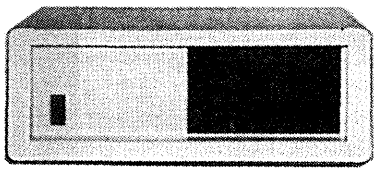

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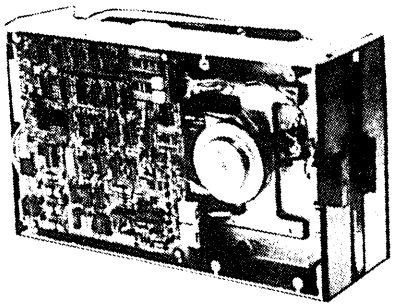

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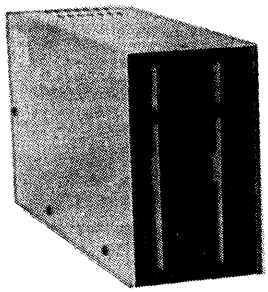

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EDITORIAL

(continued from page 1)

exchange information. The phone has become a very important part of that and when someone calls with a problem or request that eventually leads to an important solution, then we all gain. And, even more significantly, some of the calls are from people who have figured out answers to problems that have been bothering folks for a long time.

However, a large share of the requests for information are from people who are simply too lazy, or too stubborn, or too something, to get the information for themselves. The fact that we are accessible leaves us at the mercy of anyone with a spare hour (or two!) and a Sprint line.

If You Need Help

We are glad to help. Your questions can be very basic or very advanced. However, Please! Try to help us too.

1. Try your darndest to find the information for yourself. If the question is about a software package or a piece of hardware you purchased from someone other than Micro C, contact the manufacturer about the problem. We can't possibly know every nook and cranny in every product we've mentioned (or haven't mentioned).

If they won't take the time to support their product, then maybe the best thing we can do is push them a little. Send us a letter to the editor detailing the problem and the lack of support. They'll get to hear about it.

2. If you're working on something that we've covered in a back issue, please be willing to order the issue. Don't call and expect us to spend half an hour telling you what the article said so you can save $3.00.

3. Try to locate your own sources of parts like disk drives. If you call, we'll tell you to check the ads in Micro C, in the back of Byte, or in the Computer Shopper. We'll also try to keep you posted on good sources in our columns. Cascade Electronics and Micro Processors Unlimited are both good places to start.

4. We encourage you to dig into your system, but don't do it if you are totally lost. Read up, get help, practice on something a little less important than your computer.

In almost every community there is a CP/M users group. Check with your local computer stores to locate such a group. Then get active. You'll find a wealth of support and training as well as access to people with test equipment. It's very difficult for us to help you service your system by phone, especially if you have no test equipment. (We wouldn't dream of tackling our own systems without at least a logic probe.) And, much of what we can tell you on the phone we've already covered in the magazine.

5. If you are totally in a bind with nowhere else to turn, then call us. But before you pick up the phone:

Try to get as much information about the problem as possible. When does it happen? When doesn't it happen? Is it heat sensitive? Is it consistent? Have you tried swapping parts? Have your tried the ice bag trick on all the chips (including your new Z80B)? Can you undo things you did one by one and get it to work again? Did you take any shortcuts? Meanwhile, you really need some way of seeing what is happening inside the circuit (a scope or logic probe).

Now, have the system in front of you (preferably messing up), take a test probe in your left hand, the phone in your right hand and then call us (no fair swapping hands).

WANT ADS

The following folks are reaching you for only 20 cents per word. If you would like to reach the same audience, send your words and 20 cents for each to Micro Cornucopia.

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Just remember, any time we are talking on the phone is time we aren't working on new Kaypro, Xerox, Slicer, or Big Board projects. Anything you can do for yourself, will be a big help to us and to everyone who reads Micro C.

Text Co-Processor Reports

You folks calling us must wonder what the heck is going on at Micro C these days. If you're wondering why there's a bit of confusion, it's because of the rapid increase of employees (yep, 2 new ones since January, me included).

Both of us are getting our feet wet at once (the carpet is getting soggy in places) and that's causing all the stammering, stuttering and groping for answers that is part of learning a new language and system. Please bear with us through these fluid times.

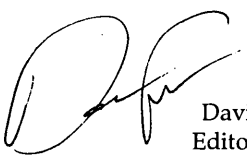
Structured vs. Unstructured

Those reading Micro C know that we're structured programming zealots. However, you may not realize that we're also unstructured work-lifestyle zealots. This, of course, creates the mayhem and anarchy that makes working here so interesting.

For example, last week I decided to work most of the days of the week, but only 2 to 4 hours at a time, popping in whenever convenient. This really makes Alice envious. She has to be here, 8 to 5, Monday through Friday, chained to her desk.

Tracey will be working Monday, Wednesday and Friday. Dana works a Monday through Thursday schedule, plus countless odd hours. Dorcas works Monday through Friday, like Alice and, of course, no one ever knows when Dave will be here or won't be here.

Having explained all this, I hope the insight will give you a couple of chuckles next time you call and find that those who are here aren't even sure who's here. (Which may come from some of us not ever being all here).



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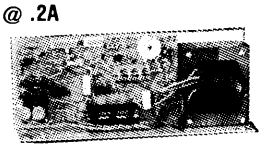

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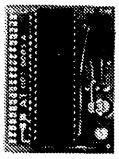

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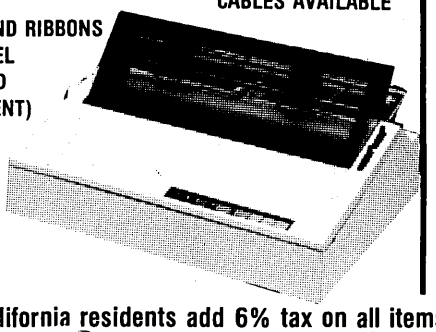

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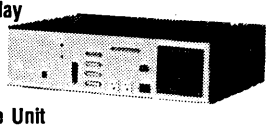

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CP/M 86 DISKS

DISK 86-1 — Disk Utilities
D.CMD/A86, SD.CMD/A86, XDIR.CMD/A86: Three extended directory programs. Each does it differently, so we included all three.
FILE-EXT.CMD/A86: Disk status program with good display format.
PAGE. CMD/A86: A text paging program. Displays 24 lines at a time.
PRINT.CMD/A86: File printing routine. Puts a header at the top of each page along with page number and file name.
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.

Plus, there are a number of demonstration files and ENTAB (insert tabs in place of spaces) and DETAB (replace tabs with spaces) programs all written in Small C.

8″ CP/M-86 Disk
$15.00 each

BOOKS

Your Fortune in the Microcomputer Business ..... $26.45 (US, Can, Mex)
..... $36.45 (Other foreign)
This is the best, most complete collection of "working for yourself" information I've found (and I've heard nothing but good comments from those who have received it). This two-volume set is perfect for those times when you need a break from monitor watching.

Inside CP/M ..... $27.95 (US, Can, Mex)
..... $37.95 (Other foreign)
This is one of the best books on CP/M. It covers the whole spectrum of users from novice to guru. There are a few books that include more programming examples but none work better for the whole range of users and this book is perfect for reference use. Micro C's copy of Inside CP/M is showing definite signs of overuse.

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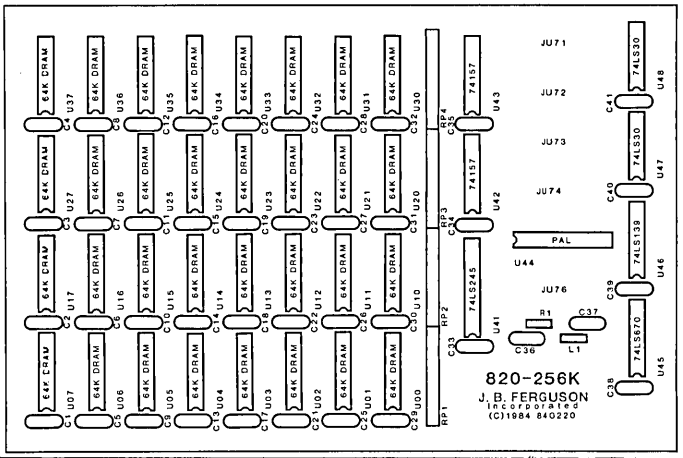
BIGBOARD-1 / 820-1 256K
RAM EXPANSION MODULE



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This memory array resides in the address space of the CPU as 16 blocks of 16K. Any 16K physical block can be mapped into any 16K logical block addressable by the CPU. A bipolar RAM mapper controls which 16K blocks the CPU has access to. The mapper is configured by easily-understood single-byte commands written to memory location OFFFFH. This extremely flexible architecture will accommodate a wide variety of applications, such as MPM, CPM+ and a host of high-speed data acquisition tasks. This RAM upgrade will work at 4 Mhz. This product comes with complete schematics and a full theory of operation with many programming examples. Assembly, installation and test procedures are thoroughly documented. PAL code is not available.

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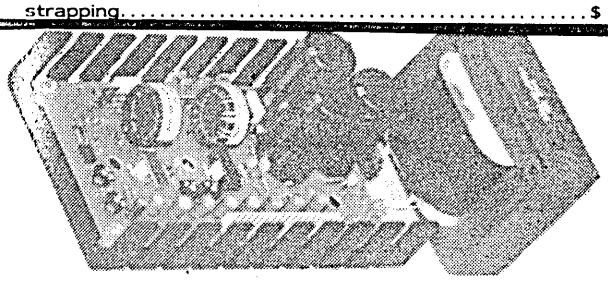

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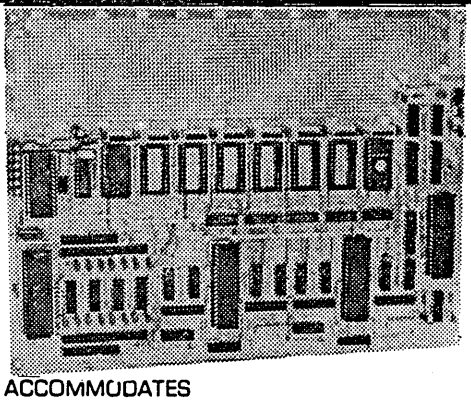

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