PEEK (65)

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INSIDE:

Column One

We all know that the buyout of OSI by M/A Com has produced many changes, virtually all of them good. A new enthusiasm, new machines, new appearance and features of the old machines, new promotional efforts, new responsiveness to user questions and complaints, a new dealer and distributor structure... the list goes on and on.

Now, rumors are flying that the Office Systems division of M/A Com is to be sold again. I have heard this rumor from three places in the past two days. By the time you read this, something much more definite may well be known. But this much is known right now: Bill Chalmers and the other executives who have worked so hard to make OSI into a real computer company are determined that the company will continue not only to exist, but also to lead the field in the manufacture of cost-effective personal and small-business computer hardware. Any new change of ownership will only mean continued, perhaps accelerated, progress. Count on it.

Speaking of which, the recent changes in the packaging of OSI's computers mean a bonanza for those who want to take advantage of it. All over the country, dealers are buying the new models, so that what the customer sees when he comes into the store is what he gets when he buys a computer. This means that loads of the "old" machines, everything from C4P's to C3B's, are for sale really cheap. Watch PEEK(65), Computer Shopper, the Source, Micronet and the other usual sources of information, and you will find some real bargains in barely used or demo equipment.

On that same line, this month's PEEK(65) features part 1 of an article on adding 8" floppy disk drives to your polled-keyboard computer. With this information (second installment next month) and a little hunting through the back pages of the large magazines and the back room of your local dealer, you could join the full-sized 8" floppy disk world for a lot less than you might think.

What all of this means is that computer capacity is doing what it has done for the last 30 years -- expanding and getting cheaper. Take your basic C4P with minimal RAM, add a MEM+ board and some drives, and you have a 500K+ dual disk system with 64K RAM, centronics-compatible printer interface, real time clock with battery backup and lots more. Look through all your back issues of PEEK(65) and you will find a hundred ways to improve the system still further!

This month's PEEK(65) also features continuing response to our Call for Articles on business subjects. Obviously some of our dealers have done as I suggested, and asked their prize installations to write short articles about what they do with their computers, and what kind of support they receive. I will be writing some more experiences, good and bad, along this line. Why don't you? We will be glad to print horror stories as well as success stories -- though we will try to make some suggestions to help even the horror stories have a happy ending!

We had hoped to have a review of a new word processor which is heavily advertised as the final solution to the word processing problem in this month's issue. They were kind enough to send me a review copy, with a beautiful, extremely well written manual, a real pleasure to read. Unfortunately, when I brought the system up (excellent installation program, easy to run and including self-testing), it did not work. Every time I try to type in the first letter in text edit mode, the system re-boots, then locks up. Maybe next month. I will restrain all comment about the continuing problem of software reliability until we make sure it isn't a problem with my hardware!

STRICTLY FOR BEGINNERS

by William K. Groover
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In the reports generated by my program, I need to have numbers rounded and columns aligned. Unfortunately, the people at M/A COM OSI have not provided PRINT FORMAT commands. Even their MONEY-MODE format truncates instead of rounding to the nearest hundredth.

My equipment includes a C2-8P (which I upgraded to 48K), dual 8-inch disk drives, a Micro-Term Act IV terminal and an Epson MX-80 printer. I write all the programs I use in my business for OS-65U: data base management systems, multiple curvilinear regression and correlation, discounted cash flow analysis, investment analysis and internal rate of return programs. Some of these are now readily available in Microsoft BASIC from dealers in software, but I could not find them four years ago. I pride myself on the fact that I have purchased only two programs - a word processor program and a printer program for my modem - both written by my dealer, Dave Broadt of Broadt Computers. Programming is very time-consuming, but time flies when we're having fun!

I am an appraiser of investment real estate. Sometimes I need to have unit prices rounded to the nearest $1 and other times to the nearest tenth or hundredth. Capitalization rates need to be rounded to the nearest ten thousandth and property values to the nearest $1,000, $10,000, or even $100,000. To solve these problems I use a series of subroutines written in BASIC (no machine codes to confound the simple mind of the BASIC programmer!) and put them early in the program. Did you know the computer can GOSUB 10 faster than GOSUB 10000?.

The first subroutine (LISTING 1, LINE 10) rounds whole numbers to the nearest unit or any power of 10. I reserve the numeric variable 'RO' for rounding and select the degree of precision (X) with an input statement.

```
1000 INPUT"ROUND TO (1, 10,
     100, etc.)";X
1010 GOSUB 10
```

The second subroutine (LISTING 1, LINES 20 THROUGH 90) performs two functions. First, it adds commas to numbers to make them more easily read. Second, it returns a value (Q) equal to the length of the string. The value is used to align the strings in columns. I reserve 'Q$' and 'Q' for these subroutines.

The first step (LINE 20) sets the variable 'Q' equal to the length of the number to be rounded. If the number is equal to or less than 999, no commas are needed and the subroutine terminates (LINE 30). If the number is equal to or less than 999,999, only one comma will be needed and the program branches to LINE 60. Otherwise, the program branches to LINE 80 because two commas will be needed. (Note: the subroutine is designed for numbers up to 999,999,999. When I get an assignment to appraise a property with a higher value, I'll add another line!)

Numbers =<999999

LINE 60 breaks the string into two parts, inserts a comma and rejoins the parts. The left part of the string includes all characters left of the third character, counting from the right:

```
MID$(Q$,1, (Q-3)).
```

The right part of the string includes the last three characters:

```
RIGHT$(Q$,3).
```

Example:

```
1000 Q$ = "99999"
1010 GOSUB 20
1020 PRINT Q$
 99,999
```

LINE 80 breaks a number larger than 999,999 into three parts, inserts commas and rejoins the parts. First, it isolates all characters left of the sixth character, counting from the right, and inserts a comma:

```
MID$(Q$,1, (Q-6)) +",".
```

Second, it adds three characters, beginning with the sixth character counting from the right, and inserts another comma:

```
+MID$(Q$,(Q-6),3) + ",".
```

Last, to these two parts it adds the last three characters to the right:

```
+RIGHT$(Q$,3).
```

Example:

```
1000 Q$ = "99999999"
1010 GOSUB 20
1020 PRINT Q$
99,999,999
```

In each case 'Q' becomes the length of the new string variable 'Q$' and provides a means of positioning the cursor or printing head for alignment. For example, assume the right margin of a column is 50. The print statement would be:

```
PRINT TAB(50-Q)Q$
```

I know there are other ways of accomplishing the same results (DEFINE FUNCTION statements, etc.), but the subroutines in the LISTING work very well. Besides, I have the satisfaction of having written the programs. ("Pride goeth before the fall!").

In my next article, I'll explain how I prevent the loss of trailing zeros and the rounding of decimal numbers.

LISTING I

```
10 RO = (INT((RO/X)+.5)*X):RETURN:REM ROUND WHOLE NUMBERS
20 Q = LEN(Q$):REM ADD ',' TO WHOLE NUMBERS
30 IF ABS(VAL(Q$)) =< 999 THEN RETURN
40 IF ABS(VAL(Q$)) =< 999999 THEN 60
50 GOTO 80
60 Q$ = MID$(Q$,1,(Q-3)) + "," + RIGHT$(Q$,3)
70 Q = LEN(Q$):RETURN
80 Q$ = MID$(Q$,1,(Q-6))+","+MID$(Q$,(Q-6),3)+","+RIGHT$(Q$,3)
90 Q = LEN(Q$):RETURN
```

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GO-NO-GO TESTER

by Leonard R. Watkins, Jr.
1044 N. Waco
Wichita, Kansas 67203

IF YOUR COMPUTER PRINTER SUDDENLY STOPPED could you tell if the trouble was in your computer or in your printer. This test unit is designed to quickly give you an indication of where the trouble may be located. As its name implies it is not a thorough tester but only a quick tester to isolate if possible where the trouble may be located.

HOW IT WORKS. Before the computer will send data it must receive a signal from printer (or printer interface) Clear to Send-CTS that the printer is Ready To Receive-RTR. Such signal is normally +5-12 Volts. Data by the computer is normally sent on Connection #3 of the RS 232c connectors. The Data signal is usually a low voltage fluctuating signal which can be displayed on a LED connected in series with a resistor across the data line to ground.

CONSTRUCTION. Contruction is straightforward. You must know what connections your computer-printer system uses for data, Clear To Send/Ready To Receive, and Ground. The schematic is for use with an OSI C2-4PMF to an Escon Interface. Note, the interface's RTR differs from the computers CTS so a cross connection is required. You will have to check your printer manual and printer pin-out to determine what connections you should use in your test unit. You should be able to determine how to wire the circuit from the schematic. You must bore three holes in the connector cover for the switch and LED's. Use a miniature push button switch and make sure there is room for all components. A little care and you should have no trouble. If you have a well stocked "junk box" you may not have any expense except for the connector and cover. The parts listed are not critical and substitution can be made if you understand what you are doing. Layout is of your own choice and limited only by the physical size and construction of the connector and cover. Anyone who has the experience in constructing projects should have no trouble adapting the test unit to any type of connector and for any Computer/Printer combination.

HOW IT IS USED. The test unit tests the Printer for output of a RTR/CTS signal to the computer and tests the computer for its response to the CTS signal and for presence of a data signal.

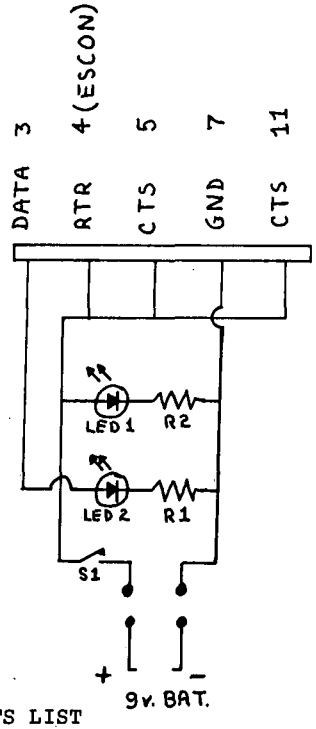
TO TEST THE COMPUTER. The test unit is connected to the Printer end of the Computer-Printer Cable. To make the test the Computer is booted up, a program entered, and preparation is made for output to both Printer and Screen, but final command to execute the program is not yet entered; S1 is closed sending a CTS signal to Computer and then final command to execute the program is entered on the computer. You should observe the program being executed on the screen as if the printer was operating and D2 should be lit with a fluctuating light (may not be very bright). Next the CTS voltage is interrupted. If the Computer is operating correctly, the program should stop on the screen and D2 should go out. Presence of CTS Voltage is confirmed by D1 being lit.

The absence of any light at D2 when CTS Voltage is present indicates that the Computer is not sending data to the printer. If there is output to screen and not to the printer this indicates computer problems. As does a failure of the computer to properly respond to the CTS voltage. The various possible

combinations of responses are many and cannot be covered here.

TO TEST THE PRINTER. Here the only test is to ascertain if the Printer is sending a RTR/CTS voltage to the computer. This test is made by connecting the test unit to the computer end of the cable and then turning the printer on and preparing it to receive data from the computer. In this condition there should be voltage on the RTR/CTS line and D1 should light. If it does not light then the trouble is somewhere in the printer as the computer cannot send until it receives this voltage.

If you have any experience at all with electronics you should have little trouble analyzing your problem and being able to know where to start or which unit to take to the repair shop. You may never have to use this little tester but if you have trouble and you do it, it will be worth its cost in the savings you will make by not having to take both the printer and computer in for testing and in some cases may allow you to fix the problem yourself.



PARTS LIST

BATTERY 9 Volts
S1 SPST Min. Pushbutton
LED 1 & 2 Your choice
Res. 1 & 2, I used 270 Ohm 1/4 Watt Not critical
So. 1 DB25S
So. 1 Cover DB51226
Misc. Battery Clip, Wire and Solder.

NOTE. Always check the Connecting Cable before undertaking any action to repair or having repaired your Computer or Printer. Sometimes all that is wrong is an open in one of the wires.

ED NOTE:

Many printers used with small systems do NOT use CTS "handshaking". Be sure yours does, before building this tester.

★

SOME QUICK FIXES FOR OSI ROM BASIC

PART TWO

by Steven P. Hendrix
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New Braunfels, TX 78130

In part one, I showed you a number of useful patches to the Basic interpreter ROMs on the C1P, scattered throughout the entire interpreter. In part two, I will show how you can have USR automatically initialized to point to a set of very useful routines when you do a cold start, I will provide a set of routines, or you can put your own routines into the available space.

In part one, we shortened some messages and rearranged enough things to leave the area from $BE43 thru $BF2C free for other uses. If you chose not to make those other changes, the area from $BEE2 thru $BF2C is still available. You can put your favorite routines here, saving you the bother and memory needed for the data statements which you normally use for your USR routines. Also, you won't have to be so careful about finding an area to place your routines and protecting that area from BASIC.

When you cold start Basic, the interpreter sets USR to the routine which prints the message "?FC ERROR" and returns to Basic's immediate mode ($AE88). The default address is stored at $BD3D (low byte) and $BD3F (high byte). For the routine which I will present here, change those bytes to $7C and $BE, respectively.

This routine performs the following functions:

SEE LISTING #1 PG.7.

Notice that this uses the character immediately after the right parenthesis to determine the type of call and does not use the parameter inside the parenthesis at all. I set it up like this so that you can still use USR as normal, perhaps reserving one value of the parameter to indicate a jump to this routine. For instance, you could set up your added USR routine to jump to this routine if the parameter is negative so that USR(0) or USR(100) executes the routine you have added for a specific program, while a negative parameter causes a jump to this routine in ROM. For those of you using HEXDOS, you can make USR(-7) access this routine by POKEing 76 and 190 to 240 and 241, respectively.

Here is the actual code for this routine, with enough comments that I hope it is understandable without further explanation.

SEE LISTING #2 PG.7.

Note that these routines rely on subroutines in the Basic ROMs themselves, so they are useless on a disk system which does not have the ROMs installed. However, disk Basic has similar routines which you should be able to tap. I have not explored disk Basic enough to find them and don't intend to, since I never write programs under OSI's disk Basic (HEXDOS gives as much or more power, with 10K more RAM to work with). If anyone is particularly interested in making similar patches to disk Basic, help yourself. The interpreter is similar in overall structure though of course, the exact addresses will change.

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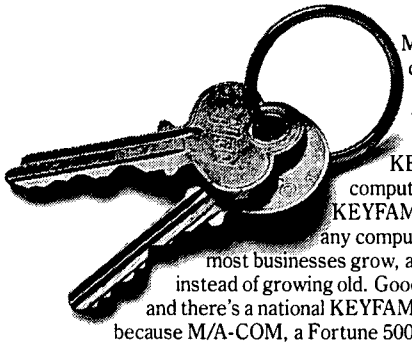

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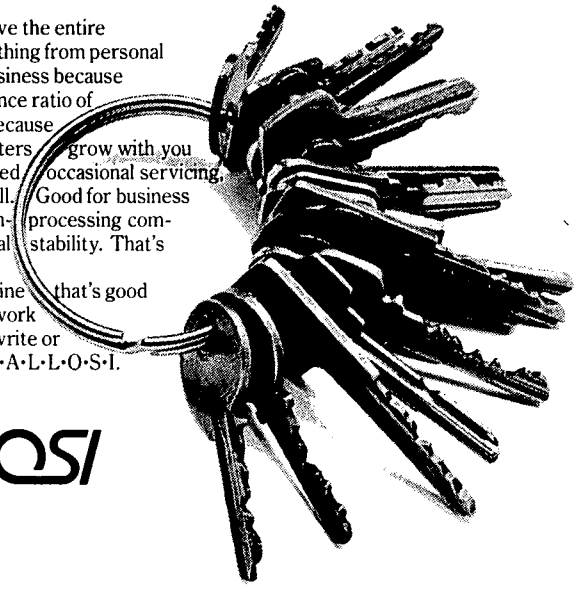

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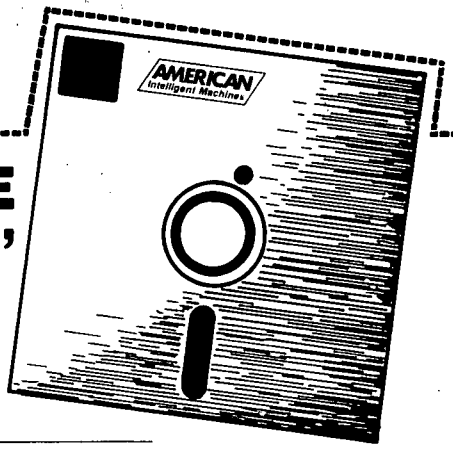

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LISTING #1

Calling Format	Function
USR(x)$<string>	Same as VAL(<string>) except assumes that <string> is given in hex.
USR(x)#<value>	Returns a 4 character string giving the hex representation of <value>
USR(x)&<value>	Returns a 2 character string giving the hex representation of <value>
USR(x)CLEAR	Clears the video screen
USR(x)TO x1,x2,x3	PRINT AT function for the video screen. The screen has columns 0-31 and rows 0-31, though only columns 5-28 and rows 5-28 are normally visible. This function prints the character whose decimal value is x3 at column x1, row x2.
USR(x)<variable>	VARPTR(<variable>). Returns the address of the first byte of four bytes containing the value of <variable>.

LISTING #2

```
$BE43  20 BC 00  JSR $00BC  ; Get the next character
$BE46  20 AD AA  JSR $AAAD  ; Evaluate an arithmetic expression
$BE49  4C 08 B4  JMP $B408  ; Convert to a 2 byte integer at $11
$BE4C  20 C2 00  JSR $00C2  ; Get the character after the )
$BE4F  C9 23     CMP #$23   ; Check for "#"
$BE51  D0 2F     BNE $BE82
$BE53  20 43 BE  JSR $BE43  ; Convert <value> to a 2-byte integer
$BE55  A9 04     LDA #$04   ; # of bytes to be in final string
$BE58  20 A4 B0  JSR $B0A4  ; allocate a 4-byte string area
$BE5B  A0 00     LDY #0     ; Pointer to current character in
$BE5D  A5 12     LDA $12    ; High byte of <value>          string
$BE5F  20 6C BE  JSR $BE6C  ; Generate 1st 2 characters
$BE62  A5 11     LDA $11    ; Low byte of <value>
$BE64  20 6C BE  JSR $BE6C  ; Generate next 2 characters
$BE67  68        PLA        ; Avoid TM ERROR
$BE68  68        PLA        ;
$BE69  4C ED B0  JMP $B0ED  ; Check for string TM ERROR on the
                            ; way back to Basic
$BE6C  48        PHA        ; Save the low-order nybble
$BE6D  4A        LSR A      ; Move the high-order nybble to the
$BE6E  4A        LSR A      ; lower 4 bits of A
$BE6F  4A        LSR A      ;
$BE70  4A        LSR A      ;
$BE71  20 75 BE  JSR $BE75  ; Convert to ASCII and enter in string
$BE74  68        PLA        ; Get back the low-order nybble
$BE75  29 0F     AND #$0F   ; Mask off garbage in high-order half
$BE77  08        PHP        ; Preserve decimal flag
$BE78  C9 0A     CMP #$0A   ; Set carry if > 9
$BE7A  F8        SED        ;
$BE7B  69 39     ADC #$69   ; Because of C and D flags, this adds
                            ; an extra 7 for nybbles > 9, making
                            ; 10 thru 15 correspond to A thru F
$BE7D  28        PLP        ; Restore decimal flag
$BE7E  91 AD     STA ($AD),Y; Store character in string
$BE80  C8        INY        ; Point to next character
$BE81  60        RTS        ;
$BE82  C9 26     CMP #$26   ; Check for "&"
$BE84  D0 0C     BNE $BE92  ;
$BE86  20 43 BE  JSR $BE43  ; Get <value> as a 2-byte integer
$BE89  A0 02     LDA #$02   ; # of characters
$BE8B  20 A4 B0  JSR $B0A4  ; Allocate a 2-byte string
$BE8E  A0 00     LDY #$00   ; Pointer to next character of string
$BE90  F0 D0     BEQ $BE62  ; Re-use the latter part of the code
                            ; for #
$BE92  C9 24     CMP #$24   ; Check for $
$BE94  D0 44     BNE $BED8  ;
$BE96  20 BC 00  JSR $00BC  ; Get next character
$BE99  20 C1 AA  JSR $AAC1  ; Get arithmetic expression (in this
                            ; case, we expect a string)
$BE9C  20 92 B3  JSR $B392  ; Set up string pointer at $71 with
                            ; length in A
$BE9F  A0 98     LDY #$98   ; Initialize Basic's floating point
$BEA1  84 AC     STY $AC    ;
$BEA3  A0 00     LDY #$00   ;
$BEA5  84 AD     STY $AD    ;
$BEA7  84 AE     STY $AE    ;
$BEA9  84 AF     STY $AF    ;
$BEAB  84 B0     STY $B0    ;
$BEAD  84 B9     STY $B9    ;
$BEAF  AA        TAX        ; Length of string
```

cont. on page 8

"HOME OF THE WHOPPER"

by John K. Oliver
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1212 E. 10th
Sioux Falls, S. Dakota 57103

Our firm is Walco Management which operates 7 BURGER KING Restuarants in Eastern South Dakota and also T.J. O'BRIENS, a bar and restuarant in Sioux Falls, S. D.

HARDWARE

The hardware we use is an OSI C-3 OEM, with 48K, a Hazeltine 1420 and a Paper Tiger 440.

We are admittedly novices in the computer field, especially to the extent of our technical knowledge. Luckily, mechanical breakdowns have been minimal during the 30 months we've had the equipment installed with the most serious being one of the floppy disk drives with an apparent bad connection. This is fixed, occasionally, by removing the cover and wiggling the power supply wires. That's as technical as we go!

The hardware was purchased through the local OSI dealer..Computer Terminal in Sioux Falls, South Dakota. Their support has been excellent.

SOFTWARE

Our office does the accounts payable for the seven Burger Kings and the general ledger for T. J. O'Briens. This involves processing and writing checks for approximately 150 invoices per store per month or 1200 total per month. The accounts payable and general ledger programs were purchased from Microsoftware International, Sioux Falls.

We looked at several OSI compatible accounting packages but decided on Microsoftware International because their A/P package will let you distribute an invoice into eight different accounting codes...i.e. food, paper, condiments, cleaning supplies, etc. The A/P package also allows 14 or more invoices per check voucher. The bookkeeping function formerly required two full-time people. Now with the computer, only one is needed.

BUSI-CALC

Microsoftware International also has a Visi-Calc type

continued on page 8

```
$BEB0  D0 03     BNE $BEB5  ;
$BEB2  4C D5 B4  JMP $B4D5  ; End of string so normalize the
                            ; floating point number and return
$BEB5  A0 00     LDY #$00   ; Zero offset
$BEB7  B1 71     LDA ($71,Y); Get next character of string
$BEB9  20 93 FE  JSR $FE93  ; Convert hex character to binary
$BEBC  30 F4     BMI $BEB2  ; Not a valid hex character
$BEBE  A0 04     LDY #$04   ; # of bits to shift
$BEC0  0A        ASL A      ; Shift low-order nybble to high half
$BEC1  88        DEY        ;
$BEC2  D0 FC     BNE $BEC0  ;
$BEC4  A0 04     LDY #$04   ; # of bits to shift
$BEC6  0A        ASL A      ; Move one bit to the C flag
$BEC9  26 AE     ASL $AE    ;
$BECB  26 AD     ASL $AD    ;
$BECD  88        DEY        ;
$BECE  D0 F6     BNE $BEC6  ;
$BED0  E6 71     INC $71    ; Move pointer to next character
$BED2  D0 02     BNE $BED6  ;
$BED4  E6 72     INC $72    ;
$BED6  CA        DEX        ; # of characters remaining in string
$BED7  4C B0 BE  JMP $BEB0  ;
$BEDA  C9 9A     CMP #$9A   ; Check for CLEAR
$BEDC  D0 16     BNE $BEF4  ;
$BEDE  A9 20     LDA #$20   ; Blank
$BEE0  A0 00     LDY #$00   ; Zero offset
$BEE2  9D 00 D0  STA $D000,Y; Video memory
$BEE5  9D 00 D1  STA $D100,Y;
$BEE8  9D 00 D2  STA $D200,Y;
$BEEB  9D 00 D3  STA $D300,Y;
$BEEE  CA        DEX        ;
$BEEF  D0 F1     BNE $BEE2  ;
$BEF1  4C BC 00  JMP $00BC  ; Get next character and jump back
$BEF4  C9 9D     CMP #$9D   ; Check for TO
$BEF6  D0 29     BNE $BF21  ;
$BEF8  20 AB B3  JSR $B3AB  ; Get a 1 byte integer in X
$BEFB  8A        TXA        ;
$BEFC  0A        ASL A      ; Shift column # to left part of A
$BEFD  0A        ASL A      ;
$BEFE  0A        ASL A      ;
$BEFF  85 FE     STA $FE    ;
$BF01  20 02 B4  JSR $B402  ; Check for and discard comma, then
                            ; get another 1-byte integer
$BF04  E0 20     CPX #$20   ; Check for row # > 31
$BF06  90 03     BCC $BF0B  ;
$BF08  4C 88 AE  JMP $AE88  ; ?FC ERROR
$BF0B  8A        TXA        ; Combine row & column numbers
$BF0C  A2 03     LDX #$03   ; # of bytes to shift
$BF0E  4A        LSR A      ;
$BF0F  66 FE     LSR $FE    ;
$BF11  CA        DEX        ;
$BF12  D0 FA     BNE $BF0E  ;
$BF14  09 D0     ORA #$D0   ; Add base address of video RAM
$BF16  85 FF     STA $FF    ;
$BF18  20 02 B4  JSR $B402  ; Check for & discard comma, then
                            ; get the value of the character
$BF1B  8A        TXA        ;
$BF1C  A0 00     LDY #$00   ; Zero offset
$BF1E  91 FE     STA ($FE,Y); Finally put the character on the
                            ; screen
$BF20  60        RTS        ;
$BF21  20 0B AD  JSR $AD0B  ; Look up the variable
$BF24  A8        TAY        ; Swap A and Y
$BF25  A5 96     LDA $96    ;
$BF27  4C C1 AF  JMP $AFC1  ; Return the value to Basic
```

★ ★ ★

spread sheet called Busi-Calc, which doesn't require CP/M. This article was written using the text editing capabilities of Busi-Calc. We also use Busi-Calc to update our Five Year Business Plan on a Monthly basis. Forecasting and Budgeting are also done on a monthly basis using Busi-Calc, which comes with a 50 page manual.

For several months I had considered adding the 8K of extra memory and the hassle of adding CP/M in order to handle the Lifeboat T-MAKER II spreadsheet program. Busi-Calc runs on OS 65U and required no additional hardware. Needless to say, I think Busi-Calc is invaluable!!

One area where we are still in the stone age is the transmission of data from the seven restuarants to the office. Presently, the sales and other financial data are called in to the office on a telephone tape recorder on Sunday, and each Monday they are input manually into the computer. The next logical step would be to have each of the seven stores transfer this information via a modem to a smart terminal program in the office which would store the information on disk and later print a hard copy report with each store listed separately and a combined total.

I have only recently subscribed to PEEK(65) and I've read with interest the articles on software reviews and new product introductions. Keep up the super job.

ADD A SIEMENS 8" DISK DRIVE TO YOUR OSI CHALLENGER (C2, C4 OR C8P)

by Len Magerman and James Loan

Directors of OSI/Boston (a sub-group of the Boston Computer Society)

An overview of the Siemens 8" Floppy Disk Drive Model FDD-100-8 and D&N Micro Product's MEM-CM9 disk controller/memory board including a step by step do-it-yourself project that shows you how to connect the disk drive and add 24K bytes of user random with access memory (RAM) to your C2, C4 or C8P. All this for under $850, including the cost of a power supply, disk drive, and the disk drive enclosure.

A few months ago I prevailed on my co-author, Jim Loan, to start a project for our user's group that would show our members how they could add a disk drive to their cassette-based systems (e.g., OSI's C2-4P, C4P and C8P). Jim researched the field and found that it was indeed possible to add 5-1/4" or 8" disk drives to these computers in several different ways. One member's machine was then converted to disk using a MPI (Micro Peripherals, Inc.) B-51 5-1/4" drive for a total cost of about $600. Following his lead, I did the same with a C4P and a Siemens 8" disk drive.

Having kept records of our work, we concluded that the information we gathered might be of interest to other OSI users, who with a little

OSI COMPATIBLE PRODUCTS

56K 2-MHz Ultra Low Power CMOS Static Memory Board MEM-56K $850

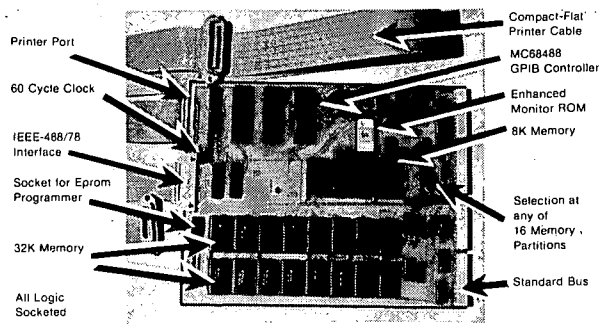
Partially Populated Boards (Specify address locations required) ... **MEM-48K $750**
MEM Board uses the new 2K-Byte Wide Static RAM chips which are 2716 EPROM compatible. Any 2K byte memory segment can be populated with RAM or EPROM (or left empty for use of Address Space by another board). Fully expandable to any memory size you will ever need. No special addressing requirements, just solder in extra sockets
MEM-32K $550
MEM-24K $450
MEM-16K $350
MEM- 8K $250
MEM- 4K $200
Extra 2K RAM Memory Chip $24
Optional Parallel Printer Port -P $120
Optional Calendar/Clock Software available in EPROM) **-T $ 25**
Both options (Disk software mods provided for use of 6522 VIA on printer). **-PT $125**

EXAMPLE USES:
C4P & C8P: Expansion to **4K RAM** of Basic workspace.
Parallel Printer Port — Reserve Serial Port for MODEM
Calendar/Clock Displaying on unused portion of screen.
Space for 5.75K of **Enhanced System Monitor EPROMS.**
All of this on 1 Board, using only one of your precious slots. Software for Enhanced System Monitor capabilities is continuously being developed and improved. As new EPROM Monitors are available, you may upgrade to them for any price differential plus a nominal $10 exchange fee. Another possibility is to fill any portion of the memory with Basic Programs in EPROM for **Power-on Instant Action.** This custom EPROM programming service is available at $25 per 2716 (Includes EPROM). Extra copies at $15 for each EPROM.
C4P-MF & C8P-DF:
Memory expansion to **48K.**
Add 6K **Memory** above BASIC for special software requirements.
Parallel Printer Interface and/or **Displaying Calendar/Clock.**
Add 1.75 K **Enhanced System Monitor ROM.**
C3: Up to **56K of Memory** Expansion — can be addressed for **Multiuser.** (Optionally, each user can have his own **Dedicated Printer Port).**

C1P,C4P & C8P FLOPPY DISC CONVERSIONS:
Memory/Floppy Board (Includes MI48P1 ROM) ..... **MEM F-16K $450**
C1P-600 Board Adapter & Cable ..... **A600/48 $ 50**
Additional Memory/Printer/Times ..... **(See MEM Board Prices)**
5¼" Drive/Case/Power Supply & Cable to MEMF Board **FD5 $399**

IEE-488 INTERFACES AND SOFTWARE:
The General Purpose Instrumentation Bus (GPIB Controller interface is available for all OSI Computers. Machine code GPIB Drivers are linked to Basic to provide easy control of IEEE-488 instruments which is equal to the best of Hewlett-Packard Controllers and far superior to most others. Basic Commands for Serial Poll, Parallel Poll, IFC Clear, full Local/Remote Control, Respond to SRQ Interrupts, Send Trigger, do Formatted Input/Output, Direct Memory Input/Output and MORE. Interface includes IEEE-488 Ribbon Cable/Connector.
GPIB Controller Interface for C2, C3, C4 and C8 Systems ..... **GPIB 4-488 $395**
GPIB Software for **OS-65D** (Add -8 for 8" or -5 for 5") ..... **GPIB 488-D $ 70**
GPIB Software for **OS-65U** ..... **GPIB 488-U $100**
GPIB Software on two 2716 EPROMS for **ROM** based systems ... **GPIB 488-R $100**
Add Optional **Parallel Printer Interface** to GPIB 4-488 ..... **-P $120**
Add Optional **Calendar/Clock** to GPIB 4-488 ..... **-T $ 25**
Add **2K RAM** to GPIB 4-488 (Specify location, $4000-$BFFF & $D000-$$EFFF available) **-M $25**
GPIB Controller for C1P, includes Software, Clock, All Features of ROMTERMS, & space for 6K EPROM ..... **GPIB 6-488R $395**
Add Optional Parallel Printer Interface to GPIB 6-488R ..... **-P $120**
EPROMS:
C1P ROM with 24/48 Col Display for Series II, Smart Terminal, Line Editing, Corrected Keyboard Screen Clear and More ..... **ROM-TERM II $59.95**
C1P ROM with 24 Col Display. Other ROM-TERM II Features, Disk Boot, and ROM/Disc Basic Interchange ..... **ROM-TERM $59.95**
C4P-MF/C8P-DF Disk warm start, changed IRQ Vector and just flip switch for Serial or Video System with Corrected Keyboard ..... **SYNKEY $39.95**
ENHANCED MONITOR ROMS FOR USE ON GPIB 4-488 & MEM BOARDS:
Expanded Support for **C4P & C8P** Featuring Calendar/Clock, Line Edit, Smart Terminal, Memory Files, Parallel Printer Control, Corrected Keyboard, All Features of ROMTERMS, **Disk Support** with Warm Start and More **MI48P1 $59.95**
Expanded C2 Monitor with Calendar/Clock Software, Hard Disk Boot, Warm Start and Multi-User Control for C2 Systems **MIC2-1 $59.95**

IEEE-488 CONTROLLER INTERFACE



THE GPIB 4-448 INTERFACE BOARD CONVERTS ANY OSI COMPUTER INTO AN IEEE-488 INSTRUMENT BUS CONTROLLER!

BENEFITS — Provides a Sophisticated Instrumentation Controller at very low cost (often saving thousands of Dollars). The combination of IEEE-488 Instrumentation Controller and High Capacity Hard Disk file storage available on OSI Computer systems is available at a fraction of the cost required by the nearest competitor. The IEEE-488 Bus, also known as the GPIB,HP-IB or IEC-625 is the most popular International Standard for connecting instrumentation systems. This 16-line bus is designed to interconnect and control up to 15 instruments at a time. Currently, over 2000 different instruments are available to work on this bus. They include: Plotters, Digitizers, Printers, Graphic Displays, Recorders and a multitude of specialized Test/MeasurementControl Equipment.

EPROM-ABLE — Can be used with a C4-P to create a dedicated IEEE-488 controller.

C2-D MULTIPLE USER SYSTEMS

SAVE — 2 and 3 user Time Sharing Systems are available on the C2-D Winchester Disk Computer at a considerable cost savings from C3 Multiple User Systems. The 3 user C2-D System can be expanded to include a word processing printer, 4 other parallel printers and 3 serial printer interfaces.

COMPATABLE — The special C2-D Multi-User Executive Program is 100% compatable with OS-65U V1.4. The Multi-User Real Time Clock, Memory Partition Control and IRQ Interrupt Management are done on the Micro Interface Memory Board. Thus, the CPU board is not modified and remains in factory condition.

CONVERSIONS — The Up-Grade of your existing C2-D Computer to Multiple User Configuration is also available. Call for details.

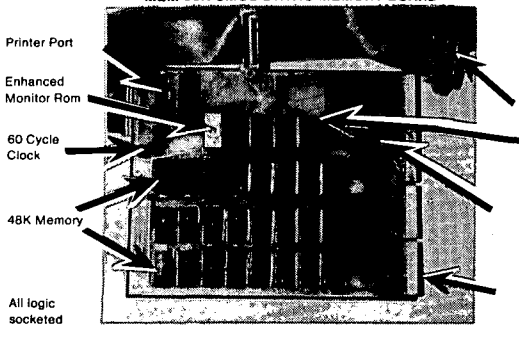
FLOPPY DISK UPGRADES FOR C1P, C4P & C8P

Our Memory/Floppy Board provides easy conversion of 502 and 600 CPU Computers to Floppy Disk Operation. The **MEMF** Board has a floppy disk interface which includes a data separator and the ability to automatically lift the disk drive heads — your floppy disk lifetime will be extended many times. You will retain the cassette interface for your existing software; which can easily be converted to Disk.

This **MEMF-16K** Board is populated with **16K RAM** (50K possible) and has features of the MEM CMOS Static Memory Board with an added floppy interface. The low power memory means extra power supply not required. **ROM Basic** is retained even when Board is populated for 48K Disc Basic. An optional Parallel Printer Port and Real Time Calendar/Clock is on board.

Complete Ready to Run conversion kits with 5¼" or 8" Disk Drives are available.

MEM-56K CMOS STATIC MEMORY BOARD



ULTRA-LOW POWER — By using CMOS Static RAM Memory, the total power consumption is about ½ Amp at 5 Volts when populated for 48K. In fact, most of power is used by the Address Line Buffers and the Data Transceivers.

MULTI-USER — Can be addressed for any of the 16 multi-user memory partitions. The low power and single memory board/partition simplify installation and provide a typical $1400 saving for a 3-user system.

MICRO-INTERFACE
3111 SO. VALLEY VIEW BLVD., SUITE I-101
LAS VEGAS, NEVADA 89102
Telephone: (702) 871-3263

Check with your local Dealer or Order Direct.
Phone orders accepted.
TERMS: Check/Money Order/Master Charge/VISA
Sent POSTPAID ON PREPAID ORDERS.
Foreign Orders: Prepaid only.
Add 5% for handling/shipping.

skill, patience and the ability to follow instructions, could upgrade their computers at their own leisure and as finances permitted.

There are two main advantages to the 8" drive approach, the most obvious being higher storage capacity (217 kilobytes of formatted data vs. 87 kilobytes for the 5 1/4" drive). Equally important is that OSI's premium operating system, OS65U, is available only in the 8-inch version.

COMPONENT DESCRIPTIONS

The Siemens Disk Drive Model FDD-100-8, configuration D5 or D27 containing the separated DATA/CLOCK circuitry, is a single-sided drive that can read and write data in single or double density format using flexible 8" IBM disks. In the single density configuration (as used in this project), the unformatted disk capacity is 400 kilobits which can be transferred at a rate of 250 kilobits per second. In addition, the drive is compatible with the IBM 3740 format.

The basic configuration as received from the factory includes track 00 sensing, activity indication, automatic erase timing and write protect. Also provided is auto disk ejection and a fail safe interlock which prevents door closure on an ejected disk.

The AC power requirements for one drive are 120 volts at 60 hz or 220 volts at 50 hz. The DC supply requires +24 volts at 1.8 amps and +5 volts at 1.3 amps. The weight of the unit is 12 pounds and consists of a rugged mainframe, carrier assembly, main deck assembly, and PC board. The PC board, as shipped, contains many features often offered as options by other manufacturers. These can be enabled or disabled with appropriate jumpers as desired. For instance:

- Write Protect: Provides write-inhibit when a write protect disk is used

- Binary Select: Provides selection for up to eight drives

- Radial Select: Allows commands to be accepted and status signals supplied in a star or non-daisy chain configuration

- Auto Head Load: Allows the head to be loaded in response to a HDLD command from the controller or when the drive is selected.

Finally, this drive is priced considerably lower than others in its class, with no apparent sacrifice in quality or reliability (mean time to failure is 6000 hours after 200 hours of operation with a recoverable read error of less than 1 in 1 billion bits read).

The key to our implementation of a disk drive on the C4P or its cousins is the D&N Micro Product, Inc. MEM-CM9 combination disk controller and 24K static RAM memory board. Unlike other disk conversion options that require replacement of the 502 CPU board with a 505 CPU board, or the installation of a separate disk controller and memory boards (using up all four slots in the backplane), this option takes up only one slot, leaving one slot free in the baseline configuration. The MEM-CM9 board can be purchased from D&N in a variety of configurations, ranging from the bare board ($50) to one fully populated and tested by D&N ($530). It can be constructed either as a 24K memory board or a disk controller or both. In addition, there is a real-time clock that can be implemented if desired. The board will support two 5 1/4" or 8" drives (single or double sided), the only requirement being that the drives must have separated clock and data output circuitry. The memory portion is separated into an 8K and a 16K block, each of which can be individually addressed anywhere from 0000 (hexidecimal) to FFFF. The memory can also be partitioned for up to 16 users.

The workmanship of the board is excellent; foil runs are neat and components are placed so as to take advantage of all available space without being overcrowded. Most of the assembly instructions are clearly and explicitly written with the latest updates included in an addendum. We found several typographical errors and omissions in the instructions accompanying the first board we ordered and notified D&N about them. The manual that came with the next board we ordered contained the appropriate corrections, a fact which we feel shows D&N's desire to produce and maintain quality products.

GENERAL PROCEDURE

Basically, the procedure is as follows:

1) Purchase a bare disk controller/memory board, populate it, time it, and install it in your computer.

2) Cut and re-route one jumper on your OSI 502 board.

3) Buy or assemble a disk-drive data cable.

4) Buy a Siemens FDD-100-8 disk drive with separated data and clock option installed and jumper it as shown in the MEM-CM9 board manual.

5) Install the drive and power supply in an appropriate enclosure and wire it according to the schematic shown in this article.

6) Connect the disk drive system to your computer.

While at first this procedure may look formidable, it is really very simple and straightforward. Construction of the MEM-CM9 board took about 8 hours (including the timing of the separated clock and data circuits) and an additional 2 hours to install the disk drive and power supply in the enclosure.

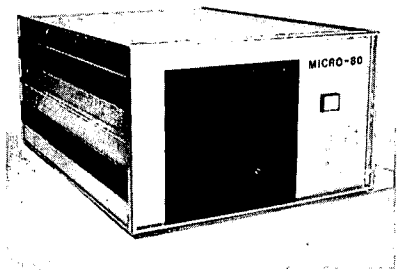
One nice thing about this project is that it can be done piecemeal so that your computer is down for only the time it takes to check out and install the completed MEM-CM9 board. After installation of the board, you will have the use of the additional 24K of RAM while you get the disk drive ready. A side benefit of the MEM-CM9 board is that it uses only one slot of your backplane resulting in an extra slot into which you can insert another memory board and bring your memory capacity up to 40K while retaining BASIC in read-only memory (ROM). These can be accessed via the C command if you follow the instructions in the manual accompanying the MEM-CM9 board.

CONSTRUCTING THE MEMORY CIRCUITS

Before starting this project you should be aware that opening and making changes to your computer can result in voiding your warranty. If you are at all hesitant about poking around inside your computer have an experienced person help you.

To avoid problems later, begin by thoroughly reading the MEM-CM9 manual to familiarize

NEW FROM D & N MICRO PRODUCTS, INC.



MICRO-80 COMPUTER

Z80A CPU with 4MHz clock and CP/M 2.2 operating system. 64K of low power static RAM. Calendar real time clock. Centronics type parallel printer interface. Serial interface for terminal communications, dip switch baud rates of 150 to 9600. 4" cooling fan with air intake on back of computer and discharge through ventilation in the bottom. No holes on computer top or side for entry of foreign object. Two 8" single or double sided floppy disk drives. IBM single density 3740 format for 243K of storage on each drive. Using double density with 1K sectors 608K of storage is available on a single sided drive or 1.2 meg on a double sided drive. Satin finish extruded aluminum with vinyl woodgrain decorative finish. 8 slot backplane for expansion. 48 pin buss is compatible with most OSI boards. Uses all standard IBM format CP/M software.

Model 80-1200	$2995
2 8" single sided drives, 1.2 meg of storage	
Model 80-2400	$3495
2 8" double sided drives, 2.4 meg of storage	
Option 001	$ 95
Serial printer port, dip switch baud rate settings	

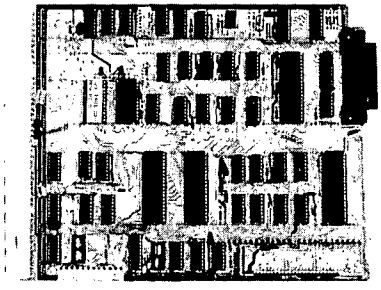
Software available in IBM single density 8" format.

Microsoft		**Digital Research**		**Micropro**	
Basic-80	$289	PL/1-80	$459	Wordstar	$299
Basic Compiler	$329	Mac	$ 85	Mail-Merge	$109
Fortran-80	$410	Sid	$ 78	Spellstar	$175
Cobol-80	$574	Z-Sid	$ 95	SuperSort I	$195
Macro-80	$175	C Basic-2	$110	**Pascal**	
Edit-80	$105	Tex	$ 90	Pascal/MT +	$429
Mu Simp/Mu Math	$224	DeSpool	$ 50	Pascal Z	$349
Mu Lisp-80	$174	**Ashton-Tate**		Pascal M	$355
		dBase II	$595		

Convert almost any static memory OSI machine to CP/M® with the D & N-80 CPU Board.

Z80A CPU with 4MHz clock. 2716 EPROM with monitor and bootstrap loader. RS-232 serial interface for terminal communications or use as a serial printer interface in a VIDEO system. Disk controller is an Intel 8272 chip to provide single or double density disk format. 243K single density or 608K double density of disk storage on a single sided 8" drive. A double sided drive provides 1.2 meg of storage. DMA used with disk controller to unload CPU during block transfers from the disk drives. Optional Centronics type parallel printer port complete with 10 ft. cable. Optional Real Time Calendar Clock may be set or read using 'CALL' function in high level languages. Power requirements are only 5 volts at 1.4 amps. Available with WORDSTAR for serial terminal systems.

D & N-80	serial	$695
D & N-80	serial w/Wordstar	$795
D & N-80	video	$695
Option 001		$ 80
	parallel printer and real time calendar clock	



D & N-80 CPU BOARD

OTHER OSI COMPATIBLE HARDWARE

IO-CA10X Serial Printer Port **$125**
Compatible with OS-65U and OS-65D software

IO-CA9 Parallel Printer Port **$175**
Centronics standard parallel printer interface with 10 ft. flat cable

BP-580 8 Slot Backplane **$ 47**
Assembled 8 slot backplane for OSI 48 pin buss

24MEM-CM9	**$380**	**24MEM-CM9F**	**$530**
16MEM-CM9	**$300**	**16MEM-CM9F**	**$450**
8MEM-CM9	**$210**	**8MEM-CM9F**	**$360**
BMEM-CM9F	**$ 50**	**FL470**	**$180**

24K memory/floppy controller card supports up to 24K of 2114 memory chips and an OSI type floppy disk controller. Available fully assembled and tested with 8, 16, or 24K of memory, with floppy controller (F). Controller supports 2 drives. Needs separated clock and data inputs. Available Bare (BMEM-CM9F) or controller only (FL-470). Ideal way to upgrade cassette based system

C1P-EXP Expansion Interface **$ 65**
Expansion for C1P 600 or 610 board to the OSI 48 pin buss. Requires one slot in backplane. Use with BP-580 backplane

BIO-1600 Bare IO card **$ 50**
Supports 8K of memory, 2 16 bit parallel ports may be used as printer interfaces. 5 RS-232 serial ports, with manual and Molex connectors

DSK-SW Disk Switch **$ 29**
Extends life of drive and media. Shuts off minifloppy spindle motor when system is not accessing the drive. Complete KIT and manual

D & N Micro Products, Inc.
3684 N. Wells St.
Fort Wayne, Ind. 46808
(219) 485-6414

VISA MasterCard

TERMS $2.50 shipping, Foreign orders add 15%. Indiana residents add 4% sales tax.

Disk Drives and Cables

8" Shugart SA801 single sided **$395**

8" Shugart SA851 double sided **$585**

FLC-6 6ft. cable from D & N or OSI controller to 8" disk drive **$ 69**

5 1/4" MPI B51 with cable, power supply and cabinet **$450**

FLC-5 1/4 8 ft. cable for connection to 5 1/4 drive and D & N or OSI controller, with data separator and disk switch **$ 75**

Okidata Microline Printers

ML 82A Dot Matrix Printer **$534**
120 CPS, 80/120 columns, 9.5" paper width, friction or pin feed

ML 83A Same as 82A except **$895**
16" paper width, 132/232 columns with tractor feed

ML 84 Same as 82A except 200 CPS, **$1152**
16" paper width, 132/232 columns, 2K buffer, dot addressable graphics, with tractor feed

yourself at least with the construction procedure. Inspect the board for breaks in the foil runs. You should find none as the quality of this product is excellent but there's always a chance for a defect to occur. The time you spend doing this will be well worth it because once you've populated the board, finding a break visually can be frustrating with all the components covering the runs. When you're satisfied that everything is OK, begin by installing and soldering sockets for EACH and EVERY chip (both memory and disk controller circuits) on the board. Then check your work for cold, bridged and non-soldered joints, using an ohmmeter in addition to visual inspection. It pays off in the long run! Now follow the step-by-step instructions in the D&N manual and check-off each item as it's completed. Use a highlighter pen so you can easily see what you've completed and where you are in the project. We suggest that you build the memory section first, so that you can check out that circuitry and RAM without having to concern yourself about the disk controller section.

When you've completed that section make ANOTHER check of all solder joints as you did before.

INSTALLING THE MEMORY BOARD

Now you are ready to open the computer and install the MEM-CM9 board.

1) Disconnect the power and I/O cables, turn your computer upside down and lay it on a soft surface.

2) Remove the 6 Allen screws holding the bottom cover to the top cover.

3) Lift the bottom cover and set it on its side. You'll see a ground wire screwed to the bottom cover which you should disconnect.

4) Insert the MEM-CM9 board into the second slot from the top of the backplane of the computer. That's where you'll see several rows (i.e., slots of 48 pins that the other boards are attached to). Be careful not to bend the board or you may crack a foil run. You may have to work the board from side to side to get it in so you may find it helpful to re-position one of the other boards. Start checking out the RAM chips with any good memory testing program. A simple one is shown at the end of this article. A better one, using the "romping" bit method, was published in OSI's Small Systems Journal (See References).

5) Locate the 502 board (it has the 40 pin 6502 CPU chip on it) and make the jumper change as explained in the D&N manual. If you have the SYN600 monitor ROM (the one next to the BASIC #1 ROM) follow the instructions per the manual. If you have the SYNMON VI ROM you'll see the jumper going from pad 3 to pad 10. Remove the end at pad 10 and solder it to pad 7. If you want to retain your BASIC-in-ROM capability, make the jumper connection switchable as shown in Figure 1. Be sure to use a connector (Molex type is fine) so you can disconnect your board at any time without having to unsolder any lines. For those of you who have installed Aardvark's CEGMON monitor ROM, no jumpering is necessary, your computer already comes up with D/C/W/M. However, be aware that you can only boot in disk operating systems with BASIC Version 3.0.

DISK CONTROLLER CIRCUIT

Once you get the memory circuits and RAM working, remove the board from your computer and start populating the disk controller circuit. The same precautions about checking your work apply here. Don't forget to make all the required jumpers shown on page 7 of the D&N's manual for the appropriate disk drive that you are installing (there are 4 for a 8" drive and 3 for a 5-1/4" drive).

Timing the disk controller circuit is also explained in the manual. It consists of tying together the separated data, clock, and write data lines on the J3 connector to generate the signals that are then timed with a 10 MHz scope by adjusting the four 10K pots. The procedure is relatively simple and should take no more than ten minutes. We suggest placing Loctite on the pots after setting them to prevent inadvertent movement during handling and use.

DATA CABLE

When you've completed the timing be sure to remove the jumpers and install the 50 conductor (35 for a 5-1/4" drive) flat ribbon data cable if you have one. D&N sells a cable for $65 which plugs right in to the MEM-CM9 board, but with the information they supply you can make one for about $30. We found that the extra $35 spent was worth the time and trouble it would take to build our own cable. The minimum cable length should be 3 feet from end to end.

The data cable can be snaked out between the top and bottom covers of the computer when you close up. If you feel uneasy about doing this, cut the cable about 2 inches past the point at which it exits from the covers. Get a set of mating 50 pin insulation displacement connectors with chassis mounting ears on the male connector (we used an AMP connector which fits nicely in the available space-See Component Sources). Nibble a rectangular hole under the bottom pair of jacks at the back of the computer to accept the connector with the mounting ears. After you fit the connector to the hole, attach it to the end of the data cable coming from the MEM-CM9 board and bolt the connector to the hole from the inside of the computer. Attach the other connector to the free end of the cable and put it aside until you're ready to connect up the drive.

With or without the cable you can now button up your computer by reversing the procedure above and use the RAM you've installed, assuming of course, that you've made the ROM jumper change switchable to retain your BASIC-in-ROM capability. If so, you should come up with 31,999 bytes free in response to the memory prompt after power on, hitting the BREAK key and typing C.

CONSTRUCTION TIPS

There are several errors and omissions in the instructions which may have not yet been corrected:

1) The two 12-pin male Molex connectors (J3) should be installed on the foil side of the board, not the component side as shown on page 14 of the D&N manual. Failure to do so will result in a reversal of pin designations on the disk-drive data cable. Also install a 390 pFd capacitor from pin 5 to pin 12 of the J3 connector.

2) Install the four 12-pin female Molex connectors at J1.

3) For the disk controller, install R62 and R63 in the

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TREK ADVENTURE by Bob Retelle — This one takes place aboard a familiar starship and is a must for trekkies. The problem is a familiar one — The ship is in a "decaying orbit" (the Captain never could learn to park!) and the engines are out (You would think that in all those years, they would have learned to build some that didn't die once a week). Your options are to start the engine, save the ship, get off the ship, or die. Good Luck.

Authors note to players — I wrote this one with a concordance in hand. It is very accurate — and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

CIRCLE WORLD by Bob Anderson — The Alien culture has built a huge world in the shape of a ring circling their sun. They left behind some strange creatures and a lot of advanced technology. Unfortunately, the world is headed for destruction and it is your job to save it before it plunges into the sun!

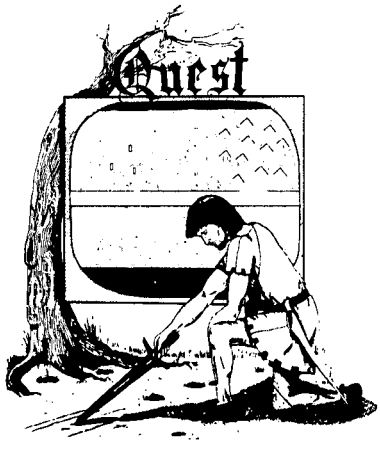
Editors note to players — In keeping with the large scale of Circle World, the author wrote a very large adventure. It has a lot of rooms and a lot of objects in them. It is a very convoluted, very complex adventure. One of our largest. Not available on OSI.

HAUNTED HOUSE by Bob Anderson — This one is for the kids. The house has ghosts, goblins, vampires and treasures — and problems designed for the 8 to 13 year old. This is a real adventure and does require some thinking and problem solving — but only for kids.

Authors note to players—This one was fun to write. The vocabulary and characters were designed for younger players and lots of things happen when they give the computer commands. This one teaches logical thought, mapping skills, and creativity while keeping their interest.

DERELICT by Rodger Olsen and Bob Anderson — For Wealth and Glory, you have to ransack a thousand year old space ship. You'll have to learn to speak their language and operate the machinery they left behind. The hardest problem of all is to live through it.

Authors note to players — This adventure is the new winner in the "Toughest Adventure at Aardvark Sweepstakes". Our most difficult problem in writing the adventure was to keep it logical and realistic. There are no irrational traps and sudden senseless deaths in Derelict. This ship was designed to be perfectly safe for its' builders. It just happens to be deadly to alien invaders like you.



NUCLEAR SUB by Bob Retelle — You start at the bottom of the ocean in a wrecked Nuclear Sub. There is literally no way to go but up. Save the ship, raise her, or get out of her before she blows or start WWIII.

Editors note to players—This was actually plotted by Rodger Olsen, Bob Retelle, and someone you don't know — Three of the nastiest minds in adventure writing. It is devious, wicked, and kills you often. The TRS-80 Color version has nice sound and special effects.

EARTHQUAKE by Bob Anderson and Rodger Olsen — A second kids adventure. You are trapped in a shopping center during an earthquake. There is a way out, but you need help. To save yourself, you have to be a hero and save others first.

Authors note to players — This one feels good. Not only is it designed for the younger set (see note on Haunted House), but it also plays nicely. Instead of killing, you have to save lives to win this one. The player must help others first if he/she is to survive — I like that.

PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

QUEST by Bob Retelle and Rodger Olsen — THIS IS DIFFERENT FROM ALL THE OTHER GAMES OF ADVENTURE!!!! It is played on a computer generated map of Alesia. You lead a small band of adventurers on a mission to conquer the Citadel of Moorlock. You have to build an army and then arm and feed them by combat, bargaining, exploration of ruins and temples, and outright banditry. The game takes 2 to 5 hours to play and is different each time. The TRS-80 Color version has nice visual effects and sound. Not available on OSI. This is the most popular game we have ever published.

MARS by Rodger Olsen — Your ship crashed on the Red Planet and you have to get home. You will have to explore a Martian city, repair your ship and deal with possibly hostile aliens to get home again.

Authors note to players — This is highly recommended as a first adventure. It is in no way simple—playing time normally runs from 30 to 50 hours — but it is constructed in a more "open" manner to let you try out adventuring and get used to the game before you hit the really tough problems.

ADVENTURE WRITING/DEATHSHIP by Rodger Olsen — This is a data sheet showing how we do it. It is about 14 pages of detailed instructions how to write your own adventures. It contains the entire text of Deathship. Data sheet - $3.95. NOTE: Owners of OSI, TRS-80, TRS-80 Color, and Vic 20 computers can also get Deathship on tape for an additional $5.00.

PRICE AND AVAILABILITY:

All adventures are $14.95 on tape except Earthquake and Haunted House which are $9.95. Disk versions are available on OSI and TRS-80 Color for $2.00 additional.

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Xtal circuit and R75 between U75 and U76.

4) On page 13 of the manual C1 should be C7 - printing error.

5) The IRQ jumper must be installed to implement the real-time clock.

6) U73 is necessary for the implementation of 5-1/4" drives.

7) One point worth repeating: Install sockets for ALL chips! Removing an unsocketed chip can be frustrating, if not disasterous, when you don't have the right tools (and sometimes even if you do).

COMPONENT COST AND AVAILABILITY

Checking the latest issues of some of the most popular computer magazines, we found that all of the necessary components (with the exception of the RAM) could be purchased from various supply houses for a total of $71. You'll find that you can get the RAM for as little as $2.60 each if purchased in quantities of 31 pieces or more. A list of the necessary components is shown below so you can get a head start on the project while waiting for delivery of the board should you decide to order it bare.

MEMORY CIRCUIT

QTY	PART
48	2114LS300 RAM
11	470 Ohm 1/4W Resistors
2	8T26 Quad Bus Dvr/Rcvr
11	1K Ohm 1/4W Resistors
3	7404 Hex Inverter
11	4.7K Ohm 1/4W Resistors
3	74LS138 3 to 8 Decoder
24	.1 uFd Capacitors
1	7427 3 Input NOR
6	47 uFd 10V Capacitors
1	74367 Hex Buffer
48	18 Pin Socket
3	7485 4 Bit Magn Comp
9	16 Pin Socket
1	1N914 Diode
4	14 Pin Socket
2	Dip Switch (8 Switches)

DISK CONTROLLER CIRCUIT

QTY	PART
1	6520 OR 6821 PIA
1	6850 ACIA
2	7400 Quad 2 Input NAND
1	7404 Hex Inverter
1	7410 Trip 3 Input NAND
2	7485 4 Bit Magn Comp
1	7493 4 Bit Bin Ctr
2	74123 Dual Rtrg 1 Shot
2	74367 Hex Buffer
3	CD4518 Dual Syn Dec Ctr
1	4.00 MHz Xtal
1	24 Pin Socket
5	14 Pin Socket
1	40 Pin Socket
9	16 Pin Socket
1	30 pFd Cap.
2	150 pFd Cap.
1	360 pFd Cap.
1	1000 pFd Cap.
3	.1 uFd Cap.
1	47 uFd Cap. 10V
1	390 pFd Cap.
4	10K Pot (Bourne 382 type)
9	220 Ohm 1/4W Res.
9	390 Ohm 1/4W Res.
10	470 Ohm 1/4W Res.
4	1K Ohm 1/4W Res.
4	4.7K Ohm 1/4W Res.
1	4.7K Ohm 1/4W Res.(8"Drive)
1	12K Ohm 1/4W Res.(5.25"Drive)

Use low power chips to keep the power consumption to a minimum. If your computer has a secondary 5 VDC supply (most new C4's do), use it to supply the MEM-CM9 board with a separate supply line routed to J2. Otherwise you will need to add a 5VDC supply with a 3 amp minimum rating.

In addition to the above components you will need a 15 to 25 watt soldering iron, resin core solder (22 gauge), a solder sucker, wire strippers, a few inches of wire for jumpers, an ohmmeter, and a 10 MHz scope. An electric drill, a hacksaw and a nibbler is also required to modify the enclosure shelf and panels.

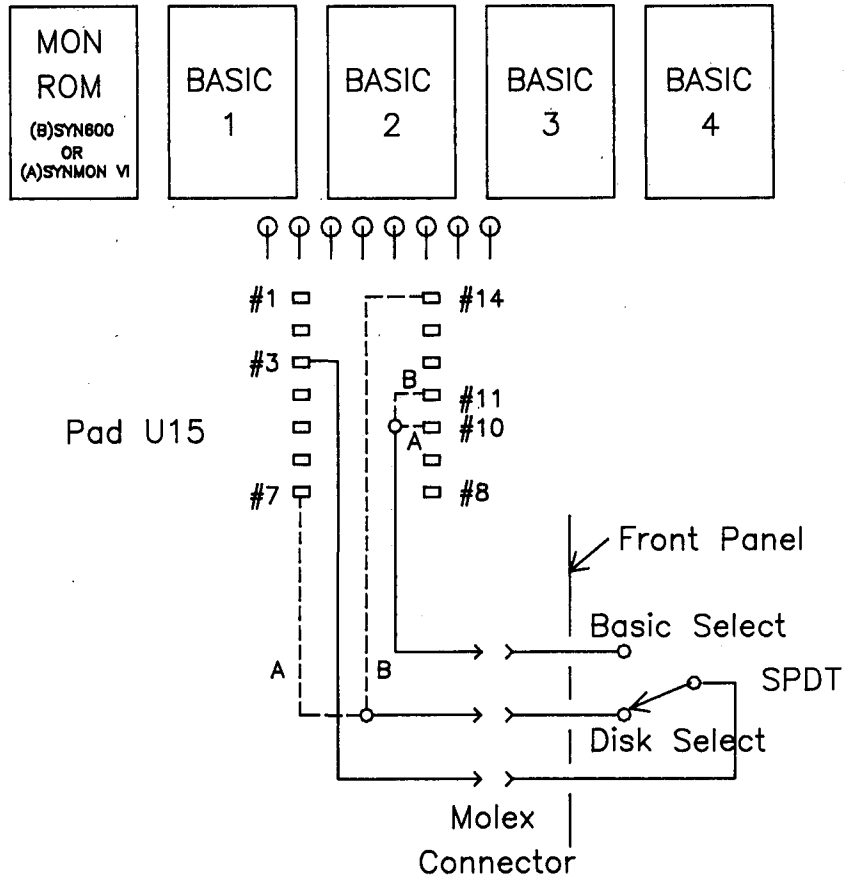
DISK DRIVE CHECKOUT AND SET-UP

The drive is packaged in 2 large pieces of EPS foam enclosed in a heavy-duty container which should have no trouble withstanding the rigors of shipping. If the container is damaged and you can see that the drive is also damaged don't accept delivery and do notify the manufacturer or supplier. Otherwise open the container, remove the drive, the packing material and any restraints. Check all items against the shipping list and inspect the drive for damage. Report all discrepancies and damage to the carrier and supplier and hold the drive for return.

FIGURE 1

Figure 1 - Switchable ROM Jumpers

Pad U15 is shown located under BASIC ROM 2 on the 502 CPU board. If your board has the SYNMON V1 ROM monitor chip, wire the pad as shown by the dotted lines marked A. Otherwise, use the dotted lines marked B for the SYN600 ROM.



If everything is OK, before you do anything else, sit down and read the manual. In it are a few simple tests which will allow you to determine if the mechanical parts of the drive are working correctly. Once you've determined that the drive is mechanically operational you're ready to configure it by making or changing the jumper connections listed in the D&N manual.

The jumper pads are located on the PC board of the drive and labeled generally with upper-case letters (see Figure 2). The location of each jumper is shown in the manual that comes with the drive. If your drive is configured as ours was you should have to make only one change to conform to the jumper set-up in D&N's manual.

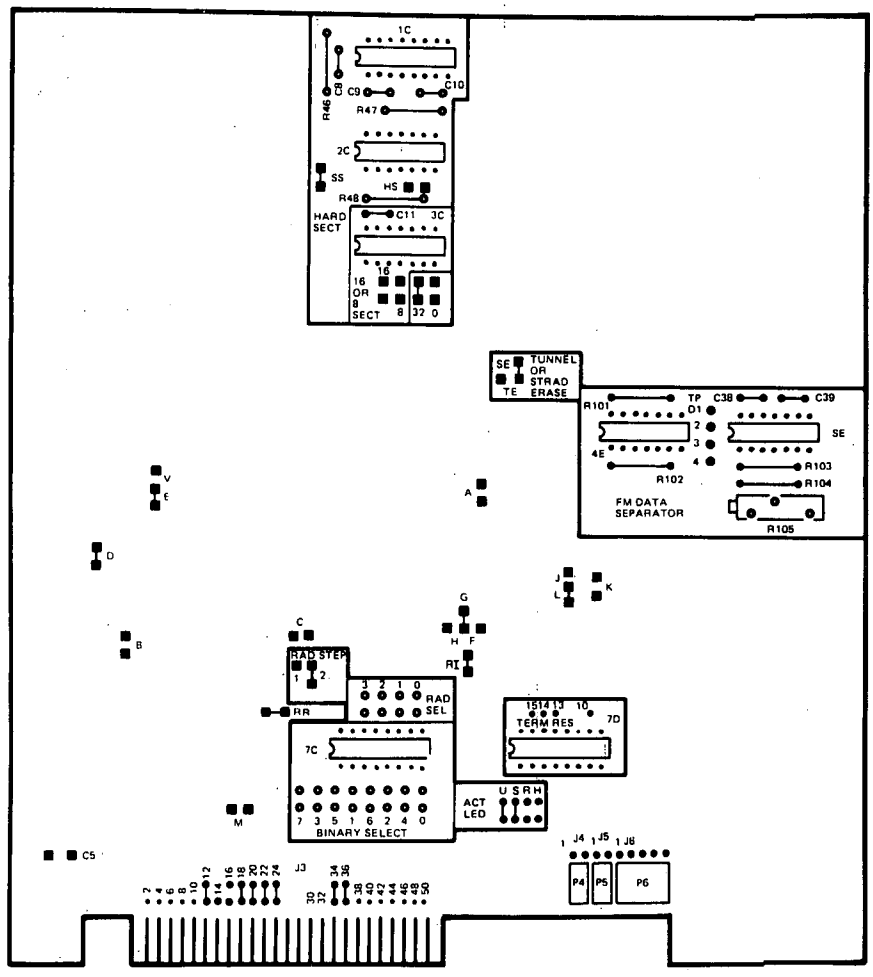
One note of caution when removing a jumper: you can tear the foil if you try to remove both sides of the jumper in a single pull. Heat one of the pads on the PC board and lift the jumper until it just clears the board and then snip the center of the jumper. Proceed to heat each end of the jumper and remove each piece separately.

After the jumper connections are made, you could install the drive in the enclosure. However, it is advisable to first test the drive so that any problems can be corrected without having to remove the drive from the enclosure.

Using 18 guage wire, route the wires to the drive and power supply according to the schematic in Figure 3. Connect the drive to the

Figure 2 - Disk Drive Internal Options

The drive options are implemented by jumpering the pads which are generally marked with capital letters as shown in this diagram. Make jumper changes according to the instructions in the D & N Manual.



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computer with the data cable you have previously prepared. A good connection between the drive and cable can be insured by gently scrubbing the copper foils on the edge connector of the drive's PC board with an ordinary pencil eraser. Check and recheck all power connections to be sure that you are applying the correct voltages to the correct pins (see the Siemens manual). Test all voltages BEFORE you make the final connections.

CONTINUED NEXT MONTH

ACKNOWLEDGEMENTS

The authors wish to thank the following people for their help and advice in preparing this article:

Alan Barrett, Senior Sales Engineer, Siemens Corporation.

J. Barrie Clark, Product Manager, Siemens Corporation.

John Goodman, Principal Engineer, Polaroid Corporation.

Dale Krauskopf, President, D & N Microproducts Corporation.

REFERENCES

1) MEM-CM9 Disk Controller Memory Board Manual, D & N Microproducts.

2) Technical Manuals 1 & 2-Model 100-8D, Siemens Corporation.

3) Sams OSI Servicing Manual for computer boards 502, 505, 527, 540 & 542.

4) OSI Small Systems Journal, September 1977, page 15 (Memory Test).

5) MICRO, January 1981 -(OSI Small Systems Journal-Memory Tests).

6) A Small Operating System: OS65D The Kernal, Compute, January-March 1981.

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FIGURE 3

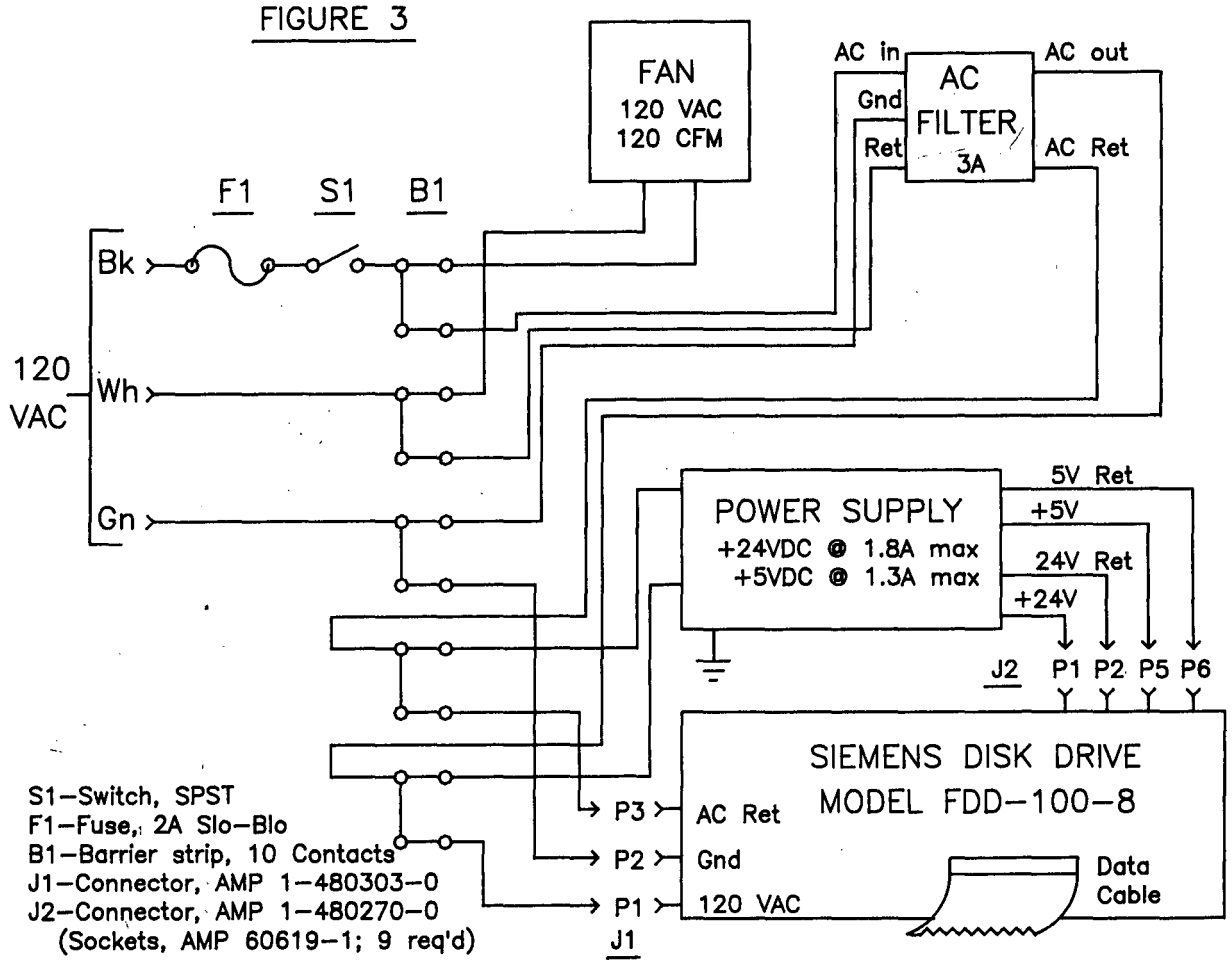


Figure 3 - Disk Drive Wiring Schematic

To add another drive, piggy-back the AC and DC power cables to the corresponding terminals on the barrier strip. The 5 VDC output of the power supply should provide a minimum of 3.0 amps.

OSI 65D V3.3 GUIDE

by Robert S. Baldassano
4045 Ashbrook Circle
San Jose, CA 95124

If you have worked with OSI 65D V3.2 as much as I have, you often wished you had an EDITOR, a FIND command, and of course, PRINT USING. You may have also wished for a screen dump routine for graphics, and other goodies like cursor control. Well, as you know OSI gave us all that with 65D V3.3.

Soooo---When it was released, I rushed out and got a copy. It was a real improvement over V3.2, but I soon found out that my screen dump did not work right, and the dealer I bought it from (Los Angeles) was no help in correcting the problem.

A short time later I noticed an ad in PEEK(65) for an OSI 65D V3.3 guide that promised to fix V3.3 bugs and do other wonderful things as well, all for $14.95 plus $1.00 shipping.

I quickly wrote out a check and sent it to Buffalo Informational Technologies, 209 Richmond Avenue, Buffalo, New York 14222. To my surprise, I had my guide in my hands seven days later.

Well, what did I get for my money? I got 20 sparse but well written pages that not only told me how to fix my screen dump bug, but told me about bugs in BEXEC* that I was not aware of. It also showed me how to make all my versions of 65D more compatible with V3.3. Let's talk about these more in detail, at least to the extent allowed by the copyright laws.

My system is an 8PDF recently upgraded to 48K, so I can only speak for how well the suggested changes worked on my system. I also am a total novice in the area of assembly and machine language, something that speaks highly of the directions, as some changes made were in machine code and as you will see, all worked fairly well.

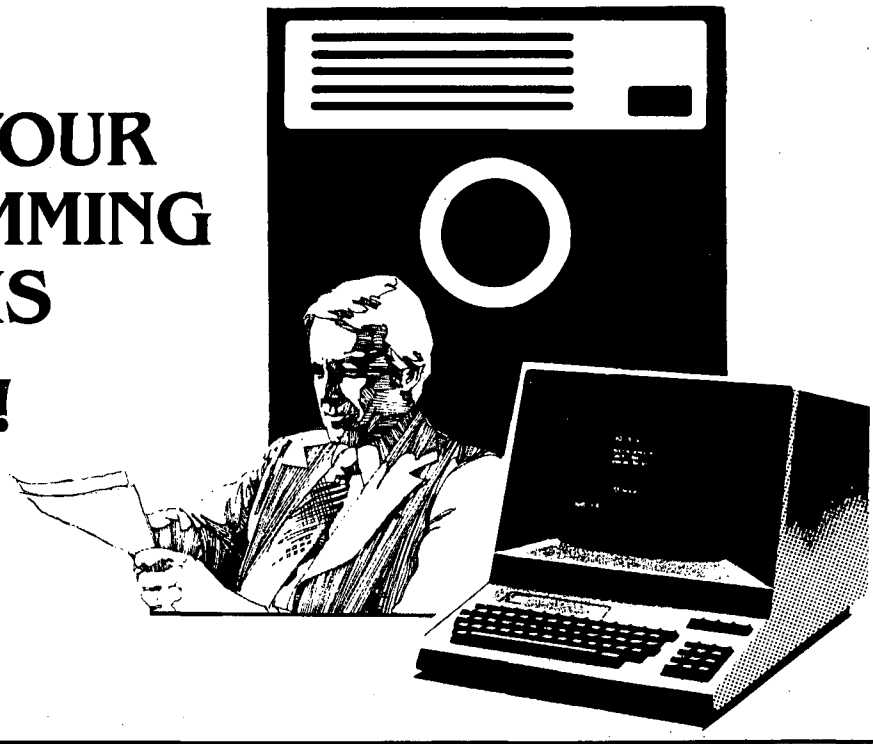
Let's talk about the screen dump first. My version of 65D V3.3 would not dump the 16 medium resolution graphics that my Epson MX-80 would recognize. All I got was either a solid block or a blank, the default mode for the routine! Well Buffalo International Technologies, BIT for short, gives a dump fix for both black and white and color video systems with either 8" or 5" disks. They walk you through the use of the Extended Monitor to make the page of changes required. I cannot speak for the validity of the code, or of its efficiency, but it works on my system without a hitch.

The next area I will cover is changes to BEXEC*. This is a good time to point out that this guide does not just present the fixes, but explains what the program is supposed to do, in a very clear fashion. What is provided here is a fix to a bug in the screen clear call that depends upon which version or 65D V3.x is booted. The proper pokes to initialize the LINE EDITOR only if V3.3 is booted are also provided.

BIT then goes on to tell you how to write video driver commands, and provides a video command conversion chart to use, so that special commands under V3.3 won't make your V3.x choke on syntax errors. This I thought was a nice feature of the guide. The authors also point out some cautions when using machine code with BEXEC*, and some things to watch for when you modify BEXEC*.

Next BIT covered what I'll call "nice to haves". These were in the area of how to modify BEXEC* to leave the directory on the screen and still run or call a program

TACKLE YOUR PROGRAMMING PROBLEMS HEAD ON!



If operating bugs and "unsolvable" coding problems have got you dodging a big project, here's help . . . Quality software products that'll let you tackle those problems and move on to something easier.

At Software Consultants, we know the kinds of problems you often face with OSI gear, so we designed our software accordingly. Most of our products are modifications and/or extensions of OSI packages, but some are complete replacements. All are easily extensible for your own custom applications. We feel they're the finest OSI software products around—and the most reasonably priced.

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A complete, cross reference utility that'll find and list any BASIC line number, variable, or numeric constant. It's available under 65D or 65U and comes on 8" floppies. This one will save your sanity, and cut out hours of wasted time. Yours for $31.95.

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This convenient extension for OS65D V1.2 really spices up your video system with little niceties like 24 separate control codes, horizontal and vertical plotting, and many variable screen parameters. Software extensions are available to connect this with the graphics resolution booster. The routine alone is $25.95, with extensions, $29.95.

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and a directory reformat to three columns instead of one. Here is where they made one minor error. The reformat ran fine on video, but overprinted all lines when output to the printer. A close look at the suggested code quickly showed that they had forgotten a #DV after a PRINT. Once corrected, this routine also worked perfectly.

BIT then explained the contents of track 7 (11 on a 5" disk) and showed how to modify contents so as to retain files improvements gained under V3.3.

The next most important feature of the guide was how to change most of the extended utilities to run under V3.3. For those not familiar with V3.3 OSI has placed a number of utilities on a separate disk with a V3.2 system on it. This was done because some of these utilities use the area reserved for the V3.3 EDITOR. The programs that cannot be run under 65DV3.3 in their normal form are REPACK, RSEQ, DATRAN, and BUFFER. The authors give the required code to make all but REPACK run under 65DV3.3. They all worked perfectly with the exception of the rewritten BUFFER. That program ran perfectly until the end of the program when you desired to disable the BYTE command, and then it hung the computer. The V3.2 version worked fine.

Since this fix required machine code changes, I cannot say what the problem is, but I have brought it to the attention of BIT. I am waiting on an answer, but it is not seven days yet! Obviously these changes make the utilities much easier to use.

The rest of the guide covers such topics as how to modify MDMS to run under V3.3; a patch for a Control X crash problem that my version of V3.3 did not exhibit (supposedly systems with less than 48K); converting V3.X disks to V3.3; how to convert the V3.3 EDITOR for use on V3.X; and a number of other useful ideas and explanations.

If you look back at the beginning of this article, you will find that I said the guide was sparse. But as you can see, it is well written to cover so much in as few pages as it contains. Do I think it's worth the $14.95 cost, and would I buy it again? You bet I would! I am only curious now to see if BIT will be as fast with a fix for the BUFFER bug as they were in sending me the guide in the first place.

★

LETTERS

ED:

I have a C4P DMF with dual 5" drives and 48K. I have OS-65D V3.3, but don't need all its features. The real reason I got it was because of its typewriter keyboard, but I don't like its line editor. The editor back-space doesn't back space consistently.

Do you know of a source for a V3.2 machine code program that will convert the OSI keyboard to typewriter fingering? I want a program that will locate itself at the apparent top of memory, and which will defend itself from other routines that seek out top of memory.

Currently, I have two machine code programs with which I am very well pleased. They are DQ Secretary and AARDVARK machine code Editor. These two programs are compatible if I load the Secretary first followed by the Editor. Now all I need is the keyboard converter, and I will revert to V3.2 and consider myself well served.

Carl M. King
Sarasota, FL.

Carl:

The keyboard in a C4P is a polled keyboard. When a key is struck on the keyboard the monitor software polls the keyboard for a byte of data which is then interpreted by the monitor Software. The monitor determines which key was depressed, writes it to the screen and then acts upon it as required.

To change the "fingering" requires that either the monitor prom program be changed, or that the vectors that point to the routine that interprets which key was pressed, be changed in the monitor prom to point to the new routine. This is all very arduous to say the least.

A quick and dirty way to change the keyboard layout is to change the hardware. What happens, is that when a key is depressed, it connects a Row Address to a Column Address. So by just changing these connections you can change the key from one character to another. For example, to move the Return Key to the Shift/Lock key position on the right side of the keyboard, you would first cut the traces on the keyboard circuit card that go to the Shift/Lock key. Do the same to the Return key. Next, run a wire from the Shift/Lock key to the Traces that you cut away from the Return key. Do the same for the old Return key.

You have just moved the Return key from its original position to the Shift/Lock key position.

However, before attempting any modification, be familiar with your hardware. You can do this by purchasing a Sams Manual for your machine.

Brian Hartson
Asst. Tech. Ed.

* * * * *

ED:

Please extend my thanks to Brian Hartson (PEEK(65) Tech. Ed.) for his letter of April 14th. His letter confirmed that I had all connections to my Heath H-14 printer correct. The printer was still not consistent. I solved the problem, which became obvious, as soon as I got the Sam's Manual from DBMS, INC.

OSI did not supply the required negative voltage to the RS-232 output transistor so that there was no voltage

swing to negative values as stated in the RS-232C standard. The printer now works flawlessly.

I have included information on the problem with the serial interface and how to utilize ATARI joysticks on OSI machines.

PRINTERS AND JOYSTICKS ON OSI

If you are using an OSI 505 board (C4P MF or C8P DF) or perhaps others, 502, 600 etc. you may have problems with the serial interface for D-25 RS-232C port. This standard requires a swing from positive to negative voltage to operate properly. OSI does not supply the negative voltage. Without it the RS232 will not be consistent. Here is what to do on the 505 board.

Cut the ground at W42 and jumper to the -9v at W43 or any other position.

If you are looking for a tough and good joystick for an OSI computer but have limited time and money, here is how to hook ATARI joysticks to a C8P DF OR C4P MF and others. The ATARI joysticks are available from any video game dealer at a reasonable price. These plug directly into the jacks for OSI joysticks. Make the following changes.

1) Inside the joystick, change the wiring so that the lead on pin 1 (TOP) is switched with the lead on pin 8 (common).

2) On the A-15 board where the joystick plugs in jumper pin 5 of J5 to pin 8 of J5 so that Col 2 has both scanned. Do the same for the other joystick and jack.

3) Remove any signs that say ATARI. Here is how the joysticks will read:

JOYSTICK A POKE 57088,128

	ALONE	FIRE ON
TOP	4	20
BOTTOM	1	17
LEFT	2	18
RIGHT	8	24
FIRE	16	

FIRE ADDS 16 TO EACH

JOYSTICK B POKE 57088,16

	ALONE	FIRE ON
TOP	16	48
BOTTOM	128	160
LEFT	8	40
RIGHT	64	96
FIRE	32	

FIRE ADDS 32 TO EACH.

John Markle
Ontario, Canada

* * * * *

ED:

In DMS 9/79 Nucleus, specifically "EDMAFL" there exists a built in provision for a printed audit trail. This audit trail can be switched on by changing line 124 to read F6=K2. Each time a field is edited or updated, DV5 will print DMS EDITOR (DATE) REC#... FIELD:.... OLD ENTRY/ NEW ENTRY unfortunately, I get a disk error after it prints out, in line 1220, which reads 1220 INDEX<K1>= BODF+((RPTR-K1)*RL)+FP(FPTR):P RINT%K1,S$. Does anyone have any ideas on the subject. How to fix this??

Fred Schaeffer
Jamaica, NY.

Fred:

To diagnose further, when you get the disk error, note the error number. Also type:

?BO,RP,RL,FP

to find out what the values are.

Also, since our BASIC only looks at the first two letters of a variable, FP=FPTR, it seems improbable that they would use what amounts to the same variable for field offset and field pointer. Look elsewhere in the program to see if perhaps this is a typo.

Readers, what else should Fred do?

Al

* * * * *

ED:

While re-reading PEEKs (a rewarding practice!), I came upon Harry Suber's means of handling conditional branching (April 1982, pg. 25). I offer another method, no better than Harry's, I am sure, but one which has its own elegance and usefulness.

The branching is determined by a simple binary tree, with a power of 2 as the result when a condition is met. These powers of 2 are summed, and that value is used in a computed GOTO to direct the computer to a statement number.

In the accompanying demon-

stration program, P, Q, and R are given 0 or 1 randomly. The condition to be met is a value greater than 0. A variable can hold anything, and the condition to be met can be anything in a real program, of course. The sum of the powers of 2 is stored in CT. It will be a value ranging from 0 to 2^N-1, where N is the number of variables being evaluated -- from 0 through 7 when there are 3 variables, 0 through 15 when there are 4, and so on. The computed GOTO will furnish statement numbers for 1 through the maximum number, and when CT is 0, the computer will fall through to the statement following.

When you have as many as, say, 6 variables yielding 64 potential conditions, this tree procedure can be a sanity saver.

```
5 DEF FNZ(X)=INT(RND(1)+.5)
10 FORK=1TO10
15 P=FNZ(X):Q=FNZ(X):R=FNZ(X):
                              CT=0
20 IFP)0THENCT=CT+1
30 IFQ)0THENCT=CT+2
40 IFR)0THENCT=CT+4
50 ONCTGOTO91,92,93,94,95,96,97
90 PRINT"90",:GOTO100
91 PRINT"91",:GOTO100
92 PRINT"92",:GOTO100
93 PRINT"93",:GOTO100
94 PRINT"94",:GOTO100
95 PRINT"95",:GOTO100
96 PRINT"96",:GOTO100
97 PRINT"97",
100 PRINTP,Q,R,CT
110 NEXT

OK
```

Ian Morton
Saint Paul, MN.

* * * * *

AD$

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* * * * *

ED:

I would like to take this opportunity to help all of the users of M/A COM OSI 65U V1.42 and Planner Plus V4.01.

I found that the codes listed for Micro-Term Act 5A terminal in CRT 0 were incorrect, and the terminal drivers in Planner Plus did not include Micro-Term.

Here is a listing of "CRT 0" as from the factory, and a corrected list for the ACT 5A. The corrections are in the forward space code, echo, and the address cursor.

Also included is the workable code for "CRT 0" for MIME 340.

You will also find a listing of added data to Planner Plus "PLNFIG", "PASS" for adding ACT 5A and MIME 340 to Planner Plus.

Allen Caise
Caise Computer Systems
Bradley, IL.

INCORRECT CODES THAT ARE ON FACTORY 65U V1.42

```
11:1  TERMINAL NAME MICRO-
      TERM ACT 5A
11:2  IN FORWARD SPACE 030
11:3  IN BACK SPACE 008
11:4  ECHO FORWARD SPACE
      030 000
11:5  ECHO BACK SPACE
      008 000
11:6  ADDRESS CURSOR
      148 000 000 000
11:7  CLEAR SCREEN
      027 096 000
11:8  CLEAR TO END OF SCREEN
      027 075 000
11:9  CLEAR TO END OF LINE
      027 073 000
11:10 FOREGROUND
      027 066 000
11:11 BACKGROUND
      027 067 000
```

CORRECT CODES FOR CRT 0

```
11:2  IN FORWARD SPACE 024
11:4  ECHO FORWARD SPACE
      024 000
11:6  ADDRESS CURSOR
      020 000 000 000
```

CODE FOR PLANNER PLUS V4.01 PROGRAM "PLNFIG","PASS"

```
1800 DATA "Micro Term ACT-5A"
1802 DATA 000,012,000,030,000,001,000,023,000,027,066,000,027,
                                                        067,000
1804 DATA 024,000,008,000,020,000,000,000,000,000,001,023,079
1806 DATA 027,066,000,-1
1820 DATA "Micro Term MIME 340"
1822 DATA 027,000,032,026,000,076,000,085,000,086,000,044,000
1824 DATA 045,000,032,012,000,032,008,000,061,000
1826 DATA 000,000,032,032,001,023,079,000,-1
```

ED:

Comment on Mr Dripp's article in June/July issue of PEEK(65).

Your Single Copy Utility program does indeed require slight adjustment when used with a drive modified for head load/unload. As we suspected, the head unloads and is not re-loaded when the time comes to read/write the track to memory, thus producing the dreaded "ERR 9". Calling the "LDHEAD" routine (At $2754) just prior to a read takes care of the problem.

After my second conversation with you, I discovered that calling "LDHEAD" also requires that you call "UNLOAD" (At $2761) after the read/write, otherwise the system loses track of the head location and the program crashes on the second Go-Round.

To complete the 'fix', add the following lines to the source and re-assemble:

```
4005  JSR LDHEAD
4015  JSR UNLOAD
4485  JSR LDHEAD
4495  JSR UNLOAD
```

Again, thanks for a much needed and well written program, and for your help in debugging this program.

Mac Allison
Eugene, OR.

* * * * *

ED:

Talking about Bill Fast's question on music programs (April '82, p.17). Sept. 1977 Byte Magazine, p.72, has a program (Assembler Type) that plays 4 part music. I found it interesting to adapt to my C4P, Basic in ROM machine. It uses the DAC output producing 4 parts by timesharing. The shape of the waveform, thence the quality of the tones, can be adjusted but not attach and decay. Therefore, the music comes out rather mechanical.

Gerald VanHorn
Junction City, OR.

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