



Editorial

Welcome to Uptime once again! This issue brings a continuation of our Basic09 series written by Chris Dekker and some news from Bob van der Poel software. I have also received more news about the upcoming Chicago Fest. Fifteen exhibitors have already signed on, which include Barsoft, ColorSystems, DELMAR, Hawksoft, Farna Systems, Crystal Palace BBS, DISTO, BudgetWARE, Adventure Survivors, Chicago and National OS-9 User's groups, StrongWare, SBUG, Blackhawk Enterprises, and JWT Enterprises. There are also verbal commitments from Kala Software, CoNext, Animajik Productions, Sub-Etha, and JoTA Productions. Seminar speakers will include Scott Gripentrog on networking, Allen Huffman, Colin McKay and Bill Nobel on NitroS9, John Strong, Brian Schubring, Glenside President, and Brother Jeremy. Next month we'll have travel instructions for those flying or driving in to the 'Fest.

-Jordan Tsvetkoff

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One Month to Chicago!

Basic09 in ?? Easy Steps

As I promised in part 2, this time we will try to run some Basic09 code. However, before I get to that I have to mention one thing: it is nearly impossible to write useful Basic09 code without the use of data structures. Interfacing Basic09 with the OS-9 operating system is also very important and nowhere nearly as difficult as you may think.

Data structures are often referred to as *complex* data structures, and that word alone gives most people a complex (or fit). However, all of us are used to dealing with complex data structures on a daily basis, so all you have to figure out is how to tell your CoCo what you mean. As an example, I will take a line that you could find in a phone book:

<u>Name</u>	<u>Address</u>	<u>Phone</u>
Doe, John	Deersville	555-1234

As you can see, this one line (or record) consists of three parts: a name, an address, and a phone number. Believe it or not, this is a simple version of a complex data structure.

Now if you want to write a program to hold addresses and phone numbers of family, friends, etc., the first thing you must do is tell the computer what a record looks like. To do so in Basic09 we use the TYPE statement.

```
TYPE phonerecord=name,  
address,phone:STRING[20]
```

Once Basic09 processes this statement, it knows that a record consists of three strings, each 20 characters long. The names of these three strings are, you guessed it, name, address, and phone and in that specific order. Now we must make some

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room for the records in the computer's memory:

```
DIM record(50):phonerecord
```

Basic09 now knows that it must make room for 50 records and will set $50 \times (3 \times 20) = 3000$ bytes aside for bufferspace. To **Basic09** the structure we just defined looks like a blank page divided into three columns.

If you want to do something useful with that page, you must be able to read and write the various records. We do this as follows: suppose you have defined another string variable called `printname` (`DIM printname:STRING[20]`) that you want to use to send the names on your page to the printer. To have the computer send the name "Doe John" to the printer, you must use the following code:

```
printname=record(1).name  
print #printer,printname
```

Note that for this code to work, you must have "Doe John" in the first record (top line of the page) and you must have opened a path to your printer. Suppose you want to print all names on the page. This takes a few more lines:

```
FOR i=1 TO 50  
printname=record(i).name  
PRINT #printer,printname  
NEXT i
```

You can access the other two strings in a record as `record(i).address` and `record(i).phone`. The line `printname=record(i).name` is basically a copy command: it copies the contents of `record(i).name` to `printname`. This copy command

works in two ways: it can also be used to fill the records. You do not have to worry about string overflows in **Basic09**. If you try to put too many characters into a string, the overflow is simply cut off: you will lose some information but your program will not crash.

Basic09 has five predefined variable types: **BYTE**, **INTEGER**, **REAL**, **STRING**, and **BOOLEAN**. The manual does a good job of explaining those (page 6-2), so I won't repeat that here. You can build up your complex data structures from any combination of these types. Of course, if you want to make your complex data structures really complex, you can use a multi-layered design: a data structure that consists of other complex data structures. But that goes beyond this article. You will have to figure that one out when you get there.

OS-9 interfacing is very important because there are a lot of **DECB** (and **MSDOS basic**) functions that are dealt with by the operating system. Consequently, you will not find an equivalent **Basic09** function. But you need the information, so you will have to request it from OS-9 itself. To make those requests easier, **Basic09** comes with a utility called **SysCall**. **SysCall** is a small (99-byte) subroutine module that allows you to issue system calls from **Basic09** by setting up a data structure, pass it to **SysCall**, and run that subroutine. When it exits, **SysCall** informs **Basic09** whether it was successful or not, and if so, it returns the requested information.

So there you have it! Another dirty word: *system calls*. System calls are to OS-9 what ROM subroutines are to **DECB**. In fact, they are **ML** subroutines: parts of the operating

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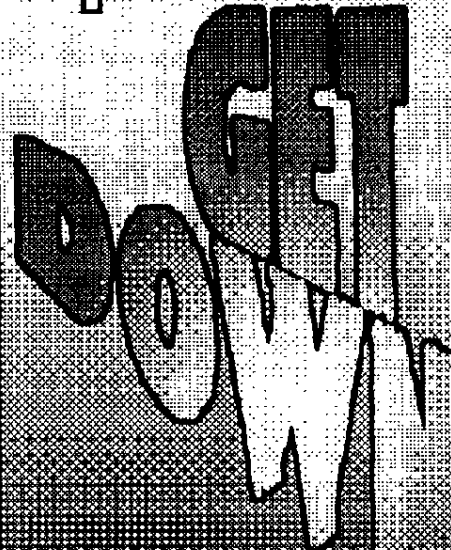
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Write or call for info

system that are accessible to the user. Just like in DECB they have entry and exit conditions. Unlike DECB, you don't have to worry about USR and VARPTR functions, and once you get the hang of it, they are surprisingly easy to use.

The other big difference is that while the ECB manual lists seven routines (ROM routines on page 315), the OS-9 manual describes 132 of such routines, so there must be lots of goodies in there for you.

Now let's get to work. The first program will show you the use of both SysCall and data structures and how they help transform Basic09 into a very powerful language. As you are probably aware, OS-9 Level II, as shipped, lacks a SAVE command (or utility if you wish), so

we are going to write one right here. Just enter the following code:

```

TYPE registers=
  cc, a, b, dp: BYTE;
  x, y, u: INTEGER
DIM regs: registers
DIM module: STRING[30]
PARAM source: STRING[30]
DIM path: BYTE;
  errnum, module size: INTEGER
ON ERROR GOTO 100
module=source
10 regs.a=0
regs.x=ADDR(module)
RUN syscall($00, regs)
IF LAND(regs.cc, 1)=1
  THEN ERROR regs.b \ENDIF
module size=256*PEEK(regs.u+2)+
  PEEK(regs.u+3)
CREATE

```

```

#path, module: WRITE+EXEC
regs.a=path\regs.x=regs.u
regs.y=module size
RUN syscall($8A, regs)
IF LAND(regs.cc, 1)=1
  then ERROR regs.b
  \ENDIF
CLOSE #path
RUN syscall($02, regs)
END
100 errnum=ERR
IF errnum=56 THEN
INPUT "module name?
", module
GOTO 10 \ENDIF
PRINT "error
"; errnum; "encountered"
PRINT "process aborted"
END

```

When you are done, type q

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<enter> to exit the editor. If there are no errors (Basic09 will only echo Ready) you can run the program by simply typing RUN. If Basic09 reports errors, you will have to go back to the editor and correct the code.

Now for the hard part: explaining what it all means. As you can see, the first line is a TYPE statement. This establishes a data structure that mimics a number of the 6809's registers. Line 2 reserves memory for the data structure. As you can see, there is a difference in the use of line numbers compared with DECB: Basic09 uses them for labels.

The next important statement is PARAM. This is used to tell the program that it can expect parameters

to be passed to it on the command line. In this case, if you want to write a copy of Shell to disk, you would type: save("shell") <enter>. Note that Shellplus users may leave out the parenthesis and quotes.

If you do not pass the program a parameter, it will generate an error 56. This error is generated the moment you try to read the string defined by the PARAM statement. In this case: module=source. This error is dealt with in the error trapping routine starting at line number 100.

If we want to save a module it means that we are trying to send a copy of the module to a disk file. So first we must try to locate the module in memory (since it's written in position independent code). To find the module OS-9 gives us a tool in

the form of the LINK system call. This call is described on page 8-23 of the technical reference.

As you can see we must set up two registers (regs.a and regs.x). In the program, that happens in line 10. We set regs.a to zero, so we can save all sorts of modules, while regs.x acts as a pointer to the module name. That is the function of the ADDR statement- you will end up using ADDR a lot.

The \$00 code in the next line tells OS-9 that it must execute the LINK system call. This number is also given in the manual. The line after that deals with trapping errors. If a system call fails, it will *always* set the carry flag in the CC register and return an error code in regs.b and this is how we check for it in Basic09.



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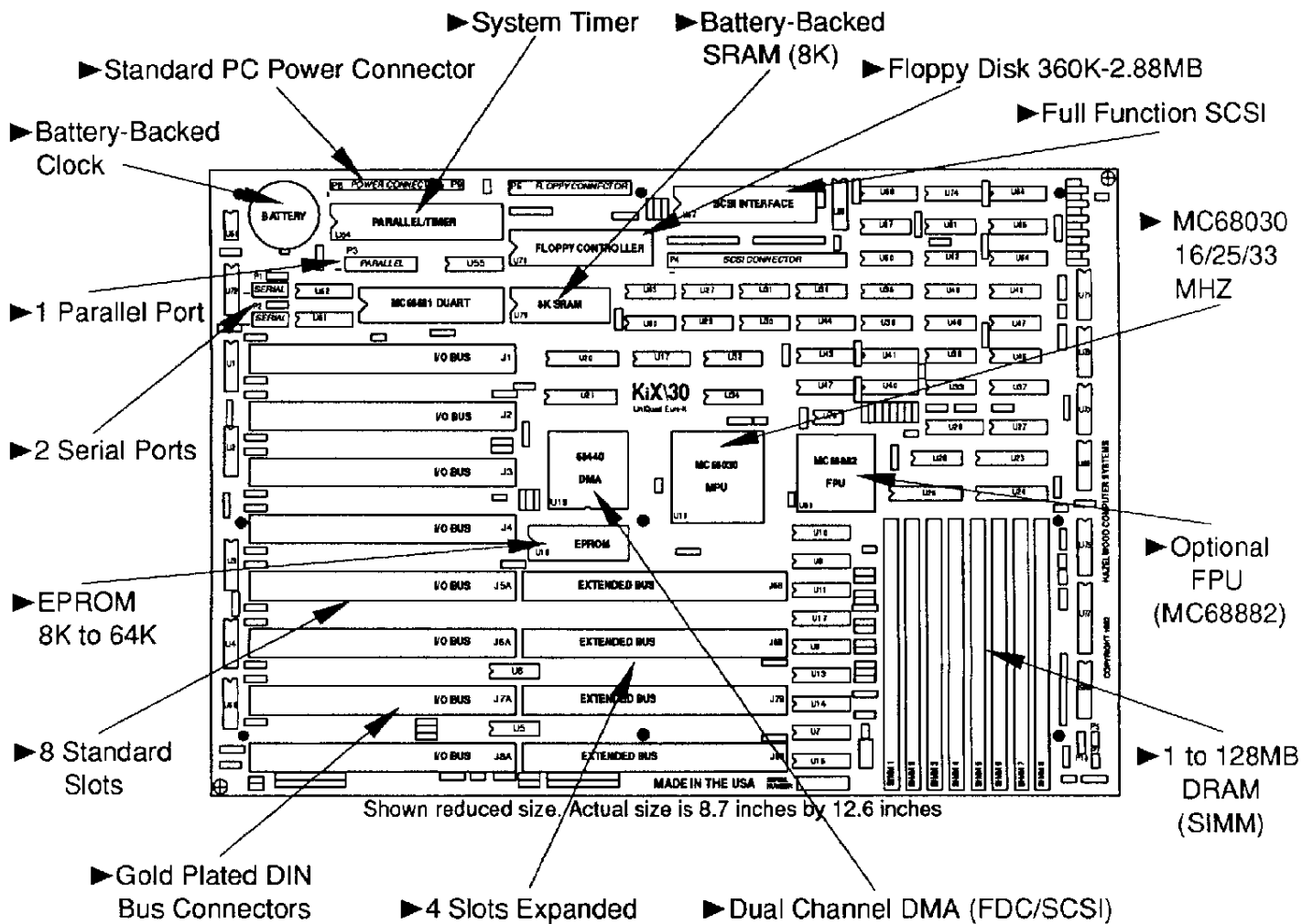
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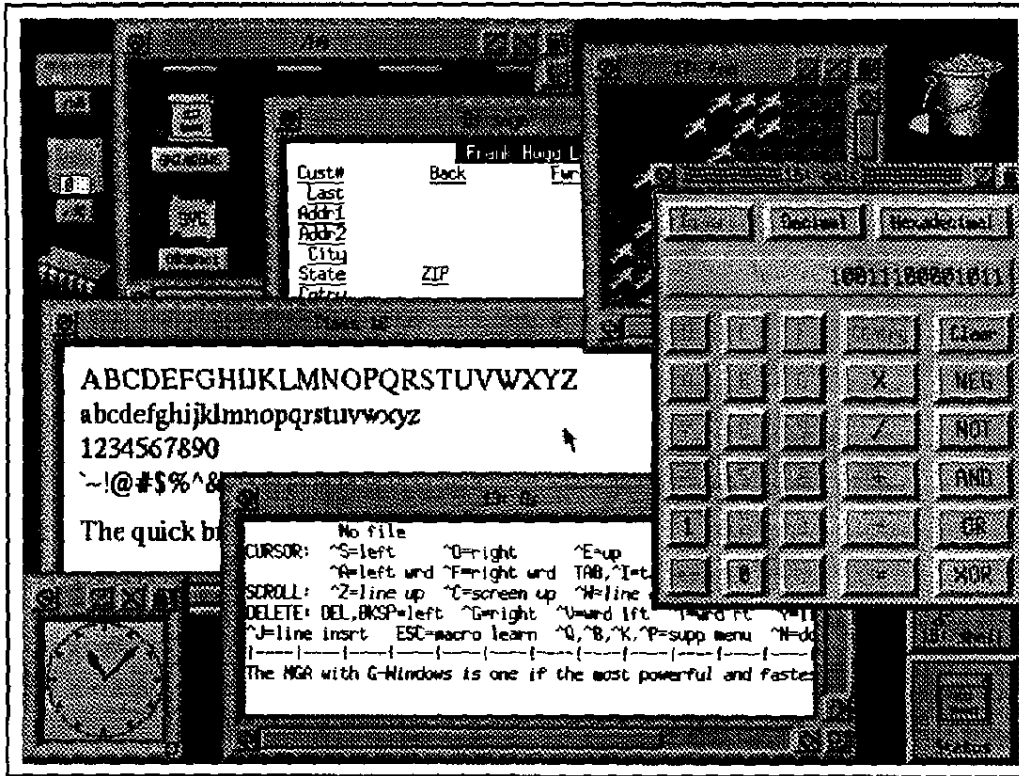
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If LINK is successful, it will return the starting address of the module in `regs.u` (`regs.u` points to the first byte in the module). If you really dig deeply in the manual, you will find that a module's size is always contained in the 3rd and 4th byte of that module, so we can calculate it by PEEKing at offsets from `regs.u`.

Then we must open a path to a diskfile so we can send a copy of the module to that file, using the CREATE call. CREATE creates a new file. To access an existing file, we would use OPEN. Path is an ordinary variable. Under OS-9, it is the only thing you have to keep track of to access a file or device: there is no need to remember various numbers for devices, buffer numbers, etc.

The name of the file will be the same as the name of the module because we specified module as filename. In other cases, you can also use a string as a filename but you must enclose that in quotation marks.

The WRITE+EXEC causes OS-9 to create a file in the execution directory, setting the e (execute) attribute. If we had just used WRITE, it would have been created in the data directory. Note that we do not check for errors here. If something goes wrong, Basic09 will generate the error by itself and jump to line 100.

Now we have an open path to a file and we must send the data down that path. The easiest way to do that is to use the WRITE system call. This system call is explained on

page 8-64 of the technical reference. As you can see, there are three entry conditions to be met. OS-9 needs to know the path number (in `regs.a`), a starting point (in `regs.x`), and the number of bytes it must write (in `regs.y`).

The lines right after the OPEN statement take care of that. Then we execute the WRITE call (RUN statement) and check for errors. If all has gone well, the module has been copied to disk and we can start cleaning up. First you must CLOSE the path to the disk file.

The next thing we want to do is UNLINK the module we copied. For this particular program, it isn't really necessary to do so but, hey, we want to keep some standards, don't we? If you check out the UNLINK

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system call (page 8-41), you will see that its only entry condition is that `regs.u` points to the starting point of the module, which it still does.

That's basically all there is to it to write a SAVE utility in Basic09. Now the only thing left is the error trapping routine. You can make this as big or as small as you want. You can even leave it out altogether. In that case, you will simply get an ERROR #xxx message as you will get from most OS-9 utilities.

If you want your version to be user friendly, you can program a number of messages into the routine pointing out the trouble. I have taken the middle road: trap error 56 and let the others slip by. The most important reason for trapping error 56 is that I don't like typing brackets and

quotation marks on a command line. This little trap solves that problem just fine.

I realize that there are a number of subjects that I have skipped, like how to actually use Basic09's editor. In part 2, we never got past the edit command. The editor functions very differently from the one used by DECB, mostly on account of the absence of line numbers. Since there are only a few commands you really have to master, I won't spend much time on them here. You can find a summary on pages 4-1 and 4-2 of your manual. The commands you need most often are +, -, s(earch), c(hange), and d(elete).

As you probably noticed, the actual code is very readable as computer languages go. This is

mostly due to the fact the Basic09 is very generous when it comes to naming variables. I am not sure of the exact rules, but I do know that even the variable names that differ only after the 20th character are kept apart.

Even if you have sworn by now that you will never in your life write another utility, you should try to understand how data structures and the SysCall utility work. The reason for that is that under OS-9, both the computer's screen and disk files are considered to be devices. So, if your program needs to know something about a window (type, size, colors, etc.) or about a file (size, pointer, etc.), it must issue a request to OS-9 using SysCall.

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Although the above code will work just fine, it has some limitations built in. For instance, you can not save modules that were loaded as part of the bootfile. The reason for that lies in the 6809's 64K addressing space and the fact that OS-9 insists on seeing the entire bootfile as one block of code. All in all, most of the time things just don't fit. To get around that, we can use a SAVE utility that is written in machine code since this has much less overhead space to deal with. I have included the code for such a utility but to be able to use it, you will have to write a program that saves it to a diskfile. What the program must do is the following: DIMension a buffer to hold the code (100 bytes would be more than enough). Then load the code into the

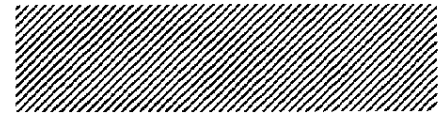
buffer: a loop using READ/DATA statements (which is the same as under DECB) will do fine.

Copy the data from the buffer to a file using the WRITE system call. Be sure to write only the exact number of bytes in the module. Also your file must be called "save" and have its e attribute set, otherwise OS-9 will not execute the program. Assuming you are working from the Basic09 disk we made in part 2, you should find the file in the CMDS directory. Now the code:

```
87 CD 00 40 00 39 11 81 5C 00 0D 01 00
34 10 86 00 10 3F 00 25 20 1F 31 30 02
EC 80 1F 02 35 10 86 02 C6 0B 10 3F 83
25 0D 1F 31 10 3F 8A 25 06 10 3F 02 25
01 5F 10 3F 06 53 61 76 E5 93 95 72
```

If you take a close look at this code, you will see the sequence 10 3F a number of times. This tells OS-9 to execute a system call. The next value is the codenumber of the call. As you can see, this program uses the same calls as the Basic09 code. The only one missing is CLOSE. We can skip that one because the EXIT call automatically closes all paths. Under Basic09 you can force an EXIT call by replacing the END statements with BYE, but not before you have debugged and saved your code. BYE also terminates Basic09, and you will lose everything you have.

- Chris Dehler



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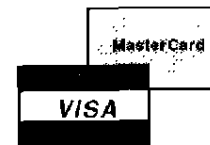
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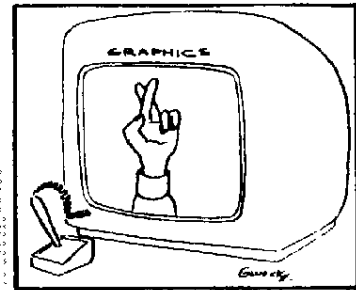
Bob van der Poel has announced the release of version 2.3.0 of **VED/68K**, their popular and powerful text editor for **OSK** systems. Some of the changes include: improved display speeds and bug fixes, addition of alias sequences, a doubling of the maximum number of macros, enhanced saveable command line history, new column commands for move, copy, and other editing commands, more support for front-end development systems, improved file-selector, DOS and UNIX format saves, terminal set up strings for beginning and ending a session, support for two-byte (e.g. Kanji) character sets, and an optional graphical front end for MM/1 systems. *Personal, \$59.95;*

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