PEEK (65)

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INSIDE

Column One

Jingle bells! Jingle bells! Hey! Wait a minute! It's not even Thanksgiving time yet. Maybe we are just old fashioned, but it is hard to get into the spirit when the leaves are still falling.

But never mind. Santa and the elves have been busy putting together just the kind of issue that you can snuggle up by the fire with - providing that you don't take your thinking cap off. This issue is full of thought provoking topics, not to mention the continued listings of available software and the annual index.

Jim McConkey gives us some practical insight into HEXDOS with his DIR programs. Leo Jankowski dives headlong into the art of debugging and testing in his Beginner's Corner. Needless to say, his principles apply to all available languages and any programmer (beginner through Santa).

Now if you really want to think, curl up with Steve Gale's follow-up on the Great Language Debate, or Part I of Rick Trethewey's explanation of OS-65U. Steve Gale is the first to respond to Roy Agee's thought provoking series of articles. Two holly leaves and a snow flake for you Steve! We sure hope that there will be more responses of the same caliber. As for Rick, I can see him now, Ho! Ho! Ho! and a twinkle in his eye. Here's a died in the wool 65-D resident expert who found 65-U, rejoiced and is now sharing its wonders through those 65-D eyes.

So you think that you have D and U under your belt. Well, here comes DB-65E. Wazzat? Thanks to Art Hughes, the wizzard of DBI, we delve into the world of operating environments as he begins, in part I, to explain this new yet compatible release. Stay tuned. There is more coming after your yule log has burned down.

OSI has pulled the wraps off their Christmas present - the 712. What we hear about, what you cannot see in their ad, should make this new addition a very viable member of the OSI family. Watch "Manufacturer's Corner" next month.

Elf Earl (Morris) advises that we need more "feedback" on articles and letters, and he is right. So, just get out your WP, and let us hear from you. In that same vein, Earl points out that the response to your Want List of Articles has been very helpful, but needs up-dating and repeating. So, even if your WP is a little hung over, it should still be able to manage a short note telling us again what types of articles you would like to see or what areas you feel need clarification or explanation.

It's time to be making your New Year's resolution list. We have a special request for dealers and business users. Please use a little of your holiday time to write us about your business applications, since we regularly are asked about business installations and the unusual tasks these machines are capable of performing.

Just to show that it is not all take and no give, PEEK (thanks to Paul Chidley) has a present for C4/8P 48k users. Paul's OSI-CALC is now available through PEEK. It is a full feature spreadsheet using 26 columns by 36 rows interactively on-line. The 30+ copies in circulation are all in BASIC (easy modification and comprehension), and we understand that someone has it running on a C1P. The best part is that it is only $10 plus P&H for either 5" or 8". Next month, watch for the TOSIE Floppy Paddle Board!

There is nothing like sitting down and writing about Christmas (well, sort of) to get one in the spirit. And now that I am, on behalf of the rest of the PEEK staff (that's Karin and Ginny), have a Merry Christmas filled with computing delights and a productive program filled New Year.

HEXDOS UTILITIES

By: Jim McConkey
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Here are a couple of HEXDOS utilities which may come in handy. The program in Listing 1 is an adaptation of the utility supplied with HEXDOS which prints a directory and asks for a program to run. It is normally made to autorun on boot. This adaptation prints the directory in alphabetical order. It also uses an unusual technique to cut down on string manipulations so that the infamous garbage collector doesn't send the machine to never never land. Instead, on concatenating letters retrieved from the directory to form file names, the ASCII values are POKEd into a string defined in line 0. This way, a single string can be reused. Note that since HEXDOS allows file names of up to 255 characters, the 60+ characters A$ in line 0 will not handle all possible file names. I have never found this to be a problem since no one wants to type such long file names anyway. Line 10 sets up logical file 5 to read the directory file, while lines 20-60 get the file names. Lines 130-300 sort the directory alphabetically.

Listing 2 is a program that will list the directory of an OS65D disk. It is much the same as the previous utility, except the directory read is different. The directory read was adapted from the OS65D READER program presented by Steve Hendrix in PEEK(65) Apr. 1983 page 2. Line 0 is a machine code subroutine and should be entered first using the monitor. The hex dump published in '83 is duplicated here for your convenience. After entering the subroutine, do a warm start and enter the rest of the program. On

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LISTING 1

```
0 A$="
1 PRINTCHR$(3):PRINT"<<<<< DIRECTORY >>>>>":PRINT
10 RESTORE:DATA0,16,0,24,1,2,0,0:FORI=574TO581:READT:POKEI,T:NEXTI
15 DIM N$(40):N=1
20 P=USR(5)+USR(5):IFP=.THENN=N-2:GOTO130
30 T=USR(5)+256*USR(5):S=2825
40 A=USR(5):IFA().THENPOKES,A:S=S+1:GOTO40
50 IFT<2THEN20
60 N$(N)=LEFT$(A$,S-2825):N=N+1:GOTO20
130 L=(2^(LOG(N)/LOG(2)))-1
140 L=INT(L/2):IFL<1THEN300
160 FORJ=1TOL:FORK=J+LTONSTEPL:I=K:T$=N$(I)
200 IFN$(I-L)<T$THEN230
220 N$(I)=N$(I-L):I=I-L:IFI>LTHEN200
230 N$(I)=T$:NEXTK:NEXTJ:GOTO140
300 FORI=1TON:PRINTN$(I):NEXT
310 PRINT:INPUT"SELECTION";S$:RUN$
```

LISTING 2

```
0 REM (THIS WILL CONTAIN A MACHINE CODE SUBROUTINE)
1 P$="        ":P=PEEK(123)+256*PEEK(124)+3
2 BP=PEEK(124)+1-(PEEK(123)>128)
3 REM
4 REM OS65D DIRECTORY BY JIM MCCONKEY ADAPTED FROM:
5 REM OS65D READER BY  STEVE HENDRIX, FROM APR 1983 PEEK(65), PP2-5
6 REM
9 PRINTCHR$(3):PRINT"   OS65D DIRECTORY":PRINT"   ----- ---------"
10 PRINT:PRINT
15 NL=LEN(FL$)
20 FL$=LEFT$(FL$+"        ",6)
30 POKE240,6:POKE241,11
40 PRINT:PRINT"INSERT OS65D DISK"
50 PRINT"AND PRESS RETURN"
60 IFUSR(0)<>13THEN60
65 PRINT:PRINT
70 T=USR(-7)12,1,BP*256:IFT<>1THENPRINT"ERROR IN DIRECTORY":END
80 T=USR(-7)12,2,(BP+1)*256:IFT<>1THENPRINT"ERROR IN DIRECTORY":END
90 FORI=BP*256TOI+511STEP8
92 POKEP,IAND255:POKEP+1,I/256
100 IFLEFT$(P$,6)="000000"THENEND
110 PRINT P$;:FT=PEEK(I+6):LT=PEEK(I+7)
120 PRINT10*INT(FT/16)+FT-10*INT(FT/16);
130 PRINT10*INT(LT/16)+LT-10*INT(LT/16)
140 NEXT
```

```
.T@B00,@B9F
@B00> 00 9E 0B 00 00 8E 20 A5
@B08> 06 8D FD 02 20 01 AC 20
@B10> A5 06 8D FE 02 20 01 AC
@B18> 20 A5 06 85 AD A5 AE 85
@B20> AE AD FD 02 C9 1E 90 04
@B28> 69 11 90 0E C9 14 90 04
@B30> 69 0B 90 06 C9 0A 90 02
@B38> 69 05 8D FF 02 A9 FF 85
@B40> E6 AD FD 02 20 F3 04 E6
@B48> E6 20 9C FC C9 43 D0 F9
@B50> 20 9C FC C9 57 D0 F5 20
@B58> 9C FC CD FF 02 F0 03 4C
@B60> 58 05 20 9C FC C9 76 D0
@B68> F9 20 9C FC CD FE 02 F0
@B70> 12 20 9C FC A8 A2 01 CA
@B78> 20 9C FC CA D0 FA 88 D0
@B80> FB F0 DF 20 9C FC 48 AA
@B88> A0 01 88 20 9C FC 91 AD
@B90> C8 D0 F8 E6 AE CA D0 F9
@B98> 68 A8 4C D0 AF 00 00 00
```

LISTING 3

```
 0 A$="
 1 PRINTCHR$(3):PRINT"<<< DISK DIFFERENCE >>>":PRINT:PRINT
 2 EL=PEEK(133):EH=PEEK(134):TL=EL:TH=EH-8:POKE134,TH
 5 PRINT"Insert disk A & (CR)";:POKE240,0:POKE241,253:X=USR(-7):PRINT:PRINT
10 RESTORE:DATA1,2,0,0:FORI=576TO581:READT:POKEI,T:NEXTI
11 POKE574,TL:POKE575,EH:POKE576,TL:POKE577,TH
15 DIMN$(40,1),T(40,1):NA=0:NB=0
20 P=USR(5)+USR(5):IFP=.THEN100
40 T=USR(5)+256*USR(5):S=2825
60 A=USR(5):IFA().THENPOKES,A:S=S+1:GOTO60
70 IFT<2THEN20
80 N$(NA,0)=LEFT$(A$,S-2825):T(NA,0)=T:NA=NA+1:GOTO20
100 PRINT"Insert disk B & (CR)";:POKE240,0:POKE241,253:X=USR(-7):PRINT:PRINT
105 PRINT
110 RESTORE:DATA1,2,0,0:FORI=576TO581:READT:POKEI,T:NEXT
111 POKE574,TL:POKE575,EH:POKE576,TL:POKE577,TH
120 P=USR(5)+USR(5):IFP=.THEN200
140 T=USR(5)+256*USR(5):S=2825
160 A=USR(5):IFA().THENPOKES,A:S=S+1:GOTO160
170 IFT<2THEN120
180 N$(NB,1)=LEFT$(A$,S-2825):T(NB,1)=T:NB=NB+1:GOTO120
200 NA=NA-2:NB=NB-2
210 FORI=0TONA:T(I,0)=T(I+1,0)-T(I,0):NEXT
220 FORI=0TONB:T(I,1)=T(I+1,1)-T(I,1):NEXT
300 PRINT"On disk A but not on B:":PRINT
310 FORI=0TONA:F=0:FORJ=0TONB
320 IFN$(I,0)=N$(J,1)ANDT(I,0)=T(J,1)THENF=-1:J=NB+1
330 NEXTJ:IFNOTFTHENPRINTT(I,0);" ";N$(I,0)
340 NEXTI:PRINT
```

Continued

```
400 PRINT"On disk B but not on A:":PRINT
410 FORI=0TONB:F=0:FORJ=0TONA
420 IFN$(I,1)=N$(J,0)ANDT(I,1)=T(J,0)THENF=-1:J=NA+1
430 NEXTJ:IFNOTFTHENPRINTT(I,1)" ";N$(I,1)
440 NEXTI:PRINT
450 POKE 134,EH:POKE133,EL
500 PRINT:PRINT"DIFF COMPLETE":CLEAR
1000 REM DISK DIFFERENCE by Jim McConkey
1010 REM Inspired by a CPU,Inc CP/M utility
1020 REM This utility  is hereby released to  the public domain.
```

listing, line 0 will look like a REM followed by all sorts of strange stuff.

Listing 3 is a disk compare utility inspired by a CPU, Inc. utility for CP/M. It compares the names and sizes of the files on two disks and lists the differences, if any. This is especially useful for checking backups. (What, you don't backup? Shame on you!) The file name reading is the same as for the first utility, but it is done twice.

Now I have an appeal. Does anyone know the current status of the HEXDOS user's library? I have been trying to get a copy of the public domain Tiny Compiler for HEXDOS, but my letters to the user's library go unanswered. If the library still exists, please let us know your whereabouts. In any case, if anyone has a copy of the Tiny Compiler, I would like to hear from you. Thanks!

★

BEGINNER'S CORNER

By: L. Z. Jankowski
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New Zealand

DEBUGGING & TESTING OF PROGRAMS

Part 1

Debugging can be the most painful part of programming. Much of the mental anguish is caused by attempts to debug a program that was written without a prior plan. The two tasks of solving a problem and writing code must be kept separate. Mix the two together and debugging becomes a nightmare.

HAVE A PLAN

If a program was written from a plan, and the program algorithm was formed away from the keyboard, then the Golden Rule of debugging can be usefully applied. When the Bug strikes ask the question: "What is this segment of code supposed to do?"

Aha! Look at the plan. If the plan is wrong, then change it, then change the program. Separating the two tasks and then completing them in the right order saves time!

Try this program:

```
10 Y=1 : A$="Whodunnit"
20 PRINT Y A$
```

No output! The syntax looks OK. What was the plan? It was, output the value of "Y" and then the value of "A$". Actual output was nothing at all. Why? Well, BASIC ignores blanks and so the program printed the value of "YA$": null. Correct the program by inserting a ";" or a "," between "Y" and "A$".

★

DESK-CHECK

A most annoying bug is when a variable persists in holding the wrong value. For example, to function correctly a program requires that "Y" must equal "2". But "Y" stubbornly persists in holding some other value. A great deal of debugging is done and now "Y=3". Aaargh!

First question, is "Y" a constant or a variable? If it's a constant, it should be declared with all the other constants at the start of the program. If not, where does "Y" take its first non-zero value? If a variable has a definite starting point, e.g., "Y=2", then its value could be observed each time it was used by the program - a "desk-check". A solid desk-check is always a worthwhile exercise if the bug is not found almost immediately. (Yup, it involves that simple word-processor - pencil and paper!)

A desk-check can be made in two ways; either forwards, from the beginning of the program or block of code, or alternatively, it is possible to work backwards from a point in the program and try to reason out why that point was reached! In either case, the programmer should be clear about what the code should be doing and compare that with what the code actually does. What causes program output to be different from the programmer's expectation?

GLOBAL & LOCAL VARIABLES

Let's get back to that variable that should be equal to 2, but persists in equaling 3. If the program is of the long spaghetti variety and the variable is global (used all over the program) then a desk-check of the program becomes a labyrinthian task. On the other hand, if the program is written in blocks, each block with only one entry and one exit, then there are fewer paths to trace between pieces of code and the bug is considerably easier to find.

The bug search becomes positively easy if the variable is local. A local variable or constant is one that is used in only one part of a program (block), and in no other. An additional advantage is that if an error does occur within a block, it will be prevented from spreading to code elsewhere.

Global variables are best limited to counting in FOR ... NEXT loops, in Input/Output routines and for other short and simple tasks.

SPEED

Extensive use of local variables could possibly affect program speed. A way round the problem is to first check if the program is running detrimentally slow ("trace" the program). If that is the case, discover the slow code and declare its variables before any others. As a last resort, when the program finally works, duplicate the use of variable names across several program blocks, thereby reducing the number of variables in the program and so speeding it up.

Program speed can often be gained with "clever" programming. Such code tends to be complex and it becomes inpenetrable with the passage of time. Keep it simple, keep it readable.

PROBLEM SOLVING

See Beginner's Corner April '85 issue.

Some debugging sessions end in frustration - the bug is intractable and no solution is forthcoming. At the very least though, a theory should have been tested and some information gained.

OK, that dangerous stage has been reached where you're thinking of giving up programming. The first thing to do is to have a rest. Next, review the problem solving techniques being employed. Is the problem properly understood? Has this problem been struck before, or one like it, and how was it solved? Does sufficient information exist about the problem?

If analysis of the code does not reveal the bug, then more information is required. Striking a balance between analysis and information gathering is part of the programmer's art.

SPIES

If the value of a variable is in question, or if just more information is required about what the program is doing, then use a "spy". This is simply an extra line inserted at an appropriate point in the program, thus:

```
100 PRINT Y CHR$(13);:
    REM Carriage Return but no
    Line-feed
```

The "CHR$(13);" stops the screen from scrolling.

Another way to examine the value of "Y" would be to stop the program with a CTRL-C (hold the "CTRL" key down and presss "C"), and then "spy" from Immediate Mode with a "PRINT Y". Follow this with "CONT" to continue the program.

DUMP

More than one variable value can be printed out of course. A dump of all variable values provides a complete description of the program at a particular point. Unfortunately, because the description is total, it tends to be very lengthy.

If you are running "HOOKS" (PEEK(65) Dec '83) then the command "VIEW" will dump the values of all variables, but not arrays. Dump array values from Immediate Mode with a FOR...NEXT loop, e.g.:

```
FOR C=1 TO 100: PRINT N$(C)
    " ";: NEXT
```

A printout of the program is, of course, extremely useful. A dump to the printer of selected program output is also invaluable, as well as a printout of information provided by "spies".

STOP THE PROGRAM

Using CTRL-C to stop a program is something of a hit and miss affair. It is at its most useful if the program wanders off and becomes stuck in an infinite loop, e.g.:

```
10 PRINT "Wombat" :GOTO 10
```

Complete precision is achieved with the BASIC word "STOP". The program halts precisely where required. For example, after line 90:

```
90 a line of BASIC

100 STOP
```

"STOP" can be made conditional by making it part of an "IF...THEN" statement. Variable values can now be examined in Immediate Mode by using "PRINT Y" etc. It is worth remembering that "VIEW" can also be used as part of a BASIC program, e.g.:

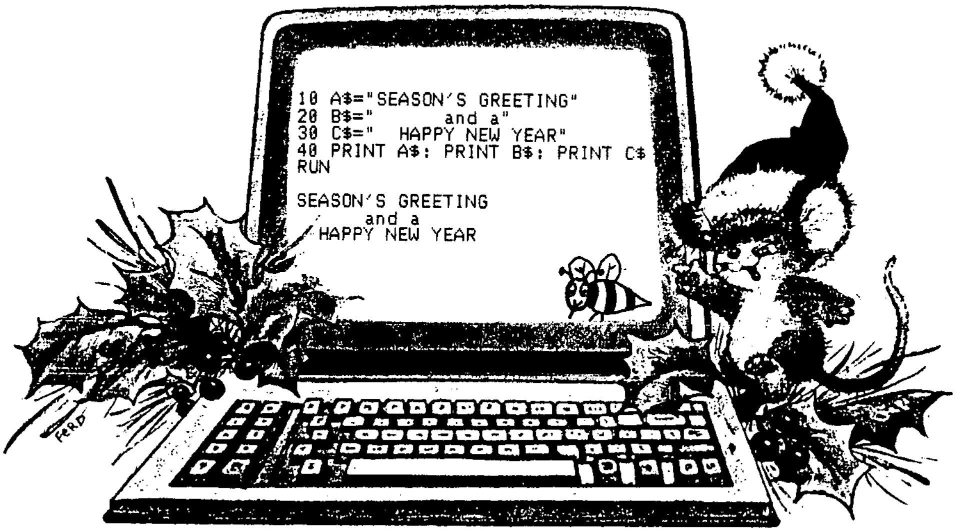
```
110 VIEW
```

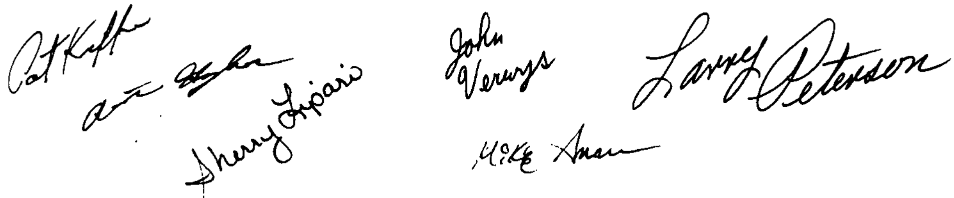
TRAP

It is possible to force errors into a program. For example, this line is part of a program:

```
100 N(V,Y)=N(V,Y)/D
```

From our terminal to your terminal!





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The program is tested by forcing D to equal zero when the program reaches line 100. BASIC will then respond with the error message "/0 ERROR" - "division by zero error". The error has been "trapped". It is a simple matter to now debug the program by inserting the line:

90 IF D=0 THEN 110

The "trap" technique can be used to simply test code or to gather information on how the program behaves. To use "trap", start by making a prediction on how the program will respond to the introduction of the deliberate error condition. Next, amend the program and run it. Compare the outcome with the prediction. Often there is an indication of what the program will NOT do as well as what it does do. The "trap" has another advantage. It is an excellent way of discovering how a programming language works, what it can and cannot do.

Next month, part two.

★

THE GREAT LANGUAGE DEBATE REVISITED

By: Steven M. Gale
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INTRODUCTION

As a student of Computer Science and a Pascal Tutor at Carnegie-Mellon University and a Data Processing Manager for a small business, I read with interest Mr. Agee's, "Great Language Debate" (PEEK(65) September, 1985). Many people, especially people who learned about computers with BASIC or FORTRAN as the only languages available, don't understand why "structured programming" is good, what it entails, and why it's here to stay. After I make a crude attempt to explain these things, I'll show how we've added some structure to our 65U applications.

WHAT STRUCTURE IS ALL ABOUT

It has been found that the most expensive part of developing software is changing it to meet the changing requirements, and maintaining it for years after the original program was written. "Structured programming" is an attempt to make changes and maintenance easy. Some of the following techniques are used: logical algorithmic break-down, logical data break-down, data protection, and formatting for easy human consumption.

By logical algorithmic break-down, I mean general problem solving by stepwise refinement. That is, you solve a problem by breaking it into separate problems and solving them similarly. To support this, a language should have some sort of sub-program structure (like subroutines). BASIC does.

Logical data break-down is similar to its algorithmic brother. Every program uses data, and this data should be organized into logical structures. This is usually done with "data types". (A "type" is the range of possible values a variable can have.) BASIC has some troubles here. It can group things of the same simple type together (arrays). It cannot group things of different types together (records). BASIC does not support the dynamic allocation of variables, so many data structures (like trees) are hard to implement without a lot of wasted space. Also, BASIC doesn't support enumerated types, i.e., TYPE MONTH = (Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec).

A common bug is when one subroutine accidentally modifies data it had no business modifying. This problem can be minimized by variable "scoping" (data protection). This means that a routine can only modify its own variables, or those explicitly "passed" from another routine (the variables passed are called "parameters"). This feature helps both data and algorithmic break-down. Break-down is the separation of things into parts, and data protection makes it possible to isolate (separate) data from data and code (that handles some data) from code (that handles other data). BASIC has no such feature. The best you can do is use variable naming conventions, but this restricts readability, and is error prone.

Formatting for easy human consumption involves many things. Identifiers (names of variables, subroutines, constants, types, etc.) should be meaningful. "GOSUB SORT" is better than "GOSUB 1024". The control structures: sequential execution, IF-ELSE, and WHILE neaten code by making it logical. It has been proven that you can write any program using these instead of GOTO. Since there are no GOTOs, no line numbers are needed. I have a hard time thinking of things less human consumable than line numbers. Proper indenting and commenting are also necessary. BASIC is weak on all of these counts. It even discourages indenting and commenting for speed reasons. It's possible to try to simulate the control structures, but this is still pretty messy.

Pascal-like languages are here to stay for technological and economical reasons. It is more economical to develop software in a Pascal-like language because updating and maintaining is easier. If you can do it for less, why not? Pascal was less popular than BASIC in the early micro community because BASIC can run on a smaller machine. Now that technology has made more powerful machines cheap, it's hard to find a new business computer that doesn't have a Pascal compiler available. It is true that there are a lot of machines running BASIC out there, but the numbers will become proportionately less and less as old machines are replaced by new ones, and new software is developed in Pascal. The European scientific and business community has been using Pascal-like languages for over 15 years. Limited application outside the classroom? They don't seem to think so.

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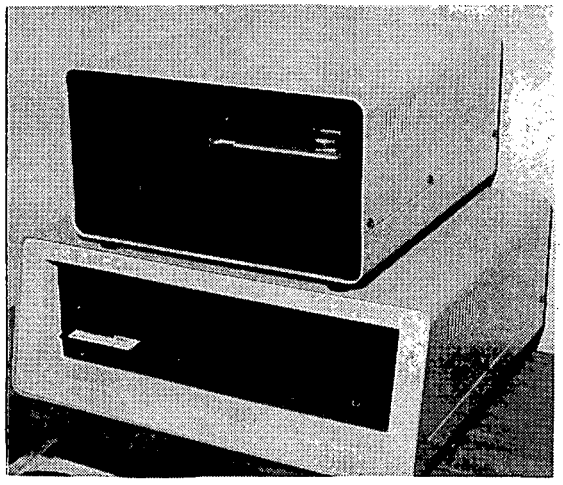

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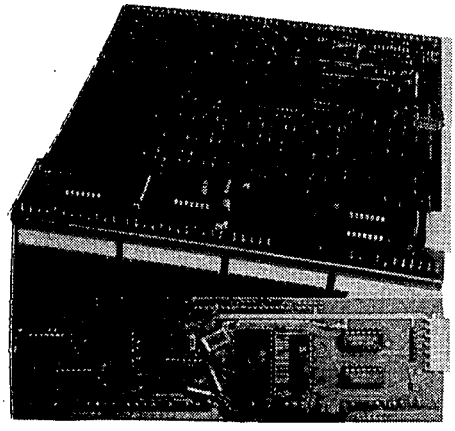

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software, since there were no packages on the market (for any machine) that would suit our needs. We bought about $2000 of commercial software anyway to try to limit the amount of development needed. All of the software we bought for the OSI (except RESEQ) was so poorly written that it was unusable, so it's a good thing we weren't counting on outside help. The main problem with developing software was the fact that BASIC was our only choice if we wanted time-sharing. The solution was to write a preprocessor for BASIC, which we called GASP (Gale's BI-RITE Structured Programming) and a set of text file utilities so text could be manipulated easily. Most programs were written with our in-house editor (JEDIT) and then compiled by GASP into compacted BASIC for fast execution. The main problem with this is the fact that the compiler is slow (compilers that are written in interpreted BASIC can't be expected to run fast).

Except for the lack of line numbers and the use of user-defined labels, any BASIC statement written using standard 65U BASIC syntax can be used in GASP. In addition, GASP recognizes structured programming keywords differentiated from BASIC statements by using an ampersand ("&") as the first character. It supports the IF, IF-ELSE, and WHILE constructs. All three can operate on a single statement or on a block of statements (grouped together with DO-END). Since it's compiled, it's okay to have lots of comments and blank lines. Putting one statement on a line also helps readability (the compiler puts as many statements on a line in the object file as it can to improve speed). It is now possible to achieve a degree of readability not possible in the best BASIC programs.

GASP doesn't add any scoping or data break-down facilities. To try to prevent as many bugs as possible, we have some (admittedly loosely enforced) naming conventions. Data is grouped into (imaginary) records. The fields of these records have the same names from program to program. There is a table of variables at the beginning of every program. Before using a new variable, you add it to the table. This helps eliminate variable naming conflicts. We try to pick meaningful variable names, but GASP doesn't process them so they must be compatible with BASIC. No keywords can be sub-strings of variable names. Changing an "O" (oh) to a "Ø" (zero) often helps. These tricks help, but the deficiencies of BASIC are not eliminated.

AN EXAMPLE

I have included the source and object code of a little program that compares files (see Listings 1 and 2). Remember that WHILE, IF, and IF-ELSE operate on single instructions. A DO-END pair groups many instructions together so they are treated as one. The label MAIN is used for clarity. Since there are no calls to MAIN, the label could be removed. Note that all of BASIC's commands are still valid (I often use the BASIC IF).

It's fun to compare the source code with the object that the compiler produces. The object code is not as efficient as it could be, but it's pretty good. I thought about adding variable scoping, long variable names, and an optimizer, but I don't really have the time...

Continued on page 17.

```
REM    COMPARE UTILITY
REM    By Steven M. Gale
REM    Created: 8/12/85
REM    Update:  8/12/85  5:00pm


REM   This program will compare 2 text files and show the lines
REM that are different.  One file is considered to be the
REM "control", and one the "test".  The computer goes down line
REM by line in each file until they don't match.  If there is a
REM number at the beginning of both lines, then the pointer to the
REM file with the smaller line number is moved to the next line.
REM If there are no line numbers, the "test" file pointer is moved
REM to the next line.  It is assumed that both files end with a
REM line ONLY containing "OK".


REM    *** VARIABLE TABLE ***
REM  CCOUNT       control line count
REM  CFILE$       control file name
REM  CLINE$       control file: last line read
REM  CPASS$       control file pass
REM  DV           output device number
REM  TCOUNT       test line count
REM  TFILE$       test file name
REM  TLINE$       test file: last line read
REM  TPASS$       test file pass


REM    The main routine calls INIT, then loops through both files
REM until one get an end-of-file marker.  Then it outputs the number
REM of lines and bytes in each file.

&MAIN
   GOSUB &INIT
   &WHILE (CLINE$ <> "OK" AND TLINE$ <> "OK")
      &DO
         &IF (CLINE$ = TLINE$)
            GOSUB &MOVE-BOTH-FILES-1-LINE
         &ELSE
            GOSUB &MOVE-DOWN-1-FILE-1-LINE
      &END

   PRINT #DV
   PRINT #DV, "Compare complete."
   PRINT #DV, "Control file:" CCOUNT "lines, " INDEX(1) "bytes."
   PRINT #DV, "Test file:" TCOUNT "lines, " INDEX(2) "bytes."
   CLOSE
END
```

```
REM    This routine is called when the files are in synch.  It moves
REM both files to the next line.  It doesn't read past an end-of-file
REM marker.


&MOVE-BOTH-FILES-1-LINE
   &IF (CLINE$ <> "OK")
      &DO
         INPUT %1, [72, "A"] CLINE$
         CCOUNT = CCOUNT + 1
      &END
   &IF (TLINE$ <> "OK")
      &DO
         INPUT %2, [72, "A"] TLINE$
         TCOUNT = TCOUNT + 1
      &END
RETURN



REM    This is called when the files are not in synch.  It outputs
REM line count and the last line read from both files.  Then it:
REM If the "test" line has a greater line number, then the "control"
REM file is read. Otherwise, (ie: "control" line number is bigger or
REM there are no line numbers) the "test" file is read.


&MOVE-DOWN-1-FILE-1-LINE
   PRINT #DV
   PRINT #DV, "C" CCOUNT; CLINE$
   PRINT #DV, "T" TCOUNT; TLINE$
   &IF (VAL(TLINE$) > VAL(CLINE$))
      &DO
         INPUT %1, [72,"A"] CLINE$
         CCOUNT = CCOUNT + 1
      &END
   &ELSE
      &DO
         INPUT %2, [72,"A"] TLINE$
         TCOUNT = TCOUNT + 1
      &END
RETURN
```

Listings continued on page 17.

SOFTWARE LISTING 1985

EXPLANATION OF LISTING CODES

BASIC Version No./
Minimum computer/
1=SB,SBII,C1P,C2/4P
4=C4P
8=C8P
O=C2/3OEM
D=C2/3-D
2=C200,C3A/B
3=C300

Minimum Storage required/
C=Cassette
5=5 1/4" MF
8=8"FD
7=CD-7
2=CD-20/23/28/30/36/74/
digit following indicates number of devices required.

Systems Supported/
S=Single User
M=Multi-User
H=Hard Disk
R=Record Locking
record lock assumes multi-user. Two may be specified.

Software Support by/
D=Dealer
P=Phone
M=Modem
N=None
O=Other

Sold by/
A=Author
D=Dealer
M=Mail order
O=Other

Copies in Circulation/
No. multiplied by 10, i.e.
1=Less than 11
11=100-110

Price/
Dollars only, no cents, tax, shipping, etc.

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That said, we hope that this listing will prove useful to our readers, dispel the belief that "there isn't any software out there."

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CP/M*UTILITY*SERIAL
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NEWPORT BEACH, CA 92663

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TAX II
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Continued on page 17

```
REM    This routine gets the file names, passwords, and the output
REM device number from the user.  Then it opens the files and
REM initializes variables.

&INIT
   PRINT
   PRINT "File comparer: see source code for doc."
   PRINT
   INPUT "Control file, password"; CFILE$, CPASS$
   IF CFILE$="" OR CFILE$="ABORT" THEN STOP
   IF CPASS$="" OR CPASS$="ABORT" THEN STOP

   INPUT "Test file, password"; TFILE$, TPASS$
   IF TFILE$="" OR TFILE$="ABORT" THEN STOP
   IF TPASS$="" OR TPASS$="ABORT" THEN STOP

   INPUT "Output device number"; DV
   IF DV = 0 THEN DV = 1

   CLOSE
   OPEN CFILE$, CPASS$, 1
   OPEN TFILE$, TPASS$, 2
   CCOUNT = 0
   TCOUNT = 0
   CLINE$ = ""
   TLINE$ = ""
RETURN
```

```
10 REM COMPARE UTILITY 8/12/85 5:30PM GASP VER.  2.31
20 GOSUB210
30 IFNOT(CLINE$<>"OK"ANDTLINE$<>"OK")THEN80
40 IFNOT(CLINE$=TLINE$)THEN60
50 GOSUB110:GOTO70
60 GOSUB160
70 GOTO30
80 PRINT#DV:PRINT#DV,"Compare complete."
90 PRINT#DV,"Control file:"CCOUNT"lines, "INDEX(1)"bytes."
100 PRINT#DV,"Test file:"TCOUNT"lines, "INDEX(2)"bytes.":CLOSE:END
110 IFNOT(CLINE$<>"OK")THEN130
120 INPUT%1,[72,"A"]CLINE$:CCOUNT=CCOUNT+1
130 IFNOT(TLINE$<>"OK")THEN150
140 INPUT%2,[72,"A"]TLINE$:TCOUNT=TCOUNT+1
150 RETURN
160 PRINT#DV:PRINT#DV,"C"CCOUNT;CLINE$:PRINT#DV,"T"TCOUNT;TLINE$
170 IFNOT(VAL(TLINE$)>VAL(CLINE$))THEN190
180 INPUT%1,[72,"A"]CLINE$:CCOUNT=CCOUNT+1:GOTO200
190 INPUT%2,[72,"A"]TLINE$:TCOUNT=TCOUNT+1
200 RETURN
210 PRINT:PRINT"File comparer: see source code for doc.":PRINT
220 INPUT"Control file, password";CFILE$,CPASS$
230 IFCFILE$=""ORCFILE$="ABORT"THENSTOP
240 IFCPASS$=""ORCPASS$="ABORT"THENSTOP
250 INPUT"Test file, password";TFILE$,TPASS$
260 IFTFILE$=""ORTFILE$="ABORT"THENSTOP
270 IFTPASS$=""ORTPASS$="ABORT"THENSTOP
280 INPUT"Output device number";DV:IFDV=0THENDV=1
290 CLOSE:OPENCFILE$,CPASS$,1:OPENTFILE$,TPASS$,2:CCOUNT=0:TCOUNT=0
300 CLINE$="":TLINE$="":RETURN
```

AN OFFER

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OS-65U DATA FILES AND OTHER MYSTERIES: FEAR AND LOATHING GUIDE

By: Rick Trethewey
8 Duran Court
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I've seen a lot of video system owners beginning to explore OS-65U in order to take advantage of the extra abilities in that operating system for handling data files. After the initial shock wears off, I think most people should find themselves pretty much at home with OS-65U's BASIC. After all, most of the language is identical to its 65D counterpart. Still, the differences are significant. In this article, I hope to describe OS-65U's data file handling and how to get the most out of it.

To begin, we need to look at how OS-65U deals with the disk, no matter what the purpose is for using it. Under 65U, every byte available is referred to by an "address". If you think of these addresses like memory locations, you'll be on the right track (pardon the pun). All requests to 65U to access the disk are done by passing information to 65U as to which drive, and disk address is involved and if data is to be read from or written to the disk. In addition, a memory address is specified, telling the operating system where to put information read or, con-

versely, where the data to be written is located. Finally, the number of bytes to be transferred is also given to the operating system. I'll be discussing how this information is passed to 65U a bit later on. When 65U needs to deal with any byte/address on the disk, it first reads the track containing the byte/address into an internal buffer and then it goes on to transfer the information needed to the desired memory location outside of the buffer. My main point here is that because the operating system reads a chunk of data before giving it to the user, 65U can effectively read or write as little as a single byte at a time.

There is a price to be paid for this ability, though. First, the operating system has to include space for this internal buffer. That's 3584 bytes out of a normal 48K workspace. Next, because there are intermediate steps involved between all reads and writes, there is some time lost as compared to 65D which has no such buffering. Finally, there is another price to be paid that is also a feature. Because the operating system is controlling this buffer, it can avoid unnecessary disk accesses because the information involved in many operations will already reside in memory and can be immediately given to the user. The price incurred by this feature is that in a multi-user environment, the contents of any disk drive may not be the "latest" version of the information because one user may not have had his changes stored on disk yet because of the buffering. Over the years, this problem has had several solutions thrown at it by OSI. Even single-user systems can run into trouble because of this if they are careless about switching diskettes. We will return to this level of the operating system a bit later. For now, just keep this information in the back of your mind.

BASIC under OS-65U supports up to 8 data files simultaneously, and all without the need of adding a separate disk buffer for each one in front of your programs. The single internal buffer takes care of this for us. However, instead of referring to each open data file by device number, as we do under OS-65D, OS-65U refers to each file by a "channel number". We still use the BASIC commands INPUT and PRINT, but instead of "#6" or "#7", we use "%x" where "x" is the channel number involved in the operation, from 1 to 8. But I'm jumping the gun a bit here.

Before you can access a data file, you have to OPEN it. The command to do this under OS-65U is;

```
OPEN "FNAME","PASS",CN
```

where "FNAME" is the name of the file, "PASS" is its password, and "CN" is the channel number to use to support that file. NOTE: The file name and password are going to be different for any file you use... well, at least the file name should be. Since passwords are limited to four characters and most people use "PASS" for personal applications, you can almost always try "PASS" as the password and be successful. The password is optional to a certain extent. If you try to access a file with the wrong password or by omitting the password from the command entirely, you will be limited to the kinds of access rights the file's creator defined when it was created. Ergo, you may not get an error message immediately if you use the wrong password. Many times, you won't see an error message at all until you exceed your "authority".

Conversely, when you've finished with a data file, you have to close it. The command to do this is simply;

```
CLOSE CN
```

where "CN" is the channel number. If no channel number is specified, all open channels will be closed. "CLOSE" has another effect that we need to pay attention to here, and that is that CLOSE forces OS-65U to write the current contents of its internal buffer back to the disk drive if that information has been altered since it was originally read from the disk.

OS-65U's BASIC gives you explicit control over where in the data file the reads or writes begin. It does this with the INDEX command. The INDEX command syntax is;

```
INDEX<CN>=xxxx
```

where "CN" is the channel number and "xxxx" is the numeric index to the file in question. In real terms, the INDEX is the value added to the file's disk address to determine where the information is to reside on the disk, and 65U's pointer for that data channel is set to that value. This pointer is used for both input and output operations for the channel involved and as each byte is retrieved or sent, the pointer is automatically incremented. If you remember that the first byte of the file is located at INDEX 0, then logically, setting the INDEX to any other value moves the beginning of the operation further along in the file. For sequential data files, INDEX is most often used to set the pointer to the beginning or the end of the data file. However, it is random access files that make the INDEX command really valuable.

Under our old friend OS-65D, unless you go to a significant amount of extra effort, random access files can only be used with record lengths that must be 2, 4, 8, 16, 32, 64, 128, or 256 bytes. The limited amount of space allocated for OS-65D is at the root of this limitation, and it is fine for personal applications, but it is extremely limiting, cumbersome, and inefficient in its use of disk space. It doesn't take a complex example to illustrate this inefficiency. If your applicaton's record length exceeds one of these values by even a single byte, you are forced to go to the next higher value and there is no built-in support past the 256 byte limit. Further, fields within these records are stored sequentially. This means that in order to access any field within a record, you must read in the entire record first. Similarly, when you need to update the record, you

Continued on page 20

must re-write the entire record to the data file, wasting both time and space.

Next month, the INDEX (X) command.

★

MANUFACTURER'S CORNER

DB-65E

An Operating Environment

What is the DB-65E Operating Environment? What do we mean by an Operating Environment? These may be some of the questions that you have in the back of your mind. In this column, and subsequent columns, we hope to answer those questions and possibly give you a different approach to efficient programming.

Historically, the communication between man and the machine has taken two distinct paths. One path has been to provide a Machine Command Set that allows basic machine functions independent of any high - order language (e.g. UNIX, CP/M, etc.). The other path provides the execution of machine functions dependent upon a high - order language being resident (e.g. OS-65U, APPLESOFT, etc.).

The concept behind an Operating Environment is that an interface to a set of machine language commands has been defined and that this low-order language is resident at all times. However, there is no direct man-machine communication via this interface. This set of machine language commands must provide all of the basic Input and Output functions to any external device and additionally coordinate all inter-processor communication and semaphore handling. This method, we believe, maximizes the flexibility of programming options and still retains a level of discipline required for program portability.

This set of machine language commands within the DB-65E Operating Environment is called the IOCS, (Input and Output Control System.) A complete description of the IOCS is beyond the scope of this particular column but will be further explained in future columns. Before we leave IOCS, please be aware of the fact that the IOCS kernal is highly structured and conceptionally machine-independent.

The second part of the DB-65E Operating Environment is a high - order language system. Initially, the DB-65E Operating Environment will be released with the DB-65E BASIC Language System. In the planning stages for future releases will be a "C" Language System, a FORTH Language System, a PASCAL Language System and a Relational Data Base Language System. Additionally, a complete Machine Language Development System containing a multi-level Macro Assembler and Linking Loader is planned for future release.

DB-65E BASIC LANGUAGE SYSTEM

THE DB-65E BASIC Language System is a BASIC Interpreter based on MicroSoft's M6502 BASIC Interpreter, but there have been many changes and extensions. However, even with these changes, the majority of programs developed for use with OSI's OS-65U BASIC Language will execute properly under the DB-65E Operating Environment.

Some of the more significant changes and extensions of the DB-65E BASIC Language System are:

CREATE, REMOVE (Delete), RENAME, and SYSTEM

These functions are now "Reserved Words" within the BASIC Interpreter and may be used within the context of a program.

INPUT/OUTPUT FUNCTIONS

The Line EDITOR is functional and resident at all times without the loss of any other functions.

Two new commands have been added, "CRT" and "{}". The "{}", allow direct cursor positioning within a "PRINT", "INPUT", or "CRT" command line. The "CRT" command allows up to 16 different screen functions to be performed. Any or all of the 16 commands may be user-defined prior to the execution of a program.

A "USING" function has been added for the formatting of printed outputs, however, this "USING" function also allows the formatting of string variables for storage or later output.

Two more new commands, "STRIP" and "[]", have been added. The "[]" command allows a string variable to be left, right or center justified within a field of predefined characters. The "STRIP" command is complementary to the "[]" command in that the predefined characters are removed from the left, right or all of the string variable.

Two additional new commands are "GET" and "INKEY". The "GET" command returns a predetermined number of characters, up to 132, from the Console device and assigns them to a string variable. The "INKEY" command polls the Console device for a character input and returns either the character or a "null" (no character present) in the string variable.

Another new command is the "DISK" function. This command allows the transfer of a block of data to, or from, the Disk and a memory location. The length of the block, disk address, memory address and direction of transfer are user-defined within the command syntax.

The new command "FILE" has been added to directly obtain such information as: Disk address of a <filename>, Length of a <filename>, Size of a Disk device, Size of the System where a <filename> is located, System Number where a <filename> is located, etc.

* Another new command "INSTR" has been added to determine the starting position of sub-string within a string variable.

The "FIND" command has been modified to allow "less than" or "greater than" searches of data and to compensate for field or record lengths as opposed to strictly linear searching of data matches. Additionally, a new command "DCARE" has been added to allow the user to define the "don't care" character to be ignored during the search function.

PROGRAM EXECUTION

A new command "SUBMIT" has been added to allow the use of a command file to control the sequence of programs to be executed.

Yet another new command is "ENCODE" which allows data to be encrypted as it is stored on the Disk device.

The "USR" command has been modified to allow the use of specific memory addressing as to the location of machine language routines.

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III

IV

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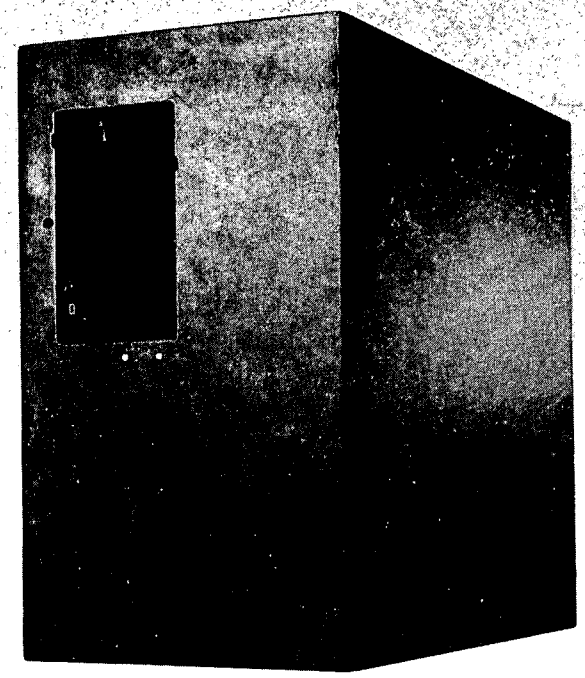

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IN SUMMARY

The DB-65E Operating Environment software, as with DBI's hardware, provides a natural evolutionary route to maximize performance and efficiency for their customers. The DB-65E Operating Environment with its BASIC Language System, containing a set of NEW and ENHANCED commands and the IOCS Machine Language interface, provides the basis for enhancing existing programs and new program development.

DBI's philosophy has been and will be to provide products that allow upgradeability and portability without necessitating the sacrificing or replacement of installed equipment and systems. The software described in this article is no exception. Even though this software presently executes only on a "6502" type of microprocessor, it will operate with the future???

By: Art Hughes

AD$

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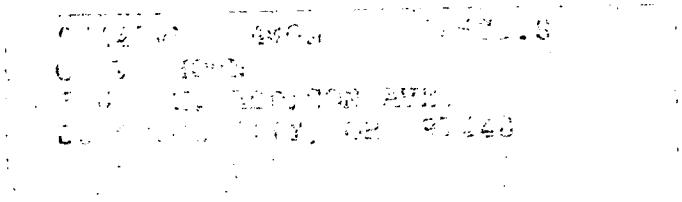

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