

HP-71 FORTH/Assembler ROM

Internal Maintenance Specification - IMS

HP-71 Assembler Internal Design Specification - IDS

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FORTH/Assembler ROM

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Introduction — CHAPTER 1

The purpose of this document is to explicate details of the implementation HP-71 FORTH/Assembler ROM. It will not explain every detail of the implementation, rather it will seek to highlight areas which are critical for an understanding of our version of FORTH and the Assembler. It is assumed that the person using this document has access to the code listings, the HP-71 IDS Vols. 1, 2 and 3 and the FORTH/Assembler ROM manual.

The code listings and their contents break down as follows (note that the file name appears in the starred block on the cover sheet of each assembly):

MR&GT0 - contains equates defining addresses of user variables; default values of data and return stacks, TIB, mass storage buffers. Contains no executable code.

MR&FT0 - contains poll handlers, error messages, FORTH system initialization, code to create, position and adjust FORTHRAM.

MR&FTB - contains code for BASIC to FORTH words.

MR&FT1 - contains ROM dictionary jump table, 0, 1 and 2 character words.

MR&FT2 - contains 3 and 4 character words.

MR&FT3 - contains 5 character words.

MR&FT4 - contains 6 character words.

MR&FT5 - contains 7 and 8 character words.

MR&FT6 - contains 9, 10, 11 and 12 character words.

MR&FT7 - contains inner loop, secondary prologues, routines to save and restore FORTH pointers.

MR&AS0 - contains opcode lookup tables.

MR&AS1 - contains Assembler variables.

MR&AS2 - contains code to handle source and listing files as well as object code I/O.

MR&AS3 - contains Assembler symbol table manipulation code.

MR&AS4 - contains lexical analysis, and expression evaluation code.

MR&AS5 - contains all opcodes for HP-71 CPU (internally known as SASM--for Saturn Assembler).

MR&AS6 - contains pseudo-ops for control, constants and macro expansion.

MR&AS7 - contains code to do source line parsing.

MR&AS8 - contains body of Assembler.

Primitive & Secondary Structure — CHAPTER 2

FORTH is compiled as a series of addresses (possibly interspersed with data). The inner loop (=NEXT) is perpetually moving through this list, getting the next address and interpreting it as a CFA (code field address) -- which means that it gets the contents of this CFA and sets the program counter to this value. The inner loop, then, does not distinguish primitives from secondaries, i.e. assembly language routines from FORTH words. In both cases the contents of the CFA are put in the program counter.

The CFA of a primitive thus has nothing more than the address of the first line to be executed. Since the first line always in fact follows the CFA, a primitive looks like this:

```
                < header>
=WORD           (WORD+5)    <----- CFA
WORD+5          < code >
                  ....
                  ....
                 RTNCC       return with carry clear
```

If there were only primitives, this would be a waste of 5 nibbles in every word, but it allows primitives and secondaries to appear the same to the inner loop.

The CFA of a SECONDARY always has the address of a prologue. A prologue, generally, prepares the system to deal with the information which follows. For example the DOCOL (do colon) routine resets the instruction pointer (CPU register D0) to the list of addresses following it, after saving the current instruction pointer on the return stack. It effectively nests the system down one level. Secondaries which use DOCOL end with the address of a routine (=SEMI) which will restore the old instruction pointer thus unnesting the sytem one level. Secondaries using DOCOL have the following form:

```
                < header >
=WORD           =DOCOL      <------CFA
```

```
addr
addr
....
....
=SEMI
```

The system provided prologues are:

DOCOL (do colon) is explained above.

DOCON (do constant) pushes the contents of the next 5 nibbles (higher addresses) to the data stack.

DOFCON (do floating point constant) performs a stack lift and puts the contents of the next 16 nibbles (higher addresses) in to the X register.

DOVAR (do variable) pushes the address of the next memory location (higher address) to the data stack.

DOSTR (do string) pushes the address of the character string (located 4 nibbles beyond--higher memory--the prologue) to the data stack and then pushes the current character count of the string (located 2 nibbles beyond the prologue) to the data stack.

DOSTRA (do string array) ensures that the index parameter is > 0 and <= the maximum dimension for the array, (maximum dimension is stored 2 nibbles beyond the prologue) it then takes the maximum length of each string in the array (stored immediately following the prologue) adds 4 to it (2 nibbles for maximum string length and 2 nibbles for current string length) and multiplies this sum by the (index -1). It pushes the address of the desired string (located 4 nibbles beyond the address calculation result) to the data stack and then pushes the current character count of the string (located 2 nibbles beyond the address calculation result) to the data stack.

DOVOC (do vocabulary) fetches the address of the word most recently defined in this vocabulary

(located 4 nibbles beyond the prologue) and stores it in CURRENT. This become the vocabulary in which word searches are started.

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Compiling A New FORTH Word — CHAPTER 3

Let's assume that the user has turned on the HP-71 and typed FORTH [ENDLINE]. The display will show "HP-71 FORTH 1A" Now the user types:

```
: SIXES  6  DUP ;  [ENDLINE]
```

The following describes how FORTH makes a new definition.

When the display shows the FORTH sign-on message "HP-71 FORTH 1A" FORTH is in EXPECT96 waiting for input from the user. After the user types in the above string and hits [ENDLINE] the input received from the user is moved to the Terminal Input Buffer (TIB) along with 2 nulls which signify the end of input. A variable >IN contains a nibble offset into the TIB pointing to the unprocessed input.

```
TIB:            : SIXES  6  DUP ;  [2 nulls]

>IN = 0
```

FORTH is in execute mode (contents of STATE = 0). INTERPRET (via WORD) finds the string ": " (a colon followed by a space) and moves it (and the space) to the end of the dictionary (pointed to by HERE) as a counted string [1 byte length field=1] and the character ":" followed by a space which is not considered part of the string. >IN is updated to 4. The context vocabulary is searched to see if ":" is recognized as an existing word. It is found (by FIND> which returns its execution--TICK--addr) and executed.

Actions Of Colon

1) The current value of the FORTH Data Stack pointer is stored in CSP.

2) The CONTEXT vocabulary is set to be the same as the CURRENT vocabulary.

3) The Name Field Address (NFA) of the last defined word in this vocabulary is compiled into the dictionary as the Link

Field (LF) of SIXES.

4) WORD is called again and it moves the counted string "SIXES " to the end of the dictionary. >IN now is set to 16.

5) The context vocabulary is searched for any previously defined words named "SIXES".

6) If "SIXES" is found to already be in the dictionary AND the WARN flag is set then "SIXES not unique" is displayed.

7) If the length of the name of the new word, "SIXES", exceeds the allowable name length (contents of WIDTH) the new word is truncated to the maximum allowable width.

8) Space is alloted in the dictionary for the name field of the new word.

9) Set the high bit of the length byte in the name field and in the last character of the name ("S" in this example). The fact that the first and last bytes of the name field have their high bit set is used by TRAVERSE to move through the dictionary.

10) Compile into the dictionary a temporary prologue (code field). This primarily saves space for the real code field address which will be added later.

11) Update the contents of CURRENT to point to the Name Field of the new word, SIXES.

12) Set the smudge bit (bit 5) in the Name Field so that if we are redefining an existing word we will find the old copy of the word rather than the new copy during word searches.

13) Set STATE = C0 to indicate compilation mode.

14) Replace the temporary code field in SIXES with DOCOLON, the runtime colon routine.

INTERPRET, now running in compile mode, uses WORD to find the next string "6 ". This is moved to the end of the dictionary as a counted string. The context dictionary is searched to see if it can find a word "6". This search fails and so NUMBER tries to interpret it as a number.

NUMBER successfully converts the ASCII character "6" into the binary 6. The contents of DPL are set to reflect the fact that we found a single length number (as opposed to a double length number or a floating point number).

INTERPRET calls LITERAL which compiles the runtime literal handler into the dictionary (during execution of SIXES this word will take the contents of the next 5 nibbles and push them onto the FORTH Data Stack). It also compiles a 5 nibble representation of a binary 6 into the dictionary. >IN now is set to 20 (decimal).

INTERPRET uses WORD to find the next string, "DUP ". This is moved to the end of the dictionary as a counted string. The context dictionary is searched to see if it can find a word "DUP". This search succeeds (FIND> returns a true flag, the raw length of the word--here 83 hex--and the execution address of DUP. (Raw length is the length byte of the name field address.) Since the word is not immediate (the raw length of the word, 83, is less than the contents of STATE, C0) the execution address is compiled into the dictionary. >IN now is set to 28 (decimal).

INTERPRET uses WORD to find the next string, ";". This is moved to the end of the dictionary as a counted string. The context dictionary is searched to see if it can find a word ";". This search succeeds. The raw length returned by FIND> is C1 hex and, thus, is NOT less than the contents of STATE, C0. The word is, therefore, an immediate word and is executed instead of being compiled.

Actions Of Semi-colon

1) The current value of the FORTH Data Stack pointer is compared to the value stored in CSP (see Actions of Colon). If these values are different an error is generated.

2) The runtime code for semi-colon is compiled into the dictionary.

3) Execute mode is set by setting STATE = 0.

INTERPRET uses WORD to find the next string and it finds a null. This null is moved to the end of the dictionary as a counted string. The context dictionary is searched to see if it can find a word, null. This search succeeds. The raw length returned by FIND> is C0 hex which means that it is an immediate word and is, therefore, executed.

Actions Of Null

1) Null pops off one level of the FORTH Return Stack--throwing away the return address to INTERPRET.

2) It then returns which restores control to the outer loop.

At this point the OK { 0 } message is displayed and then control moves to QUERY which calls EXPECT96 which is where we started.

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Vocabulary Structure — CHAPTER 4

First of all, remember that a vocabulary word is itself just another word with a header in the dictionary. When created with the VOCABULARY statement, it is the latest word in the chain of the current vocabulary. When DEFINITIONS is executed, it becomes the current vocabulary. DEFINITIONS simply puts [CONTEXT] into [CURRENT], so our word (let's call it NEW) must first have become the CONTEXT vocabulary. Therefore executing NEW must accomplish this, and in fact that is all there is to the run-time action of NEW. Aside from this, a vocabulary consists of two pointers: one to the latest word defined while it was CURRENT, and another to the previously defined vocabulary word (such as FORTH). So a vocabulary word looks like this:

```
LFA         < link >      link to previous word in vocabulary
                          to which this word itself belongs
NFA         < header >    e.g. "NEW"
CFA         =DOVOC        address of routine to set CONTEXT
            180A
            < last-word link >
            < previous vocabulary link >
```

The 4 nibbles 180A between the runtime code address and the last-word link are a relic of other FORTH systems.

It is important to note that the previous vocabulary mentioned here is strictly the most recent one in the dictionary, whether or not it is in the search order for NEW or not. To understand why this is so, see FORGET (discussed below).

The last-word link is initialized to point to the NFA of the word itself. Therefore when words are added to the chain, they will link back up with the chain to which this word (e.g. NEW) itself belongs.

DOVOC sets CONTEXT to point to the last-word link. The previous-vocabulary link points at the previous-vocubulary-link field of the previous vocabulary, so that one can easily chain back through vocabularies. The

previous-word link of the FORTH vocabulary is zero to mark the end of the chain.

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Action of FORGET

CHAPTER 5

HP-71 FORTH implements a "smart" FORGET which allows the multiple vocabularies to be maintained and any word to be forgotten while still using the linear dictionary structure. Of course words cannot simply be pulled out of the middle of this structure without moving other words up -- but this is not possible since addresses (which would have to be updated) are not distinguishable from data within the compiled word. Therefore one either has to waste space in the dictionary which would never be reclaimed, or else forget all words after the word to be forgotten, even if they belong to other vocabularies. We do the latter.

So FORGET must accomplish the following:

1. FIND the word to be forgotten (of course it must be in the current CONTEXT search order).

2. Make sure that the word is neither in the ROM nor protected by the variable FENCE, i.e. that its address is greater than FENCE.

3. See whether it is prior to the CONTEXT vocabulary; if so this vocabulary will be forgotten, so what we do is just to reset CONTEXT to FORTH.

4. Forget all vocabularies which are after the forgotten word. This is done by getting VOC-LINK, which points to the most vocabulary in the dictionary. The vocabularies are linked to each other in a strictly linear way, since our only concern is to chain back through them all until we find one prior to the forgotten word. (This explains the reference made above in discussing vocabulary structure.) We reset VOC-LINK to point to this one.

5. Look at each vocabulary again, starting from [VOC-LINK], to see if its last word (see vocabulary structure for last-word pointer) is after the forgotten word. If so, we chain back through the words to find one which is okay, and reset the las-word pointer in the vocabulary to point to it. Repeat this for every vocabulary, all the way back to FORTH.

6. Reset dictionary pointer (DP) to reclaim space.

ROM Dictionary Search Method — CHAPTER 6

In typical FORTH implementations words are found by a sequential search through the active vocabulary. In seeking to minimize the time spent looking for words HP-71 FORTH takes a different approach.

When seeking to find a word the FORTH system first does a sequential search through the RAM portion of the context vocabulary. This part is like typical FORTH implementations. However when the search fails to find the word in RAM, FORTH searches ROM in a more efficient manner. (Note that all vocabularies eventually chain back to FORTH and that the link field of FORTH is 0 which signifies to the FORTH system that the desired word is not in RAM.)

The ROM dictionary is broken up into 13 separate linked lists. The first list contains all 0 character words (there is only 1--the null word), the second list contains all 1 character words, etc. There are no words in ROM longer than 12 characters, thus the 13 linked lists. At address E0000 is a jump table with 13 entries (5 nibbles each), one for each linked list. The contents of each entry is a pointer to the name field address of the first word in that chain.

The FORTH search routine (FIND› in MR&FT3) uses the length of the string being searched for (length * 5) as an offset into the table at E0000. It picks up the contents from the entry in the table and uses it as the starting point in its ROM search. In this manner when searching for a 3 character word only other 3 character words are examined. No search time is spent looking for words longer than 12 characters.

Control Structures — CHAPTER 7

The FORTH interpreter acts on each word as it is encountered in the input stream, either executing or compiling depending on the value of STATE and the IMMEDIATE-bit in the word header. So it can check the syntax of compile-time words which come in pairs, triples, etc. only by remembering what words have been compiled beforehand. It does this by putting numbers on the data stack when it compiles such a word (these are all control structure words). The numbers are of no significance in themselves, but serve as codes for the matching words to check.

For instance, IF leaves a 2 on the stack, which is expected by THEN. There is no other legitimate way a 2 can appear on the stack by the time THEN is executed, so if it doesn't see a 2, it concludes that there is a syntax error and aborts. If there was no IF but a pernicious user had an immediate word which left 2 on the stack, THEN will be deceived and bad results will follow.

Since some words go searching down through the stack for markers left by their counterparts, there must be a bottom-of-stack marker relative to the word being defined: it is the data stack marker at the time <colon> is interpreted, stored in the variable CSP. This value will also be checked by <semicolon>; if it is not equal to the stack pointer at that time, it is assumed that an unmatched control structure (e.g. IF without a THEN) was entered, and "definition not finished" is issued. Thus if the user leaves something on the stack at compile-time (by doing,say, "[" and something which alters the stack), he will produce the "definition not finished" error, which might be confusing.

A general rule for control structure words is that whatever they leave on the data stack at compile-time MUST COME IN PAIRS. This is necessitated by the function of LEAVE.

Most words need to leave two things on the stack anyway. Consider the operation of IF...THEN. What must be done is to compile a conditional jump at the IF location, followed by the offset to the THEN location. Of course the THEN location is not known when the IF is compiled. So if

leaves, in addition to the code number 2, a pointer to the place where the offset will later be filled in by THEN. (This pointer is easily obtained: it is HERE after the conditional branch has been compiled in.) THEN pops the 2 after checking for it, gets the next item which it assumes to be the proper address, and fills in the offset to THEN at the address left by IF.

Words like CASE which do not leave an address must still leave a pair of things on the stack; it just leaves a pair of 8's (its code).

ELSE can also use a 2 for its code. Since it is optional, its presence must look the same as IF to THEN. And in fact the action of THEN is the same: store the offset to its address at the address on the stack. ELSE compiles an unconditional rather than conditional branch, and must fill in its own address (or rather the offset to it) at the IF location. Therefore it first executes THEN, and then compiles the unconditional branch, leaving the HERE and 2 on the stack. A similar situation obtains between BEGIN, WHILE and REPEAT.

LEAVE occurs between DO and LOOP or +LOOP. An unconditional jump to the LOOP location must be compiled at each LEAVE location; but other control structures may be nested within the loop, and LOOP's first responsibility is to check for a DO. Therefore LEAVE has to: 1) find a DO marker on the stack (put there since the colon was interpreted), and 2) insert its own marker and address beneath the DO-pair on the stack. Thus LOOP can first find a DO and fill in its address at the DO location, then look for LEAVE markers (arbitrarily many) below it and keep filling in its address at those locations. Because all items left on the stack by control structure words come in pairs, it is possible for LEAVE to look through marker/address pairs left by nested words (e.g. IF inside DO...LOOP) until finding the DO marker (or bottom of stack relative to the word being defined).

7.1 Control Structure Markers

Word	Marker	Actions
DO	3	puts an addr and 3 on data stack.

LEAVE	6	searches through data stack until it finds DO marker. Inserts its own marker, 6, and addr on stack before the DO marker and addr.
LOOP	***	expects to find a DO marker, 3, on top of stack. Uses DO addr to compute offset to start of loop; resolves all LEAVE markers and addresses above DO for branching.
+LOOP	***	same as LOOP
IF	2	puts an addr and a 2 on data stack.
ELSE	2	expects to find IF marker, 2, on top of stack. Resolves IF addr for branching and leaves its own addr and marker, 2, on data stack.
THEN	***	expects to find IF or THEN marker, 2, on top of stack. Resolves IF or THEN address for branching.
BEGIN	1	puts an addr and a 1 on data stack.
WHILE	4	puts an addr and a 4 on data stack.
REPEAT	***	expects to find WHILE marker, 4, and WHILE addr, and also BEGIN marker, 1, and BEGIN addr. Resolves addresses for branching.
UNTIL	***	expects to find BEGIN marker, 1, on data stack and resolves BEGIN addr for branching.
CASE	8	leaves 2 markers, 8 , on data stack.
OF	5	expects either pair of 8's left by CASE in which case it drops the 8's and puts an addr and a marker, 5, on stack; or it expects to find a 7 left by ENDOF in which case it leaves the ENDOF

		marker, 7, and addr and puts its addr and marker, 5, on data stack.
ENDOF	7	expects to find an OF marker, 5, on stack. It resovles the OF addr for branching and leaves its marker, 7, and an addr on stack.
ENDCASE	***	expects to find at least 1 ENDOF marker, 7, and an addr. It resolves all ENDOF addresses for branching.

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Interpreting From A File — CHAPTER 8

The word LOADF switches input from the keyboard to a LIF1 text file either in RAM or on mass storage. It is possible for a file being LOADFed to LOADF another file, etc. The depth is restricted only by the number of items on the FORTH Return Stack.

The inputs to LOADF are 2 20 bit numbers, the first of which is the length of the character string specifying the file to be LOADFed and the second, the address of this string. As mentioned above, the user can directly access a file on a tape without first storing it in RAM.

The idea of a block has been changed to mean 1 line from a file rather than a 1024 byte sector on a disk. LOADF opens the file and using mainframe code, creates a "file information block" (fib) entry in the fib General Purpose buffer (a system General Purpose buffer). In this fashion it is not necessary for FORTH to retain the string which specifies the file, and further, it is not necessary to worry about whether the file is in RAM or on mass storage. FORTH calls mainframe routines to open, close, and read from the file. These routines, in turn, interface to the HP-IL module if it is present.

When a file is LOADFed the first line of the file is read into the disc buffer least recently used. The fib # provided by the system is stored into the disc buffer and into a FORTH User Variable SCRFIB (screen fib#). The number in SCRFIB describes the active file. The contents of the buffer are interpreted until the null at the end of the line (placed there by EXPECT96) is reached. At that point the FORTH word "WORD", which finds the next word in the input stream to be handled, checks to see if we are loading from a screen. If we are loading from a screen it further checks to see if we have reached the end of the active file. If EOF is false, WORD causes the next line to be read from the file into the same disc buffer and then it finds the next word to handle.

As with other FORTHs it is possible to have nested file LOADFs. LOADF saves the necessary information to return to the file it is currently interpreting when it is told to

load another file.

When a file is being loaded 4 User Variables are of prime importance. When LOADF begins to execute it stores these values on the FORTH Return Stack.

BLK -- When contents of BLK are zero FORTH expects input from the keyboard. When the contents of BLK are non-zero they represent the line number in a file to be interpreted.

>IN -- The contents of this are used as an offset into either the TIB (Terminal Input Buffer) or the currently active mass storage buffer (PREV @).

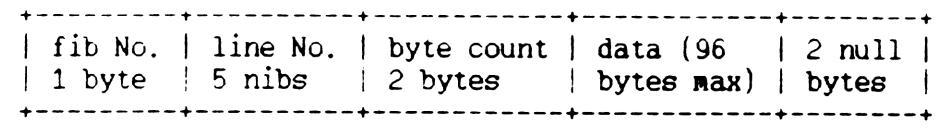
SCRFIB -- This variable contains the fib# (file information block number) of the active file, or 0 if no file is active, or the fib# of the file that was being interpreted when an error occurred.

LINE# -- This variable contains the line number of the file being interpreted, or the line number of a file that was being interpreted when an error occurred.

Superficially BLK and LINE# seem to contain the same information. However, BLK contains the number of the line we want to interpret, LINE# contains the number of the line which is currently in a mass storage buffer to be interpreted. BLK controls where input is taken from; when an error occurs while interpreting from a file BLK is reset to 0 while LINE# preserves an error tracking trail (along with SCRFIB).

When EOF (end of file) is reached the above 4 variables are restored and execution continues.

There are 3 mass storage buffers. Each is 208 nibbles long. The maximum length of data allowed per line is 96 bytes. If the data is longer than 96 characters, only the first 96 will be copied into the buffer. However, the byte count will reflect the true number of bytes for the current line. The buffer has the following form:



Contents of FORTHRAM — CHAPTER 9

In the following lines the contents of FORTHRAM are explicated. This explanation assumes that FORTHRAM is at its default size--in other words that it has not been grown or shrunk.

9..1 User Variables

Addresses are given in hexadecimal and size in nibbles is given in hexadecimal also. In most cases the appropriate FORTH word will return the address of the variable in question. The item of interest is usually the contents of this address.

Name: DSTKAD Addr: 2FAFD Size: 5

The current value of the FORTH Data Stack is saved here during calls to Main Frame routines which are likely to destroy the contents of the CPU registers used by FORTH (see FORTH CPU Register Usage). The value of the Data Stack is also saved here when FORTH returns control to BASIC. There is no FORTH word which returns this address.

Name: RSTKAD Addr: 2FB02 Size: 5

The current value of the FORTH Return Stack is saved here during calls to Main Frame routines which are likely to destroy the contents of the CPU registers used by FORTH (see FORTH CPU Register Usage). There is no FORTH word which returns this address.

Name: IREG Addr: 2FB07 Size: 5

The current value of the FORTH Instruction pointer is saved here during calls to Main Frame routines which are likely to destroy the contents of the CPU registers used by FORTH (see

FORTH CPU Register Usage). There is no FORTH word which returns this address.

Name: ACTIVE Addr: 2FB0C Size: 5

The contents of this location determines the state of FORTH--whether it is active, whether it is running BASICX, whether it is inactive, etc. (see section on ACTIVE for a complete explanation of the values this variable can contain and their exact meaning). The code which handles the various polls (Error, Configuration, Version, Main Loop) examines the contents of this location to determine how to proceed. There is no FORTH word which returns this address.

Name: oS0 Addr: 2FB11 Size: 5

This location contains the address of the bottom of the FORTH Data Stack. The contents of this location are altered by GROW and SHRINK. The FORTH word S0 returns the contents of this address, and the FORTH word SP0 returns this address.

Name: oR0 Addr: 2FB16 Size: 5

This location contains the address of the bottom of the FORTH Return Stack. The contents of this location are altered by GROW and SHRINK. The FORTH word RP0 returns this address.

Name: oTIB Addr: 2FB1B Size: 5

This location contains the address of the Terminal Input Buffer. The contents of this location are altered by GROW and SHRINK. The FORTH word TIB returns the contents of this address.

Name: oUSE Addr: 2FB20 Size: 5

This location contains the address of the next Mass Storage buffer to be used. The contents of this location are altered by GROW and SHRINK. The FORTH word USE returns this address.

Name: oPREV Addr: 2FB25 Size: 5

This location contains the address of the most recently accessed Mass Storage buffer. The contents of this location are altered by GROW and SHRINK. The FORTH word PREV returns this address.

Name: oFIRST Addr: 2FB2A Size: 5

This location contains the address of the first Mass Storage buffer in FORTHRAM. The contents of this location are altered by GROW and SHRINK. The FORTH word FIRST returns this address.

Name: oLIMIT Addr: 2FB2F Size: 5

This location contains the address of the 1st nibble beyond the last Mass Storage buffer in FORTHRAM. The contents of this location are altered by GROW and SHRINK. The FORTH word LIMIT returns this address.

Name: oVOC-L Addr: 2FB34 Size: 5

This location contains the address of the vocabulary link field in the most recently defined vocabulary (see section on Vocabularies for more details). There is no FORTH word which returns this address.

Name: oRSIZE Addr: 2FB39 Size: 5

This location contains the maximum record size, in bytes, of a line to be read into a Mass Storage buffer (see description of Mass Storage buffers for more details). The default size is 96 (decimal) There is no FORTH word which returns this address.

Name: o#TIB Addr: 2FB3E Size: 5

This location contains the number of characters put into the Terminal Input Buffer by the outer loop. This count is put here by QUERY. The FORTH word #TIB returns this address.

Name: oWIDTH Addr: 2FB43 Size: 5

This location contains the maximum number of characters allowable in a name. The default (and the maximum) is 31 (decimal). The FORTH word WIDTH returns this address.

Name: oWARN Addr: 2FB48 Size: 5

If the contents of this location is non-zero a warning will be issued when a user defines a word that already exists. No warning is given when the contents of this location are 0. The FORTH word WARN returns this address.

Name: oOKFLG Addr: 2FB4D Size: 5

If the contents of this location are zero the "OK { n }" prompt will be given when FORTH is ready to process more input. The FORTH word OKFLG returns this address.

Name: oBLK Addr: 2FB52 Size: 5

If the contents of this location are zero, input is taken from the keyboard. If the contents of this location are non-zero, input is taken from a file and the value at this location is the line number in the file being interpreted. The FORTH word BLK returns this address.

Name: oIN Addr: 2FB57 Size: 5

The contents of this location represent the nibble offset into the Terminal Input Buffer or Mass Storage buffer at which the next word to be processed can be found. The FORTH word >IN returns this address.

Name: oSPAN Addr: 2FB5C Size: 5

The contents of this location represent the number of bytes read during the last execution of EXPECT96. The FORTH word SPAN returns this address.

Name: oSCFIB Addr: 2FB61 Size: 5

When the contents of this location are non-zero they represent the fib# (see file information block in the HP-71 IDS) of the file being interpreted. When an error occurrs during interpretation from a file the fib# associated with that file remains in this location. The FORTH word SCRFIB returns this address.

Name: oCONTX Addr: 2FB66 Size: 5

The contents of this variable point to the name field address of the last word to be defined in the search vocabulary. The FORTH word CONTEXT returns this address.

Name: oCURR Addr: 2FB6B Size: 5

The contents of this variable point to the name field address of the last word to be defined in the vocabulary to which new definitions will be added. The FORTH word CURRENT returns this address.

Name: oSTATE Addr: 2FB70 Size: 5

The contents of this variable determine whether the FORTH system is in execute mode (0) or compile mode (C0). The FORTH word STATE returns this address.

Name: oBASE Addr: 2FB75 Size: 5

The contents of this variable determine the base in which numbers will be interpreted and displayed. The default base is 10 (decimal). Legal base values should be between 2 and 72 (decimal). The FORTH word BASE returns this address.

Name: oDPL Addr: 2FB7A Size: 5

The contents of this variable are used by NUMBER to let INTERPRET know whether it (NUMBER) found an integer, a double integer or a floating point number. There is no FORTH word which returns this address.

Name: oFLD Addr: 2FB7F Size: 5

Used in some FORTH versions to hold a length field reserved for a number during output conversion. This space may be used by the user's application. There is no FORTH word which returns this address.

Name: oCSP Addr: 2FB84 Size: 5

This location is used to hold the current value of the FORTH Data Stack pointer when compilation starts (a ":" was found). When compilation ends (a ";" is found) the current value of the Data Stack must equal the value stored in this location. (See section on Compiling of a FORTH Word for

more details.) There is no FORTH word which returns this address.

Name: oHLD Addr: 2FB89 Size: 5

This location is used when a number is being formatted for display. It contains the address of the last character inserted into the display string. (See section of Number Formatting for more details.) There is no FORTH word which returns this address.

Name: oFENCE Addr: 2FB8E Size: 5

The contents of this location are checked during FORGET. Words which begin at a lower memory address than the value of this location are protected from FORGET. The default setting of this location is 2FCB1 (just after FORTH in the RAM vocabulary). The FORTH word FENCE returns this address.

Name: oDP Addr: 2FB93 Size: 5

The contents of this location are the address of the first free nibble in the RAM dictionary. This location is up-dated whenever space is ALLOTed. The default setting of this location is 2FCB1. The FORTH word HERE returns the contents of this address.

Name: oBSIZE Addr: 2FB98 Size: 5

This location contains the size, in nibbles, of each Mass Storage buffer. The default setting of this location is 208 (decimal). There is no FORTH word which returns this address.

Name: oLINE# Addr: 2FB9D Size: 5

This location contains the line number being interpreted in the currently active file (see SCRFIB). If an error occurs while interpreting from a file this location contains the line number in which the error occurred. The FORTH word LINE# returns this address.

Name: oBASIC Addr: 2FBA2 Size: 5

The contents of this location are used as both a flag and an

address holder. If the contents of this location are zero then FORTH is not executing a FORTH to BASIC word. If however the contents of this location are non-zero they are the address at which the FORTH to BASIC word is to finish. (See the section of FORTH to BASIC and BASIC to FORTH for more details.) There is no FORTH word which returns this address.

Name: oLOOP Addr: 2FBA7 Size: 5

The contents of this location are used to specify the LOOP over which ENTER and OUTPUT statements will function. At present there are no facilities to make use of the multiple loop capability. There is no FORTH word which returns this address.

Name: oSECD Addr: 2FBAC Size: 5

The contents of this location specify the secondary address to be used in ENTER and OUTPUT statements. (See documentation of ENTER and OUTPUT in HP-71 FORTH manual for more details on secondary addressing). The default setting of this location is 0. The FORTH word SECONDARY returns this address.

Name: oPRIME Addr: 2FBB1 Size: 5

The contents of this location is used by ENTER and OUTPUT to determine the primary address of the desired device. The valid range of this variable is 0 through 31. The default setting of this location is 1. The FORTH word PRIMARY returns this address. (See HP-71 FORTH manual for further explanation of PRIMARY.)

Name: oONERR Addr: 2FBB6 Size: 5

The contents of this location are used by the FORTH error poll handler and the internal FORTH ABORT words (different from the ABORT and ABORT" words available to the user). If the contents of this location are zero then errors proceed normally. However if the contents of this location are non-zero it is assumed that the non-zero value is the execution (TICK) address of a user defined ON ERROR routine. (See section on ONERR for more details.)

Name: oERR? Addr: 2FBBB Size: 5

This contents of this location are used in 3 distinct ways by FORTH error poll handlers. First, it signals that an error occurred in FORTH during a FORTHX statement. Second, it signals that an "insufficient memory" error occurred; and third it signals that an error poll was generated by FORTH code rather than Main Frame routines. (See section on poll handling for more details.)

Name: oLASTX Addr: 2FBC0 Size: 10

The contents of this location are used as the LAST X register in the FORTH floating point stack. The FORTH word L returns this address and the FORTH word LASTX returns the contents of this address to the X register.

Name: oX Addr: 2FBD0 Size: 10

The contents of this location are used as the X register in the FORTH floating point stack. The FORTH word X returns this address.

Name: oY Addr: 2FBE0 Size: 10

The contents of this location are used as the Y register in the FORTH floating point stack. The FORTH word Y returns this address.

Name: oZ Addr: 2FBF0 Size: 10

The contents of this location are used as the Z register in the FORTH floating point stack. The FORTH word Z returns this address.

Name: oT Addr: 2FC00 Size: 10

The contents of this location are used as the T register in the FORTH floating point stack. The FORTH word T returns this address.

Name: oFNAME Addr: 2FC10 Size: 10

This location is used to hold an 8 character string used by file manipulation words (CREATEF, ADJUSTF, FINDF). There is no FORTH word which returns this address.

Name: oINTRP Addr: 2FC20 Size: 5

This location holds the execution (TICK) address of the default INTERPRET word. There is no FORTH word which returns this address.

Name: oCREAT Addr: 2FC25 Size: 5

This location holds the execution (TICK) address of the default CREATE word. There is no FORTH word which returns this address.

Name: oNUMB Addr: 2FC2A Size: 5

This location holds the execution (TICK) address of the default NUMBER word. There is no FORTH word which returns this address.

Name: oCOMMA Addr: 2FC2F Size: 5

This location holds the execution (TICK) address of the default comma "," word. There is no FORTH word which returns this address.

Name: oCCOMA Addr: 2FC34 Size: 5

This location holds the execution (TICK) address of the default byte-comma "C," word. There is no FORTH word which returns this address.

Name: oALLOT Addr: 2FC39 Size: 5

This location holds the execution (TICK) address of the default ALLOT word. There is no FORTH word which returns this address.

Name: oUNIQ Addr: 2FC3E Size: 5

This location holds the execution (TICK) address of the word which displays the "XXX not unique" message. There is no FORTH word which returns this address.

Name: oVARID Addr: 2FC43 Size: 5

The Assembler uses this location to save the ID number of the general purpose buffer which contains its symbol table. When this location is non-zero FORTH will treat its contents as the ID of a general purpose buffer and FORTH will preserve this buffer from being purged by Main Frame routines. The user may use this location to preserve 1 buffer. Note that when the Assembler is run it will not preserve the contents of this variable. The FORTH word VARID returns this address.

Name: oPAGES Addr: 2FC48 Size: 5

The contents of this variable specifies the number of print lines per page when the Assembler is sending its output to a device. The minimum setting is 8. The FORTH word PAGESIZE returns this address. Assembler is run it will not preserve the contents of this variable. The FORTH word VARID returns this address.

Name: oLSTNG Addr: 2FC4D Size: 2C

The contents of this location are a string variable, maximum length of 20 (decimal) plus 1 max length byte and 1 current length byte. It is used by the Assembler to store the name of the listing file or device. The FORTH word LISTING returns the current length of the string in this location as well as the address of the 1st byte in the string at this location.

Name: oPARRT Addr: 2FC79 Size: 5

This location is used by the Assembler. When the Assembler is handling an op-code it does not recognize it will check the contents of this location. If non-zero it assumes that the value is the execution address of a user defined word which will handle one or more new op-codes. There is no FORTH word which returns this address.

Name: oPRORT Addr: 2FC7E Size: 5

This location is used by the Assembler in conjunction with oPARRT. If the user has handled some processing for a new op-code the Assembler will expect this variable to contain an execution address of a word which will finish the processing of the new op-code(s). See the Assembler portion of the IMS for more details on this.

Name: oPSTAT Addr: 2FC83 Size: 5

This location is used by the FORTH system to store status information about the condition of the BASIC system when FORTH was entered.

Name: oGRAB Addr: 2FC88 Size: 5

This location is used by the Assembler to hold the current value in oSCFIB (either 0 or the FIB--file information block--number of the file currently being LOADFed). This allows a user to assemble a file in the middle of loading FORTH secondaries.

9.1 RAM Dictionary

Addr: 2FC8D

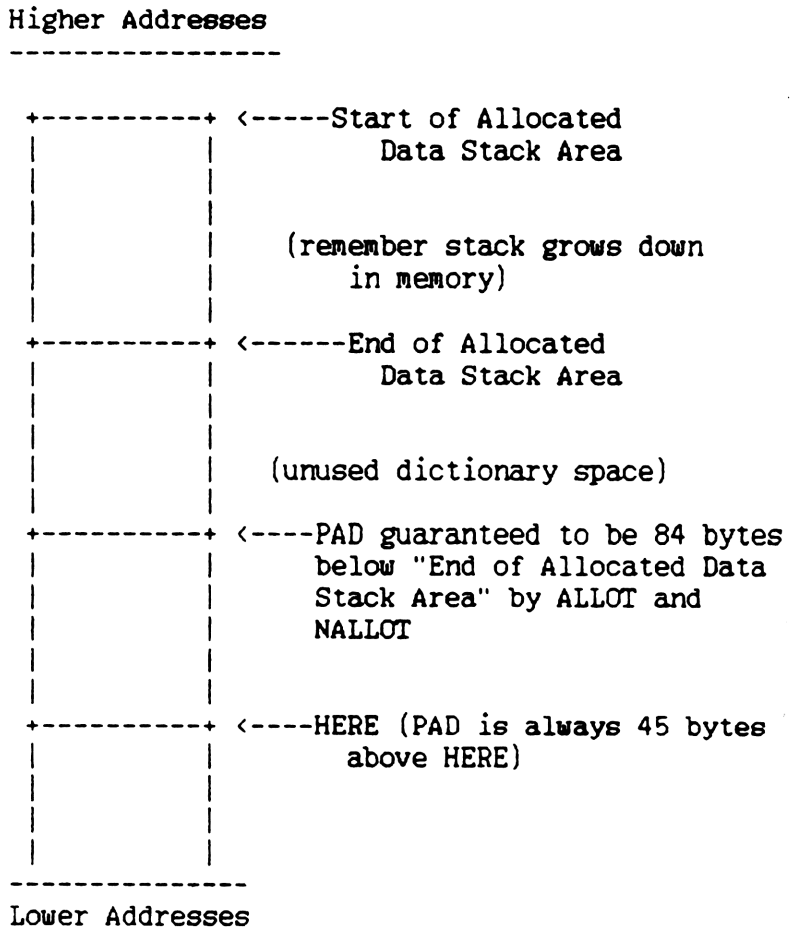
The link field of the word FORTH starts at this address. New words defined by the user are compiled after this word moving toward higher memory addresses.

9.2 PAD

Addr: 2FD0B

The PAD floats above the end of the user RAM dictionary. When space is ALLOTed in the dictionary the address of the PAD will move. Temporary strings and the results of most string operations will be placed in the PAD moving toward high memory. Various algorithms in FORTH seek to ensure that there is always 84 bytes between the start of the PAD area and the top of the Data Stack area.

Numbers being formatted for display (except floating point numbers) are converted into ASCII characters and these characters are temporarily stored directly beneath the PAD. The PAD is situated so that there are 45 bytes between the current end of the dictionary and the beginning of the PAD area.



9.3 FORTH Data Stack

In the default size FORTHRAM file the FORTH Data Stack starts at 30D7C. The stack grows down in memory and there is room for at least 40 entries on the stack. No error is generated if the Data Stack grows into the dictionary area, and, in fact, the system may be corrupted by overwriting the dictionary.

9.4 Terminal Input Buffer & FORTH Return Stack

Two hundred bytes are allocated for both of these structures together. In the default size FORTHRAM the Terminal Input

Buffer begins at 30DC7 (note that this is the bottom of the Data Stack) and is filled toward higher memory addresses. The Return Stack starts at 30F0C and grows down in memory toward the Terminal Input Buffer (TIB).

9.5 Mass Storage Buffers

There are 3 mass storage buffers in the FORTHRAM file. Each is 208 nibbles long. In the default size FORTHRAM the first buffer begins at 30F0C (note that this is the bottom of the Return Stack). See explanation on Mass Storage Buffers in the previous chapter (Interpreting From A File) for more specifics on the mass storage buffers and their usage.

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The FORTH System Variable ACTIVE — CHAPTER 10

The location ACTIVE in the file FORTHRAM is used by the system to keep track of where it has been in the many and convoluted paths through BASIC and FORTH. Here are the meaningful values of ACTIVE:

-2	Flag set while handling the error poll, before we send another error poll, so we can ignore this second-order poll.
-1	We went to sleep in FORTH, and have now awakened, realized this in BASPOL, and set the new value in forpon, which will be checked and reset in RESTRT.
0	FORTH has not been called, or it was left with a BYE.
1	Normal condition; FORTH environment is active.
2	BASICI,BASICF or BASIC$ is running; they can't return via BASPOL, so if MainLoop poll occurred we have to go to ABORT.
3	BASICX is running the BASIC environment, ready to return via the MainLoop poll(BASPOL).
[4,5]	There's a check in ERR02 which cares about 2&3 but would also catch 4&5.
99	We just went to sleep by calling power-off in EXPECT96, and have just awakened.

Poll Handling — CHAPTER 11

There are six types of polls handled by FORTH, to gain control back from, or supply needed information to, the mainframe.

11.1 VER$ POLL

When VER$ is executed, the operating system polls the Lex files to get a string identifier from each. We point at the string " FTH:1A " in the ROM, and return saying we handled he poll.

11.2 FILE TYPE POLL

The file FORTHRAM is of a unique type unknown to the mainframe. It issues this poll and we recognize that the file is indeed our type. Then we set up pointers into our own File Type Table, which includes the name of the file-type ("FORTH"), and identifies the file as SECURE if it has been secured. This poll is issued when copying to external media as well as in the CAT function.

11.3 CONFIGURATION POLL

The configuration of the machine can change when the HP-71 wakes up, when a FREEPORT or CLAIMPORT is performed, or when modules are plugged in or pulled out of the machine. If the configuration changes, memory moves. The FORTH ROM intercepts this poll to examine the address of the FORTHRAM file in memory. If FORTHRAM has moved then we must adjust the size of the deadspace within FORTHRAM in order to keep our data at the right address. FORTHRAM must, however, be the first file in the file chain and of the right type,

otherwise we just give up.

If FORTHRAM is the first file in memory and is of the right type we check the contents of oVARID (after ensuring FORTHRAM is in the right place) to see if there is an I/O buffer around which we want to save. This is done by calling a system routine which will re-set (they are first all cleared by the operating system) the high bit in the buffer ID and thus prevent the system from reclaiming

11.4 MAIN LOOP POLL

If FORTH is active, we need to regain control from the operating system. There are several states we might be in, however. We decide what to do based on the value of ACTIVE, as follows:

0 -------- do nothing, RTNSXM (FORTH not active)

IF ACTIVE 0:

first check if from FORTHX (oBASIC 0) if so clear ACTIVE, return having handled poll

ELSE

1 -------- assume INIT1 has happened; reset pointers, show sign-on message and ABORT

2 -------- BASICI/F/$ -- hit a PAUSE (in user function). set ACTIVE to 1 and "WAKEUP" (goto QUIT)

3 -------- BASICX -- collapse HP-71 math stack and restore FORTH pointers; KILL buffer used for BASIC command, clean up items on RTN stack, exit BASICX.

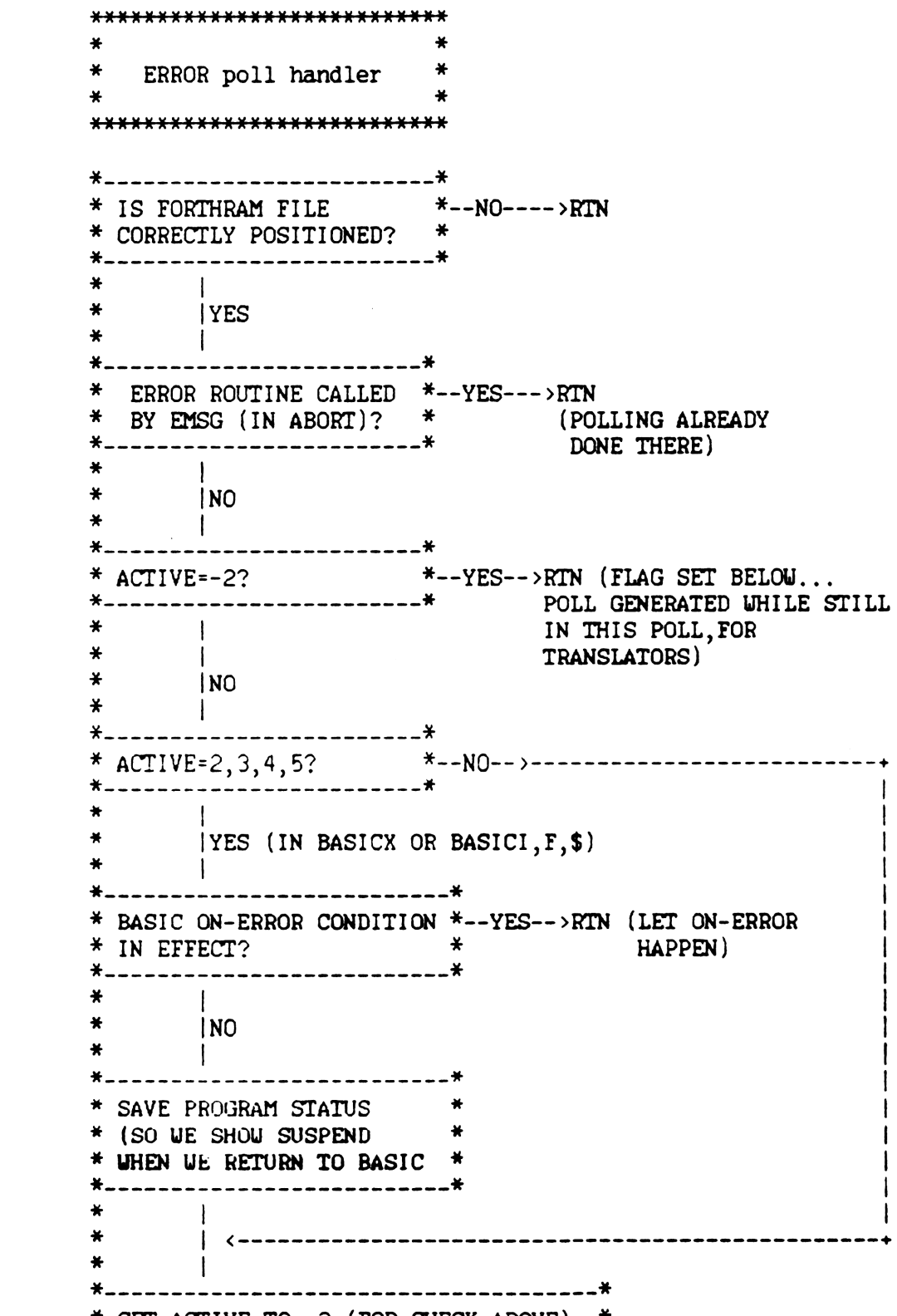
Another way to get here, which is not recognizable from ACTIVE, is through a memory error. In this case a GOSUB to MFERR never returns but goes to MAINLOOP. MEMERR's are flagged by oERR=1 in the error-poll-handler. So when oERR=1 then ABORT.

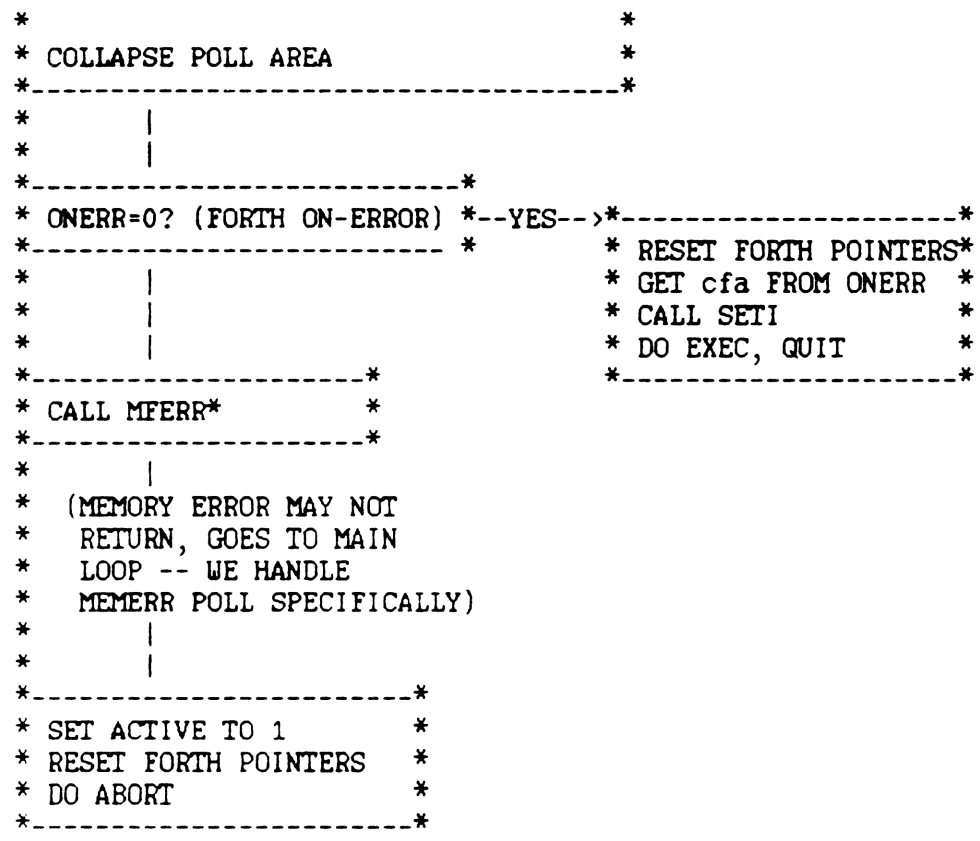
11.5 INSUFFICIENT MEMORY POLL

This is really just like any other error, except for the fact mentioned above. So we set oERR as a flag to the Main-Loop Poll, then jump into the Error-Poll handler.

11.6 ERROR POLL

Errors in FORTH which are generated by one of the ABORT routines will, for the most part, take care of themselves. Here we are concerned primarily with errors that occurred during a mainframe routine called from assembly language. We need to take over and return control to the ABORT code, so as to function like other errors in FORTH. There are many complications, however: we have to recognize when BASIC is running out of FORTH (through BASICX/I/F/$) and perhaps let the BASIC ON-ERROR routine take over; we have to check for the FORTH ONERR condition and perhaps let it take over; and, mainly, we have to generate the error message, by calling the mainframe routine which will first issue a poll to allow other ROM's (like foreign language translators) to substitute their own messages, and then return control to us (except in the case of a memory error as explained above). This means we also have to distinguish when this poll is generated from inside our poll handler itself. And we have to recognize when it is generated by the ABORT routine's primitive, EMSG. Here is a flow chart for all this:


ERROR poll handler
IS FORTHRAM FILE CORRECTLY POSITIONED?
--NO---->RTN
YES
ERROR ROUTINE CALLED BY EMSG (IN ABORT)?
--YES--->RTN (POLLING ALREADY DONE THERE)
NO
ACTIVE=-2?
--YES-->RTN (FLAG SET BELOW... POLL GENERATED WHILE STILL IN THIS POLL,FOR TRANSLATORS)
NO
ACTIVE=2,3,4,5?
--NO-->
YES (IN BASICX OR BASICI,F,$)
BASIC ON-ERROR CONDITION IN EFFECT?
--YES-->RTN (LET ON-ERROR HAPPEN)
NO
SAVE PROGRAM STATUS (SO WE SHOW SUSPEND WHEN WE RETURN TO BASIC
SET ACTIVE TO -2 (FOR CHECK ABOVE)



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Positioning Of FORTHRAM File — CHAPTER 12

The functioning of FORTH in the HP-71 is based on absolute addresses. The ROM dictionary is hard configured to always live at E0000. A problem arises when we examine the positioning of FORTH system variables and user definitions. The entire RAM address space is managed by the BASIC O/S; this system works with entities called files. The FORTH system had to respect the integrity of BASIC and therefore all FORTH system variables and user definitions have to exist within the framework of a file. However, files move in RAM and, worse, their movement is unpredictable.

To solve these problems, FORTHRAM is always positioned at the beginning (lowest memory address) of the RAM file chain. Directly beneath the beginning of file memory are the BASIC O/S configuration buffers (see the HP-71 IDS for a complete description of these buffers). These buffers have a minimum and a maximum size. Therefore it is possible to identify the lowest possible start address for a file in the file chain (2FA01) and the highest possible start address (2FAD3). To this latter address we add 25 (hex) nibbles for file overhead (file name, time, creation date, etc.) plus 5 nibbles of storage for FORTH's purposes. This gives us an address at which we can always count on being able to use for FORTH's variables, 2FAFD.

The FORTHRAM file is created, if it does not already exist, when the FORTH or FORTHX keyword is executed. The file is approximately 3K bytes in its default size and enough RAM must exist to create the entire default size file--the file size can be grown or shrunk once FORTH is entered. The difference between the maximum start address and the actual start address is padded with "dead space" (unused RAM) so that FORTH's variables always start at 2FAFD.

Once FORTHRAM exists and is at the beginning of the file chain, the start address of the file will only change when the BASIC O/S re-configures (see HP-71 IDS for conditions when configuration occurs). However the BASIC O/S issues a poll to let ROMs know that configuration has occurred. FORTH sees the poll and adjusts the amount of "dead space" so that its data will still start at 2FAFD.

If FORTHRAM exists but is not at the beginning of the file chain (i.e., FORTHRAM was copied from cassette into memory) when FORTH or FORTHX is executed it will move FORTHRAM to the beginning of the file chain and adjust the amount of dead space to start the data at 2FAFD. There must be at least 37 or more free bytes to affect this change.

The algorithm for creating and/or repositioning FORTHRAM follows:

1) Does FORTHRAM exist? If YES goto 13.

2) Compute the necessary size needed to create FORTHRAM.

HIGH = (highest possible start addr)

ACTUAL = actual start addr (contents of BASIC variable MAINST)

DIFF = HIGH - ACTUAL

3) If DIFF < 0 then memory is in an unpredictable state, error out with Configuration message.

FSIZET = size needed for FORTH system and user dictionary (5801 nibbles).

SIZE = FSIZET + DIFF

3) Is there enough memory to create file of SIZE? If YES goto 5.

4) Error out with Insufficient Memory message.

5) Create FORTHRAM file and store address of FORTHRAM in the 5 nibbles immediately following the file header.

6) Initialize FORTH system variables

7) Save BASIS program status.

8) Initialize FORTH Data Stack and Return Stack pointers.

9) Set FORTH as active (ACTIVE = 1). Reset FORTH to BASIC indicator (oBASIC = 0).

10) Did we goto sleep in FORTH and are now waking up? (previous value of ACTIVE = -1)

If so goto 12.

11) Give FORTH sign on message, run QUIT.

12) Get previous value of Data Stack stored in DSTKAD; give wake-up message, run QUIT.

13) Is file correct type? If yes goto 15.

14) Error out with File Type message.

15) Calculate DIFF as above. If DIFF < 0 error out with Configuration message.

16) Is FORTHRAM first file in memory? If not goto 20.

17) Store current address of FORTHRAM immediately following FORTHRAM header. Has FORTHRAM moved in memory since last time we were in FORTH environment (compare old addr stored immediately after FORTHRAM header with current addr of FORTHRAM)? If it has moved goto 19.

18) Reset FORTH ONERR (oONERR=0) and oERR?. Save BASIC program status. Get FORTH Data Stack address from FORTH save area (DSTKAD). Reset FORTH Return Stack pointer. Goto 9.

19) Adjust dead space in FORTHRAM (change file size) to position data at 2FAFD. Goto 18.

20) Are there at least 37 bytes of free memory? If not error out with Insufficient Memory message.

21) Open a hole at the beginning of memory as large as the entire file or as large as available memory allows.

22) Move all or as much as possible of the old FORTHRAM into position as the new FORTHRAM.

23) Shrink old FORTHRAM by amount moved (except for old file's header).

24) Any more to move? (Is link field in header of old FORTHRAM > 5?) If more to move goto 22.

25) Get rid of old FORTHRAM's header. New FORTHRAM

is now in position but its dead space may need
to be adjusted, goto 1.

BASIC/FORTH Interface — CHAPTER 13

FORTH is invoked from the BASIC Interpreter loop via the keywords FORTH or FORTHX. They are statements, meaning that they return no results and are not expected to do anything in particular by the operating system. They end by jumping to the main loop entry point (FORTH) or the Next-statement entry point (FORTHX) -- the latter being almost equivalent to the former except for a few checks such as service requests. FORTHX is programmable and FORTH is not.

The keywords FORTHI/F/$ do not invoke the FORTH system; they simply look into the FORTHRAM file (if it is of the right type and in position) and return values stored there, possibly updating the stack pointer (FORTHI/$). Thus they are not subject to the prohibition against re-entrancy.

This prohibition says that the command string to FORTHX cannot contain BASICX; and that the command string to BASICX cannot contain FORTHX. Also a user-defined function called by BASICI/F/$ cannot call FORTHX. In all these cases it is a question of not saving the environments of the calling function, and not being able to prevent essential pointers (e.g. the continue-address used by Next-statement) from being scrambled. Note however that FORTHX can contain a call to the BASICI/F/$ words. This is because of the different mechanisms used by them and BASICX, as explained below.

BASICX puts the command string in a buffer and jumps to an entry point which is equivalent to executing a statement from the keyboard. In other words we are executing a "program" and the system has to worry about its environment. This becomes apparent when the command statement is "RUN","CALL",etc. The other words, by contrast, are simply passed to the expression- execution routine; they can be thought of as invoking the keyword VAL, whose job is to return a number (or VAL$, which returns a string) to the math stack. Here there is no problem about the program environment, the continue-address and so forth (EXCEPT, let us note, in the irregular and troublesome case of user-defined functions).

Because BASICI/F/$ simply call a function (in effect), they

have control returned to them, and need only pull their result off the math stack. BASICX, on the other hand, has simulated execution from the keyboard and the system will return to the main loop when it is finished. We have to regain control, then, via the main-loop poll.

The BASIC/FORTH interface is complicated by the occurrence of errors. In this case as elsewhere, the value of ACTIVE is used to sort out the appropriate path to take. When an error occurs in BASICX we save away the program status, so that on exit from FORTH we can restore the suspend annunciator, etc. When an error occurs in FORTHX we remember to set the No-continue flag, so a BASIC program will halt after the FORTH error is displayed.

The main idea is to have the two environments continuous within themselves while switching back and forth, in other words whatever is happening in BASIC continues after FORTH has been invoked and exited, and vice versa. For instance, the FORTH data stack is preserved when BASIC becomes active. This result is achieved by maintaining the integrity of FORTHRAM and the ACTIVE variable in it, and by placing the restrictions on re-entrancy mentioned above.

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8:01 AM FRI., 1 JUNE, 1984

Headerless Words — CHAPTER 14

The following words have no headers and can be accessed only by getting their addresses from the listings. Not included are the runtime actions for immediate words, or vectored words.

MODULE: FT2

name	stack conditions	purpose
DPL	(-- addr)	variable used in determining number of digits to right of decimal point in double integer math
FLD	(-- addr)	variable giving field length in formatting a number for display
CSP	(-- addr)	variable which contains stack addr at start of compilation
HLD	(-- addr)	variable which holds addr of latest char output in numeric display
LIT	(-- n)	pushes contents of next dictionary addr onto stack
PFA	(nfa -- pfa)	convert name field address of compiled word to its parameter field address
FLIT	(--)	pushes the next 16 nibs from the dictionary onto the floating point stack
QCSP	(--)	issue error message if stack position differs from value saved in CSP
PT1+	(--)	advance >IN pointer by one char

MODULE: FT3

F.AND (flag1 flag2 -- flag3)
reverses sense of flag1 and flag2 (i.e., if 0 make it -1, if non-zero make it 0), ORs the result and reverses the sense of the OR. A logical AND as opposed to the provided bitwise AND.

FIND› (addr1 addr2 -- cfa b true)
(-- false)
search through headers to find a dictionary entry; return cfa and first byte of header if found (subroutine of FIND)

VOC-L (-- addr) variable containing addr of the parent-vocabulary field of the most recently created vocabulary

AGAIN
compile-time: (addr 1 -) compiles BRANCH to BEGIN

-FIND (-- cfa b true)
(-- false) calls WORD, gets CONTEXT, and calls FIND›
(subroutine of FIND)

CLEANX resets stack and context, closes all files, flushes disk buffers and unsmudges last dictionary entry (subroutine of ABORT words)

ERRTST execute contents of ONERR if non-zero, else QUIT (subroutine of ABORT words)

ABRT"X (flag --) system version of ABORT" which uses error message table; must be followed by error number in dictionary

ABORTW (flag --) similar to ABRT"X, but prefixes word at HERE to error message, e.g. "FTH ERR: XYZ not recognized"

WHERE (--) display word at HERE

ROM;C (--) stores the runtime address of the

		prologue (compiled after it)
BASIC	(-- addr)	normally zero, variable has addr of return to FORTHX when FORTHX is being executed
MODULE: FT4		
CLAP	(--)	collapse mainframe math stack
?PAIR	(n1 n2 --)	issue error message if n1 n2
GCHAR	(c -- addr t/f)	moves string to HERE, looks for ending char c
MOVDP		move dictionary pointer past string at end of dictionary
BUFFR	(n1 n2 -- addr)	obtain nect block buffer, assigning it to block n1 n2=fib of desired file addr=addr of 1st data byte in buffer
M255	(n1 -- n2)	if n1>255, n2=255
ROMC+		ROM;C with DOSTR (runtime for string)
ROMC*		ROM;C with DOSTRA (runtime for string-array
MODULE: FT5		
RSIZE	(-- addr)	variable with max size of a disk buffer record
ZBRNH	(flag --)	conditional branch; compile the offset to jump after it in dictionary
BRNCH	(--)	unconditional branch, followed by offset to jump in dictionary
?NEG	(n1 n2 -- n3)	if n2<0 then negate n1
<;COD		<;CODE> for RAM defining words (subroutine od DOES>)
FNAME	(-- addr)	variable with eight character filename set by SYNTAXF

SETNAM	(str --)	set up string with quotes around it and blankfilled, in STMTR0 -- prepares for mainframe routine FSPECx, called by FSYNTAX
CRFIL	(size fnameptr -- filaddr/false)	attempts to create file (subroutine of CREATEF)
NQOT?	(-- flag)	compare next char in stream to quote
D?NEG	(d1 n -- d2)	if n<0, negate d1

MODULE: FT7

DOCOL		pushes I to return stack, makes word-address into new I; found at pfa of all secondaries
DOCON	(-- n)	runtime code for constant (value compiled after it in dictionary) pushes value to stack
DOFCON	(--)	runtime code for floating point constants; does stack-lift and pushes value to X-register
DOVAR	(-- addr)	runtime code for variable; value is after it in word, i.e. at pfa
DOSTR	(-- addr len)	runtime code for string pushes addr of 1st char (=pfa +4) and current length (at pfa+2) to stack
DOSTRA	(n -- addr len)	runtime code for string-array finds nth element and pushes its addr and length
DODOES	(-- pfa)	list of cfa's is compiled after it; it pushes I onto rtn stk; resets I to the cfa list; and pushes pfa of word being executed
DOVOC	(--)	runtime code for a vocabulary word; resets CONTEXT
SAVEFP		saves pointers (CPU registers D1,D0,

	B[A]) in DSTKAD
GETFP	restores pointers saved by SAVEFP
SEMI	pop rtn stack to I (=D0) and go to inner loop; ends every secondary
DOATN	checks to see if ATTN key was hit, and if so runs ABORT; included in BRNCH,ZBRNH and SEMI
GETX	gets contents of X-register as 15-form number in registers (A,B)
GETX+L	calls GETX and puts X in LASTX
PUTABX	puts result of computation (in (A,B)) into X-register
STKLFT	simulates 41-C stack-lift on the "registers" X,Y,Z,T
STKDRP	simulates 41-C stack-drop on the "registers" X,Y,Z,T

Misc FORTH Details — CHAPTER 15

15.1 FORTH And The ATTN Key And Service Requests

The ATTN key functions in 2 ways within FORTH. When the ATTN key is hit while entering input from the keyboard the line is cleared and only the blinking cursor appears. When the ATTN key is hit while a FORTH word is running FORTH executes its internal ABORT routine and again only the blinking cursor is seen.

Hitting the ATTN key, and in fact any key, causes a hardware interrupt. The Main Frame has a vectored routine to handle this key interrupt. It is possible to disable the ATTN key--while a word is executing, not when taking input from the keyboard--by storing some non-zero value in the nibble at 2F441. If the ATTN key has not been disabled this code will set a flag at 2F442.

FORTH checks to see if the ATTN key has been hit each time it executes the runtime semi-colon code (at the end of each secondary) and also each time the runtime branching code (0BRANCH and BRANCH) are executed. If the ATTN key has been hit FORTH clears the ATTN hit flag (2F442) and runs its internal ABORT word. If the ATTN key has not been hit FORTH further checks the exception flag to see if any device has requested service. If the service request flag is set it issues the exception poll (see HP-71 IDS for more detailed information on this poll).

15.2 FORTH Usage Of CPU Registers

D0 : contains FORTH Instruction Pointer

D1 : contains FORTH Data Stack Pointer

B(A) : contains FORTH Return Stack Pointer

Stack Discipline: The stack pointer (Data and Return) is first decremented by 5 BEFORE pushing a new value. The stack pointer is incremented AFTER popping (reading) a value from the stack. Remember that stacks grow down in memory toward lower addresses.

15.3 ONERR: FORTH's "On Error Goto"

When the value contained in oONERR (this address is returned by ONERR) is non-zero, FORTH assumes that it is the execution address of a word the user wishes to run whenever there is a FORTH error.

This location is zeroed out whenever the FORTH environment is entered (FORTH, FORTHX) and also during an INIT1 when FORTH is active.

FORTH often makes use of Main Frame subroutines to accomplish certain tasks. Many of these routines jump immediately to the Main Frame error handler if they encounter a problem without first giving FORTH a chance to handle the error. This fact makes the usage of ONERR problematic but still a useful tool. Before FORTH calls a Main Frame routine which might error out it saves away the FORTH system pointers (see section of FORTH Usage Of CPU Registers). In these cases FORTH gains control of the machine when the BASIC O/S issues the error poll. FORTH sees that ONERR is set and, after restoring the FORTH system pointers from the save area, runs the user's ON ERROR routine. Neither the FORTH Return or Data stacks are reset. It is the responsiblity of the user to determine what useful information is on the stacks for a particular error.

If the user's routine simply returns without cleaning up the stacks, FORTH will run the QUIT word (otherwise the system would crash). The user may attempt to handle the problem and pop the appropriate number of addresses off the FORTH Return Stack to return to a point in their application where execution may safely continue.

```
                TITLE   FORTH_GLOBALS_<840608.1403>

*
* FORTH RAM File:   Addrs are approximate at this point.
*
*       File Size=5969 nibbles max (approx 3K bytes)
*
*       +-------------------------------------+
*       | File Overhead (37 nibbles)          |
*       | RAM file address (5 nibbles)        |
*       |                                     |
*       | --floating area (210 nibbles Max)-- |
*       |                                     |
*       | #2FAFD  Housekeeping                |
*       |                                     |
*       |      DATA STACK SAVE AREA           |
*       |      RTN STACK SAVE AREA            |
*       |      IREG SAVE AREA                 |
*       |                                     |
*       | #2FB11 Start of USER VARIABLE TABLE |
*       |                                     |
*       | #2FCB1 Dictionary Start             |
*       |                                     |
*       |  PAD                                |
*       |                                     |
*       |  Text Buffer: temporary holding     |
*       |  area for strings                   |
*       |-------------------------------------|
*       |     /|\                            |
*       |      |                              |
*       | DATA STK Start                      |
*       |-------------------------------------|
*       |            Terminal Input Buffer    |
*       |                      |              |
*       |     /|\             \|/             |
*       |      |                              |
*       | RTN STK Start                       |
*       |-------------------------------------|
*       | Disk Buffer Area (612 nibbles)      |
*       | ( 3 102 byte buffers)               |
*       +-------------------------------------+
*
```

```
43                      EJECT
44
45              *
46              * FILE EQUATES: see discussion on how DSTKAD is obtained
47              *               at end of this file
48              *
49
50              =DSTKAD  EQU   #2FAFD        DATA STK Save area
51              =RSTKAD  EQU   (DSTKAD)+5    RTN STK Save area
52              =IREG    EQU   (RSTKAD)+5    "I" REG Save area
53              =ACTIVE  EQU   (IREG)+5      Says if FORTH is active or not
54              * ------------------------------
55              =UVARP   EQU   20            SUM OF ITEMS BEFORE UVAR
56              =UVAR    EQU   (ACTIVE)+5    Start of User Variable Table
57
58              *-------------------------------------------------------
59              *
60              * U S E R   V A R I A B L E S
61              *
62              *-------------------------------------------------------
63
64
65              =oS0     EQU  (UVAR)+0        Data Stack Ptr
66              =oR0     EQU  (UVAR)+5        Rtn Stack Ptr
67              =oTIB    EQU  (UVAR)+10      TERMINAL INPUT BUFFER POINTER
68              =oUSE    EQU  (UVAR)+15      NEXT BUFFER TO USE
69              =oPREV   EQU  (UVAR)+20      MOST RECENT DISK BUFFER
70              =oFIRST  EQU  (UVAR)+25      ADDR OF 1ST DISC BUFFER
71              =oLIMIT  EQU  (UVAR)+30      ADDR OF 1ST NIB BEYOND BUFFERS
72              =oVOC-L  EQU  (UVAR)+35      VOCABULARY LINK
73              =oRSIZE  EQU  (UVAR)+40      RECORD SIZE IN BYTES OF BUFFER
74              =o#TIB   EQU  (UVAR)+45      # CHARS IN TIB, PUT THERE BY QUERY
75              =oWIDTH  EQU  (UVAR)+50      MAX NAME LENGTH (DEFAULT=31)
76              =oWARN   EQU  (UVAR)+55      WARNING MODE
77              =oOKFLG  EQU  (UVAR)+60      ENABLE/DISABLE "OK" IN QUIT
78              =oBLK    EQU  (UVAR)+65      CURRENT DISK BLOCK BEING LOADED (0=TE
79              =oIN     EQU  (UVAR)+70      OFFSET IN TERMINAL INPUT BUFFER
80              =oSPAN   EQU  (UVAR)+75      # CHARS READ DURING LAST EXPECT96
81              =oSCFIB  EQU  (UVAR)+80      CURRENT FORTH DISK SCREEN
82              =oCONTX  EQU  (UVAR)+85      CONTEXT
83              =oCURR   EQU  (UVAR)+90      CURRENT
84              =oSTATE  EQU  (UVAR)+95
85              =oBASE   EQU  (UVAR)+100
86              =oDPL    EQU  (UVAR)+105     OFFSET TO DEC PT AFTER DINT INPUT
87              =oFLD    EQU  (UVAR)+110     OUTPUT FIELD WIDTH
88              =oCSP    EQU  (UVAR)+115     CURR STK POS (USED BY COMPILER)
89              =oHLD    EQU  (UVAR)+120     POINTS TO LAST CHAR IN PAD
90              =oFENCE  EQU  (UVAR)+125     PREVENT FORGETTING BELOW FENCE
91              =oDP     EQU  (UVAR)+130     DICTIONARY POINTER=NEXT AVAIL NIB
92              =oBSIZE  EQU  (UVAR)+135     SIZE OF BUFFERS IN NIBBLES
93              =oLINE#  EQU  (UVAR)+140     CURRENT LINE IN ACTIVE BUFFER
94              =oBASIC  EQU  (UVAR)+145     RETURN ADDR FOR BASIC KEYWORDS
95              =oLOOP   EQU  (UVAR)+150     selected HPIL LOOP (0,1 or 2)
96              =oSECD   EQU  (UVAR)+155     SECONDARY loop addr, if any
97              =oPRIME  EQU  (UVAR)+160     PRIME loop address
```

```
 98            =oONERR  EQU  (UVAR)+165    ON ERROR flag
 99            =oERR?   EQU  (UVAR)+170    ERROR OCCURRED?
100
101            *
102            *  (more user variables below)
103            *---------------------------------------------------------
104
105            =BUFLEN  EQU  208           208 NIBS LONG
106            =RECSIZ  EQU  96            RECORD IS 96 BYTES LONG
107
108            *---------------------------------------------------------
109            * X, Y, Z, T AND L FLOATING POINT STACK
110            *---------------------------------------------------------
111
112            =oLASTX EQU  (UVAR)+175      LAST X register
113            =oX     EQU  (UVAR)+191      X register
114            =oY     EQU  (UVAR)+207      Y register
115            =oZ     EQU  (UVAR)+223      Z register
116            =oT     EQU  (UVAR)+239      T register
117
118            *---------------------------------------------------------
119            =oFNAME  EQU  (UVAR)+255    FILENAME SET BY FSYNTX,USED BY CRFILE
120            *                           EIGHT BYTES LONG
121            *---------------------------------------------------------
122
123            *
124            * LOCATIONS FOR INDIRECT EXECUTION OF FOLLOWING 6 WORDS
125            *
126
127            =oINTRP  EQU  (UVAR)+271    INTERPRET
128            =oCREAT  EQU  (UVAR)+276    CREATE
129            =oNUMB   EQU  (UVAR)+281    NUMBER
130            =oCOMMA  EQU  (UVAR)+286    COMMA ,
131            =oCCOMA  EQU  (UVAR)+291    C-COMMA C,
132            =oALLOT  EQU  (UVAR)+296    ALLOT
133            =oUNIQ   EQU  (UVAR)+301    FOR "ISN'T UNIQUE MESSAGE"
134            *
135            * ASSEMBLER VARIABLES
136            *
137
138            =oVARID  EQU  (UVAR)+306    ASSEMBLER VARIABLE
139            =oPAGES  EQU  (UVAR)+311    "           "
140            =oLSTNG  EQU  (UVAR)+316    ASSEMBLER STRING VARIABLE
141            *                           44 NIBBLES LONG
142            =oPARRT  EQU  (UVAR)+360
143            =oPRORT  EQU  (UVAR)+365
144            *
145            * STILL MORE VARIABLES
146            *
147            =oPSTAT  EQU   (UVAR)+370    PROGRAM STATUS STUFF
148            =oGRAB   EQU   (UVAR)+375    used by ASSEMBLER to hold SCRFIB#
149            *
150            =TSIZE   EQU  380
151            =ENDVAR  EQU  (UVAR)+(TSIZE)
152            *
```

```
153           * FRTHHD MUST BE SET TO (ENDVAR)+5 INSTEAD OF (ENDVAR) BECAUSE
154           * IT IS PRECEEDED BY 5 NIBS OF 0 SIGNIFYING NO MORE LINKS IN RAM
155           *
156           =FRTHHD  EQU  (ENDVAR)+5      RAM DICTIONARY ENTRY FOR FORTH
157           *
158
159           =FRTHVC  EQU  (FRTHHD)+#15    ( ' FORTH 5 + ) CURRENT/CONTEXT fie
160           =FRTHVL  EQU  (FRTHHD)+#1A    ( ' FORTH 7 + ) VOC-LINK field
161           =DICTST  EQU  (FRTHHD)+#1F    start of available dictionary space
162           =TBLLEN  EQU (UVARP)+(TSIZE)+5+#24  STARTING STUFF FROM DSTKAD TH
163           *                             UVARS+FRTHHDLINK+FRTHVC,ETC.
164           *-------------------------------------------------------
165           * ERROR MESSAGE NUMBERS
166           *-------------------------------------------------------
167           =eRROR  EQU      0            GOES EVERYWHERE
168           =eNEND  EQU      1            no ending something
169           =eNOTF  EQU      2            xxx Not Found
170           =eNO;   EQU      3            no ending ;
171           =eNOEP  EQU      4            no ending )
172           =eNO"   EQU      5            no ending "
173           =eLT1   EQU      6            less than 1
174           =eNDEF  EQU      7            def not finished
175           =eDFUL  EQU      8            dictionary full
176           =eCOMP  EQU      9            compile only
177           =ePILE  EQU     10            HPIL error
178           =eRDNL  EQU     11            redefined null
179           =eBADD  EQU     12            bad dictionary entry
180           =ePDIC  EQU     13            in protected dictionary
181           =eEMPT  EQU     14            empty stack
182           =eFULL  EQU     15            full  stack
183           =eNREC  EQU     16            not recognized
184           =eCOND  EQU     17            conditionals not paired
185           =eNOFTH EQU     18            wrong # of items left on stack
186           =eBFIL  EQU     19            bad file specifier
187           *
188           *
189           *
190           =eRANGE EQU     43            address out of range
191           *
192           =eDUPFL EQU     45            FILE EXISTS
193           =eBADPM EQU     46            BAD PARAMETERS
194           *
195           =eCONF  EQU     52            CONFIGURATION
196           =eSWF   EQU     53             STRING WON'T FIT
197           =eNCUR  EQU     54            NOT IN CURRENT VOCABULARY
198           =eCNLD  EQU     55              CANNOT LOAD
199           =eNODO  EQU     59             NO DO BEFORE LEAVE
200           =eCASE  EQU     60             BAD CASE STATEMENT
201           * JEFF
202           =eREENT EQU     62          not re-entrant
203           =eBASCX EQU     63           BASIC not re-entrant
204           =eFORTX EQU     64           FORTH not re-entrant
205           *-------------------------------------------------------
206           *More Useful Equates
207
```

```
208             =CELL    EQU  5           5 nibbles
209
210             =NAMLEN  EQU  31         word name length =31
211
212             =FSIZE   EQU  5759       REQUIRED START SIZE OF FORTH FILE:
213             *
214             *                              20 NIBS HOUSEKEEPING
215             *                             275 NIBS USER VARIABLE TABLE
216             *                              80 NIBS X,Y,Z,T & L STACK
217             *                            4096 NIBS FOR DICTIONARY (2K BYTES)
218             *                              64 NIBS FOR PAD
219             *                             200 NIBS DATA STACK (40 ENTRIES)
220             *                             400 NIBS TIB & RTN STACK
221             *                             612 NIBS 3 102 BYTE DISC BUFFS
222             *                            ----
223             *                            5759 NIBS
224
225
226             =MINFIL  EQU  (DSTKAD)-37-5     ADJUSTABLE STARTING ADDR
227
228
229
230
231             =FSIZET  EQU  (FSIZE)+37+5
232             *
233             *                              37 NIBS FILE HEADER
234             *                               5 NIBS RAM FILE START ADDR
235             *                            5759 NIBS FOR FIXED FORTH FILE
236             *
237
238             =FILEST EQU  #2FA01          This is the theoretical lowest
239             *                            starting address for the 1st file
240             *                            in the file chain.  The actual
241             *                            start addr (found in MAINST) will
242             *                            determine the amount of dead space
243             *                            required in the FORTHRAM file.
244             *
245             *
246             *  The lowest addr. is #2FA01 plus the max. size of the
247             *  configuration buffer gives us the highest possible
248             *  start addr of #2FAD3.  This would be the start of the file
249             *  to which we would add the 37 nibs of file overhead and
250             *  5 nibs to hold the RAM addr of our file the last time
251             *  we were in FORTH gives us the addr at which we can always
252             *  count on being able to start our data at:  #2FAFD
253             *
254
255             =TOP     EQU  ((FSIZE)+(DSTKAD))
256
257             =DISKBF  EQU  624         ALLOW 3 104 BYTE BUFFERS
258
259             =TERMBF  EQU  400         200 bytes for RTN STK & Terminal
260             *                          input buffer
261
262             =PADOFF  EQU  64          Offset from top of dictionary
```

```
263             *                       to start of Text Buffer. 64 NIBS
264             *                       allows 31 chars and 1 length byte
265             *                       which is the max name length.
266
267             =RSTK    EQU  ((TOP)-(DISKBF))   Start of RTN STK
268
269             =USEIT   EQU  ((RSTK)+(BUFLEN))  BUFFER TO USE FIRST
270
271             =LAST+1  EQU  (TOP)              BUFFER LIMIT
272
273             =TIBF    EQU  ((RSTK)-(TERMBF))   Terminal Buffer Start
274
275             =DSTK    EQU  (TIBF)             Start of DATA STK
276
277             =TXBUF   EQU  ((DICTST)+(PADOFF))  Start of Text Buffer
278
279             =FthFil  EQU  #E218       FORTH RAM FILE TYPE
280             =F7STRT  EQU  #E7000       BEGINNING OF 7TH MODULE
281             =TYTABF  EQU  F7STRT      TYPE TABLE, REFERENCED IN FT0,
282             *                         IS FIRST THING IN FT7
283             =ID      EQU  47          IDENTIFICATION # FOR OUR ROM
284             *
285             * TABLE OF CONSTANTS LEFT BY CONTROL STRUCTURE WORDS
286             * FOR SYNTAX CHECKING AT COMPILE TIME
287             *
288             * word leaving
289             * value on stack              word checking for it
290             * BEGIN          1            UNTIL
291             * IF             2            THEN
292             * DO             3            LOOP,+LOOP
293             * WHILE          4            REPEAT
294             * OF             5            ENDOF
295             * LEAVE          6            LOOP,+LOOP
296             * ENDOF          7            ENDCASE
297             * CASE           8            OF
298
299
300 00000                 END
```

```
=ACTIVE  Abs  195340 #2FB0C -    53    56
=BUFLEN  Abs     208 #000D0 -   105   269
=CELL    Abs       5 #00005 -   208
=DICTST  Abs  195761 #2FCB1 -   161   277
=DISKBF  Abs     624 #00270 -   257   267
=DSTK    Abs  200060 #30D7C -   275
=DSTKAD  Abs  195325 #2FAFD -    50    51   226   255
=ENDVAR  Abs  195725 #2FC8D -   151   156
=F7STRT  Abs  946176 #E7000 -   280   281
=FILEST  Abs  195073 #2FA01 -   238
=FRTHHD  Abs  195730 #2FC92 -   156   159   160   161
=FRTHVC  Abs  195751 #2FCA7 -   159
=FRTHVL  Abs  195756 #2FCAC -   160
=FSIZE   Abs    5759 #0167F -   212   231   255
=FSIZET  Abs    5801 #016A9 -   231
=FthFil  Abs   57880 #0E218 -   279
=ID      Abs      47 #0002F -   283
=IREG    Abs  195335 #2FB07 -    52    53
=LAST+1  Abs  201084 #3117C -   271
=MINFIL  Abs  195283 #2FAD3 -   226
=NAMLEN  Abs      31 #0001F -   210
=PADOFF  Abs      64 #00040 -   262   277
=RECSIZ  Abs      96 #00060 -   106
=RSTK    Abs  200460 #30F0C -   267   269   273
=RSTKAD  Abs  195330 #2FB02 -    51    52
=TBLLEN  Abs     441 #001B9 -   162
=TERMBF  Abs     400 #00190 -   259   273
=TIBF    Abs  200060 #30D7C -   273   275
=TOP     Abs  201084 #3117C -   255   267   271
=TSIZE   Abs     380 #0017C -   150   151   162
=TXBUF   Abs  195825 #2FCF1 -   277
=TYTABF  Abs  946176 #E7000 -   281
=USEIT   Abs  200668 #30FDC -   269
=UVAR    Abs  195345 #2FB11 -    56    65    66    67    68    69    70    71
                               72    73    74    75    76    77    78    79
                               80    81    82    83    84    85    86    87
                               88    89    90    91    92    93    94    95
                               96    97    98    99   112   113   114   115
                              116   119   127   128   129   130   131   132
                              133   138   139   140   142   143   147   148
                              151
=UVARP   Abs      20 #00014 -    55   162
=eBADD   Abs      12 #0000C -   179
=eBADPM  Abs      46 #0002E -   193
=eBASCX  Abs      63 #0003F -   203
=eBFIL   Abs      19 #00013 -   186
=eCASE   Abs      60 #0003C -   200
=eCNLD   Abs      55 #00037 -   198
=eCOMP   Abs       9 #00009 -   176
=eCOND   Abs      17 #00011 -   184
=eCONF   Abs      52 #00034 -   195
=eDFUL   Abs       8 #00008 -   175
=eDUPFL  Abs      45 #0002D -   192
=eEMPT   Abs      14 #0000E -   181
=eFORTX  Abs      64 #00040 -   204
```

```
=eFULL   Abs      15 #0000F -   182
=eLT1    Abs       6 #00006 -   173
=eNCUR   Abs      54 #00036 -   197
=eNDEF   Abs       7 #00007 -   174
=eNEND   Abs       1 #00001 -   168
=eNO"    Abs       5 #00005 -   172
=eNO;    Abs       3 #00003 -   170
=eNODO   Abs      59 #0003B -   199
=eNOEP   Abs       4 #00004 -   171
=eNOFTH  Abs      18 #00012 -   185
=eNOTF   Abs       2 #00002 -   169
=eNREC   Abs      16 #00010 -   183
=ePDIC   Abs      13 #0000D -   180
=ePILE   Abs      10 #0000A -   177
=eRANGE  Abs      43 #0002B -   190
=eRDNL   Abs      11 #0000B -   178
=eREENT  Abs      62 #0003E -   202
=eRROR   Abs       0 #00000 -   167
=eSWF    Abs      53 #00035 -   196
=o#TIB   Abs  195390 #2FB3E -    74
=oALLOT  Abs  195641 #2FC39 -   132
=oBASE   Abs  195445 #2FB75 -    85
=oBASIC  Abs  195490 #2FBA2 -    94
=oBLK    Abs  195410 #2FB52 -    78
=oBSIZE  Abs  195480 #2FB98 -    92
=oCCOMA  Abs  195636 #2FC34 -   131
=oCOMMA  Abs  195631 #2FC2F -   130
=oCONTX  Abs  195430 #2FB66 -    82
=oCREAT  Abs  195621 #2FC25 -   128
=oCSP    Abs  195460 #2FB84 -    88
=oCURR   Abs  195435 #2FB6B -    83
=oDP     Abs  195475 #2FB93 -    91
=oDPL    Abs  195450 #2FB7A -    86
=oERR?   Abs  195515 #2FBBB -    99
=oFENCE  Abs  195470 #2FB8E -    90
=oFIRST  Abs  195370 #2FB2A -    70
=oFLD    Abs  195455 #2FB7F -    87
=oFNAME  Abs  195600 #2FC10 -   119
=oGRAB   Abs  195720 #2FC88 -   148
=oHLD    Abs  195465 #2FB89 -    89
=oIN     Abs  195415 #2FB57 -    79
=oINTRP  Abs  195616 #2FC20 -   127
=oLASTX  Abs  195520 #2FBC0 -   112
=oLIMIT  Abs  195375 #2FB2F -    71
=oLINE#  Abs  195485 #2FB9D -    93
=oLOOP   Abs  195495 #2FBA7 -    95
=oLSTNG  Abs  195661 #2FC4D -   140
=oNUMB   Abs  195626 #2FC2A -   129
=oOKFLG  Abs  195405 #2FB4D -    77
=oONERR  Abs  195510 #2FBB6 -    98
=oPAGES  Abs  195656 #2FC48 -   139
=oPARRT  Abs  195705 #2FC79 -   142
=oPREV   Abs  195365 #2FB25 -    69
=oPRIME  Abs  195505 #2FBB1 -    97
=oPRORT  Abs  195710 #2FC7E -   143
```

```
oPSTAT  Abs  195715 #2FC83 -   147
oR0     Abs  195350 #2FB16 -    66
oRSIZE  Abs  195385 #2FB39 -    73
oS0     Abs  195345 #2FB11 -    65
oSCFIB  Abs  195425 #2FB61 -    81
oSECD   Abs  195500 #2FBAC -    96
oSPAN   Abs  195420 #2FB5C -    80
oSTATE  Abs  195440 #2FB70 -    84
oT      Abs  195584 #2FC00 -   116
oTIB    Abs  195355 #2FB1B -    67
oUNIQ   Abs  195646 #2FC3E -   133
oUSE    Abs  195360 #2FB20 -    68
oVARID  Abs  195651 #2FC43 -   138
oVOC-L  Abs  195380 #2FB34 -    72
oWARN   Abs  195400 #2FB48 -    76
oWIDTH  Abs  195395 #2FB43 -    75
oX      Abs  195536 #2FBD0 -   113
oY      Abs  195552 #2FBE0 -   114
oZ      Abs  195568 #2FBF0 -   115
```

Input Parameters

Source file name is MR&GTO

Listing file name is MR/GTO::65

Object file name is MR%GTO::65

```
                                  111111
                        0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                      TITLE MR%FT0_INITIALIZATION__<840608.1403>
 2                      RDSYMB MR%GT0
 3                  **************************
 4                  *                        *
 5                  * File: MR%FR0           *
 6                  *                        *
 7                  * Re-released 2/6/84     *
 8                  *                        *
 9                  **************************
10
11
12
13                  *  File Header
14
15
16 00000 0000 =FR0ST  CON(8) 0
          0000
17 00008 64F4         NIBASC \FORTHROM\       File Name
          2545
          8425
          F4D4
18
19 00018 0000         CON(4) (=fLEX)          File Type: LEX
20 0001C 20           NIBHEX 20               Flags (PRIVATE)
21 0001E 2541         NIBHEX 2541             Time
22 00022 9110         NIBHEX 911038           Date
          38
23 00028 0000         REL(5)  =FILEND          File Length
          0
24                  *
25 0002D F2           CON(2)  =ID             Id
26 0002F 10           CON(2)   1              Lowest Token
27 00031 50           CON(2)   5              Highest Token
28 00033 0000         NIBHEX 00000            End of lex table chain
          0
29                  *
30 00038 F            NIBHEX F                Speed table omitted
31 00039 B300         CON(4) (TxTbSt)+1-(*)   Offset to text table
32 0003D 2800         CON(4) (MsgTbl)-*       Offset to message table
33 00041 D8B0         REL(5) POLHND           Offset to poll handler
          0
```

```
34                      STITLE M a i n  T a b l e
35                 *  Main Table
36 00046           =xromF0
37                 *
38 00046 C30            CON(3) 60               01  Invoke FORTH system
39 00049 C9F0 =xfrth    REL(5) =XFORTH
         0
40 0004E 1              NIBHEX 1                    Non-programmable!
41
42 0004F D20            CON(3) 45               02  Do FORTH with parameter
43 00052 0000           REL(5) =FORTHX              from BASIC
         0
44 00057 D              NIBHEX D
45
46 00058 E10            CON(3)  30              03  BASIC-->FORTH with
47 0005B 0000           REL(5)  =FORTHI              integer result
         0
48 00060 F              NIBHEX  F
49
50 00061 F00            CON(3)  15              04  BASIC-->FORTH with
51 00064 0000           REL(5)  =FORTHF              floating point result
         0
52 00069 F              NIBHEX  F
53
54
55 0006A 000            CON(3)  0               05  BASIC-->FORTH with
56 0006D 0000           REL(5)  =FORTH$              string result
         0
57 00072 F              NIBHEX  F
58
59
```

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NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
                    STITLE T e x t   T a b l e

            *  Text Table

00073        TxTbSt                          Text table start
            *
00073 B             NIBHEX  B
00074 64F4          NIBASC  \FORTH$\
      2545
      8442
00080 50            NIBHEX  50

00082 B             NIBHEX  B
00083 64F4          NIBASC  \FORTHF\
      2545
      8464
0008F 40            NIBHEX  40

00091 B             NIBHEX  B
00092 64F4          NIBASC  \FORTHI\
      2545
      8494
0009E 30            NIBHEX  30

000A0 B             NIBHEX B
000A1 64F4          NIBASC \FORTHX\
      2545
      8485
000AD 20            NIBHEX 20

000AF 9             NIBHEX 9                 Invoke FORTH system
000B0 64F4          NIBASC \FORTH\
      2545
      84
000BA 10            NIBHEX 10

000BC 1FF    TxTbEn NIBHEX 1FF              Text termination
```

```
                STITLE  ACTIVE TABLE
*************************************************************
*
* The location ACTIVE in the file FORTHRAM is used by
* the system to keep track of where it has been in
* the many and convoluted paths through BASIC and FORTH.
* Here are the meaningful values of ACTIVE:
*
*       -2        Flag set while handling the error poll,
*                 before we send another error poll, so we
*                 can ignore this second-order poll.
*       -1        We went to sleep in FORTH, and have now
*                 awakened, realized this in BASPOL, and set
*                 the new value in forpon, which will be
*                 checked and reset in RESTRT.
*        0        FORTH has not been called, or it
*                 was left with a BYE.
*        1        Normal condition; FORTH environment
*                 is active.
*        2        BASICI,BASICF or  BASIC$ is running; they
*                 can't return via BASPOL, so if
*                 MainLoop poll occurred we have to go to
*                 ABORT.
*        3        BASICX is running the BASIC environment,
*                 ready to return via the MainLoop poll(BASPOL).
*      [4,5]      There's a check in ERR02 which cares about 2&3
*                 but would also catch 4&5.
*       99        We just went to sleep by calling power-off
*                 in EXPECT, and have just awakened.
*
*************************************************************
```

```
119                     STITLE  ERROR MESSAGE TABLE
120 000BF       MsgTbl
121 000BF 10            CON(2)   1       Min message #
122 000C1 04            CON(2)  64       Max message #
123             *
124             * NOTE: First message has to be of length which is
125             * multiple of 16, i.e. next nibble right here has
126             * to be zero, because of bug in message-driver code.
127             *
128             *eTMAD  EQU     36
129 000C3 04            CON(2)  64
130 000C5 42            CON(2)  36              Message number  36
131 000C7 A             CON(1)  10
132 000C8 47F6          NIBASC \too many\
          F602
          D616
          E697
133 000D8 0214          NIBASC \ AS\              changed to upper case
          35
134 000DE A             CON(1)  10                2/6/84
135 000DF 3494          NIBASC \CII char\
          9402
          3686
          1627
136 000EF 3702          NIBASC \s p\
          07
137 000F5 5             CON(1)   5
138 000F6 2756          NIBASC \resent\
          3756
          E647
139 00102 C             CON(1)  12
140             *
141             *eRROR  EQU      0              GOES EVERYWHERE
142 00103 E0            CON(2)  14
143 00105 00            CON(2)   0              Message number   0
144 00107 3             CON(1)   3
145 00108 6445          NIBASC \FTH \
          8402
146 00110 C             CON(1)  12
147             *
148             *eNEND  EQU      1              no ending something
149 00111 A1            CON(2)  26
150 00113 10            CON(2)   1              Message number   1
151 00115 9             CON(1)   9
152 00116 E6F6          NIBASC \no endin\
          0256
          E646
          96E6
153 00126 7602          NIBASC \g \
154 0012A C             CON(1)  12
155             *
156             *eNOTF  EQU      2              xxx Not Found
157 0012B A0            CON(2)  10
158 0012D 20            CON(2)   2              Message number   2
159 0012F F3            CON(2)  63
```

```
160 00131 E           CON(1)  14
161 00132 00          CON(2) =eNFOUN
162 00134 C           CON(1)  12
163           *
164           *eNO;   EQU      3          no ending ;
165 00135 B0          CON(2)  11
166 00137 30          CON(2)   3          Message number   3
167 00139 D           CON(1)  13
168 0013A 10          CON(2) =eNEND
169 0013C 0           CON(1)   0
170 0013D B3          NIBASC \;\
171 0013F C           CON(1)  12
172           *
173           *eNOEP  EQU      4          no ending )
174 00140 B0          CON(2)  11
175 00142 40          CON(2)   4          Message number   4
176 00144 D           CON(1)  13
177 00145 10          CON(2) =eNEND
178 00147 0           CON(1)   0
179 00148 92          NIBASC \)\
180 0014A C           CON(1)  12
181           *
182           *eNO"   EQU      5          no ending "
183 0014B B0          CON(2)  11
184 0014D 50          CON(2)   5          Message number   5
185 0014F D           CON(1)  13
186 00150 10          CON(2) =eNEND
187 00152 0           CON(1)   0
188 00153 22          NIBASC \"\
189 00155 C           CON(1)  12
190           *
191           *eLT1   EQU      6
192 00156 12          CON(2)  33
193 00158 60          CON(2)   6          Message number   6
194 0015A F3          CON(2)  63
195 0015C B           CON(1)  11
196 0015D B           CON(1)  11
197 0015E 1627        NIBASC \argument\
          7657
          D656
          E647
198 0016E 02C3        NIBASC \ < 1\
          0213
199 00176 C           CON(1)  12
200           *
201           *eNDEF  EQU      7
202 00177 63          CON(2)  54
203 00179 70          CON(2)   7          Message number   7
204 0017B A           CON(1)  10
205 0017C 4656        NIBASC \definiti\
          6696
          E696
          4796
206 0018C F6E6        NIBASC \on \
          02
```

```
207 00192 B           CON(1)  11
208 00193 B           CON(1)  11
209 00194 E6F6        NIBASC \not fini\
          4702
          6696
          E696
210 001A4 3786        NIBASC \shed\
          5646
211 001AC C           CON(1)  12
212           *
213           *eDFUL  EQU      8
214 001AD 52          CON(2)  37
215 001AF 80          CON(2)   8          Message number   8
216 001B1 B           CON(1)  11
217 001B2 E           CON(1)  14
218 001B3 4696        NIBASC \dictiona\
          3647
          96F6
          E616
219 001C3 2797        NIBASC \ry full\
          0266
          57C6
          C6
220 001D1 C           CON(1)  12
221           *
222           *eCOMP  EQU      9
223 001D2 12          CON(2)  33
224 001D4 90          CON(2)   9          Message number   9
225 001D6 F3          CON(2)  63
226 001D8 B           CON(1)  11
227 001D9 B           CON(1)  11
228 001DA 36F6        NIBASC \compile \
          D607
          96C6
          5602
229 001EA F6E6        NIBASC \only\
          C697
230 001F2 C           CON(1)  12
231           *
232           *ePILE  EQU     10
233 001F3 C1          CON(2)  28
234 001F5 A0          CON(2)  10          Message number  10
235 001F7 F3          CON(2)  63
236 001F9 9           CON(1)   9
237 001FA 8405        NIBASC \HPIL err\
          94C4
          0256
          2727
238 0020A F627        NIBASC \or\
239 0020E C           CON(1)  12
240           *
241           *eRDNL  EQU     11
242 0020F C3          CON(2)  60
243 00211 B0          CON(2)  11          Message number  11
244 00213 A           CON(1)  10
```

```
245 00214 1647          NIBASC \attempte\
          4756
          D607
          4756
246 00224 4602          NIBASC \d t\
          47
247 0022A B             CON(1)  11
248 0022B E             CON(1)  14
249 0022C F602          NIBASC \o redefi\
          2756
          4656
          6696
250 0023C E656          NIBASC \ne null\
          02E6
          57C6
          C6
251 0024A C             CON(1)  12
252             *
253             *eBADD  EQU     12
254 0024B F2            CON(2)  47
255 0024D C0            CON(2)  12              Message number  12
256 0024F A             CON(1)  10
257 00250 2616          NIBASC \bad dict\
          4602
          4696
          3647
258 00260 96F6          NIBASC \ion\
          E6
259 00266 8             CON(1)   8
260 00267 1627          NIBASC \ary entr\
          9702
          56E6
          4727
261 00277 97            NIBASC \y\
262 00279 C             CON(1)  12
263             *
264             *ePDIC  EQU     13
265 0027A 63            CON(2)  54
266 0027C D0            CON(2)  13              Message number  13
267 0027E A             CON(1)  10
268 0027F 96E6          NIBASC \in prote\
          0207
          27F6
          4756
269 0028F 3647          NIBASC \cte\
          56
270 00295 B             CON(1)  11
271 00296 B             CON(1)  11
272 00297 4602          NIBASC \d dictio\
          4696
          3647
          96F6
273 002A7 E616          NIBASC \nary\
          2797
274 002AF C             CON(1)  12
```

```
275                *
276                *eEMPT  EQU     14
277 002B0 C1               CON(2)  28
278 002B2 E0               CON(2)  14          Message number  14
279 002B4 A                CON(1)  10
280 002B5 56D6             NIBASC \empty st\
          0747
          9702
          3747
281 002C5 1636             NIBASC \ack\
          B6
282 002CB C                CON(1)  12
283                *
284                *eFULL  EQU     15
285 002CC A1               CON(2)  26
286 002CE F0               CON(2)  15          Message number  15
287 002D0 9                CON(1)   9
288 002D1 6657             NIBASC \full sta\
          C6C6
          0237
          4716
289 002E1 36B6             NIBASC \ck\
290 002E5 C                CON(1)  12
291                *
292                *eNREC  EQU     16
293 002E6 52               CON(2)  37
294 002E8 01               CON(2)  16          Message number  16
295 002EA F3               CON(2)  63
296 002EC B                CON(1)  11
297 002ED D                CON(1)  13
298 002EE E6F6             NIBASC \not reco\
          4702
          2756
          36F6
299 002FE 76E6             NIBASC \gnized\
          96A7
          5646
300 0030A C                CON(1)  12
301                *
302                *eCOND  EQU     17
303 0030B 83               CON(2)  56
304 0030D 11               CON(2)  17          Message number  17
305 0030F F3               CON(2)  63
306 00311 A                CON(1)  10
307 00312 36F6             NIBASC \conditio\
          E646
          9647
          96F6
308 00322 E616             NIBASC \nal\
          C6
309 00328 B                CON(1)  11
310 00329 B                CON(1)  11
311 0032A 3702             NIBASC \s not pa\
          E6F6
          4702
```

```
           0716
312 0033A  9627          NIBASC \ired\
           5646
313 00342  C             CON(1)  12
314                *
315                *eNOFTH EQU     18
316 00343  C3            CON(2)  60
317 00345  21            CON(2)  18            Message number  18
318 00347  A             CON(1)  10
319 00348  64F4          NIBASC \FORTHRAM\
           2545
           8425
           14D4
320 00358  0266          NIBASC \ fi\
           96
321 0035E  B             CON(1)  11
322 0035F  E             CON(1)  14
323 00360  C656          NIBASC \le not i\
           02E6
           F647
           0296
324 00370  E602          NIBASC \n place\
           07C6
           1636
           56
325 0037E  C             CON(1)  12
326                *
327                *eBFIL  EQU     19
328 0037F  A0            CON(2)  10
329 00381  31            CON(2)  19            Message number  19
330 00383  F3            CON(2)  63
331 00385  E             CON(1)  14
332 00386  00            CON(2) =eFSPEC
333 00388  C             CON(1)  12
334                *
335                *eUNKO  EQU     20
336 00389  32            CON(2)  35
337 0038B  41            CON(2)  20            Message number  20
338 0038D  B             CON(1)  11
339 0038E  D             CON(1)  13
340 0038F  57E6          NIBASC \unknown \
           B6E6
           F677
           E602
341 0039F  F607          NIBASC \opcode\
           36F6
           4656
342 003AB  C             CON(1)  12
343                *
344                *eGRYR  EQU     21
345 003AC  83            CON(2)  56
346 003AE  51            CON(2)  21            Message number  21
347 003B0  A             CON(1)  10
348 003B1  74F4          NIBASC \GOYES or\
           9554
```

```
            3502
            F627
    349 003C1 0225          NIBASC \ RT\
            45
    350 003C7 B             CON(1)  11
    351 003C8 C             CON(1)  12
    352 003C9 E495          NIBASC \NYES req\
            5435
            0227
            5617
    353 003D9 5796          NIBASC \uired\
            2756
            46
    354 003E3 C             CON(1)  12
    355             *
    356             *eMISL  EQU     22
    357 003E4 13            CON(2)  49
    358 003E6 61            CON(2)  22              Message number  22
    359 003E8 A             CON(1)  10
    360 003E9 D696          NIBASC \missing/\
            3737
            96E6
            76F2
    361 003F9 96C6          NIBASC \ill\
            C6
    362 003FF 9             CON(1)   9
    363 00400 5676          NIBASC \egal lab\
            16C6
            02C6
            1626
    364 00410 56C6          NIBASC \el\
    365 00414 C             CON(1)  12
    366             *
    367             *eNLST  EQU     23
    368 00415 83            CON(2)  56
    369 00417 71            CON(2)  23              Message number  23
    370 00419 A             CON(1)  10
    371 0041A 96E6          NIBASC \invalid \
            6716
            C696
            4602
    372 0042A C696          NIBASC \lis\
            37
    373 00430 B             CON(1)  11
    374 00431 C             CON(1)  12
    375 00432 4796          NIBASC \ting arg\
            E676
            0216
            2776
    376 00442 57D6          NIBASC \ument\
            56E6
            47
    377 0044C C             CON(1)  12
    378             *
    379             *eCCMS  EQU     24
```

```
380 0044D 13          CON(2)  49
381 0044F 81          CON(2)  24          Message number  24
382 00451 A           CON(1)  10
383 00452 96E6        NIBASC \invalid \
          6716
          C696
          4602
384 00462 1757        NIBASC \quo\
          F6
385 00468 9           CON(1)   9
386 00469 4756        NIBASC \ted stri\
          4602
          3747
          2796
387 00479 E676        NIBASC \ng\
388 0047D C           CON(1)  12
389             *
390             *eWNUQ  EQU     25
391 0047E 83          CON(2)  56
392 00480 91          CON(2)  25          Message number  25
393 00482 A           CON(1)  10
394 00483 7716        NIBASC \warning:\
          27E6
          96E6
          76A3
395 00493 0277        NIBASC \ wo\
          F6
396 00499 B           CON(1)  11
397 0049A C           CON(1)  12
398 0049B 2746        NIBASC \rd not u\
          02E6
          F647
          0257
399 004AB E696        NIBASC \nique\
          1757
          56
400 004B5 C           CON(1)  12
401             *
402             *eIFNS  EQU     26
403 004B6 C3          CON(2)  60
404 004B8 A1          CON(2)  26          Message number  26
405 004BA A           CON(1)  10
406 004BB 96E6        NIBASC \invalid \
          6716
          C696
          4602
407 004CB 6696        NIBASC \fil\
          C6
408 004D1 B           CON(1)  11
409 004D2 E           CON(1)  14
410 004D3 56E6        NIBASC \ename sp\
          16D6
          5602
          3707
411 004E3 5636        NIBASC \ecifier\
```

```
           9666
           9656
           27
412 004F1 C            CON(1)  12
413            *
414            *eILFS  EQU     27
415 004F2 D2           CON(2)  45
416 004F4 B1           CON(2)  27          Message number  27
417 004F6 A            CON(1)  10
418 004F7 96C6         NIBASC \illegal \
           C656
           7616
           C602
419 00507 77F6         NIBASC \wor\
           27
420 0050D 7            CON(1)   7
421 0050E 4602         NIBASC \d select\
           3756
           C656
           3647
422 0051E C            CON(1)  12
423            *
424            *eILEN  EQU     28
425 0051F 63           CON(2)  54
426 00521 C1           CON(2)  28          Message number  28
427 00523 A            CON(1)  10
428 00524 A657         NIBASC \jump or \
           D607
           02F6
           2702
429 00534 6716         NIBASC \val\
           C6
430 0053A B            CON(1)  11
431 0053B B            CON(1)  11
432 0053C 5756         NIBASC \ue too l\
           0247
           F6F6
           02C6
433 0054C 1627         NIBASC \arge\
           7656
434 00554 C            CON(1)  12
435            *
436            *eRPTS  EQU     29
437 00555 64           CON(2)  70
438 00557 D1           CON(2)  29          Message number  29
439 00559 A            CON(1)  10
440 0055A E656         NIBASC \needs pr\
           5646
           3702
           0727
441 0056A 5667         NIBASC \evi\
           96
442 00570 A            CON(1)  10
443 00571 F657         NIBASC \ous test\
           3702
```

```
            4756
            3747
    444 00581 0296          NIBASC \ in\
            E6
    445 00587 8             CON(1)   8
    446 00588 3747          NIBASC \structio\
            2757
            3647
            96F6
    447 00598 E6            NIBASC \n\
    448 0059A C             CON(1)  12
    449               *
    450               *eILPT  EQU     30
    451 0059B 83            CON(2)  56
    452 0059D E1            CON(2)  30          Message number  30
    453 0059F A             CON(1)  10
    454 005A0 96C6          NIBASC \illegal \
            C656
            7616
            C602
    455 005B0 07F6          NIBASC \poi\
            96
    456 005B6 B             CON(1)  11
    457 005B7 C             CON(1)  12
    458 005B8 E647          NIBASC \nter pos\
            5627
            0207
            F637
    459 005C8 9647          NIBASC \ition\
            96F6
            E6
    460 005D2 C             CON(1)  12
    461               *
    462               *eILSB  EQU     31
    463 005D3 B2            CON(2)  43
    464 005D5 F1            CON(2)  31          Message number  31
    465 005D7 A             CON(1)  10
    466 005D8 96C6          NIBASC \illegal \
            C656
            7616
            C602
    467 005E8 3747          NIBASC \sta\
            16
    468 005EE 6             CON(1)   6
    469 005EF 4757          NIBASC \tus bit\
            3702
            2696
            47
    470 005FD C             CON(1)  12
    471               *
    472               *eIDPA  EQU     32
    473 005FE E3            CON(2)  62
    474 00600 02            CON(2)  32          Message number  32
    475 00602 A             CON(1)  10
    476 00603 96C6          NIBASC \illegal \
```

```
            C656
            7616
            C602
477 00613 4607          NIBASC \dp \
            02
478 00619 B             CON(1)  11
479 0061A F             CON(1)  15
480 0061B 1627          NIBASC \arithmet\
            9647
            86D6
            5647
481 0062B 9636          NIBASC \ic value\
            0267
            16C6
            5756
482 0063B C             CON(1)  12
483             *
484             *eILTV  EQU     33
485 0063C 33            CON(2)  51
486 0063E 12            CON(2)  33          Message number  33
487 00640 A             CON(1)  10
488 00641 96C6          NIBASC \illegal \
            C656
            7616
            C602
489 00651 4727          NIBASC \tra\
            16
490 00657 A             CON(1)  10
491 00658 E637          NIBASC \nsfer va\
            6656
            2702
            6716
492 00668 C657          NIBASC \lue\
            56
493 0066E C             CON(1)  12
494             *
495             *eNHDP  EQU     34
496 0066F 24            CON(2)  66
497 00671 22            CON(2)  34          Message number  34
498 00673 A             CON(1)  10
499 00674 E6F6          NIBASC \non-hexa\
            E6D2
            8656
            8716
500 00684 4656          NIBASC \dec\
            36
501 0068A A             CON(1)  10
502 0068B 96D6          NIBASC \imal dig\
            16C6
            0246
            9676
503 0069B 9647          NIBASC \it \
            02
504 006A1 6             CON(1)   6
505 006A2 0727          NIBASC \present\
```

```
            5637
            56E6
            47
  506 006B0 C             CON(1)  12
  507             *
  508             *eTMHD  EQU     35
  509 006B1 E3            CON(2)  62
  510 006B3 32            CON(2)  35            Message number  35
  511 006B5 A             CON(1)  10
  512 006B6 47F6          NIBASC \too many\
            F602
            D616
            E697
  513 006C6 0286          NIBASC \ he\
            56
  514 006CC B             CON(1)  11
  515 006CD F             CON(1)  15
  516 006CE 8702          NIBASC \x digits\
            4696
            7696
            4737
  517 006DE 0207          NIBASC \ present\
            2756
            3756
            E647
  518 006EE C             CON(1)  12
  519             *
  520             *eUNRL  EQU     37
  521 006EF B2            CON(2)  43
  522 006F1 52            CON(2)  37            Message number  37
  523 006F3 A             CON(1)  10
  524 006F4 57E6          NIBASC \unrecogn\
            2756
            36F6
            76E6
  525 00704 96A7          NIBASC \ize\
            56
  526 0070A 6             CON(1)   6
  527 0070B 4602          NIBASC \d label\
            C616
            2656
            C6
  528 00719 C             CON(1)  12
  529             *
  530             *eMMPR  EQU     38
  531 0071A 33            CON(2)  51
  532 0071C 62            CON(2)  38            Message number  38
  533 0071E A             CON(1)  10
  534 0071F D696          NIBASC \mismatch\
            37D6
            1647
            3686
  535 0072F 5646          NIBASC \ed \
            02
  536 00735 A             CON(1)  10
```

```
537 00736 0716          NIBASC \parenthe\
          2756
          E647
          8656
538 00746 3756          NIBASC \ses\
          37
539 0074C C             CON(1)  12
540               *
541               *eUCIE  EQU     39
542 0074D B2            CON(2)  43
543 0074F 72            CON(2)  39          Message number  39
544 00751 A             CON(1)  10
545 00752 96C6          NIBASC \illegal \
          C656
          7616
          C602
546 00762 5687          NIBASC \exp\
          07
547 00768 6             CON(1)   6
548 00769 2756          NIBASC \ression\
          3737
          96F6
          E6
549 00777 C             CON(1)  12
550               *
551               *eECIE  EQU     40
552 00778 64            CON(2)  70
553 0077A 82            CON(2)  40          Message number  40
554 0077C A             CON(1)  10
555 0077D 5687          NIBASC \excess c\
          3656
          3737
          0236
556 0078D 8616          NIBASC \har\
          27
557 00793 A             CON(1)  10
558 00794 1636          NIBASC \acters i\
          4756
          2737
          0296
559 007A4 E602          NIBASC \n e\
          56
560 007AA 8             CON(1)   8
561 007AB 8707          NIBASC \xpressio\
          2756
          3737
          96F6
562 007BB E6            NIBASC \n\
563 007BD C             CON(1)  12
564               *
565               *eDLAB  EQU     41
566 007BE 52            CON(2)  37
567 007C0 92            CON(2)  41          Message number  41
568 007C2 B             CON(1)  11
569 007C3 E             CON(1)  14
```

```
570 007C4 4657          NIBASC \duplicat\
          07C6
          9636
          1647
571 007D4 5602          NIBASC \e label\
          C616
          2656
          C6
572 007E2 C             CON(1)  12
573             *
574             *eSYTF  EQU     42
575 007E3 92            CON(2)  41
576 007E5 A2            CON(2)  42              Message number  42
577 007E7 A             CON(1)  10
578 007E8 3797          NIBASC \symbol t\
          D626
          F6C6
          0247
579 007F8 1626          NIBASC \ab1\
          C6
580 007FE 5             CON(1)   5
581 007FF 5602          NIBASC \e full\
          6657
          C6C6
582 0080B C             CON(1)  12
583             *
584             *eRANGE EQU     43
585 0080C A3            CON(2)  58
586 0080E B2            CON(2)  43              Message number  43
587 00810 A             CON(1)  10
588 00811 1646          NIBASC \address \
          4627
          5637
          3702
589 00821 E6F6          NIBASC \not\
          47
590 00827 B             CON(1)  11
591 00828 D             CON(1)  13
592 00829 0296          NIBASC \ inside \
          E637
          9646
          5602
593 00839 1602          NIBASC \a file\
          6696
          C656
594 00845 C             CON(1)  12
595             *
596             *eLFUL  EQU     44
597 00846 92            CON(2)  41
598 00848 C2            CON(2)  44              Message number  44
599 0084A A             CON(1)  10
600 0084B C696          NIBASC \listing \
          3747
          96E6
          7602
```

```
601 0085B 6696          NIBASC \fil\
          C6
602 00861 5             CON(1)   5
603 00862 5602          NIBASC \e full\
          6657
          C6C6
604 0086E C             CON(1)  12
605             *
606             *eDUPFL EQU     45
607 0086F A0            CON(2)  10
608 00871 D2            CON(2)  45          Message number  45
609 00873 F3            CON(2)  63
610 00875 E             CON(1)  14
611 00876 00            CON(2) =eFEXST
612 00878 C             CON(1)  12
613             *
614             *eBADPM EQU     46
615 00879 52            CON(2)  37
616 0087B E2            CON(2)  46          Message number  46
617 0087D F3            CON(2)  63
618 0087F B             CON(1)  11
619 00880 D             CON(1)  13
620 00881 2616          NIBASC \bad para\
          4602
          0716
          2716
621 00891 D656          NIBASC \meters\
          4756
          2737
622 0089D C             CON(1)  12
623             *
624             *eNRFA  EQU     47
625 0089E 64            CON(2)  70
626 008A0 F2            CON(2)  47          Message number  47
627 008A2 A             CON(1)  10
628 008A3 E6F6          NIBASC \not enou\
          4702
          56E6
          F657
629 008B3 7686          NIBASC \gh \
          02
630 008B9 A             CON(1)  10
631 008BA D656          NIBASC \memory f\
          D6F6
          2797
          0266
632 008CA F627          NIBASC \or \
          02
633 008D0 8             CON(1)   8
634 008D1 1637          NIBASC \assemble\
          3756
          D626
          C656
635 008E1 27            NIBASC \r\
636 008E3 C             CON(1)  12
```

```
637                *
638                *eLFNT  EQU     48
639 008E4 13              CON(2)  49
640 008E6 03              CON(2)  48          Message number  48
641 008E8 A               CON(1)  10
642 008E9 C696            NIBASC \listing \
          3747
          96E6
          7602
643 008F9 6696            NIBASC \fil\
          C6
644 008FF 9               CON(1)   9
645 00900 5602            NIBASC \e not TE\
          E6F6
          4702
          4554
646 00910 8545            NIBASC \XT\
647 00914 C               CON(1)  12
648                *
649                *eIVLF  EQU     49
650 00915 F2              CON(2)  47
651 00917 13              CON(2)  49          Message number  49
652 00919 A               CON(1)  10
653 0091A 96E6            NIBASC \invalid \
          6716
          C696
          4602
654 0092A C696            NIBASC \lis\
          37
655 00930 8               CON(1)   8
656 00931 4796            NIBASC \ting fil\
          E676
          0266
          96C6
657 00941 56              NIBASC \e\
658 00943 C               CON(1)  12
659                *
660                *eCOSF  EQU     50
661 00944 63              CON(2)  54
662 00946 23              CON(2)  50          Message number  50
663 00948 A               CON(1)  10
664 00949 3616            NIBASC \cannot o\
          E6E6
          F647
          02F6
665 00959 0756            NIBASC \pen\
          E6
666 0095F B               CON(1)  11
667 00960 B               CON(1)  11
668 00961 0237            NIBASC \ source \
          F657
          2736
          5602
669 00971 6696            NIBASC \file\
          C656
```

```
670 00979 C           CON(1)  12
671           *
672           *eMMFT  EQU     51
673 0097A C3          CON(2)  60
674 0097C 33          CON(2)  51          Message number  51
675 0097E A           CON(1)  10
676 0097F D696        NIBASC \missing/\
          3737
          96E6
          76F2
677 0098F D657        NIBASC \mul\
          C6
678 00995 B           CON(1)  11
679 00996 E           CON(1)  14
680 00997 4796        NIBASC \tiple fi\
          07C6
          5602
          6696
681 009A7 C656        NIBASC \le type\
          0247
          9707
          56
682 009B5 C           CON(1)  12
683           *
684           *eCONF  EQU     52
685 009B6 12          CON(2)  33
686 009B8 43          CON(2)  52          Message number  52
687 009BA B           CON(1)  11
688 009BB C           CON(1)  12
689 009BC 34F6        NIBASC \Configur\
          E666
          9676
          5727
690 009CC 1647        NIBASC \ation\
          96F6
          E6
691 009D6 C           CON(1)  12
692           *
693           *eSWF   EQU     53
694 009D7 92          CON(2)  41
695 009D9 53          CON(2)  53          Message number  53
696 009DB F3          CON(2)  63
697 009DD B           CON(1)  11
698 009DE F           CON(1)  15
699 009DF 3747        NIBASC \string w\
          2796
          E676
          0277
700 009EF F6E6        NIBASC \on't fit\
          7247
          0266
          9647
701 009FF C           CON(1)  12
702           *
703           *eNCUR  EQU     54
```

```
704 00A00 C3          CON(2)  60
705 00A02 63          CON(2)  54          Message number  54
706 00A04 F3          CON(2)  63
707 00A06 A           CON(1)  10
708 00A07 E6F6        NIBASC \not in c\
          4702
          96E6
          0236
709 00A17 5727        NIBASC \urr\
          27
710 00A1D B           CON(1)  11
711 00A1E D           CON(1)  13
712 00A1F 56E6        NIBASC \ent voca\
          4702
          67F6
          3616
713 00A2F 2657        NIBASC \bulary\
          C616
          2797
714 00A3B C           CON(1)  12
715             *
716             *eCNLD  EQU     55
717 00A3C E1          CON(2)  30
718 00A3E 73          CON(2)  55          Message number  55
719 00A40 F3          CON(2)  63
720 00A42 A           CON(1)  10
721 00A43 3616        NIBASC \cannot l\
          E6E6
          F647
          02C6
722 00A53 F616        NIBASC \oad\
          46
723 00A59 C           CON(1)  12
724             *
725             *eASAB  EQU     56
726 00A5A 92          CON(2)  41
727 00A5C 83          CON(2)  56          Message number  56
728 00A5E A           CON(1)  10
729 00A5F 1637        NIBASC \assemble\
          3756
          D626
          C656
730 00A6F 2702        NIBASC \r a\
          16
731 00A75 5           CON(1)   5
732 00A76 26F6        NIBASC \borted\
          2747
          5646
733 00A82 C           CON(1)  12
734             *
735             *eCREQ  EQU     57
736 00A83 13          CON(2)  49
737 00A85 93          CON(2)  57          Message number  57
738 00A87 A           CON(1)  10
739 00A88 3616        NIBASC \cannot r\
```

```
           E6E6
           F647
           0227
   740 00A98 5637          NIBASC \eso\
           F6
   741 00A9E 9             CON(1)   9
   742 00A9F C667          NIBASC \lve equa\
           5602
           5617
           5716
   743 00AAF 4756          NIBASC \te\
   744 00AB3 C             CON(1)  12
   745             *
   746             *ePSTS  EQU     58
   747 00AB4 B2            CON(2)  43
   748 00AB6 A3            CON(2)  58          Message number  58
   749 00AB8 A             CON(1)  10
   750 00AB9 0716          NIBASC \pagesize\
           7656
           3796
           A756
   751 00AC9 0247          NIBASC \ to\
           F6
   752 00ACF 6             CON(1)   6
   753 00AD0 F602          NIBASC \o small\
           37D6
           16C6
           C6
   754 00ADE C             CON(1)  12
   755             *
   756             *eNODO  EQU     59
   757 00ADF B2            CON(2)  43
   758 00AE1 B3            CON(2)  59          Message number  59
   759 00AE3 A             CON(1)  10
   760 00AE4 E6F6          NIBASC \no DO be\
           0244
           F402
           2656
   761 00AF4 66F6          NIBASC \for\
           27
   762 00AFA 6             CON(1)   6
   763 00AFB 5602          NIBASC \e LEAVE\
           C454
           1465
           54
   764 00B09 C             CON(1)  12
   765             *
   766             *eCASE  EQU     60
   767 00B0A 33            CON(2)  51
   768 00B0C C3            CON(2)  60          Message number  60
   769 00B0E A             CON(1)  10
   770 00B0F 96C6          NIBASC \illegal \
           C656
           7616
           C602
```

```
771 00B1F 3414          NIBASC \CAS\
          35
772 00B25 A             CON(1)  10
773 00B26 5402          NIBASC \E struct\
          3747
          2757
          3647
774 00B36 5727          NIBASC \ure\
          56
775 00B3C C             CON(1)  12
776             *
777             *eRLAB  EQU     61
778 00B3D 44            CON(2)  68
779 00B3F D3            CON(2)  61              Message number  61
780 00B41 A             CON(1)  10
781 00B42 2756          NIBASC \restrict\
          3747
          2796
          3647
782 00B52 5646          NIBASC \ed \
          02
783 00B58 A             CON(1)  10
784 00B59 C616          NIBASC \label Fi\
          2656
          C602
          6496
785 00B69 C456          NIBASC \LeN\
          E4
786 00B6F 7             CON(1)   7
787 00B70 4602          NIBASC \d exists\
          5687
          9637
          4737
788 00B80 C             CON(1)  12
789             *
790             *eREENT EQU     62
791 00B81 52            CON(2)  37
792 00B83 E3            CON(2)  62              Message number  62
793 00B85 B             CON(1)  11
794 00B86 E             CON(1)  14
795 00B87 02E6          NIBASC \ not re-\
          F647
          0227
          56D2
796 00B97 56E6          NIBASC \entrant\
          4727
          16E6
          47
797 00BA5 C             CON(1)  12
798             *
799             *eBASCX EQU     63
800 00BA6 31            CON(2)  19
801 00BA8 F3            CON(2)  63              Message number  63
802 00BAA 4             CON(1)   4
803 00BAB 2414          NIBASC \BASIC\
```

```
           3594
           34
    804 00BB5 D            CON(1)  13
    805 00BB6 E3           CON(2) =eREENT
    806 00BB8 C            CON(1)  12
    807             *
    808             *eFORTX EQU     64
    809 00BB9 31           CON(2)  19
    810 00BBB 04           CON(2)  64           Message number  64
    811 00BBD 4            CON(1)   4
    812 00BBE 64F4         NIBASC \FORTH\
           2545
           84
    813 00BC8 D            CON(1)  13
    814 00BC9 E3           CON(2) =eREENT
    815 00BCB C            CON(1)  12
    816             *
    817 00BCC FF           NIBHEX FF            Table terminator
```

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NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
                    STITLE POLL_HANDLING
              ******************************************************
              * The following code is the FORTH ROM poll handler.    *
              * On entry B(B) = process#.  The FORTH ROM will respond *
              * to the following process numbers:                    *
              *                                          CODE#(HEX)*
              * pERROR (slow poll) - poll for errors      F2        *
              * pVER$ - VER$ function poll                          *
              * pMNLP - main loop poll                    FA        *
              * pMEM - insufficient memory error poll     F1        *
              * pFTYPE - unknown file type poll           2D        *
              * pCONFG - configuration poll               FB        *
              *                                                     *
              ******************************************************


00BCE 04    POLHND SETHEX
00BD0 20           P=     0
00BD2 969          ?B=0   B              VER$ poll?
00BD5 23           GOYES  hVER$0         Yes.
00BD7 3100         LC(2)  =pMNLP
00BDB 961          ?B=C   B              MAINLOOP poll?
00BDE 95           GOYES  baspol         Yes.
00BE0 3100         LC(2)  =pFTYPE
00BE4 961          ?B=C   B              CAT poll?
00BE7 45           GOYES  catpol         Yes.
00BE9 3100         LC(2)  =pERROR
00BED 961          ?B=C   B              ERROR?
00BF0 F4           GOYES  errhnd         Yes.
00BF2 3100         LC(2)  =pMEM
00BF6 961          ?B=C   B              INSUFFICIENT MEMORY poll?
00BF9 A4           GOYES  errMEM         Yes.
00BFB 3100         LC(2)  =pCONFG
00BFF 961          ?B=C   B              CONFIGURATION poll?
00C02 16           GOYES  config         Yes.

00C04 503          GONC   hVER$2         No.  To hVER$2 w/carry clear.
00C07 11B   hVER$0 C=R3
00C0A 135          D1=C
00C0D 112          A=R2
00C10 1CD          D1=D1- (VER$en)-(VER$st)-2
00C13 137          CD1EX
00C16 8B6          ?A>C   A
00C19 C1           GOYES  hVER$1
00C1B 135          D1=C
00C1E 10B          R3=C
00C21 3D14  VER$st LCASC  \ FTH:1A\
      13A3
      8445
      6402
00C31 15DD  VER$en DAT1=C (VER$en)-(VER$st)-2
00C35       hVER$1
00C35       hVER$2
00C35 00           RTNSXM
00C37 62A0 baspol  GOTO    BASPOL
```

```
870 00C3B 62E1 catpol  GOTO    CATPOL
871 00C3F 6B42 errhnd  GOTO    ERRHND
872
873            * MEMERR poll is problematic because it returns
874            * to mainloop instead of caller of MFERR
875            * So we're setting this flag in oERR? to tell
876            * MAINLOOP(baspol)poll to abort.
877 00C43 7BF1 errMEM  GOSUB   FTHRM?
878 00C47 5DE          GONC    hVER$2      IF NO FORTHRAM, RTNSXM
879 00C4A 7322         GOSUB   GOOD?       FORTHRAM in position?
880 00C4E 56E          GONC    hVER$2      no, RTNSXM
881 00C51 1BBB         D0=(5)  =oERR?
          BF2
882 00C58 D2           C=0     A
883 00C5A E6           C=C+1   A
884 00C5C 144          DAT0=C  A           ERR?=1
885 00C5F 6C42         GOTO    ERHX0
886
```

```
887                     EJECT
888                 ****************************************
889                 *
890                 * CONFIGURATION poll handler
891                 *
892                 * A user may have pulled or added modules
893                 * while the machine was turned off!
894                 * This code will allow us to ensure that
895                 * our RAM file is put back where it should
896                 * be!
897                 *
898                 * So, given that FORTHRAM is the first file
899                 * in memory and that it is of the right type,
900                 * this rtne allows us to assume that the
901                 * addresses in FORTHRAM (i.e., ACTIVE) will
902                 * always be correct.
903                 *
904                 ****************************************
905
906 00C63 7BD1 config  GOSUB   FTHRM?          if this rtne returns w/
907                 *                          with carry clear FORTHRAM
908                 *                          is not right type or in
909                 *                          right place, so just rtnsxm
910 00C67 5DC         GONC    hVER$2
911
912                 *
913                 * now we know that FORTHRAM is the first file in memory
914                 * and that it is of the correct type, let's check to see
915                 * if it has moved since that last time we were in FORTH!
916                 *
917 00C6A 16F         D0=D0+  16              pt to old addr of FORTHRAM
918 00C6D 164         D0=D0+  5               which we keep right after
919                 *                          the file header
920 00C70 142         A=DAT0  A               read old addr
921 00C73 1B00       D0=(5)  =MAINST
          000
922 00C7A 146         C=DAT0  A               current addr
923 00C7D 8A2         ?A=C    A               are addresses different?
924 00C80 22          GOYES   conf0           no, so continue
925                 *                          yes, so we must adjust file
926
927                 ************************************************************
928                 *
929                 * XFTH will adjust the file as needed; it will never do an
930                 * insufficient memory error; this is because FORTHRAM already
931                 * exists; someone has pulled out a number of modules and the
932                 * size of FORTHRAM must be increased, however all we are doing
933                 * is absorbing the memory freed up when the size of the configura
934                 * buffers shrunk
935                 *
936                 ************************************************************
937
938 00C82 DF          CDEX    A               save D(A) in R3
939 00C84 10B         R3=C                    I believe that R3 is not trashed
940                 *                          in any permutation of XFTH
```

```
941 00C87 22          P=      2               save 3 CPU RTN STK levels
942 00C89 8F00        GOSBVL  =R<RSTK
          000
943 00C90 7C93        GOSUB   XFTH
944 00C94 22          P=      2
945 00C96 8F00        GOSBVL  =RSTK<R         restore 3 CPU RTN STK levels
          000
946
947 00C9D 11B         C=R3
948 00CA0 D7          D=C     A               restore D(A) for config poll
949
950             ****************************************************************
951             *
952             * We also check the contents of oVARID.  If it contains a number
953             * we assume that this number is the buffer ID of a buffer that
954             * we want to save. So use I/ORES  to save buffer.
955             *
956             ****************************************************************
957 00CA2      conf0
958 00CA2 1F34        D1=(5)  =oVARID         get buffer ID
          CF2
959 00CA9 147         C=DAT1  A               read buffer contents
960 00CAC 8AA         ?C=0    A               any to save?
961 00CAF 90          GOYES   conf2           no
962
963 00CB1 8F00        GOSBVL  =I/ORES         claim our buffer
          000
964             *                             I/ORES uses A,C,D1,Carry
965
966 00CB8 00   conf2  RTNSXM
```

```
967                EJECT
968             ********************************************
969             *
970             * IF FORTH IS ACTIVE, WE HAVE TO DO SOMETHING
971             * HERE. WE DECIDE WHAT TO DO BASED ON THE
972             * VALUE OF ACTIVE, AS FOLLOWS:
973             * 0  --------   DO NOTHING, RTNSXM
974             *  IF ACTIVE#0
975             *  FIRST CHECK IF FROM FORTHX (oBASIC#0)
976             *  IF SO CLEAR ACTIVE, RETURN HAVING HANDLED POLL
977             *  ELSE
978             * 1  --------   ASSUME INIT1 HAS HAPPENED;
979             *               RESET POINTERS, SHOW SIGN-ON MESSAGE
980             *               AND ABORT
981             * 2  --------   BASICI/F/$ -- HIT A PAUSE. SET ACTIVE
982             *               TO 1 AND "WAKEUP" (GO TO QUIT)
983             * 3  --------   BASICX -- COLLAPSE STACK
984             *               AND RESTORE FORTH POINTERS; KILL
985             *               IOBUFFER USED FOR BASIC COMMAND, CLEAN
986             *               UP ITEMS ON RTN STACK, EXIT BASICX.
987             * ONE OTHER WAY WE CAN GET HERE, WHICH IS NOT DEPENDENT
988             * ON ACTIVE, IS THROUGH A MEMORY ERROR: IN THAT CASE
989             * A GOSUB TO MFERR NEVER RETURNS BUT GOES TO MAINLOOP.
990             * MEMERR'S ARE FLAGGED BY oERR=1 IN THE ERROR-POLL-HANDLER.
991             * SO WHEN oERR=1 WE WANT TO ABORT.
992             *
993             ********************************************
994 00CBA 1BC0 abqq    D0=(5)  =ACTIVE
          BF2
995 00CC1 CE          C=C-1   A           C WAS 2, MAKE IT 1
996 00CC3 144         DAT0=C  A
997 00CC6 71F2        GOSUB   RSFP
998 00CCA 7576        GOSUB   SETI
999 00CCE 0000        CON(5)  =WAKE
          0
1000
1001 00CD3 144  abq    DAT0=C  A           RESET ERR? TO ZERO
1002 00CD6 6D82        GOTO    abortq
1003
1004
1005 00CDA 7461 BASPOL  GOSUB   FTHRM?      FORTHRAM?
1006 00CDE 59D         GONC    conf2       NO JUST RTNSXM
1007
1008 00CE1 7C81        GOSUB   GOOD?       FORTHRAM in position?
1009 00CE5 52D         GONC    conf2       no just RTNSXM
1010
1011 00CE8 1BC0        D0=(5)  =ACTIVE     MAKE SURE FORTH IS
          BF2
1012 00CEF 142         A=DAT0  A           ACTIVE
1013 00CF2 8AC         ?A#0    A           ACTIVE?
1014 00CF5 50          GOYES   BPL001      YES
1015 00CF7 50C         GONC    conf2       ELSE JUST RTNSXM
1016
1017 00CFA 1B2A BPL001  D0=(5)  =oBASIC     CHECK IF FROM FORTHX
          BF2
```

```
1018 00D01 146          C=DAT0  A
1019 00D04 8AA          ?C=0    A           IF NOT,
1020 00D07 02           GOYES   BPL002              CONTINUE
1021
1022            * we're coming from FORTHX--we know this because
1023            * oBASIC contains a return addr instead of 0--however,
1024            * we may be in the middle of an implicit BASICF
1025            * i.e., FORTHX' 1.0*FNF'  would invoke BASICF and would
1026            * also invoke the BASIC interpreter inorder to evaluate
1027            * the user defined function, FNF.  Therefore, we must
1028            * check to see if this is a BASICF by examining the
1029            * value in ACTIVE, if it is 2 then don't reset anything.
1030
1031            *                               A(A)=ACTIVE
1032 00D09 CC           A=A-1   A            if ACTIVE = 2 then  1
1033 00D0B CC           A=A-1   A            now 0
1034 00D0D CC           A=A-1   A            we'll carry after 3nd subtract
1035 00D0F 411          GOC     BPDONE       clear nothing, just return
1036 00D12 D2           C=0     A            set C(A)=0 and clear oBASIC & ACTIVE
1037 00D14 144          DAT0=C  A            clear oBASIC
1038 00D17 1BC0         D0=(5)  =ACTIVE
          BF2
1039 00D1E 144          DAT0=C  A            clear oBASIC
1040 00D21 00   BPDONE  RTNSXM               BACK TO MAIN LOOP
1041
1042 00D23 669F abqqq   GOTO    abqq         intermediate jump
1043
1044 00D27 3436 BPL002  LC(5)   99           HERE FROM OFF KEY FROM FORTH?
          000
1045 00D2E 8A2          ?A=C    A
1046 00D31 B7           GOYES   forpon       YES, RESTART
1047 00D33 1BBB         D0=(5)  =oERR?       ERR?=1 IF WE'RE IN MEMERR
          BF2
1048 00D3A 146          C=DAT0  A            WHICH RETURNS TO MAINLOOP
1049 00D3D CE           C=C-1   A
1050 00D3F 8AA          ?C=0    A
1051 00D42 19           GOYES   abq          abort
1052 00D44 3420         LC(5)   2            ACTIVE=2 means BASICI,F,$
          000
1053 00D4B 8A2          ?A=C    A
1054 00D4E 5D           GOYES   abqqq
1055 00D50 E6           C=C+1   A            check ACTIVE=3
1056 00D52 8A6          ?A#C    A             IF ACTIVE#3 THEN THIS MUST BE
1057 00D55 96           GOYES   init1           could be INIT1
1058 00D57 8F00         GOSBVL  =COLLAP          DON'T LEAVE MTH STK GARBAGE
          000
1059 00D5E 8F00         GOSBVL  =GETFP           RESTORE FORTH POINTERS
          000
1060
1061            *
1062            * FORTH RTN STACK HAS 3 THINGS SAVED THERE BEFORE CONTROL
1063            * PASSED TO BASIC SYSTEM: FIRST IS BUFFER ID#
1064            * OF IOBUFFER USED BY BASICX -- SAVED SO WE
1065            * CAN GET RID OF THAT BUFFER NOW;
1066            * THEN POP 2 RTNS TO CPU (SAVED FROM OS).
```

```
1067                *
1068 00D65 DC              ABEX    A               RTN STK TO A(A)
1069 00D67 132             AD0EX
1070 00D6A 146             C=DAT0  A              GET BUFFER ID TO DEALLOCATE
1071 00D6D 109             R1=C                   SAVE
1072 00D70 164             D0=D0+  5
1073 00D73 146             C=DAT0  A               GET 1ST ADDR
1074 00D76 06              RSTK=C                  PUSH BACK TO CPU STACK
1075 00D78 164             D0=D0+  5
1076 00D7B 146             C=DAT0  A               GET 2ND ADDR
1077 00D7E 06              RSTK=C                  PUSH BACK TO CPU STACK
1078 00D80 164             D0=D0+  5
1079 00D83 132             AD0EX                  NEW RTN STACK
1080 00D86 DC              ABEX    A              INTO B(A)
1081 00D88 8F00            GOSBVL  =SAVEFP        IODAL WILL USE ALL PTRS
           000
1082 00D8F 119             C=R1                   BUFFER ID FOR IODAL
1083 00D92 8F00            GOSBVL  =I/ODAL
           000
1084 00D99 84D             ST=0    13              THERE IS NO LEGITIMATE WAY FOR
1085                *                              PRGM TO BE RUNNING HERE, ALTHOUGH
1086                *                              SOMETIMES MAINLOOP HASN'T CLEARED
1087                *                              S13 YET
1088 00D9C 8F00            GOSBVL  =SVSTAT        SAVE PRGM STATUS AND CLEAR ANNUNCI
           000
1089 00DA3 8F00            GOSBVL  =GETFP
           000
1090 00DAA 03              RTNCC
1091
1092 00DAC D2    forpon    C=0     A
1093 00DAE CE              C=C-1   A              SET ACTIVE FOR RESTART
1094 00DB0 1BC0            D0=(5)  =ACTIVE
           BF2
1095 00DB7 144             DAT0=C  A
1096 00DBA 6A22            GOTO    XFORTH
1097
1098                *
1099                * note: this sign on message is duplicated at
1100                *       OUTER INTERPRETER, if this message
1101                *       changes, it must also be changed there.
1102                *
1103
1104 00DBE 1F6B  init1     D1=(5)  =oONERR         clear ONERR
           BF2
1105 00DC5 D2              C=0     A
1106 00DC7 145             DAT1=C  A
1107 00DCA 7DE1            GOSUB   RSFP            set D1 and B(A)
1108 00DCE 7175            GOSUB   SETI
1109 00DD2 0000            CON(5)  =PDOTQ
           0
1110 00DD7 E0              CON(2)  14
1111 00DD9 8405            NIBASC  \HP-71 FO\
           D273
           1302
           64F4
```

```
1112 00DE9 2545         NIBASC  \RTH 1A\
           8402
           1314
1113 00DF5 0000         CON(5)  =ABORT
           0
1114
1115
```

```
                    STITLE  FORTH_INITIALIZATION
            ****************************************
            *
            * ROUTINE TO CHECK THAT FILE TYPE
            * IN A[A] IS IN RANGE FthFil TO FthFil+3
            * EXIT: CARRY SET IF OK. A STILL HAS TYPE
            *
            ****************************************

00DFA 3491 TYPCHK  LC(5)   (=FthFil)+1
      2E0
            *
            * THERE ARE 2 FORTH TYPES, FTHFIL & FTHFIL+1 (SECURE)
            *
00E01 E2          C=C-A  A             C=OFFSET
            * OFFSET MUST BE ZERO OR ONE
00E03 CE          C=C-1  A             CARRY IF ZERO
00E05 490         GOC    CHKYES
00E08 CE          C=C-1  A             NOW CARRY IF 1
00E0A 440         GOC    CHKYES
00E0D 03          RTNCC
00E0F 02   CHKYES RTNSC

            * CHECK TYPE OF FILE -- WHEN D0 POINTS TO
            * BEGINNING OF FILE
            * GET TYPE IN A[A] AND CALL TYPCHK
            *
            ************************************************

00E11 16F  CHKTYP  D0=D0+  16              POINT PAST NAME
00E14 D0           A=0     A
00E16 15A3         A=DAT0  4
00E1A 6FDF         GOTO    TYPCHK
            *                              SAME EXIT CONDITIONS
            *                              AS TYPCHK
```

```
1151                EJECT
1152            ************************************
1153            *
1154            * CATALOG poll handler for FORTH
1155            * type files
1156            *
1157            ************************************
1158
1159 00E1E 78DF CATPOL GOSUB  TYPCHK
1160 00E22 440         GOC    CATP0
1161 00E25 00          RTNSXM
1162
1163            * IT IS ONE OF OUR TYPES.
1164            * TYPE IS IN A[A]
1165            * SET D1 TO TYPE TABLE, A[S] TO OFFSET,A[A] TO TYPE
1166 00E27 821  CATP0  XM=0
1167 00E2A 1F00        D1=(5)  =TYTABF
           07E
1168 00E31 3471        LC(5)   (=FthFil)-1     FIRST TYPE IN TABLE
           2E0
1169            *                              MINUS ONE BECAUSE THEY WANT
1170            *                               A ONE FOR 1ST TYPE,2 FOR 2ND
1171 00E38 EE          C=A-C   A                GET "OFFSET" INTO TABLE
1172            *                              (ONE IF NORMAL TYPE)
1173 00E3A 816         CSRC                     PUT IN C[S]
1174            *                              A[A] STILL HAS TYPE
1175 00E3D ACA         A=C     S                WITH OFFSET IN S
1176 00E40 03          RTNCC
```

```
                    EJECT
            ****************************************************
            *
            * THIS RTNE MAKES SURE THAT:
            *
            *        1) THE FIRST FILE IN THE CHAIN (POINTED
            *           TO BY MAINST IS CALLED "FORTHRAM"
            *
            *        2) THAT IF THIS FILE IS CALLED
            *           "FORTHRAM" IT IS OF THE CORRECT
            *           TYPE.
            *
            * IT RETURNS WITH CARRY set IF ITS THE RIGHT FILE
            * AND IT RETURNS WITH CARRY clear OTHERWISE
            *
            * It assumes that if the above 2 conditions are
            * met that the data in FORTHRAM is in the correct
            * location because the configuration poll handler
            * will make sure of it.
            *
            ***************************************************

00E42 20    =FTHRM? P=      0
00E44 1B00          D0=(5)  =MAINST         first let's see if
      000
00E4B 146           C=DAT0  A               FORTHRAM has been created!
00E4E 134           D0=C                    if not, don't handle
00E51 1527          A=DAT0  W               read name of 1st file in chain
00E55 3F64          LCASC   \MARHTROF\      see if its FORTHRAM
      F425
      4584
      2514
      D4
00E67 976           ?A#C    W               RIGHT NAME?
00E6A 50            GOYES   NOFTRM          NO!
            *                               NOW CHECK TYPE
00E6C 54A           GONC    CHKTYP          CARRY SET IF OK, ELSE CLEAR

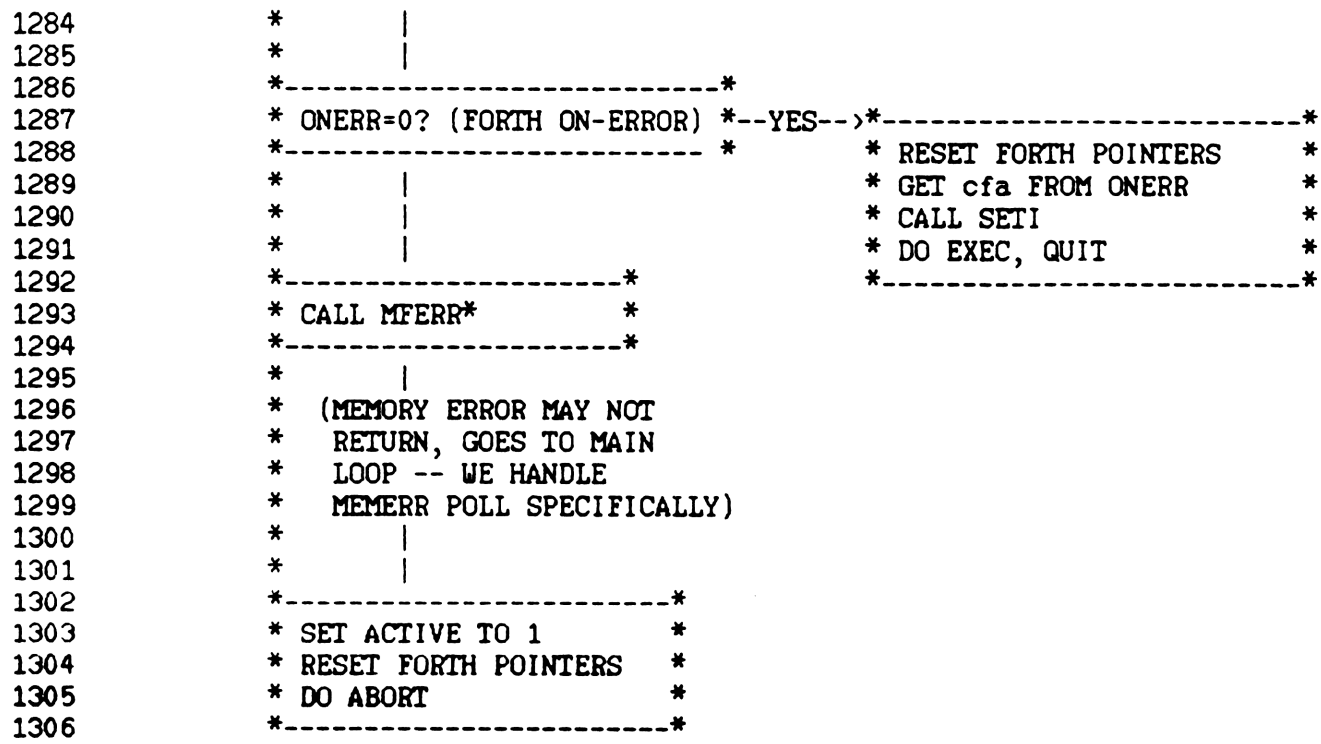
00E6F 03    NOFTRM  RTNCC

            * this routine is a further check used by Main Loop poll
            * handler, error poll handler and insufficient mem poll
            * handler, it is called after FTHRM? in these routines.
            * It assumes that D0 points beyond the name field in the
            * file header and that it can use D0, A and C.  It makes
            * sure that the FORTHRAM file is correctly positioned;
            * if it is not correctly positioned it rtns carry clear
            * and none of these polls should activate FORTH.

00E71 16F   =GOOD?  D0=D0+  16
00E74 164           D0=D0+  5       point to old addr of FORTHRAM
00E77 142           A=DAT0  A       read old addr
00E7A 1B00          D0=(5)  =MAINST
      000
00E81 146           C=DAT0  A       addr of FORTHRAM
```

```
1226 00E84 8A2          ?A=C    A       file in position?
1227 00E87 00           RTNYES          yes, rtn with carry set
1228 00E89 03           RTNCC           no, rtn with carry clear
```

```
1229                EJECT
1230
1231            ***************************
1232            *                         *
1233            *   ERROR poll handler    *
1234            *                         *
1235            ***************************
1236
1237            *-------------------------*
1238            * IS FORTHRAM FILE        *--NO----->RTN
1239            * CORRECTLY POSITIONED?   *
1240            *-------------------------*
1241            *       |
1242            *       |YES
1243            *       |
1244            *-------------------------*
1245            *  ERROR ROUTINE CALLED   *--YES--->RTN
1246            *  BY EMSG (IN ABORT)?    *         (POLLING ALREADY
1247            *-------------------------*          DONE THERE)
1248            *       |
1249            *       |NO
1250            *       |
1251            *-------------------------*
1252            * ACTIVE=-2?              *--YES-->RTN (FLAG SET BELOW...
1253            *-------------------------*             POLL GENERATED WHILE STILL
1254            *       |                               IN THIS POLL,FOR TRANSLATO
1255            *       |
1256            *       |NO
1257            *       |
1258            *-------------------------*
1259            * ACTIVE=2,3,4,5?         *--NO-->--------------------------+
1260            *-------------------------*                                  |
1261            *       |                                                  |
1262            *       |YES (IN BASICX OR BASICI,F,$)                     |
1263            *       |                                                  |
1264            *-------------------------*                                  |
1265            * BASIC ON-ERROR CONDITION *--YES-->RTN (LET ON-ERROR       |
1266            * IN EFFECT?              *             HAPPEN)              |
1267            *-------------------------*                                  |
1268            *       |                                                  |
1269            *       |NO                                                |
1270            *       |                                                  |
1271            *-------------------------*                                  |
1272            * SAVE PROGRAM STATUS     *                                  |
1273            * (SO WE SHOW SUSPEND     *                                  |
1274            * WHEN WE RETURN TO BASIC *                                  |
1275            *-------------------------*                                  |
1276            *       |                                                  |
1277            *       | <------------------------------------------------+
1278            *       |
1279            *-------------------------------------*
1280            * SET ACTIVE TO -2 (FOR CHECK ABOVE)  *
1281            *                                     *
1282            * COLLAPSE POLL AREA                  *
1283            *-------------------------------------*
```


ONERR=0? (FORTH ON-ERROR)
YES
RESET FORTH POINTERS
GET cfa FROM ONERR
CALL SETI
DO EXEC, QUIT
CALL MFERR*
(MEMORY ERROR MAY NOT
RETURN, GOES TO MAIN
LOOP -- WE HANDLE
MEMERR POLL SPECIFICALLY)
SET ACTIVE TO 1
RESET FORTH POINTERS
DO ABORT

```
1307                        EJECT
1308 00E8B 73BF ERRHND  GOSUB   FTHRM?          IS IT RIGHT FILE?
1309 00E8F 440          GOC     ERRH00          YES! HANDLE IT
1310
1311 00E92 00   rtnhnd  RTNSXM                 OTHERWISE JUST RTN
1312
1313 00E94 79DF ERRH00  GOSUB   GOOD?           FORTHRAM in position?
1314 00E98 59F          GONC    rtnhnd          no RTNSXM
1315
1316 00E9B 1BBB         D0=(5) =oERR?           FIRST CHECK FOR FORTH ERROR
         BF2
1317 00EA2 146          C=DAT0 A
1318 00EA5 8AA          ?C=0   A                NOT FROM EMSG? (IN FT3)
1319 00EA8 40           GOYES  ERHX0            THEN GO ON
1320 00EAA 00           RTNSXM
1321 00EAC 1BC0 ERHX0   D0=(5) =ACTIVE          LET'S SEE IF FORTH IS ALIVE
         BF2
1322 00EB3 AF2          C=0    W                CLEAR FOR CSRB BELOW
1323 00EB6 146          C=DAT0 A                READ FLAG
1324 00EB9 8AE          ?C#0   A                ACTIVE?
1325 00EBC 40           GOYES  ERRH01
1326 00EBE 00           RTNSXM                  NO, just return
1327
1328            *
1329            * WE HAVE AN ERROR OR OUT OF MEMORY CONDITION
1330            * THE FORTHRAM FILE EXISTS AND FORTH IS ACTIVE
1331            * NOW WE MUST DISPLAY THE ERROR MESSAGE AND THEN
1332            * REACTIVATE FORTH
1333            *
1334
1335 00EC0 E6   ERRH01  C=C+1  A                CHECK FOR -2
1336 00EC2 E6           C=C+1  A                SET RIGHT BELOW AT ERR03
1337 00EC4 8AE          ?C#0   A                0 MEANS THIS IS THE POLL
1338 00EC7 B0           GOYES  ERR02             WE JUST SENT
1339
1340 00EC9 D2   ERRrtn  C=0     A
1341 00ECB E6           C=C+1   A                 NEED TO CLEAR CARRY
1342 00ECD 118          C=R0                     SAVE MSG#
1343 00ED0 00           RTNSXM
1344 00ED2 1B2A ERR02   D0=(5) =oBASIC      FORTHX?
         BF2
1345 00ED9 142          A=DAT0 A
1346 00EDC 8A8          ?A=0   A
1347 00EDF 90           GOYES  ERR02+       IF SO,
1348 00EE1 8F00         GOSBVL =GTS13             RESTORE PGM-RUNNING FLAG
         000
1349            *                           SO ON ERROR CAN HAPPEN
1350            *                           (C UNTOUCHED)
1351 00EE8 86D  ERR02+  ?ST=0   13          PRGM NOT RUNNING?
1352 00EEB 74           GOYES   ERR03       THEN IGNORE ON ERROR
1353 00EED 81E          CSRB                check for ACTIVE=3 (BASICX)
1354            *                           or ACTIVE=2 (BASICI,F,$)
1355 00EF0 81E          CSRB                plus two added above, =5or4
1356            *                           (we're also testing for 6&7)
1357 00EF3 CE           C=C-1  A            lose former 4's bit
```

```
1358 00EF5 8AE          ?C#0   A
1359 00EF8 A3           GOYES  ERR03        IF IN BASIC,
1360 00EFA 1B00         D0=(5)  =ERRSUB     THEN RETURN IF ON ERROR
           000
1361 00F01 146          C=DAT0  A            IS IN EFFECT
1362 00F04 8AE          ?C#0    A
1363 00F07 2C           GOYES   ERRrtn
1364 00F09 164          D0=D0+  5
1365 00F0C 146          C=DAT0  A
1366 00F0F 8AE          ?C#0    A
1367 00F12 7B           GOYES   ERRrtn
1368            *
1369 00F14 118          C=R0                 SVST WIPES OUT R0 WHICH IS IMPORTANT
1370 00F17 109          R1=C                 (IT DOESN'T TOUCH R1)
1371 00F1A 3100         LC(2)   =flSUSP      SET SUSPEND FLAG SO PROGRAM HALTS
1372 00F1E 8F00         GOSBVL  =SFLAGS      WHEN WE EXIT FORTH
           000
1373 00F25 8F00         GOSBVL  =SVSTAT      SAVE CURRENT PRGM STATUS (OVERWRITE
           000
1374            *                            STATUS ON ENTRY TO FORTH) & CLEAR AN
1375 00F2C 119          C=R1
1376 00F2F 108          R0=C                 RESTORE R0
1377 00F32 1BC0 ERR03   D0=(5) =ACTIVE        RESET IN CASE WE FELL THROUGH HERE
           BF2
1378 00F39 D2           C=0    A
1379 00F3B CE           C=C-1  A              FLAG CHECKED ABOVE
1380 00F3D CE           C=C-1  A               -2
1381 00F3F 144          DAT0=C A              SET IN ACTIVE
1382 00F42 8F00         GOSBVL =COLLAP        COLLAPSE POLL AREA
           000
1383 00F49 1B6B         D0=(5) =oONERR
           BF2
1384 00F50 146          C=DAT0 A              CHECK ON ERROR FLAG
1385 00F53 D7           D=C    A              SAVE POSSIBLE CFA
1386 00F55 8AE          ?C#0   A
1387 00F58 A2           GOYES  ONERX
1388 00F5A 118          C=R0                  R0 HAS MSG#
1389
1390 00F5D 8F00         GOSBVL =MFERR*        GO DO THE MESSAGE
           000
1391
1392 00F64 84D  abortq  ST=0   13
1393 00F67 1BC0         D0=(5) =ACTIVE
           BF2
1394 00F6E D2           C=0    A
1395 00F70 E6           C=C+1  A              RESET ACTIVE TO 1
1396 00F72 144          DAT0=C A
1397
1398 00F75 7240         GOSUB  RSFP
1399 00F79 76C3         GOSUB  SETI           SET D0=I AND RUN
1400 00F7D 0000         CON(5) =ABORT
           0
1401
1402            ************************************************************
1403            *
```

```
1404            * We make the assumption here that we were executing some
1405            * mainframe subroutine when an error occurred over which we
1406            * no ability to stop; since we always save the FORTH system
1407            * pointers away before we call a mainframe routine we also
1408            * assume that the info returned by GETFP (see MR/FT7) is
1409            * valid.
1410            *
1411            ************************************************************
1412
1413 00F82 1BC0 =ONERX  D0=(5) =ACTIVE        must reset ACTIVE to 1
          BF2
1414 00F89 D2           C=0    A             which means FORTH is
1415 00F8B E6           C=C+1  A             running in normal mode
1416 00F8D 144          DAT0=C A
1417 00F90 1B00         D0=(5)  =ERR#
          000
1418 00F97 118          C=R0                ERRMSG#
1419 00F9A 15C3         DAT0=C  4           STORE ERROR NUM, WHICH MFER WOULD HAV
1420 00F9E 8F00         GOSBVL =GETFP         restore FORTH pointers
          000
1421 00FA5 DB           C=D    A              GET CFA
1422 00FA7 1C4          D1=D1- 5
1423 00FAA 145          DAT1=C A              PUT CFA ON STACK
1424 00FAD 7293         GOSUB  SETI
1425 00FB1 0000         CON(5) =EXEC
          0
1426 00FB6 0000         CON(5) =QUIT
          0
1427
1428            * RESET FORTH POINTERS
1429
1430 00FBB 1B11 RSFP    D0=(5) =oS0           START OF DATA STACK
          BF2
1431 00FC2 146          C=DAT0 A
1432 00FC5 137          CD1EX                 D1 NOW DATA STK PTR
1433 00FC8 164          D0=D0+ 5              D0-->RTN STK PTR
1434 00FCB 146          C=DAT0 A
1435 00FCE DD           BCEX   A              B(A)=RTN STK PTR
1436 00FD0 01           RTN
```

```
1437                    EJECT
1438
1439 00FD2 8D00  FORTHd GOVLNG =OUTELA
           000
1440 00FD9 03    FORTHp RTNCC
1441 00FDB 7FFF         REL(5) FORTHd
           F
1442 00FE0 9FFF         REL(5) FORTHp
           F
```

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THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
1443                    EJECT
1444 00FE5 7740 =XFORTH GOSUB   XFTH
1445            * HANDLED ALL FILE INITIALIZATION
1446            * NOW SET UP INTERPRETER LOOP
1447 00FE9 63F2         GOTO    RESTRT
1448
1449
1450
1451 00FED AF2  =FRCHK  C=0     W
1452 00FF0 20           P=      0
1453 00FF2 3F64         LCASC   \MARHTROF\
           F425
           4584
           2514
           D4
1454 01004 AFA          A=C     W
1455 01007 8F00         GOSBVL  =FILEF      CHECK TO SEE IF THE RAM FILE EXISTS
           000
1456            *                           FILEF only checks in MF RAM which is
1457            *                           what we want.
1458
1459 0100E 441          GOC     FRCK0       FILE DOESN'T EXIST
1460 01011 133          AD1EX                    PUT FILEPTR IN A
1461 01014 131          D1=A                     PUT BACK IN D1 FOR FILEEX
1462 01017 130          D0=A                     TO PUT IN D0 FOR CHKTYP
1463 0101A 73FD         GOSUB   CHKTYP
1464 0101E 560          GONC    typerr           FILE EXISTS BUT IS WRONG TYPE
1465 01021 03           RTNCC
1466
1467 01023 02   FRCK0   RTNSC
1468
1469 01025 3100 typerr  LC(2)   =eFTYPE
1470 01029 8D00         GOVLNG  =MFERR
           000
1471
```

```
1472                    EJECT
1473 01030 79BF =XFTH   GOSUB  FRCHK        DOES FILE EXIST?
1474 01034 460          GOC    INIT05       NO
1475 01037 6B13         GOTO   FILEEX       YES, IT DOES
1476
1477            ********************************************************
1478            * WE MAY NEED THIS ADDR FOR CUSTOM ROMS (SOFT ADDRESSED)
1479            ********************************************************
1480            * Determine ROM base addr, return it in C(A)
1481            *
1482            *
1483            * =ROMADR GOSUB  ROMST       determine start addr of this ROM
1484            *  ROMST  C=RSTK
1485            *         C=0     X          clear offset from start of file
1486            *         RTN                C has ROM start addr
1487
1488            *--------------------------------------------------------
1489            *
1490            * OUR RAM FILE DOES NOT EXIST, THEREFORE, WE MUST BLOW OPEN
1491            * A HOLE AT THE START OF THE FILE CHAIN AND CREATE THE
1492            * SUCKER.
1493            *
1494
1495 0103B 349A  INIT05 LC(5)   FSIZET          FILE SIZE APPROX 3K BYTES
          610
1496 01042 D5           B=C     A              FILE SIZE IN NIBS
1497 01044 343D         LC(5)   =MINFIL        ADJUSTIABLE FILE START
          AF2
1498            *
1499 0104B DA           A=C     A
1500 0104D 1B00         D0=(5)  =MAINST        POINTER TO START OF CHAIN
          000
1501 01054 146          C=DAT0  A              C(A)=START OF 1ST FILE
1502 01057 EE           C=A-C   A              NEEDED DEAD SPACE IN FILE
1503
1504 01059 412          GOC     BIGERR         IF THIS NUMBER IS NEGATIVE
1505            *                              THEN WE HAVE CONFIGURATION
1506            *                              PROBLEM--FORTHRAM WILL NOT BE
1507            *                              ABLE TO BE PLACED CORRECTLY
1508            *
1509
1510 0105C C1           B=B+C   A              REAL NECESSARY SIZE TO CREATE
1511 0105E D9           C=B     A
1512 01060 109          R1=C                   SAVE COPY IN R1 FOR LATER
1513 01063 146          C=DAT0  A              START OF 1ST FILE
1514 01066 DA           A=C     A              A(A)=START OF 1ST FILE
1515 01068 8F00         GOSBVL  =MVMEM+        A(A)=C(A)=1ST FILE IN CHAIN,
          000
1516            *                              P=0, B(A)=OFFSET(FILE SIZE)
1517
1518 0106F 5E1          GONC    INIT10         FILE CREATED
1519 01072 20   ERR     P=      0              NOT CREATED, ERROR
1520 01074 8D00         GOVLNG  =MFERR         JUMP TO ERROR CODE
          000
1521
```

```
1522 0107B 22   BIGERR  P=      2
1523 0107D 31F2         LC(2)   =ID
1524 01081 20           P=      0
1525 01083 3143         LC(2)   =eCONF          GIVE CONFIGURATION ERR
1526 01087 8D00         GOVLNG  =BSERR
           000
1527
1528 0108E 110  INIT10  A=R0                    A(A)=START OF FILE
1529 01091 130          D0=A
1530 01094 131          D1=A
1531 01097 3F64         LCASC   \MARHTROF\
           F425
           4584
           2514
           D4
1532 010A9 1557         DAT1=C W                WRITE OUT FILENAME
1533 010AD 17F          D1=D1+ 16
1534 010B0 3381         LC(4) =FthFil           FILE TYPE
           2E
1535 010B6 15D3         DAT1=C 4                WRITE OUT FILE TYPE
1536 010BA 17F          D1=D1+  16
1537 010BD 111          A=R1                    RECOVER FILE SIZE
1538 010C0 3402         LC(5)   32              HEADER OVERHEAD
           000
1539 010C7 EE           C=A-C   A               OFFSET TO NEXT FILE IN CHAIN
1540 010C9 145          DAT1=C  A               WRITE TO FILE
1541
1542 010CC 174          D1=D1+  5               POINT TO RAMFILE ADDR HOLDER
1543 010CF 136          CD0EX
1544 010D2 145          DAT1=C  A               WRITE OUT RAMFILE START ADDR
1545 010D5 136          CD0EX
1546
1547 010D8 8F00         GOSBVL  =WFTMDT         D0->START OF FILE; WRITE
           000
1548            *                               FLAGS, TIME & CREATION
1549            *                               DATE TO FILE
1550
1551 010DF 79B1         GOSUB   TBLMOV          move stuff to ram
1552 010E3 9B10         CON(5)  =TBLLEN         length of table
           0
1553            ****************************************
1554            *                                      *
1555            *    INITIALIZATION OF RAM FILE        *
1556            *                                      *
1557            ****************************************
1558 010E8 C7D0         CON(5)  =DSTK           DSTKAD
           3
1559 010ED C0F0         CON(5)  =RSTK           RSTKAD
           3
1560 010F2 0000         CON(5)  0               IREG
           0
1561 010F7 1000         CON(5)  1               ACTIVE
           0
1562 010FC C7D0         CON(5)  =DSTK           S0
           3
```

```
1563 01101 C0F0          CON(5)  =RSTK           R0
           3
1564 01106 C7D0          CON(5)  =TIBF           TIB
           3
1565 0110B CDF0          CON(5)  =USEIT          USE
           3
1566 01110 C0F0          CON(5)  =RSTK           PREV
           3
1567 01115 C0F0          CON(5)  =RSTK           FIRST
           3
1568 0111A C711          CON(5)  =LAST+1         LIMIT
           3
1569 0111F CACF          CON(5)  =FRTHVL         VOC-LINK
           2
1570 01124 0600          CON(5)  RECSIZ          SET RECORD SIZE TO 96 BYTES
           0
1571 01129 0000          CON(5)  0               #TIB
           0
1572 0112E F100          CON(5)  NAMLEN          WIDTH
           0
1573 01133 FFFF          CON(5)  #FFFFF          WARNING
           F
1574 01138 0000          CON(5)  0               OKFLG
           0
1575 0113D 0000          CON(5)  0               BLK
           0
1576 01142 0000          CON(5)  0               IN
           0
1577 01147 0000          CON(5)  0               SPAN
           0
1578 0114C 0000          CON(5)  0               SCR
           0
1579 01151 7ACF          CON(5)  FRTHVC          CONTEXT
           2
1580 01156 7ACF          CON(5)  FRTHVC          CURRENT
           2
1581 0115B 0000          CON(5)  0               STATE
           0
1582 01160 A000          CON(5)  10              BASE
           0
1583 01165 0000          CON(5)  0               DPL
           0
1584 0116A 0000          CON(5)  0               FLD
           0
1585 0116F 0000          CON(5)  0               CSP
           0
1586 01174 0000          CON(5)  0               HLD
           0
1587 01179 1BCF          CON(5)  DICTST          FENCE
           2
1588 0117E 1BCF          CON(5)  DICTST          DP
           2
1589 01183 0D00          CON(5)  BUFLEN          BUFFER LENGTH IN NIBS
           0
1590 01188 0000          CON(5)  0               CURRENT LINE # IN ACTIVE BUFFER
```

```
            0
 1591 0118D 0000        CON(5)  0              BASIC RETURN
            0
 1592 01192 1000        CON(5)  1              HPIL LOOP #
            0
 1593 01197 0000        CON(5)  0              HPIL SECONDARY ADDR
            0
 1594 0119C 1000        CON(5)  1              HPIL PRIMARY ADDR
            0
 1595 011A1 0000        CON(5)  0              ON ERROR
            0
 1596 011A6 0000        CON(5)  0              ERROR?
            0
 1597           * MORE VARIABLES...
 1598           * FLOATING POINT STACK TAKES 80 NIBS!
 1599           * (VARIABLES oX,oY,oZ,oT)
 1600 011AB             BSS   80
 1601           * FILENAME VARIABLE TAKES 8 BYTES, 16 NIBS
 1602 011FB             BSS   16
 1603           *
 1604           * INDIRECTION VECTORS
 1605           *
 1606 0120B 0000        CON(5)  =IINTRP        INTERPRET
            0
 1607 01210 0000        CON(5)  =ICREAT        CREATE
            0
 1608 01215 0000        CON(5)  =INUMB         NUMBER
            0
 1609 0121A 0000        CON(5)  =ICOMMA        COMMA
            0
 1610 0121F 0000        CON(5)  =ICCOMA        C,
            0
 1611 01224 0000        CON(5)  =IALLOT        ALLOT
            0
 1612 01229 0000        CON(5)  =IUNIQ         not unique message
            0
 1613
 1614           * ASSEMBLER VARIABLES
 1615
 1616 0122E 0000        CON(5)  0              VARID -- ASSEMBLER VARIABLE
            0
 1617 01233 8300        CON(5)  56             PAGESIZE
            0
 1618
 1619           * NOW THE STRING VARIABLE LISTING
 1620           * IT LOOKS LIKE: 20 00 {40 NIBBLES} -- i.e.,STRING OF MAXLEN 20
 1621 01238 41          CON(2)  20
 1622 0123A             BSS     42
 1623           * 2 MORE ASSEMBLER VARIABLES
 1624 01264 0000        CON(5)   0             PARRT
            0
 1625 01269 0000        CON(5)   0             PRORT
            0
 1626           * MORE VARIABLES
 1627 0126E 0000        CON(5)   0             PSTAT -- PROGRAM STATUS SAVE
```

```
           0
1628 01273 0000          CON(5)   0              UNUSED VARIABLE AS OF 11-8-83
           0
1629                *
1630                *-------------------------------------------------------
1631                * END OF VARIABLES
1632                *
1633                * FORTH - first entry in RAM dictionary
1634
1635 01278 0000          CON(5)  0               end of RAM dictionary chain
           0
1636                *FRTHHD goes here
1637 0127D 5C            CON(2)  #C5
1638 0127F 64F4          NIBASC  \FORT\
           2545
1639 01287 8C            CON(2)  \H\+#80
1640 01289 0000          CON(5)  =DOVOC
           0
1641 0128E 18            CON(2)  #81
1642 01290 0A            CON(2)  \ \+#80
1643                *FRTHVC goes here
1644 01292 29CF          CON(5)  FRTHHD
           2
1645                *FRTHVL goes here
1646 01297 0000          CON(5)  0
           0
1647                *DICTST goes here
1648
1649 0129C 07    TBLMOV  C=RSTK
1650 0129E 135           D1=C    A
1651 012A1 AF0           A=0     W               clear for shift below
1652 012A4 143           A=DAT1  A               get count
1653 012A7 174           D1=D1+  5
1654 012AA 1BDF          D0=(5)  =DSTKAD
           AF2
1655                *
1656                * enter NMOVE after MOVSET with word count in A[A]
1657                * and nibbles extra in A[S]
1658                *      D1=source address
1659                *      D0=target address
1660                *
1661 012B1 814           ASRC                  /16, REMAINDER IN A[S]
1662 012B4 8F00          GOSBVL  =NMOVE1
           000
1663                *
1664                * NOW SAVE PROGRAM STATUS, INCASE WE HAVE BEEN RUNNING
1665                * OR WANT TO TURN ANNUNCIATORS BACK ON AT THE END
1666 012BB 8F00          GOSBVL  =SVSTAT
           000
1667 012C2 20            P=      0
1668 012C4 1F11          D1=(5)  =oS0
           BF2
1669 012CB 147           C=DAT1  A               DATA STK ADDR
1670 012CE 135           D1=C                    D1=DATA STK PTR
1671 012D1 1B61          D0=(5)  =oR0
```

```
            BF2
1672 012D8  146          C=DAT0  A              SET C=RTN STK PTR
1673 012DB  01           RTN
1674
1675                *
1676                * IF CALLED FROM XFORTH, WE ESSENTIALLY DROP THROUGH HERE
1677                *
1678
1679 012DD  D5   RESTRT  B=C     A              B(A)=RTN STK PTR
1680 012DF  1BC0         D0=(5)  =ACTIVE        SET FORTH AS ACTIVE
            BF2
1681 012E6  142          A=DAT0  A              SEE WHAT'S THERE NOW
1682 012E9  D2           C=0     A
1683 012EB  E6           C=C+1   A
1684 012ED  144          DAT0=C  A              WRITE A ONE TO ACTIVE
1685 012F0  1B2A         D0=(5)  =oBASIC        reset oBASIC to 0
            BF2
1686 012F7  CE           C=C-1   A              C(A)=0
1687 012F9  144          DAT0=C  A
1688 012FC  E4           A=A+1   A              CHECK FOR -1 LEFT BY SLEEP
1689 012FE  4E2          GOC     WAKEUP
1690
1691 01301  7E30         GOSUB   SETI           SET I TO QUIT RTNE
1692                *                           WHICH IS REALLY THE
1693                *                           OUTER INTERPRETER
1694                *
1695                * OUTER INTERPRETER
1696                *
1697                * note: this sign on message is replicated at init1
1698                *       if this message changes it must also be changed
1699                *       there!
1700                *
1701 01305  0000         CON(5)  =PDOTQ
            0
1702 0130A  E0           CON(2)  14
1703 0130C  8405         NIBASC  \HP-71 FO\
            D273
            1302
            64F4
1704 0131C  2545         NIBASC  \RTH 1A\
            8402
            1314
1705 01328  0000         CON(5)  =QUIT
            0
1706
1707 0132D  1BDF WAKEUP  D0=(5)  =DSTKAD        data stack save area
            AF2
1708 01334  146          C=DAT0  A              read old data stack value
1709 01337  137          CD1EX                  restore old data stk
1710 0133A  7500         GOSUB   SETI
1711 0133E  0000         CON(5)  =WAKE
            0
1712
1713
1714 01343  07   =SETI   C=RSTK                 POP ADDR OF OI
```

```
1715 01345 136          CD0EX                   D0=I
1716 01348 8D00         GOVLNG =NEXT00
           000
1717
1718
1719            * RE-ENTERING FORTH, THE FILE ALREADY EXISTS
1720
1721 0134F 622D ERR1    GOTO    ERR             ERROR OUT
1722
1723 01353 1B00 FILEEX  D0=(5)  =MAINST
           000
1724 0135A 343D         LC(5)   =MINFIL           HIGHEST POSSIBLE START ADDR
           AF2
1725 01361 DE           ACEX    A
1726 01363 146          C=DAT0  A               C(A)=ADDR OF 1ST FILE
1727 01366 8B6          ?A>C    A                 ARE WE SAFE???
1728 01369 60           GOYES   OKY               YES
1729 0136B 6F0D         GOTO    BIGERR            NO
1730
1731 0136F 133  OKY     AD1EX                   A(A)=ADDR OF OUR FILE
1732 01372 131          D1=A
1733
1734 01375 8A2          ?A=C    A               IS FILE IN PLACE?
1735 01378 60           GOYES   OKY0            YES, SEE IF IT NEEDS ADJUSTING
1736 0137A 6680         GOTO    MVFILE          NO, MOVE IT
1737
1738 0137E 3452 OKY0    LC(5)   37              SET D0-->OLD RAM FILE ADDR
           000
1739 01385 C2           C=A+C   A               WHICH LIVES AFTER FILE
1740 01387 134          D0=C                    HEADER
1741
1742 0138A 146          C=DAT0  A               C(A)=OLD FILE ADDR
1743 0138D 140          DAT0=A  A               WRITE OUT NEW "OLD FILE ADDR"
1744
1745 01390 8A2          ?A=C    A               NO SHIFT NECESSARY?
1746 01393 83           GOYES   GOFRTH          RIGHT!
1747
1748            *
1749            * CASE 1:
1750            *
1751            * IF NEW FILE ADDR IS LOWER IN MEMORY THAN OLD FILE ADDR
1752            * THEN WE MUST INCREASE THE AMOUNT OF DEAD SPACE IN RAM FILE
1753            *
1754            * CASE 2:
1755            *
1756            * IF NEW FILE ADDR IS HIGHER IN MEMORY THAN OLD FILE ADDR
1757            * THEN WE MUST DECREASE THE AMOUNT OF DEAD SPACE IN RAM FILE
1758            *
1759
1760 01395 8B6          ?A>C    A               NEW > OLD ?
1761 01398 51           GOYES   CASE2           YES
1762
1763 0139A D5   CASE1   B=C     A
1764 0139C E8           B=B-A   A               B=(OLD-NEW), A POSITIVE #
1765 0139E 34A2         LC(5)   42              OVRHD+5 FOR RAM FILE ADDR
```

```
            000
1766 013A5 C2          C=C+A   A
1767 013A7 DE          ACEX    A              A(A)=(START OF DEAD SPACE)
1768             *                            B(A)=# NIBS TO BLOW OPEN
1769             *                            C(A)=FILE START ADDR
1770 013A9 6A10        GOTO    SHIFT
1771
1772 013AD 130  CASE2  D0=A                   D0--> FILE
1773 013B0 D5          B=C     A
1774 013B2 EE          C=A-C   A              (NEW-OLD), A POSITIVE #
1775 013B4 CA          A=A+C   A              FILE START + (NEW-OLD)
1776 013B6 34A2        LC(5)   42
            000
1777 013BD CA          A=A+C   A              A(A)=DEAD SPACE + (NEW-OLD)
1778 013BF 136         CD0EX                  C(A)=NEW FILE ADDR
1779 013C2 E1          B=B-C   A              B(A)=(OLD-NEW), NEG #
1780
1781 013C4 8F00 SHIFT  GOSBVL  =MVMEM+        SHIFT FILE
            000
1782
1783 013CB 1B6B GOFRTH D0=(5)  =oONERR       ZERO ON ERROR FLAG
            BF2
1784 013D2 D2          C=0     A              (THIS IS FOR START-UP
1785 013D4 144         DAT0=C  A                FILE-EXISTS PATH OF BOTH
1786             *                              FORTH AND XFTH)
1787 013D7 1BBB        D0=(5)  =oERR?         FLAG USED BY EMSG, CHECKED IN BYE
            BF2
1788 013DE 144         DAT0=C  A              CLEAR IT
1789 013E1 8F00        GOSBVL  =SVSTAT          save BASIC program  status
            000
1790 013E8 1BDF        D0=(5)  =DSTKAD          TOS SAVED BY BYE
            AF2
1791 013EF 146         C=DAT0  A                READ START OF DATA STACK
1792 013F2 135         D1=C                     SET D1 UP AS DATA STACK
1793 013F5 1B61        D0=(5)  =oR0
            BF2
1794 013FC 146         C=DAT0  A                READ START OF RTN STK
1795 013FF 01          RTN                    (SET UP FOR RESTRT)
1796
1797             *
1798             * THIS AMBITIOUS ROUTINE WILL ADJUST THE FILE ORDER TO
1799             * MAKE SURE THAT THE FORTHRAM FILE IS FIRST IN THE CHAIN.
1800             * AS LONG AS WE HAVE 37 BYTES OF FREE MEMORY WE CAN SWITCH
1801             * FILE ORDER.
1802             *
1803
1804             *
1805             * FIND AVM (AVAILABLE MEMORY); ERROR OUT IF AVM < 37 BYTES
1806             * (BOTH OLD AND NEW FILES MUST KEEP THEIR HEADERS DURING THIS
1807             *  AND EACH HEADER REQUIRES 37 NIBS)
1808             *
1809
1810 01401 17F  MVFILE  D1=D1+  16
1811 01404 17F          D1=D1+  16             PT TO LINK FIELD OF OLD FILE
1812 01407 137          CD1EX
```

```
1813 0140A 134          D0=C                    D0 IS NOT TRASHED BY MEMCKL
1814
1815 0140D 20           P=      0
1816 0140F 34A4         LC(5)   74              MIN NIBS TO DO TRANSFER
          000
1817              *
1818              * IT WOULD BE HANDY TO NOT HAVE TO ALLOW FOR LEEWAY'S WORTH
1819              * OF MEMORY HERE, SIMPLY BY SETTING P=1, HOWEVER....
1820              * MVMEM+ DOES INSIST THAT THERE BE ENOUGH MEMORY TO
1821              * ACCOMMODATE LEEWAY PLUS THE AMOUNT OF THE MOVE.
1822              *
1823
1824 01416 8F00           GOSBVL  =MEMCKL         CHECK FREE MEMORY
          000
1825 0141D 560          GONC    MVOK
1826 01420 6E2F ERR2    GOTO    ERR1            NOT ENOUGH MEMORY
1827
1828 01424 DE   MVOK    ACEX    A               A(A)=AVM-74
1829 01426 C0           A=A+B   A               ADD 74 BACK IN
1830 01428 136          CD0EX                   SAVE LINK FIELD OF OLD
1831 0142B 06           RSTK=C                  FILE ON CPU RTN STK
1832 0142D 134          D0=C
1833
1834              *
1835              * TEST TO SEE IF AVM => FILE SIZE; IF SO MOVE WHOLE FILE, ELSE
1836              * MOVE AVM
1837              *
1838
1839 01430 3402          LC(5)   32              # NIBS OVERHD PRECEEDING LINK FIELD
          000
1840 01437 DD           BCEX    A               INTO B(A)
1841
1842 01439 146          C=DAT0  A               # NIBS TO NEXT FILE
1843 0143C C9           C=C+B   A               TOTAL FILE SIZE
1844
1845 0143E 8B2          ?A<C    A               AVM < REQUIRED ? A=AVM
1846 01441 40           GOYES   NEMEM           NOT ENOUGH MEMORY TO TRANSFER WHOLE
1847              *                             FILE, TRANSFER AVM
1848
1849 01443 DA           A=C     A               PLENTY OF MEMORY, TRANSFER FILE
1850
1851              *
1852              * OPEN AVM AT @MAINST FOR NEW FILE
1853              *
1854
1855 01445 DC   NEMEM   ABEX    A               B(A)=#NIBS TO OPEN
1856 01447 1F00         D1=(5)  =MAINST         SET BOTH A(A) & C(A)
          000
1857 0144E 147          C=DAT1  A               TO @MAINST, THIS TELLS MVMEM+
1858 01451 DA           A=C     A               WE ARE CREATING A NEW FILE
1859
1860 01453 8F00         GOSBVL  =MVMEM+         B(A)=AVM STILL
          000
1861 0145A 45C          GOC     ERR2            out of memory!!!!
1862
```

```
1863                *
1864                * MOVE AVM WORTH OF OLD FILE TO NEW FILE
1865                *
1866
1867 0145D 07           C=RSTK                  C=LINK FIELD OF OLD FILE
1868 0145F C9           C=C+B   A               MUST ADJUST OLD ADDR BY AVM
1869 01461 06           RSTK=C
1870
1871 01463 136          CD0EX                   B(A)=AVM; COUNT
1872 01466 18F          D0=D0-  16
1873 01469 18F          D0=D0-  16
1874 0146C 132          AD0EX                   A(A)=ADDR OF OLD FILE; SOURCE
1875 0146F 11A          C=R2                    HEADER OF NEW FILE STORED
1876                *                           HERE BY MVMEM+; DESTINATION
1877
1878 01472 8F00         GOSBVL  =MOVE*M         MOVE BLOCK OF MEMORY
           000
1879                *                           A,B,C = ENTRY CONDITIONS
1880
1881                *
1882                * SET LINK FIELD IN NEW FILE
1883                *
1884
1885 01479 134          D0=C
1886 0147C 16F          D0=D0+  16
1887 0147F 16F          D0=D0+  16              D0--> LINK FIELD OF NEW FILE
1888
1889 01482 340E         LC(5)   (0-32)          SET LINK TO AVM-32
           FFF
1890 01489 C9           C=C+B   A
1891 0148B 144          DAT0=C  A
1892
1893                *
1894                * RECOVER AVM-37 NIBS OF MEMORY; IF NOT DONE
1895                * AVM=AVM-37
1896                *
1897                * STATUS: A(A)=ADDR OF OLD FILE; P=0; B(A)=AVM
1898                *
1899
1900 0148E 130          D0=A
1901 01491 C0           A=A+B   A               A(A)=(OLD FILE START+AVM)
1902
1903 01493 3452         LC(5)   37              RECOVER ABS|37-AVM| NIBS
           000
1904 0149A E9           C=C-B   A               FROM OLD FILE
1905 0149C DD           BCEX    A
1906
1907 0149E 06           RSTK=C                  SAVE AVM ON CPU STACK
1908
1909 014A0 136          CD0EX                   C(A)=OLD FILE HEADER ADDR
1910 014A3 8F00         GOSBVL  =MVMEM+         RECOVER MEMORY
           000
1911
1912                *
1913                * TEST TO SEE IF WE'RE DONE (LINK FIELD OF OLD FILE <=5
```

```
1914            *
1915
1916 014AA 3452         LC(5)   37              AFTER MOVING HEADER WE
          000
1917 014B1 DA           A=C     A               37 NIBS LESS OF AVM TO PLAY WITH
1918 014B3 07           C=RSTK
1919 014B5 E2           C=C-A   A
1920
1921 014B7 D5   AGAIN   B=C     A               B(A)= NEW AVM
1922 014B9 07           C=RSTK
1923 014BB 06           RSTK=C
1924 014BD 134          D0=C                    D0=LINK FIELD OF OLD FILE
1925
1926 014C0 3450         LC(5)   5
          000
1927 014C7 142          A=DAT0  A               A(A)=LINK
1928 014CA 8B6          ?A>C    A               MORE TO DO?
1929 014CD 52           GOYES   NDONE           NOT DONE YET
1930
1931            *
1932            * DONE: NOW GET RID OF OLD FILE'S HEADER
1933            *
1934
1935 014CF 34BD         LC(5)   #FFFDB           (-37 NIBS) TO RECOVER
          FFF
1936 014D6 DD           BCEX    A               B(A)=AMT TO RECOVER
1937 014D8 07           C=RSTK                  C(A)=LINK FIELD OF OLD FILE
1938 014DA DE           ACEX    A               CLEAN UP CPU RTN STK
1939 014DC 3450         LC(5)   5
          000
1940 014E3 CA           A=A+C   A               SET BOTH A&C TO PT TO NEXT
1941 014E5 D6           C=A     A               FILE IN CHAIN
1942 014E7 8F00         GOSBVL  =MVMEM+         DELETE OLD FILE HEADER
          000
1943
1944            *
1945            * NOW WE'RE ALL DONE & WE WANT TO CLEAN UP THE DEADSPACE
1946            * IN THE FILE SO JUMP BACK TO THE START OF THIS SECTION
1947            *
1948 014EE 614B         GOTO    XFTH
1949
1950            *
1951            * WE'RE NOT DONE & WE HAVE TO MOVE SOME MORE OF THE OLD
1952            * FILE.
1953            *
1954            * STATUS: B(A)=AVM;  RSTK--> OLD FILE LINK ADDR
1955            *         A(A)=OLD FILE LINK   C(A)=5
1956            *         D0-->OLD LINK FIELD
1957
1958 014F2 EA   NDONE   A=A-C   A               A(A)=#NIBS LEFT TO MOVE
1959 014F4 8B0          ?B<A    A               AVM < NEEDED SPACE?
1960 014F7 40           GOYES   NEMEM2          CAN ONLY MOVE AVM NIBS
1961 014F9 D8           B=A     A               PLENTY OF MEM, ONLY MOVE
1962            *                               NEEDED NIBS
1963
```

```
1964            *
1965            * OPEN AVM'S WORTH OF NIBS AT END OF NEW FILE
1966            *
1967
1968 014FB 1F00 NEMEM2  D1=(5)  =MAINST       C(A)=START OF NEW FILE
          000
1969 01502 147          C=DAT1  A
1970 01505 135          D1=C
1971 01508 17F          D1=D1+  16
1972 0150B 17F          D1=D1+  16
1973 0150E 143          A=DAT1  A             A(A)=LINK FIELD OF NEW FILE
1974 01511 137          CD1EX
1975 01514 CA           A=A+C   A             ADDR OF NEW FILE; SOURCE FOR MOVE
1976 01516 137          CD1EX                 C(A)=START OF NEW FILE
1977 01519 8F00         GOSBVL  =MVMEM+       OPEN HOLE AT END OF NEW FILE
          000
1978            *                             THIS TIME MVMEM+ ADJUSTS THE LINK
1979            *                             FIELD OF NEW FILE
1980
1981 01520 07           C=RSTK
1982 01522 C9           C=C+B   A             AJUST OLD LINK FIELD BY AVM
1983 01524 06           RSTK=C
1984
1985 01526 DE           ACEX    A
1986 01528 3450         LC(5)   5
          000
1987 0152F CA           A=A+C   A             A(A)=SOURCE OF MEM TO MOVE
1988 01531 118          C=R0                  C(A)=DESTINATION
1989
1990 01534 8F00         GOSBVL  =MOVE*M       EXIT: A(A)=SOURCE
          000
1991            *                                   B(A)=AVM
1992            *                                   C(A)=DESTINATION
1993
1994            *
1995            * COLLAPSE OLD FILE BY AVM
1996            *
1997
1998 0153B 3452         LC(5)   37            C(A)=OLD FILE HEADER
          000
1999 01542 EE           C=A-C   A
2000 01544 C0           A=A+B   A             A(A)=SOURCE+AVM
2001 01546 134          D0=C
2002 01549 D2           C=0     A
2003 0154B DD           BCEX    A
2004 0154D 06           RSTK=C                SAVE AVM ON STACK
2005 0154F E1           B=B-C   A             B(A)=0-AVM
2006 01551 136          CD0EX                 C(A)=OLD FILE HEADER
2007
2008 01554 8F00         GOSBVL  =MVMEM+
          000
2009
2010 0155B 07           C=RSTK                C(A)=AVM
2011 0155D 695F         GOTO    AGAIN
2012 01561              END
```

```
 ABORT   Ext                  -  1113  1400
 AGAIN   Rel    5303 #014B7   -  1921  2011
 BASPOL  Rel    3290 #00CDA   -  1005   869
 BIGERR  Rel    4219 #0107B   -  1522  1504  1729
 BPDONE  Rel    3361 #00D21   -  1040  1035
 BPL001  Rel    3322 #00CFA   -  1017  1014
 BPL002  Rel    3367 #00D27   -  1044  1020
 BSERR   Ext                  -  1526
 CASE1   Rel    5018 #0139A   -  1763
 CASE2   Rel    5037 #013AD   -  1772  1761
 CATP0   Rel    3623 #00E27   -  1166  1160
 CATPOL  Rel    3614 #00E1E   -  1159   870
 CHKTYP  Rel    3601 #00E11   -  1144  1208  1463
 CHKYES  Rel    3599 #00E0F   -  1136  1132  1134
 COLLAP  Ext                  -  1058  1382
 DOVOC   Ext                  -  1640
 ERHX0   Rel    3756 #00EAC   -  1321   885  1319
 ERR     Rel    4210 #01072   -  1519  1721
 ERR#    Ext                  -  1417
 ERR02   Rel    3794 #00ED2   -  1344  1338
 ERR02+  Rel    3816 #00EE8   -  1351  1347
 ERR03   Rel    3890 #00F32   -  1377  1352  1359
 ERR1    Rel    4943 #0134F   -  1721  1826
 ERR2    Rel    5152 #01420   -  1826  1861
 ERRH00  Rel    3732 #00E94   -  1313  1309
 ERRH01  Rel    3776 #00EC0   -  1335  1325
 ERRHND  Rel    3723 #00E8B   -  1308   871
 ERRSUB  Ext                  -  1360
 ERRrtn  Rel    3785 #00EC9   -  1340  1363  1367
 EXEC    Ext                  -  1425
 FILEEX  Rel    4947 #01353   -  1723  1475
 FILEF   Ext                  -  1455
 FILEND  Ext                  -    23
 FORTH$  Ext                  -    56
 FORTHF  Ext                  -    51
 FORTHI  Ext                  -    47
 FORTHX  Ext                  -    43
 FORTHd  Rel    4050 #00FD2   -  1439  1441
 FORTHp  Rel    4057 #00FD9   -  1440  1442
=FR0ST   Rel       0 #00000   -    16
=FRCHK   Rel    4077 #00FED   -  1451  1473
 FRCK0   Rel    4131 #01023   -  1467  1459
=FTHRM?  Rel    3650 #00E42   -  1199   877   906  1005  1308
 GETFP   Ext                  -  1059  1089  1420
 GOFRTH  Rel    5067 #013CB   -  1783  1746
=GOOD?   Rel    3697 #00E71   -  1221   879  1008  1313
 GTS13   Ext                  -  1348
 I/ODAL  Ext                  -  1083
 I/ORES  Ext                  -   963
 IALLOT  Ext                  -  1611
 ICCOMA  Ext                  -  1610
 ICOMMA  Ext                  -  1609
 ICREAT  Ext                  -  1607
 IINTRP  Ext                  -  1606
 INIT05  Rel    4155 #0103B   -  1495  1474
```

```
 INIT10  Rel    4238 #0108E -  1528  1518
 INUMB   Ext                -  1608
 IUNIQ   Ext                -  1612
 MAINST  Ext                -   921  1200  1224  1500  1723  1856  1968
 MEMCKL  Ext                -  1824
 MFERR   Ext                -  1470  1520
 MFERR*  Ext                -  1390
 MOVE*M  Ext                -  1878  1990
 MVFILE  Rel    5121 #01401 -  1810  1736
 MVMEM+  Ext                -  1515  1781  1860  1910  1942  1977  2008
 MVOK    Rel    5156 #01424 -  1828  1825
 MsgTbl  Rel     191 #000BF -   120    32
 NDONE   Rel    5362 #014F2 -  1958  1929
 NEMEM   Rel    5189 #01445 -  1855  1846
 NEMEM2  Rel    5371 #014FB -  1968  1960
 NEXT00  Ext                -  1716
 NMOVE1  Ext                -  1662
 NOFTRM  Rel    3695 #00E6F -  1210  1206
 OKY     Rel    4975 #0136F -  1731  1728
 OKY0    Rel    4990 #0137E -  1738  1735
=ONERX   Rel    3970 #00F82 -  1413  1387
 OUTELA  Ext                -  1439
 PDOTQ   Ext                -  1109  1701
 POLHND  Rel    3022 #00BCE -   834    33
 QUIT    Ext                -  1426  1705
 R<RSTK  Ext                -   942
 RESTRT  Rel    4829 #012DD -  1679  1447
 RSFP    Rel    4027 #00FBB -  1430   997  1107  1398
 RSTK<R  Ext                -   945
 SAVEFP  Ext                -  1081
=SETI    Rel    4931 #01343 -  1714   998  1108  1399  1424  1691  1710
 SFLAGS  Ext                -  1372
 SHIFT   Rel    5060 #013C4 -  1781  1770
 SVSTAT  Ext                -  1088  1373  1666  1789
 TBLMOV  Rel    4764 #0129C -  1649  1551
 TYPCHK  Rel    3578 #00DFA -  1125  1147  1159
 TxTbEn  Rel     188 #000BC -    86
 TxTbSt  Rel     115 #00073 -    64    31
 VER$en  Rel    3121 #00C31 -   865   865   858
 VER$st  Rel    3105 #00C21 -   864   865   858
 WAKE    Ext                -   999  1711
 WAKEUP  Rel    4909 #0132D -  1707  1689
 WFTMDT  Ext                -  1547
=XFORTH  Rel    4069 #00FE5 -  1444    39  1096
=XFTH    Rel    4144 #01030 -  1473   943  1444  1948
 abortq  Rel    3940 #00F64 -  1392  1002
 abq     Rel    3283 #00CD3 -  1001  1051
 abqq    Rel    3258 #00CBA -   994  1042
 abqqq   Rel    3363 #00D23 -  1042  1054
 baspol  Rel    3127 #00C37 -   869   840
 catpol  Rel    3131 #00C3B -   870   843
 conf0   Rel    3234 #00CA2 -   957   924
 conf2   Rel    3256 #00CB8 -   966   961  1006  1009  1015
 config  Rel    3171 #00C63 -   906   852
 eFEXST  Ext                -   611
```

eFSPEC	Ext			-	332				
eFTYPE	Ext			-	1469				
eNFOUN	Ext			-	161				
errMEM	Rel	3139	#00C43	-	877	849			
errhnd	Rel	3135	#00C3F	-	871	846			
fLEX	Ext			-	19				
flSUSP	Ext			-	1371				
forpon	Rel	3500	#00DAC	-	1092	1046			
hVER$0	Rel	3079	#00C07	-	855	837			
hVER$1	Rel	3125	#00C35	-	866	861			
hVER$2	Rel	3125	#00C35	-	867	854	878	880	910
init1	Rel	3518	#00DBE	-	1104	1057			
pCONFG	Ext			-	850				
pERROR	Ext			-	844				
pFTYPE	Ext			-	841				
pMEM	Ext			-	847				
pMNLP	Ext			-	838				
rtnhnd	Rel	3730	#00E92	-	1311	1314			
typerr	Rel	4133	#01025	-	1469	1464			
=xfrth	Rel	73	#00049	-	39				
=xromF0	Rel	70	#00046	-	36				

Input Parameters

Source file name is MR&FT0

Listing file name is MR/FT0::65

Object file name is MR%FT0::65

```
                                    111111
                          0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                      TITLE   BASIC-->FORTH KEYWORDS
 2                      RDSYMB  MR%GTO
 3
 4              FLOATF  EQU     5               STATUS BIT USED FOR FLOAT FLAG
 5              REV?    EQU     2               1ST OR 2ND TIME THROUGH NEXTOK
 6              NUMFLG  EQU     1               NUMBER OR STRING
 7              FUN     EQU     0               FUNCTION FLAG
 8              ********************************
 9              *
10              * PUT PARAMETERS ON FORTH STACK
11              *
12              ********************************
13              *
14              * R0[S]=PARAMETER COUNT SET IN PFSET
15              * IF FROM FORTHF, R0[6-2]=PTR INTO TEMP BUFFER
16              *
17
18 00000 850   FNSET2  ST=1    FUN
19 00003 7C94  FNSET3  GOSUB   SAVDX       SAVE D1,D0
20 00007 24            P=      4
21 00009 8F00          GOSBVL  =R<RSTK
         000
22              * SET ACTIVE FLAG; CLEAR ERR? FLAG
23 00010 1BBB          D0=(5)  =oERR?
         BF2
24 00017 D2            C=0     A
25 00019 144           DAT0=C  A               CLEAR ERR?
26 0001C 1BC0          D0=(5)  =ACTIVE
         BF2
27 00023 E6            C=C+1   A
28 00025 144           DAT0=C  A               SET ACTIVE
29
30              * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
31              * FROM HERE TO TLOOP IS JUST TO SET SIZE OF FORTH  STACK
32              *
33 00028 7F84          GOSUB   GETDX       RESTORE D1, D0
34 0002C 34DF          LC(5)   (=DSTKAD)   GET CURRENT STACK BASE
         AF2
35 00033 137           CD1EX
36 00036 DA            A=C     A           SAVE D1
37 00038 147           C=DAT1  A           GET FORTH TOS
38 0003B 133           AD1EX               RESTORE D1
39 0003E 134           D0=C                USE D0 TO SET FORTH TOS
40 00041 137           CD1EX
41 00044 D7            D=C     A           SAVE D1 AGAIN
42 00046 135           D1=C
43 00049 118           C=R0                GET PARAMETER COUNTER
44 0004C AE2           C=0     B           #PARMS IN C[S];ZERO OUR COUNTER
45 0004F 108           R0=C
46 00052 852           ST=1    REV?        REVERSE STRINGS THIS TIME
47              *
48              * LOOP TO SET STACK SIZE
49              * IN THIS LOOP D,D0&D1 ARE WHAT SHOULD BE SAVED
50              *
51 00055 7601  ST1     GOSUB   NEXTOK      LOOK AT TOKEN
```

```
 52 00059 72E1          GOSUB   PCOUNT      DONE WITH PARAMETERS?
 53 0005D 4B1           GOC     ST2
 54              * ADJUST D0 FOR FORTH TOS
 55 00060 861           ?ST=0   NUMFLG      STRING?
 56 00063 70            GOYES   STX1        IF SO WE WANT TO SUBTRACT 10
 57 00065 875           ?ST=1   FLOATF      FLOATING?
 58 00068 DE            GOYES   ST1         FLOAT NUM DOESN'T CHANGE INT STACK
 59 0006A 184   STX1    D0=D0-  5           ELSE PUT ANOTHER ITEM ON FORTH STK
 60 0006D 871           ?ST=1   NUMFLG      NUM?
 61 00070 5E            GOYES   ST1
 62 00072 184           D0=D0-  5           EXTRA 5 FOR STRING
 63 00075 6FDF          GOTO    ST1
 64              ********************************************************
 65              * NOW ACTUALLY PUT THINGS ON STACKS IN TLOOP
 66              *
 67 00079 DB    ST2     C=D     A           RESTORE BASIC TOS
 68 0007B 135           D1=C
 69 0007E 136           CD0EX
 70 00081 D7            D=C     A           D=FORTH TOS
 71 00083 10B           R3=C                SAVE FOR SETBAS
 72 00086 AC2           C=0     S
 73 00089 109           R1=C                ZERO F.P. COUNTER
 74              * reset temp param counter R0[B]
 75 0008C 118           C=R0
 76 0008F AE2           C=0     B
 77 00092 108           R0=C
 78 00095 842           ST=0    REV?            STRINGS ALREADY REVERSED
 79              *
 80              * IN TLOOP WE CARE ABOUT A&B (DATA ITEMS) AND D (STK PTR)
 81              * AS WELL AS D1 WHICH WE WILL STORE AWAY IN FNSET1
 82              * R0[S,B] ARE COUNTERS;R0[2-6]=IOBUF PTR
 83              * R1 IS STR PTR WHEN NEXTOK HITS STRING;R1[S]=F.P.COUNTER
 84              * R2 IS SCRATCH USED BY PCOUNT
 85              * R3[A] IS BEING SAVED FOR SETBAS
 86              *
 87 00098 73C0  TLOOP   GOSUB   NEXTOK
 88 0009C 7F91          GOSUB   PCOUNT      COUNT PARAMETERS
 89 000A0 412           GOC     FPSET?      DONE DOING PARAMETERS
 90 000A3 861           ?ST=0   NUMFLG      STRING?
 91 000A6 E0            GOYES   PUTSTR
 92              * NUMERIC PARAMETER
 93 000A8 7890          GOSUB   PUTSTK      PUT IT ON INT OR F.P. STACK
 94 000AC 6BEF          GOTO    TLOOP
 95 000B0 6C71  DATER   GOTO    DATERR
 96
 97 000B4 7190  PUTSTR  GOSUB   PUTINT      PUT A ON STK
 98 000B8 D4            A=B     A
 99 000BA 7B80          GOSUB   PUTINT
100 000BE 69DF          GOTO    TLOOP
101             * ----------------------------------------------
102 000C2 865  FPSET?   ?ST=0   FLOATF
103 000C5 54            GOYES   FNSET1
104             * NOW PUT F.P. ITEMS IN X,Y,Z,T FROM TEMP BUFFER
105 000C7 137           CD1EX
106 000CA 10A           R2=C                SAVE D1 FROM STKLFT
```

```
107 000CD 111          A=R1                    GET COUNTER IN S
108 000D0 118          C=R0
109 000D3 BF6          CSR     W
110 000D6 BF6          CSR     W               GET BUFFER PTR IN C[A]
111 000D9 134          D0=C
112             * PTR WAS LEFT AT LAST ENTRY + 16
113 000DC 18F          D0=D0-  16
114 000DF 948  FPSTO   ?A=0    S               NO MORE PARAMS?
115 000E2 E2           GOYES   FNST1+          R2 ALREADY HAS D1
116 000E4 8F00         GOSBVL  =STKLFT         USES A,C,D1
          000
117 000EB 1F0D         D1=(5)  =oX
          BF2
118 000F2 1567         C=DAT0  W
119 000F6 18F          D0=D0-  16              POINT TO NEXT ENTRY
120 000F9 1557         DAT1=C  W
121 000FD 111          A=R1
122 00100 A4C          A=A-1   S               DECREMENT COUNTER
123 00103 101          R1=A
124 00106 68DF         GOTO    FPSTO
125             ************************************************
126             *
127             * PARAMETERS ARE ON STACK -- NOW GET COMMAND STRING
128             *
129 0010A 137  FNSET1  CD1EX
130 0010D 10A          R2=C                    SAVE D1
131 00110 77A3 FNST1+  GOSUB   GETDX
132 00114 11A          C=R2                    RESTORE D1
133 00117 135          D1=C
134 0011A 7583         GOSUB   SAVDX
135             * SAVED ORIGINAL D0,AND D1 AFTER PARAMS POPPED
136 0011E 119          C=R1                    GET PTR TO STR FROM NEXTOK
137 00121 135          D1=C                    SET FOR POP1S
138 00124 8F00         GOSBVL  =POP1S          A=LEN;D1-->STR
          000
139 0012B 137          CD1EX
140 0012E D7           D=C     A               D=STR PTR FOR SETBAS
141 00130 81C          ASRB                    NIBS-->CHARS (A SAFE FROM RSTK<R)
142 00133 24           P=      4
143 00135 8F00         GOSBVL  =RSTK<R         RESTORE RTN STACK
          000
144 0013C D8           B=A     A               B=LEN FOR SETBAS
145 0013E 7202         GOSUB   SETBAS
146 00142 01           RTN
147
148 00144 875  PUTSTK  ?ST=1   FLOATF          FLOATING?
149 00147 41           GOYES   putflt
150
151 00149 DB   PUTINT  C=D     A               GET SP
152 0014B 134          D0=C
153 0014E 140          DAT0=A  A               PUT A ON STK
154 00151 164          D0=D0+  5
155 00154 136          CD0EX                   SAVE TOS
156 00157 D7           D=C     A               D=SP
157 00159 01           RTN
```

```
158
159 0015B 6D80 putflt  GOTO    PUTFLT
160
161
162           ****************************************
163           *
164           * NEXTOK GETS ITEM FROM STACK
165           * ENTRY: D1 POINTS TO STACK
166           * EXIT: D1 POINTS TO NEXT ITEM, P=0
167           *       S1=1 FOR NUM, 0 FOR STRING
168           *       R1 POINTS TO STR IF IT WAS ONE
169           * USES: A,B,C,R1
170           ****************************************
171 0015F 1537 NEXTOK  A=DAT1  W
172 00163 851         ST=1    NUMFLG      FLAG NUM
173 00166 309         LC(1)   9
174 00169 986         ?A>C    P           NOT REAL?
175 0016C F1          GOYES   NT01
176 0016E 875         ?ST=1   FLOATF      FLOATING?
177 00171 B0          GOYES   ENDNT       THEN JUST LEAVE AS IS
178 00173 8F00        GOSBVL  =FLTDH      ELSE UNFLOAT IT IN A
          000
179 0017A 04          SETHEX
180 0017C 17F ENDNT   D1=D1+  16
181 0017F 137         CD1EX
182 00182 135         D1=C                RESTORE D1
183 00185 01          RTN
184 00187 65A0 daterr GOTO    DATERR
185 0018B 31E0 NT01   LCHEX   0E          COMPLEX?
186 0018F 962         ?A=C    B
187 00192 5F          GOYES   daterr
188 00194 B04         A=A+1   P
189 00197 A64         A=A+A   B
190 0019A 96C         ?A#0    B
191 0019D AE          GOYES   daterr      DOPEVECTOR
192           * STRING
193 0019F 862         ?ST=0   REV?      STR WAS REVERSED 1ST TIME
194 001A2 71          GOYES   STRNT      THROUGH HERE
195           *  FIRST REVERSE IT (IT'S BACKWARDS)
196 001A4 DB          C=D     A           SAVE D
197 001A6 06          RSTK=C              ON RTNSTK
198 001A8 8F00        GOSBVL  =REV$       REVERSE STRING
          000
199 001AF 1537        A=DAT1  W           GET BACK HEADER
200 001B3 20          P=      0
201 001B5 07          C=RSTK              RETRIEVE D (SP)
202 001B7 D7          D=C     A
203           * UPDATE D1
204 001B9 841 STRNT   ST=0    NUMFLG      FLAG STRING
205 001BC AF8         B=A     W
206 001BF F5          BSR     A
207 001C1 F5          BSR     A           B[A]=LENGTH
208 001C3 119         C=R1                SAVE COUNT IN R1[S]
209 001C6 137         CD1EX
210 001C9 109         R1=C                SAVE STR PTR FOR FNSET1
```

```
211 001CC DA          A=C     A          GET HEADER ADDR
212 001CE 133         AD1EX
213 001D1 17F         D1=D1+  16         POINT TO STR ITSELF
214 001D4 133         AD1EX              A=STR PTR
215 001D7 C9          C=C+B   A          ADVANCE D1 BY STRING LENGTH
216 001D9 81D         BSRB               NIBS-->CHARS FOR FORTH
217 001DC 135         D1=C
218 001DF D9          C=B     A
219 001E1 D8          B=A     A
220 001E3 DA          A=C     A          SWITCH B&A SO LEN GOES ON 1ST
221 001E5 669F        GOTO    ENDNT
222
223           * PUT REAL # IN A ON FORTH F.P.STACK
224           * PUT IN TEMP BUFFER, POINTED TO BY R0[6-2]
225           * UPDATE COUNTER IN R1[S]
226 001E9 AF8 PUTFLT  B=A     W              SAVE DATA ITEM
227 001EC 111         A=R1                   GET COUNTER
228 001EF 304         LC(1)   4              ONLY COUNT UP TO 4
229 001F2 816         CSRC                   PUT IN C[S]
230 001F5 942         ?A=C    S
231 001F8 00          RTNYES                 IGNORE ALL BUT LAST 4
232 001FA B44         A=A+1   S
233 001FD 101         R1=A                   UPDATE COUNTER
234 00200 118         C=R0
235 00203 BF6         CSR     W
236 00206 BF6         CSR     W
237 00209 134         D0=C
238 0020C AF4         A=B     W
239 0020F 1507        DAT0=A  W              PUT ITEM IN BUFFER
240 00213 16F         D0=D0+  16             POINT TO NEXT SPACE
241 00216 132         ABUEX
242 00219 BF0         ASL     W
243 0021C BF0         ASL     W
244 0021F 118         C=R0
245 00222 AEA         A=C     B              PRESERVE R0[S,B]
246 00225 ACA         A=C     S
247 00228 100         R0=A
248 0022B 01          RTN
249
250 0022D 8F00 DATERR GOSBVL  =BYE1
          000
251 00234 3100        LC(2)   =eDATTY
252 00238 8D00        GOVLNG  =BSERR
          000
253
254           **********************
255           * RETURN CARRY SET IF DONE WITH PARAMS
256           *
257 0023F 870 PCOUNT  ?ST=1   FUN
258 00242 72          GOYES   FUNCNT
259           * FROM FORTHX -- JUST DETERMINE IF WE'RE DONE
260           * BY CHECKING AGAINST BOTTOM OF STACK
261
262 00244 102         R2=A                   SAVE DATA ITEM
263 00247 133         AD1EX                  SAVE D1
```

```
264 0024A 1F00          D1=(5)  =TFORN          BOTTOM OF STACK
          000
265 00251 147           C=DAT1  A
266 00254 8A2           ?A=C    A               THERE YET?
267 00257 A0            GOYES   BOT
268 00259 131           D1=A
269 0025C 112           A=R2                    RESTORE DATA ITEM
270 0025F 03            RTNCC
271 00261 131  BOT      D1=A
272 00264 112           A=R2                    "
273 00267 02            RTNSC
274
275             * FOR FUNCTIONS, USE COUNTER IN R0
276 00269 102  FUNCNT  R2=A                     SAVE DATA ITEM
277 0026C 110           A=R0                    A[S]=# OF PARMS;A[B]=COUNT
278 0026F AF6           C=A     W
279 00272 B66           C=C+1   B
280 00275 108           R0=C                    UPDATE TEMP COUNTER
281 00278 816           CSRC                    PUT COUNT IN S
282 0027B 942           ?A=C    S
283 0027E 70            GOYES   BOT2
284 00280 112           A=R2
285 00283 03            RTNCC
286 00285 112  BOT2     A=R2
287 00288 02            RTNSC
```

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```
                        EJECT
                *
                * FORTHX
                *
                * Execute string parameter as line of FORTH words.
                * Take up to 14 extra parameters, which go to integer stack.

00028A 8D00 FRTHXd  GOVLNG  =FIXDC      (REPLACES  DELAYd)
       000
00291 AC2  FRTHXp  C=0      S
00294 10A          R2=C                 PARAM COUNTER
00297 8F00 NPAR    GOSBVL   =EXPPAR
       000
0029E 4D2          GOC      SYNTER          DUMMY ARRAY
002A1 870          ?ST=1    0               INVALID EXPRESSION?
002A4 82           GOYES    SYNTER
002A6 11A          C=R2                 GET COUNTER
002A9 94E          ?C#0     S
002AC 70           GOYES    NP01
                * FIRST TIME, CHECK FOR STRING
002AE 873          ?ST=1    3               NOT STR?
002B1 B1           GOYES    SYNTER
002B3 B46  NP01    C=C+1    S               COUNT
002B6 451          GOC      SYNTER      >15
002B9 10A          R2=C                 UPDATE COUNTER
                * DEMAND COMMA OR END OF STATEMENT
002BC 3100         LC(2)    =tCOMMA
002C0 962          ?A=C     B
002C3 4D           GOYES    NPAR
002C5 8D00         GOVLNG   =RESPTR
       000

002CC 8D00 SYNTER  GOVLNG   =SYNTXe
       000

002D3 7BFF         REL(5)   FRTHXd
       F
002D8 9BFF         REL(5)   FRTHXp
       F

002DD 8F00 =FORTHX GOSBVL   =EXPEXC         PUT VALUES ON MTHSTK
       000
002E4 7BB1         GOSUB    SAVDX       SAVE FROM XFTH
002E8 8E00         GOSUBL   =XFTH
       00
002EE 1BC0         D0=(5)   =ACTIVE     FORTHRAM NOW IN PLACE
       BF2
002F5 146          C=DAT0   A           GET VALUE OF ACTIVE
002F8 CE           C=C-1    A
002FA CE           C=C-1    A           ACTIVE=2? (BASICF/I/$)
002FC 8AA          ?C=0     A
002FF F1           GOYES    BXERR
00301 CE           C=C-1    A           ACTIVE=3? (BASICX)
00303 8AA          ?C=0     A
00306 81           GOYES    BXERR
```

```
334 00308 7FA1          GOSUB   GETDX
335 0030C 845           ST=0    FLOATF          FLAG NOT FLOATING PT
336 0030F 840           ST=0    FUN             FLAG STATEMENT, NOT FUNCTION
337 00312 7DEC          GOSUB   FNSET3
338 00316 7C00          GOSUB   BXRTN
339 0031A 6ED0          GOTO    FX
340
341 0031E 3104 BXERR    LC(2)   =eFORTX     "FORTH NOT RE-ENTRANT"
342 00322 6171          GOTO    ERRSET
343
344             * * *
345 00326 7301 BXRTN    GOSUB   BRTN
346             * RETURN HERE
347 0032A 8F00 FXRTN    GOSBVL  =BYE1           CLEAR ACTIVE,
          000
348             *                               RESTORE PRGM STATUS
349 00331 7681          GOSUB   GETDX
350 00335 8D00          GOVLNG  =NXTSTM
          000
351
```

```
352                     EJECT
353                 ********************************************************
354                 * CODE PREPARED FOR BY FNSET2, FNSET1 (WHICH CALLS IT)...
355                 * SET UP COMMAND STRING IN TIB
356                 * ZERO BLK AND IN
357                 * SET PTR TO BASIC, FILLED IN AT FX
358                 ********************************************************
359 0033C 3153 SWF      LC(2)   =eSWF
360 00340 6351          GOTO    ERRSET
361
362 00344 1F61 SETBAS   D1=(5)  =oR0         RTN STK PTR
          BF2
363 0034B D4            A=B     A           GET LEN
364 0034D C4            A=A+A   A           IN NIBS
365 0034F 1BB1          D0=(5)  =oTIB
          BF2
366 00356 146           C=DAT0  A           C=CURRENT TIB
367 00359 108           R0=C                SAVE IT
368 0035C C2            C=C+A   A           END OF WHERE STRING WILL GO
369 0035E 143           A=DAT1  A           GET RTN STK PTR (WE WILL RESET IT BEL
370 00361 8B2           ?A<C    A           WILL IT TRASH RTN STK?
371 00364 8D            GOYES   SWF
372 00366 11B           C=R3                GET STACK PTR
373 00369 135           D1=C
374 0036C 1C4           D1=D1-  5
375 0036F DB            C=D     A           get ptr to string back
376 00371 145           DAT1=C  A           push "from" addr for NMOVE
377 00374 118           C=R0                GET BACK CURRENT TIB
378 00377 1C4           D1=D1-  5
379 0037A 145           DAT1=C  A           push "to" addr (=TIB)
380 0037D D9            C=B     A           get length
381 0037F 108           R0=C                save length (R0,R3 safe from NMOVE)
382 00382 C6            C=C+C   A           make nibs for NMOVE
383 00384 1C4           D1=D1-  5
384 00387 145           DAT1=C  A           push length
385 0038A 8F00          GOSBVL  =$NMOVE
          000
386                 * put in two nulls
387 00391 20            P=      0
388 00393 1FB1          D1=(5)  (=oTIB)
          BF2
389 0039A 147           C=DAT1  A           CURRENT TIB
390 0039D 110           A=R0                get length of string
391 003A0 C4            A=A+A   A           chars-->nibs
392 003A2 C2            C=C+A   A
393 003A4 135           D1=C
394 003A7 D2            C=0     A
395 003A9 145           DAT1=C  A
396                 * clear the LCD in case something is to be shown
397 003AC 26            P=      6
398 003AE 8F00          GOSBVL  =R<RSTK
          000
399                 *       GOSBVL  =CRLFOF
400                 * ZERO BLOCK AND IN
401 003B5 20            P=      0
```

```
402 003B7 D0          A=0     A
403 003B9 3425        LC(5)   (=oBLK)
          BF2
404 003C0 135         D1=C
405 003C3 141         DAT1=A  A
406 003C6 3475        LC(5)   (=oIN)
          BF2
407 003CD 135         D1=C
408 003D0 141         DAT1=A  A
409 003D3 26          P=      6
410 003D5 8F00        GOSBVL  =RSTK<R
          000
411 003DC 1F61        D1=(5)  =oR0
          BF2
412 003E3 147         C=DAT1  A
413 003E6 D5          B=C     A           SET RTN STK PTR
414 003E8 113         A=R3                GET TOS IN A
415 003EB 20          P=      0
416 003ED 342A        LC(5)   (=oBASIC)
          BF2
417 003F4 135         D1=C
418 003F7 01          RTN
```

```
419                     EJECT
420 003F9 145  FX       DAT1=C  A           PUT RTN IN oBASIC
421 003FC 133           AD1EX               RESTORE D1
422
423 003FF 8E00          GOSUBL  =SETI
          00
424 00405 0000          CON(5)  =INTRP
          0
425 0040A 0000          CON(5)  =BASIC
          0
426 0040F 0000          CON(5)  =AT          PUT RTN ADDR ON STACK
          0
427 00414 0000          CON(5)  =ZERO
          0
428 00419 0000          CON(5)  =BASIC
          0
429 0041E 0000          CON(5)  =STORE      ZERO OUT BASIC
          0
430 00423 0000          CON(5)  =?STK
          0
431 00428 0000          CON(5)  =BSCRTN
          0
432             *
433             * THIS ROUTINE IS IN THE HARD ROM
434             *=BSCRTN CON(5)  =$BSR
435             *=$BSR   C=DAT1  A
436             *        D1=D1+  5
437             *        D0=(5)  =DSTKAD
438             *        CD1EX
439             *        DAT0=C  A
440             *        CD1EX
441             *        RSTK=C
442             *        RTN
443             *
444             *
445             * RETURN FROM FORTH ENVIRONMENT
446             *
447 0042D 07   BRTN    C=RSTK
448 0042F 01           RTN
449
```

```
450                     EJECT
451                 ********************************************
452                 *
453                 * FORTHI
454                 * Same as FORTHX but returns an integer.
455                 *
456                 ********************************************
457
458 00431 00               NIBHEX  00          NO PARAMETERS
459 00433 7C60  =FORTHI     GOSUB   SAVDX
460 00437 8E00              GOSUBL  =FTHRM?         DOES FORTH EXIST?
          00
461 0043D 5A4               GONC    NOFRTH          NO
462 00440 8E00              GOSUBL  =GOOD?       IN RIGHT PLACE?
          00
463 00446 514               GONC    NOFRTH
464 00449 1B11              D0=(5)  =oS0
          BF2
465 00450 146               C=DAT0  A               BOTTOM OF STACK
466 00453 1BDF              D0=(5)  =DSTKAD         GET TOS
          AF2
467 0045A 142               A=DAT0  A
468 0045D 8BE               ?A>=C   A
469 00460 03                GOYES   EMPSTK          EMPTY STACK
470 00462 131               D1=A
471 00465 143               A=DAT1  A               GET ITEM
472 00468 174               D1=D1+  5
473 0046B 137               CD1EX
474 0046E 144               DAT0=C  A               RESET TOS
475 00471 8F00              GOSBVL  =HDFLT          FLOAT NUMBER
          000
476 00478 04                SETHEX
477 0047A 7D30              GOSUB   GETDX
478 0047E AF6               C=A     W            RESULT IN C
479 00481 8D00              GOVLNG  =FNRTN1      check mem, rtn answer
          000
480
481
482 00488 3121  NOFRTH      LC(2)   =eNOFTH
483 0048C 6700              GOTO    ERRSET
484 00490 31E0  EMPSTK      LC(2)   =eEMPT
485 00494 22    ERRSET      P=      2
486 00496 31F2              LC(2)   =ID
487 0049A 20                P=      0
488 0049C 8D00  GOERR       GOVLNG  =BSERR
          000
489
490
491                 * SAVE D0,D1 AT FUNCR0
492 004A3 137   SAVDX       CD1EX
493 004A6 1F00              D1=(5)  =FUNCR0
          000
494 004AD 145               DAT1=C  A
495 004B0 174               D1=D1+  5
496 004B3 136               CD0EX
```

```
497 004B6 145          DAT1=C  A
498 004B9 01           RTN
499             * RESTORE D1,D0
500 004BB 1B00 GETDX   D0=(5)  =FUNCR0
          000
501 004C2 146          C=DAT0  A
502 004C5 137          CD1EX
503 004C8 164          D0=D0+  5
504 004CB 146          C=DAT0  A
505 004CE 136          CD0EX
506 004D1 01           RTN
507
```

```
508                     EJECT
509              *
510              * FORTHF
511              *
512              * Same as FORTHI but uses floating point stack
513              *
514 004D3 00             NIBHEX  00
515 004D5 7ACF =FORTHF   GOSUB   SAVDX
516 004D9 8E00           GOSUBL  =FTHRM?
          00
517 004DF 58A            GONC    NOFRTH
518 004E2 8E00           GOSUBL  =GOOD?
          00
519 004E8 5F9            GONC    NOFRTH
520 004EB 1B0D           D0=(5)  =oX
          BF2
521 004F2 1527           A=DAT0  W               GET RESULT
522 004F6 71CF           GOSUB   GETDX
523 004FA AF6            C=A     W
524 004FD 8D00           GOVLNG  =FNRTN1         check mem, rtn answer
          000
525
```

```
                        EJECT
                *
                * FORTH$
                *
                * Return string to BASIC
                *
00504 638F GNFRTH  GOTO    NOFRTH
00508 00           NIBHEX  00
0050A 759F =FORTH$ GOSUB   SAVDX
0050E 8E00         GOSUBL  =FTHRM?
      00
00514 5FE          GONC    GNFRTH
00517 8E00         GOSUBL  =GOOD?
      00
0051D 56E          GONC    GNFRTH
00520 1B11         D0=(5)  =oS0        BOS
      BF2
00527 146          C=DAT0  A
0052A 136          CD0EX
0052D 189          D0=D0-  10
00530 136          CD0EX               C=STK WITH 2 THINGS
00533 1BDF         D0=(5)  =DSTKAD
      AF2
0053A 142          A=DAT0  A           GET TOS
0053D 8BA          ?A<=C   A
00540 60           GOYES   F$1         OK
00542 6D4F         GOTO    EMPSTK
00546 131  F$1     D1=A
00549 AF2          C=0     W           CLEAR FOR CSRB BELOW
0054C 147          C=DAT1  A               GET TOP ITEM (LEN)
0054F 174          D1=D1+  5
00552 143          A=DAT1  A               GET NEXT (ADDR)
00555 174          D1=D1+  5
00558 103          R3=A                R3=ADDR
0055B 133          AD1EX               A=NEW TOS
0055E 140          DAT0=A  A           UPDATE FORTH TOS
00561 113          A=R3
00564 C6           C=C+C   A           NIBS FOR STRHDR
00566 10A          R2=C                SAVE LEN
00569 7E4F         GOSUB   GETDX
0056D 11A          C=R2
00570 8F00         GOSBVL  =STRHDR
      000
00577 11A          C=R2                GET BACK CHAR COUNT*2
0057A 132          AD0EX
0057D 102          R2=A                SAVE D0
00580 113          A=R3                GET STR PTR
00583 CA           A=A+C   A           POINT TO END OF STR
00585 130          D0=A
00588 81E          CSRB                NIBS-->CHARS AGAIN
0058B 8AA          ?C=0    A
0058E 51           GOYES   FIN$
                * STR IS BACKWARDS
00590 181  PUTST   D0=D0-  2           POINT TO NEXT CHAR (LAST FIRST)
00593 14A          A=DAT0  B           GET A CHAR
```

```
576 00596 149          DAT1=A  B          PUT IT ON STACK
577 00599 171          D1=D1+  2          POINT TO NEXT CHAR
578 0059C CE           C=C-1   A          COUNT DOWN CHARS
579 0059E 8AE          ?C#0    A
580 005A1 FE           GOYES   PUTST
581 005A3 111  FIN$    A=R1               GET TOS LEFT BY STRHDR
582 005A6 131          D1=A
583 005A9 112          A=R2               GET BACK D0
584 005AC 130          D0=A
585 005AF 8D00         GOVLNG  =EXPR
          000
586
587 005B6 00   =FILEND NIBHEX 00
588
589 005B8              END
```

$NMOVE	Ext			-	385							
?STK	Ext			-	430							
AT	Ext			-	426							
BASIC	Ext			-	425	428						
BOT	Rel	609	#00261	-	271	267						
BOT2	Rel	645	#00285	-	286	283						
BRTN	Rel	1069	#0042D	-	447	345						
BSCRTN	Ext			-	431							
BSERR	Ext			-	252	488						
BXERR	Rel	798	#0031E	-	341	330	333					
BXRTN	Rel	806	#00326	-	345	338						
BYE1	Ext			-	250	347						
DATER	Rel	176	#000B0	-	95							
DATERR	Rel	557	#0022D	-	250	95	184					
EMPSTK	Rel	1168	#00490	-	484	469	548					
ENDNT	Rel	380	#0017C	-	180	177	221					
ERRSET	Rel	1172	#00494	-	485	342	360	483				
EXPEXC	Ext			-	322							
EXPPAR	Ext			-	298							
EXPR	Ext			-	585							
F$1	Rel	1350	#00546	-	549	547						
=FILEND	Rel	1462	#005B6	-	587							
FIN$	Rel	1443	#005A3	-	581	572						
FIXDC	Ext			-	295							
FLOATF	Abs	5	#00005	-	4	57	102	148	176	335		
FLTDH	Ext			-	178							
FNRTN1	Ext			-	479	524						
FNSET1	Rel	266	#0010A	-	129	103						
FNSET2	Rel	0	#00000	-	18							
FNSET3	Rel	3	#00003	-	19	337						
FNST1+	Rel	272	#00110	-	131	115						
=FORTH$	Rel	1290	#0050A	-	534							
=FORTHF	Rel	1237	#004D5	-	515							
=FORTHI	Rel	1075	#00433	-	459							
=FORTHX	Rel	733	#002DD	-	322							
FPSET?	Rel	194	#000C2	-	102	89						
FPSTO	Rel	223	#000DF	-	114	124						
FRTHXd	Rel	650	#0028A	-	295	319						
FRTHXp	Rel	657	#00291	-	296	320						
FTHRM?	Ext			-	460	516	535					
FUN	Abs	0	#00000	-	7	18	257	336				
FUNCNT	Rel	617	#00269	-	276	258						
FUNCR0	Ext			-	493	500						
FX	Rel	1017	#003F9	-	420	339						
FXRTN	Rel	810	#0032A	-	347							
GETDX	Rel	1211	#004BB	-	500	33	131	334	349	477	522	561
GNFRTH	Rel	1284	#00504	-	532	536	538					
GOERR	Rel	1180	#0049C	-	488							
GOOD?	Ext			-	462	518	537					
HDFLT	Ext			-	475							
INTRP	Ext			-	424							
NEXTOK	Rel	351	#0015F	-	171	51	87					
NOFRTH	Rel	1160	#00488	-	482	461	463	517	519	532		
NP01	Rel	691	#002B3	-	308	304						
NPAR	Rel	663	#00297	-	298	314						

NT01	Rel	395	#0018B	-	185	175					
NUMFLG	Abs	1	#00001	-	6	55	60	90	172	204	
NXTSTM	Ext			-	350						
PCOUNT	Rel	575	#0023F	-	257	52	88				
POP1S	Ext			-	138						
PUTFLT	Rel	489	#001E9	-	226	159					
PUTINT	Rel	329	#00149	-	151	97	99				
PUTST	Rel	1424	#00590	-	574	580					
PUTSTK	Rel	324	#00144	-	148	93					
PUTSTR	Rel	180	#000B4	-	97	91					
R<RSTK	Ext			-	21	398					
RESPTR	Ext			-	315						
REV$	Ext			-	198						
REV?	Abs	2	#00002	-	5	46	78	193			
RSTK<R	Ext			-	143	410					
SAVDX	Rel	1187	#004A3	-	492	19	134	323	459	515	534
SETBAS	Rel	836	#00344	-	362	145					
SETI	Ext			-	423						
ST1	Rel	85	#00055	-	51	58	61	63			
ST2	Rel	121	#00079	-	67	53					
STKLFT	Ext			-	116						
STORE	Ext			-	429						
STRHDR	Ext			-	563						
STRNT	Rel	441	#001B9	-	204	194					
STX1	Rel	106	#0006A	-	59	56					
SWF	Rel	828	#0033C	-	359	371					
SYNTER	Rel	716	#002CC	-	317	299	301	307	309		
SYNTXe	Ext			-	317						
TFORN	Ext			-	264						
TLOOP	Rel	152	#00098	-	87	94	100				
XFTH	Ext			-	324						
ZERO	Ext			-	427						
daterr	Rel	391	#00187	-	184	187	191				
eDATTY	Ext			-	251						
putflt	Rel	347	#0015B	-	159	149					
tCOMMA	Ext			-	312						

Input Parameters

Source file name is MR&FTB

Listing file name is MR/FTB::65

Object file name is MR%FTB::65

```
                                  111111
                         0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                      TITLE  Jump_Table,_0,1,&2_char_words
 2                      RDSYMB MR%GTO
 3 E0000                ABS    #E0000
 4
 5                ******************************************************
 6                *                                                    *
 7                * MR&FR1:    This is the first assembly in the       *
 8                *          hard addressed FORTH.  It contains the    *
 9                *          ROM word jump table and 0, 1, and 2 char  *
10                *          words.                                    *
11                *                                                    *
12                ******************************************************
13
14                *      ***  FIND'S SPEED TABLE  ***
15
16 E0000 6400 =TABLE  CON(5) =!X              THE NULL WORD
          E
17 E0005 4050         CON(5) =!QUOTE          1 CHAR WORDS
          E
18 E000A 8F11         CON(5) =!S<             2 CHAR WORDS
          E
19 E000F 0000         CON(5) =!ASC            3 CHAR WORDS
          0
20 E0014 0000         CON(5) =!END$           4 CHAR WORDS
          0
21 E0019 0000         CON(5) =!LEFT$          5 CHAR WORDS
          0
22 E001E 0000         CON(5) =!RITE$          6 CHAR WORDS
          0
23 E0023 0000         CON(5) =!FADJ           7 CHAR WORDS
          0
24 E0028 0000         CON(5) =!CLALL          8 CHAR WORDS
          0
25 E002D 0000         CON(5) =!IMMED          9 CHAR WORDS
          0
26 E0032 0000         CON(5) =!VOCAB          10 CHAR WORDS
          0
27 E0037 0000         CON(5) =!DEFIN          11 CHAR WORDS
          0
28 E003C 0000         CON(5) =!STRAR          12 CHAR WORDS
          0
```

```
29                      EJECT
30                  ********************************************
31                  *
32                  * X null word
33                  *
34                  * FIND "recognizes" this word of length zero
35                  * when WORD has hit its terminator.
36                  * INTERPRET then calls EXECUTE which branches
37                  * to this routine. Its main purpose is to pop
38                  * the return to the repeat-branch in INTERPRET,
39                  * landing us up a level in QUIT.
40                  * When we are interpreting from a screen (file),
41                  * we need to check that we aren't in an
42                  * unfinished colon definition, because WORD doesn't
43                  * quit until the EOF when it's in a file (whereas
44                  * you get here at the end of every line from the
45                  * terminal/keyboard).
46                  *
47                  ********************************************
48
49 E0041 0000          CON(5)  0               No more 0 length words!
          0
50 E0046 0C    =!X    CON(2)  #C0             IMMEDIATE
51 E0048 08           CON(2)  #80
52 E004A 0000  =X     CON(5) =DOCOL
          0
53 E004F 0000         CON(5) =BLK             are we working from a screen?
          0
54 E0054 1720         CON(5) =AT
          E
55 E0059 0000         CON(5) =ZBRNH           branch if not
          0
56 E005E 6100         CON(5) (X1)-*
          0
57 E0063 0000         CON(5) =STATE           we're working from a screen and it
          0
58 E0068 1720         CON(5) =AT              EOF;  if we're still in compile
          E
59 E006D 0000         CON(5) =ABRT"X          mode then we have an error conditi
          0
60 E0072 30           CON(2)  =eNO;           we'll give "FTH ERR: no ending ;"
61                *   NIBASC  \no endin\      message
62                *   NIBASC  \g  ;\
63 E0074 0F90 X1      CON(5) =R>              pop one level from return stack
          E
64 E0079 0000         CON(5) =DROP            throw it away
          0
65 E007E 0000         CON(5) =SEMI            return
          0
```

```
                    EJECT
            ************************************************
            *                                              *
            *          START OF 1 CHAR WORDS*              *
            *      ADD NEW DEFINITIONS AT THIS END         *
            *                                              *
            ************************************************

            ****************************************
            *
            *  X  ( --- addr )  This rtne returns the
            *       addr of the X register in the floating
            *       point stack.
            *
            ***********************************************
E0083 0000          CON(5) 0
      0
E0088 18    =!XX    CON(2) #81
E008A 8D            CON(2) \X\+#80
E008C 1900  =XX     CON(5) =$XX
      E

E0091 8E15  =$XX    GOSUBL =DOUSE
      C0
E0097 0DBF          CON(5) (=oX)
      2


            ********************************************
            *
            *  Y  ( --- addr ) This rtne returns the
            *       addr of the Y register in the floating
            *       point stack.
            *
            ***********************************************
E009C 8800          CON(5) =!XX
      E
E00A1 18    =!Y     CON(2) #81
E00A3 9D            CON(2) \Y\+#80
E00A5 AA00  =Y      CON(5) =$Y
      E

E00AA 8E83  =$Y     GOSUBL =DOUSE
      C0
E00B0 0EBF          CON(5) (=oY)
      2


            ************************************************
            *
            * Z  ( --- addr)  This rtne returns the
            *       addr of the Z register in the floating
            *       point stack.
            *
            ************************************************
```

```
113 E00B5 1A00          CON(5) =!Y
          E
114 E00BA 18    =!Z     CON(2) #81
115 E00BC AD            CON(2) \Z\+#80
116 E00BE 3C00  =Z      CON(5) =$Z
          E
117
118 E00C3 8EF1  =$Z     GOSUBL =DOUSE
          C0
119 E00C9 0FBF          CON(5) (=oZ)
          2
120
121
122             ***********************************************
123             *
124             * T ( --- addr) This rtne returns the addr
125             *       of the T register in the floating
126             *       point stack.
127             *
128             ***********************************************
129 E00CE AB00          CON(5) =!Z
          E
130 E00D3 18    =!T     CON(2) #81
131 E00D5 4D            CON(2) \T\+#80
132 E00D7 CD00  =T      CON(5) =$T
          E
133
134 E00DC 8E60  =$T     GOSUBL =DOUSE
          C0
135 E00E2 00CF          CON(5) (=oT)
          2
```

```
136                     EJECT
137                 ***********************************************
138                 *
139                 * L ( --- addr) This rtne returns the addr
140                 *       of the L register in the floating
141                 *       point stack.
142                 *
143                 ***********************************************
144 E00E7 3D00           CON(5) =!T
          E
145 E00EC 18     =!L     CON(2) #81
146 E00EE CC             CON(2) \L\+#80
147 E00F0 5F00   =L       CON(5) =$L
          E
148
149 E00F5 8EDE   =$L      GOSUBL =DOUSE
          B0
150 E00FB 0CBF           CON(5) (=oLASTX)
          2
```

```
151                     EJECT
152                 ****************************************************************
153                 *
154                 * ' (TIC)  ( --- addr)  Leave compilation address of next word
155                 *
156                 ****************************************************************
157
158 E0100 CE00            CON(5)  =!L
        E
159 E0105 18    =!TIC    CON(2)  #81             '
160 E0107 7A             CON(2)  \'\+#80
161 E0109 0000  =TIC     CON(5)  =DOCOL          :
        0
162 E010E 0000           CON(5)   =-FIND        search dictionary for word
        0
163
164                 * -FIND returns cfa ch flag
165
166 E0113 58A0            CON(5)   =ZEQ          reverse sense of flag
        E
167 E0118 0000           CON(5)   =ABORTW       ABORT" not found"
        0
168 E011D 20             CON(2)  =eNOTF
169 E011F 0000           CON(5)   =DROP         drop the character,
        0
170                 *                           leaving just the cfa
171 E0124 0000           CON(5)   =LITR         if compiling, literal will
        0
172                 *                           compile in code which will
173                 *                           return cfa to stack at
174                 *                           runtime
175 E0129 0000           CON(5)   =SEMI         ;
        0
176                 ************************************************
177                 *
178                 * I  ( --- n)  Copy loop index to data stack
179                 *
180                 * In a loop, the index is supposed to be the
181                 * top value on the return stack. So this word
182                 * is the same as R@, except it only works in
183                 * a definition.
184                 *
185                 * IMMEDIATE, COMPILE ONLY
186                 *
187                 ************************************************
188
189 E012E 5010               CON(5)  =!TIC
        E
190 E0133 1C    =!I      CON(2)  #C1             IMMEDIATE
191 E0135 9C               CON(2)  \I\+#80
192 E0137 0000  =II      CON(5)  =DOCOL          R@ DOES SAME FUNCTION
        0
193 E013C 0000           CON(5)  =COMPL         enforce compile mode
        0
194 E0141 04A0           CON(5)  =R@            copy top value of rtn stk to data
```

```
                E
    195 E0146 0000          CON(5)  =SEMI           ;
                0
```

```
196                     EJECT
197                 ************************************************************
198                 *
199                 * J  ( --- n)  returns the value of the 2nd loop index
200                 *    contained on the RTN STK.  This routine
201                 *    only makes sense in a colon definition in the middle
202                 *    of 2 DO LOOPs.
203                 *
204                 *    IMMEDIATE, COMPILE ONLY
205                 *
206                 *                              LIMIT 2
207                 *                              INDEX 2
208                 *                              LIMIT 1
209                 *      RTN STK PTR --------> INDEX 1
210                 *
211                 ************************************************************
212
213 E014B 3310              CON(5)  =!I
          E
214 E0150 1C    =!J       CON(2)  #C1             IMMEDIATE
215 E0152 AC              CON(2)  \J\+#80
216 E0154 0000  =J        CON(5)  =DOCOL          :
          0
217 E0159 0000            CON(5)  =COMPL          enforce compile mode
          0
218 E015E 8610            CON(5)  =JJ             J RUN TIME ROUTINE
          E
219 E0163 0000            CON(5)  =SEMI           ;
          0
220
221 E0168 D610  =JJ       CON(5)  $JJ
          E
222 E016D D9    $JJ       C=B     A                 copy rtn stk to C(A)
223 E016F 137             CD1EX                     D1=RTN STK, C=DATA STK
224 E0172 179             D1=D1+  10                POINT TO 2ND INDEX
225 E0175 143             A=DAT1  A                 A=2ND INDEX
226 E0178 135             D1=C                      RECOVER DATA STK TO D1
227 E017B 1C4             D1=D1-  5
228 E017E 141             DAT1=A  A                 PUSH INDEX TO DATA STACK
229 E0181 03              RTNCC
```

```
230                     EJECT
231                 ******************************************************
232                 *
233                 * ADD  (n1 n2 --- n3 ) leave sum (n1+n2) on stack
234                 *
235                 ******************************************************
236
237 E0183 0510             CON(5)  =!J
        E
238 E0188 18    =!ADD       CON(2)  #81
239 E018A BA                CON(2)  \+\+#80
240 E018C 1910  =ADD        CON(5)  =$ADD
        E
241
242 E0191 147   =$ADD       C=DAT1  A               POP n2
243 E0194 174               D1=D1+  5
244 E0197 143               A=DAT1  A               POP n1
245 E019A C2                C=C+A   A               add 'em!
246 E019C 145               DAT1=C  A               PUSH sum
247 E019F 03                RTNCC
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
                EJECT
               ****************************************
               *
               * MINUS  (n1 n2 --- n3)
               *
               * Leave difference (n1-n2) on stack.
               *
               ****************************************

E01A1 8810          CON(5)  =!ADD
      E
E01A6 18    =!MINUS CON(2)  #81             -
E01A8 DA            CON(2)  \-\+#80

E01AA FA10  =MINUS  CON(5)  =$MINUS
      E
E01AF 147   =$MINUS C=DAT1  A               POP n2
E01B2 174           D1=D1+  5
E01B5 143           A=DAT1  A               POP n1
E01B8 EA            A=A-C   A               n1-n2
E01BA 141           DAT1=A  A           RETURN DIFFERENCE TO STACK
E01BD 03            RTNCC
```

```
268                     EJECT
269                 ************************************************
270                 *
271                 * =  (n1 n2 --- flag) true if n1=n2 else flase
272                 *
273                 ************************************************
274
275 E01BF 6A10             CON(5)  =!MINUS
        E
276 E01C4 18    =!EQUAL     CON(2)  #81             =
277 E01C6 DB                CON(2)  \=\+#80
278 E01C8 DC10  =EQUAL      CON(5)  =$EQUAL
        E
279
280 E01CD 143   =$EQUAL     A=DAT1  A               POP n2
281 E01D0 174               D1=D1+  5
282 E01D3 147               C=DAT1  A               POP n1
283 E01D6 E2                C=C-A   A
284 E01D8 D0                A=0     A               PREPARE FOR FALSE
285 E01DA 8AE               ?C#0    A               EQUAL?
286 E01DD 40                GOYES   EQ0             NO
287 E01DF CC                A=A-1   A               TRUE, (ALL 1'S)
288 E01E1 141   EQ0         DAT1=A  A               WRITE FLAG
289 E01E4 03                RTNCC
```

```
290                     EJECT
291                 ************************************************
292                 *
293                 * LT  (n1 n2 --- flag)  True if n1 is less than n2
294                 *
295                 ************************************************
296
297 E01E6 4C10             CON(5)  =!EQUAL
            E
298 E01EB 18        =!LT    CON(2)  #81
299 E01ED CB                CON(2)  \<\+#80
300 E01EF 4F10      =LT     CON(5)  =$LT
            E
301
302 E01F4 143       =$LT    A=DAT1  A               POP n2
303 E01F7 174               D1=D1+  5
304 E01FA 147               C=DAT1  A               POP n1
305 E01FD 25        GTLT1   P=      5
306 E01FF A80               A=0     P               CLEAR HIGH NIB FOR SIGN SHIFT
307 E0202 A82               C=0     P
308 E0205 A14               A=A+A   WP              n2*2
309 E0208 A16               C=C+C   WP              n1*2
310 E020B 902               ?C=A    P               DO n1 & n2 HAVE SAME SIGN?
311 E020E 50                GOYES   SAMSGN          YES, THEN COMPARE NOW
312 E0210 A9E               ACEX    WP              DIFFERENT SIGNS, SWITCH SENSE
313                 *                               OF TEST
314 E0213 996       SAMSGN  ?A>C    WP              n2 > n1 ?
315 E0216 90                GOYES   TRUE            YES
316 E0218 D0        FALSE   A=0     A               RETURN FALSE (0) FLAG
317 E021A 141               DAT1=A  A               STORE FLAG
318 E021D 03                RTNCC
319
320 E021F D0        TRUE    A=0     A
321 E0221 CC                A=A-1   A               TRUE = ALL 1'S
322 E0223 141               DAT1=A  A               STORE FLAG ON STACK
323 E0226 03                RTNCC
```

```
                        EJECT
                *******************************************************
                *
                * GT (n1 n2 --- flag)  True if n1 greater than n2
                *
                *******************************************************

E0228 BE10              CON(5)  =!LT
      E
E022D 18        =!GT    CON(2)  #81
E022F EB                CON(2)  \>\+#80
E0231 6320      =GT     CON(5)  =$GT
      E

E0236 147       =$GT    C=DAT1  A               POP n2
E0239 174               D1=D1+  5
E023C 143               A=DAT1  A               POP n1
E023F 6DBF              GOTO    GTLT1           FINISH IN LT
```

```
340                     EJECT
341                 ****************************************
342                 *
343                 * !  (n addr --- )   store n at addr.
344                 *
345                 ****************************************
346
347 E0243 D220             CON(5)  !GT
        E
348 E0248 18       =!STORE CON(2)  #81             !
349 E024A 1A               CON(2)  \!\+#80
350 E024C 1520     =STORE  CON(5)  =$STORE
        E
351
352 E0251 147      =$STORE C=DAT1  A               pop addr
353 E0254 174              D1=D1+  5
354 E0257 143              A=DAT1  A               read n into A
355 E025A 174              D1=D1+  5               return nothing on stack
356 E025D 137              CD1EX                   ADDR TO D1, SAVE DATA STK IN C
357 E0260 141              DAT1=A  A               store n in addr
358 E0263 135              D1=C                    DATA STK PTR to D1
359 E0266 03               RTNCC                   all done!
```

```
360                     EJECT
361                 ********************************************************
362                 *
363                 * @  (addr --  n)   replace addr with contents of addr
364                 *
365                 ********************************************************
366
367 E0268 8420             CON(5)  =!STORE
        E
368 E026D 18        =!AT    CON(2)  #81
369 E026F 0C                CON(2)  \@\+#80
370 E0271 6720      =AT     CON(5)  =$AT
        E
371
372 E0276 147       =$AT    C=DAT1  A               pop addr
373 E0279 137               CD1EX                   addr to D1
374 E027C 143               A=DAT1  A               contents of addr
375 E027F 135               D1=C                    D1=DATA STK PTR,
376 E0282 141               DAT1=A  A               PUSH CONTENTS TO STACK
377 E0285 03                RTNCC
```

```
                        EJECT

                ****************************************
                *
                * 0 ( -- 0) push  a 0 to the DATA STK
                *
                ****************************************

E0287 D620      =!AT    CON(5)  !AT
      E
E028C 18        =!ZERO  CON(2)  #81              0
E028E 0B                CON(2)  \0\+#80

E0290 0000      =ZERO   CON(5)  =DOCON
      0
E0295 0000              CON(5)  0
      0

                ************************************
                *
                * 1 ( -- 1)  Put a 1 on the DATA STK
                *
                ************************************

E029A C820              CON(5)  !ZERO
      E
E029F 18        =!ONE   CON(2)  #81
E02A1 1B                CON(2)  \1\+#80

E02A3 0000      =ONE    CON(5)  =DOCON
      0
E02A8 1000              CON(5)  1
      0
```

```
                        EJECT

                ****************************************
                *
                * 2 ( -- 2)  Put a 2 on the DATA STK
                *
                ****************************************

E02AD F920      =!ONE   CON(5)  =!ONE
       E
E02B2 18        =!TWO   CON(2)  #81
E02B4 2B                CON(2)  \2\+#80

E02B6 0000      =TWO    CON(5)  =DOCON
       0
E02BB 2000              CON(5)  2
       0


                ****************************************************
                *
                * THREE   ( --- 3) leaves a 3 on the data stack
                *
                ****************************************************

E02C0 2B20              CON(5)  =!TWO
       E
E02C5 18        =!THREE CON(2)  #81              3
E02C7 3B                CON(2)  \3\+#80

E02C9 0000      =THREE  CON(5)  =DOCON
       0
E02CE 3000              CON(5)  3
       0
```

```
433                     EJECT
434                 ********************************************************
435                 *
436                 * COMMA  ( n --- )  Allot 5 NIBS in the dictionary,
437                 *        storing n there.
438                 *
439                 * -----VECTORED WORD-----
440                 *
441                 ********************************************************
442
443 E02D3 5C20         CON(5)  =!THREE
          E
444 E02D8 18    =!COMMA CON(2)  #81             COMMA ,
445 E02DA CA             CON(2)  \,\+#80
446 E02DC 0000  =COMMA   CON(5)  =DOCOL          :
          0
447 E02E1 0000         CON(5)  =LIT
          0
448 E02E6 F2CF         CON(5)  =oCOMMA         VECTOR FOR COMMA
          2
449 E02EB 1720         CON(5)  =AT             CFA TO USE
          E
450 E02F0 0000         CON(5)  =EXEC           EXECUTE
          0
451 E02F5 0000         CON(5)  =SEMI           ;
          0
452
453                 *
454                 * DEFAULT COMMA ROUTINE
455                 *
456
457 E02FA 0000 =ICOMMA CON(5)  =DOCOL          :
          0
458 E02FF 0000         CON(5)   =HERE          first free addr in dictionary
          0
459 E0304 C420         CON(5)   =STORE         store n HERE
          E
460 E0309 0000         CON(5)   =LIT
          0
461 E030E 5000         CON(5)   5                5
          0
462 E0313 0000         CON(5)   =ALLOT         update DP by 5
          0
463 E0318 0000         CON(5)   =SEMI          ;
          0
```

```
464                     EJECT
465                 ******************************************************
466                 *
467                 * /  (DIVIDE)  (n1 n2 --- n3)  Divide n1 by n2 leave
468                 *       quotient n3.
469                 *
470                 ******************************************************
471
472 E031D 8D20             CON(5)  =!COMMA
        E
473 E0322 18        =!/     CON(2)  #81
474 E0324 FA                CON(2)  \/\+#80
475 E0326 0000      =/      CON(5)  =DOCOL          :
        0
476
477 E032B 0000               CON(5)   =/MOD           /MOD
        0
478                 * /MOD leaves remainder quotient
479 E0330 0000               CON(5)   =SWAP      quotient remainder
        0
480 E0335 0000               CON(5)   =DROP      drop the remainder
        0
481 E033A 0000               CON(5)   =SEMI      leave quotient
        0
482
483                 ************************************************************
484                 *
485                 * [  (left bracket) Text from input stream is subsequently
486                 *    executed.
487                 *
488                 *  IMMEDIATE
489                 *
490                 ************************************************************
491
492 E033F 2230               CON(5)  =!/
        E
493 E0344 1C        =!LBRAC CON(2)  #C1             [
494 E0346 BD                CON(2)  \[\+#80
495
496 E0348 0000      =LBRAC  CON(5)  =DOCOL          :
        0
497 E034D 0920               CON(5)   =ZERO          set value of user variable
        E
498 E0352 0000               CON(5)   =STATE         STATE to 0
        0
499 E0357 C420               CON(5)   =STORE
        E
500 E035C 0000               CON(5)   =SEMI           ;
        0
```

```
501                     EJECT
502
503             ************************************************************
504             *
505             * .  (DOT)  (n --- ) Display the top number on the stack
506             *
507             ************************************************************
508
509 E0361 4430         CON(5)  =!LBRAC
          E
510 E0366 18   =!DOT   CON(2)  #81
511 E0368 EA           CON(2)  \.\+#80
512
513 E036A 0000 =DOT    CON(5)  =DOCOL          : .
          0
514 E036F 0000         CON(5)   =S->D      MAKE DOUBLE NUMBER
          0
515 E0374 DBE0         CON(5)   =D.        DISPLAY IT
          E
516 E0379 0000         CON(5)   =SEMI          ;
          0
```

```
                        EJECT
                *****************************************************************
                *
                * # (SHARP)     (ud1 --- ud2)  Generate from an unsigned double
                *               number (ud1) the next ASCII char which is placed
                *               in an output string.  ud2 is the quotient after
                *               division by BASE and is maintained for further
                *               processing.  Used between <# and #>.
                *
                *****************************************************************

E037E 6630      !DOT    CON(5)  !DOT
      E
E0383 18        =!N#    CON(2)  #81             #
E0385 3A                CON(2)  \#\+#80
E0387 0000      =N#     CON(5)  =DOCOL          : #
      0
E038C 0000              CON(5)   =BASE          ud1
      0
E0391 1720              CON(5)   =AT            ud1 b
      E
E0396 0000              CON(5)   =M/MOD         u2 ud2
      0
E039B 0000              CON(5)   =ROT           ud2 u2
      0
E03A0 0000              CON(5)   =LIT
      0
E03A5 9000              CON(5)  9               ud2 u 9
      0
E03AA 0000              CON(5)   =OVER          ud2 u 9 u
      0
E03AF FE10              CON(5)   =LT            ud2 u (9<u)
      E
E03B4 0000              CON(5)   =ZBRNH         IF greater than 9 add 7
      0
E03B9 4100              CON(5)  (N#00)-*
      0

                * ASCII "0"=48; A=10 (in higher base) needs to
                * be offset by 7+48=55 because ASCII "A"=10+55=65

E03BE 0000              CON(5)   =LIT
      0
E03C3 7000              CON(5)  7               7
      0
E03C8 C810              CON(5)   =ADD           +
      E

E03CD 0000 N#00         CON(5)   =LIT
      0

                * ASCII "0"=48

E03D2 0300              CON(5)  #30             48
```

```
                0
    556 E03D7 C810          CON(5)   =ADD            +
                E
    557 E03DC 0000          CON(5)   =HOLD       put in numeral temp space
                0
    558 E03E1 0000          CON(5)   =SEMI           ;
                0
```

```
559                     EJECT
560                 **********************************
561                 *
562                 * * (n1 n2 --- n3)  (MULTIPLY)
563                 *
564                 **********************************
565
566 E03E6 3830          CON(5)  =!N#
           E
567 E03EB 18    =!MULT  CON(2)  #81              *
568 E03ED AA            CON(2)  \*\+#80
569
570 E03EF 0000 =MULT    CON(5)  =DOCOL           :
           0
571 E03F4 0000          CON(5)   =U*         leaves double number
           0
572 E03F9 0000          CON(5)   =DROP       drop the high 5 nibbles
           0
573 E03FE 0000          CON(5)   =SEMI             ;
           0
```

```
574                     EJECT
575
576               ********************************************************
577               *
578               * ; (SEMICOLON) Terminate a colon definition and stop
579               *                 compilation.
580               *
581               ********************************************************
582 E0403 BE30           CON(5)  =!MULT
          E
583 E0408 1C     =!SEMIC CON(2)  #C1              ;  (IMMEDIATE)
584 E040A BB             CON(2)  \;\+#80
585
586 E040C 0000 =SEMIC    CON(5)  =DOCOL           :
          0
587 E0411 0000           CON(5)   =QCSP           ?CSP make sure that stack is
          0
588               *                               at the same level as when we
589               *                               started compilation of this
590               *                               definition.
591
592 E0416 0000           CON(5)   =COMPL          COMPILE  runtime exit routine
          0
593 E041B 0000           CON(5)   =SEMI           ;  (REPLACES EXIT)
          0
594
595 E0420 0000           CON(5)   =SMUDG          unsmudges (SMUDGE is a toggle)
          0
596               *                               this definition so it can be foun
597               *                               in word searches
598
599 E0425 8430           CON(5)   =LBRAC          set STATE to zero, this restores
          E
600               *                               execute mode
601 E042A 0000           CON(5)   =SEMI           ;
          0
```

```
                    EJECT

            ******************************************************
            *
            * ] (RIGHT BRACKET)  Sets compilation mode so that
            *   subsequent text from the input stream is compiled.
            *
            ******************************************************
E042F 8040          CON(5)  !SEMIC
      E
E0434 18    =!RBRAC CON(2)  #81             ]
E0436 DD            CON(2)  \]\+#80

E0438 0000  =RBRAC  CON(5)  =DOCOL          :
      0
E043D 0000          CON(5)   =LIT
      0
E0442 0C00          CON(5)  #C0             #C0
      0
E0447 0000          CON(5)   =STATE         STATE
      0
E044C C420          CON(5)   =STORE         !
      E
E0451 0000          CON(5)   =SEMI          ;
      0
            *
            * THE POINT OF STORING #C0 IS FOR A COMPARE
            * IN INTERPRET WITH THE FIRST BYTE OF A WORD
            * HEADER -- IF IT'S >#C0 THEN IT IS IMMEDIATE.
            * SO IMMEDIATE WORDS EXECUTE ANYTIME, THE FIRST
            * BYTE OF OTHER NAME FIELDS ARE < #C0 AND THEY
            * ARE COMPILED RATHER THAN EXECUTED.
            *
```

```
628                     EJECT
629
630               ****************************************
631               *
632               * :    ( - )    used as     : <name>
633               * This is "colon" for colon-definitions!
634               * First remember top-of-stack so ";" can check
635               * that it is the same at the end of the definition.
636               * Then make sure the defining-context is the
637               * search-context so this word gets entered as
638               * the proper "LATEST" word in the CURRENT vocabulary.
639               *
640               ****************************************************
641
642 E0456 4340           CON(5)  =!RBRAC
          E
643 E045B 18    =!COLON CON(2)  #81
644 E045D AB            CON(2)  \:\+#80
645
646 E045F 0000  =COLON   CON(5) =DOCOL
          0
647 E0464 0000           CON(5)  =SP@          store away current top of stack
          0
648 E0469 0000           CON(5)  =CSP          into the user variable CSP
          0
649 E046E C420           CON(5)  =STORE
          E
650 E0473 0000           CON(5)  =CURR         make the current vocabulary the
          0
651 E0478 1720           CON(5)  =AT           context (or search ) vocabulary
          E
652 E047D 0000           CON(5)  =CONTX
          0
653 E0482 C420           CON(5)  =STORE
          E
654 E0487 0000           CON(5)  =CREAT        CREATE a dictionary entry for <name
          0
655 E048C 0000           CON(5)  =SMUDG        SMUDGE its name field so it can't
          0
656               *                            be recursively defined.
657
658 E0491 8340           CON(5)  =RBRAC        ]  set compilation mode
          E
659 E0496 0000           CON(5)  =ROM;C        ROM;CODE  insert prologue
          0
660 E049B 0000           CON(5) =DOCOL         docolon
          0
```

```
661                     EJECT
662
663             ****************************************
664             *
665             * ?  (addr --- ) display value at addr.
666             *
667             ****************************************
668
669 E04A0 B540         CON(5)  =!COLON
        E
670 E04A5 18    =!QUEST CON(2)  #81           ?
671 E04A7 FB            CON(2)  \?\+#80
672
673 E04A9 0000 =QUEST  CON(5)  =DOCOL        :
        0
674 E04AE 1720          CON(5)   =AT          @
        E
675 E04B3 A630          CON(5)   =DOT         .
        E
676 E04B8 0000          CON(5)   =SEMI        ;
        0
```

```
677                     EJECT
678                 ********************************************************************
679                 *
680                 * (  PAREN      Set comment mode in either compile or execution m
681                 *               insists on closing ")" or will give error message
682                 *
683                 ********************************************************************
684
685 E04BD 5A40             CON(5)  =!QUEST
          E
686 E04C2 1C    =!PAREN   CON(2)  #C1            (
687 E04C4 8A              CON(2)  \(\+#80
688
689 E04C6 0000  =PAREN    CON(5)  =DOCOL          :
          0
690 E04CB 0000            CON(5)   =LIT
          0
691 E04D0 EFFF            CON(5)  (0-2)          -2
          F
692 E04D5 0000            CON(5)   =IN           >IN
          0
693 E04DA 6AA0            CON(5)   =PSTOR        +!
          E
694                 * MOVED POINTER BACK ONE CHAR FOR GCHAR, IN CASE
695                 * THERE WAS JUST "( )"
696 E04DF 0000            CON(5)   =LIT
          0
697 E04E4 9200            CON(5)  #29            ")"
          0
698 E04E9 0000            CON(5)   =GCHAR        moves string to HERE
          0
699                 *                            tries to match )
700                 *                            returns 1 if no match
701                 *                            also string addr.
702 E04EE 0000            CON(5)   =ABRT"X
          0
703 E04F3 40              CON(2)  =eNOEP
704                 *       NIBASC   \no endin\
705                 *       NIBASC   \g  )\
706 E04F5 0000            CON(5)   =DROP          don't need string addr
          0
707 E04FA 0000            CON(5)   =SEMI         ;
          0
```

```
                    EJECT

            ****************************************
            * "
            * QUOTE                    ( -- str )
            *
            * Get string constant from input stream,
            * create a temporary string on the PAD (execute mode),
            * or compile run-time action and string into dictionary.
            *
            * string= {maxlen} {len} {chars}
            *
            * String on PAD has a MAXLEN of 80 or length of
            * string, whichever is greater; string compiled into
            * dictionary must of course have maxlen=len=just what
            * the actual length is.
            *
            ********************************************

E04FF 2C40        CON(5)  =!PAREN
      E
E0504 1C   =!QUOTE CON(2)  #C1        IMMEDIATE
E0506 2A          CON(2)  \"\+#80

E0508 0000 =QUOTE CON(5)  =DOCOL
      0
E050D 0000        CON(5)  =STATE      if contents of STATE
      0
E0512 1720        CON(5)  =AT         are non-zero then we
      E
            *                         are compiling.

E0517 0000        CON(5)  =ZBRNH      IF we are compiling
      0
E051C 9100        CON(5)  (QUOT2)-*
      0
E0521 0000        CON(5)  =COMPL      then COMPILE the runtime
      0
E0526 0460        CON(5)  =QUOTC      quote word QUOTE-C into dictionary;
      E
E052B 6B20        CON(5)  =TWO        ALLOT 2 nibs for the string's
      E
E0530 0000        CON(5)  =ALLOT      maxlen byte
      0

E0535 0000 QUOT2  CON(5)  =NQOT?      NULL STRING?  (NQOT? returns
      0
            *                         a true if next char is quote, returns
            *                         false otherwise.  i.e. " " is a null
            *                         string.

E053A 0000        CON(5)  =ZBRNH       IF null then
      0
E053F 8200        CON(5)  (QUOT02)-*   we simply
      0
```

```
750 E0544 0000          CON(5)  =PT1+          point past the ending "
          0
751 E0549 0920          CON(5)  =ZERO          put a 0 on data stack
          E
752 E054E 0000          CON(5)  =HERE          HERE points to current-len byte
          0
753 E0553 CCC0          CON(5)  =C!            set current-length byte to 0
          E
754 E0558 0000          CON(5)  =HERE         LEAVE HERE ON STACK AS GCHAR DOES
          0
755 E055D 0000          CON(5)  =BRNCH
          0
756 E0562 B100          CON(5)  (QUOT5)-*      ELSE get string delimited by "
          0
757 E0567 0000 QUOT02   CON(5)  =LIT
          0
758 E056C 2200          CON(5)  34             "
          0
759 E0571 0000          CON(5)  =GCHAR        move string to HERE, look for
          0
760             *                             ending ", return -1 if not there
761             *                             also return string addr gained from
762             *                             WORD, part of GCHAR
763
764 E0576 0000          CON(5)  =ABRT"X        if flag returned from GCHAR is not
          0
765 E057B 50            CON(2)  =eNO"          0 then give error message and ABORT
766             *       NIBASC  \no endin\
767             *       NIBASC  \g  "\
768
769 E057D 0000 QUOT5     CON(5)  =STATE        check contents of STATE
          0
770 E0582 1720          CON(5)  =AT           if non-zero we are compiling
          E
771 E0587 0000          CON(5)  =ZBRNH        IF COMPILING
          0
772 E058C 8200          CON(5)  (QUOT3)-*
          0
773 E0591 0000          CON(5)  =DUP          duplicate address of counted string
          0
774 E0596 9AC0          CON(5)  =CAT          get length of string
          E
775 E059B 0000          CON(5)  =OVER         COPY HERE (HERE points to curr len byt
          0
776 E05A0 49B0          CON(5)  =TWO-         MOVE BACK TO MAXLEN POSITION
          E
777 E05A5 CCC0          CON(5)  =C!           STORE LEN AS MAXLEN
          E
778 E05AA 0000          CON(5)  =MOVDP        update dictionary pointer to point
          0
779             *                             beyond string.
780
781 E05AF 0000          CON(5)  =SEMI         ; CHEAT AND END HERE !
          0
782
```

```
783                *
784                * we are executing, not compiling; enter here with ADDR on stack;
785                * ADDR means address of string prefaced by its length in bytes
786                * (i.e., a counted string)
787                *
788 E05B4 0000 QUOT3  CON(5)  =DUP        (ADDR  ADDR)
           0
789 E05B9 E5B0        CON(5)  =TWO+       (ADDR ADDR+2)
           E
790 E05BE 0000        CON(5)  =OVER       (ADDR ADDR+2 ADDR)
           0
791                *
792                * C-COUNT means char count of string
793                *
794 E05C3 9AC0        CON(5)  =CAT        C@  (ADDR ADDR+2 C-COUNT)
           E
795 E05C8 0000        CON(5)  =PAD            (ADDR ADDR+2 C-COUNT PAD)
           0
796                *
797                * PAD+4 is our destination address
798                * ADDR+2 is our source addr
799                *
800 E05CD 0D90        CON(5)  =FOUR+      4+  (ADDR ADDR+2 C-COUNT DEST)
           E
801 E05D2 0000        CON(5)  =SWAP           (ADDR ADDR+2 DEST C-COUNT)
           0
802                *
803                * NOTE IT IS IMPORTANT THAT WE FIRST COPY THE STRING TO
804                * THE PAD BEFORE WE SET THE STRING LENGTHS AND THAT WE USE
805                * CMOVE> SINCE OTHERWISE, IF THE STRING IS LONGER THAN 39
806                * 39 CHARS WE OVERWRITE PART OF IT DURING THE MOVE.
807                *
808 E05D7 0000        CON(5)  =CMOV>      MOVE STRING TO PAD+4  (ADDR)
           0
809 E05DC 9AC0        CON(5)  =CAT        C@  (C-COUNT)
           E
810 E05E1 0000        CON(5)  =DUP        C@  (C-COUNT C-COUNT)
           0
811
812                *
813                * when we move a string to the PAD we will always set
814                * its max length to be the maximum of either 80 or its
815                * current length--this makes string operations like
816                * concatenate possible on temporary strings created with
817                * quote.
818                *
819 E05E6 0000        CON(5)  =LIT
           0
820 E05EB 0500        CON(5)  80              (C-COUNT C-COUNT 80)
           0
821 E05F0 0000        CON(5)  =MAX            (C-COUNT MAX(C-COUNT,80) )
           0
822 E05F5 0000        CON(5)  =SWAP           (MAX(CC,80) C-COUNT)
           0
823 E05FA 0000        CON(5)  =PAD           (MAX(CC,80) C-COUNT PAD)
```

```
          0
824 E05FF 0000        CON(5)  =SWAP           (MAX PAD C-COUNT)
          0
825 E0604 0000        CON(5)  =OVER           (MAX PAD C-COUNT PAD)
          0
826 E0609 E5B0        CON(5)  =TWO+       2+  (MAX PAD C-COUNT PAD+2)
          E
827 E060E CCC0        CON(5)  =C!         STORE CURR LEN  (MAX PAD)
          E
828 E0613 CCC0        CON(5)  =C!         STORE MAX LEN
          E
829             *
830             * now we will return to user the current char count of
831             * the string (contained at PAD+2) and the address of the
832             * string (contained at PAD+4).
833             *
834 E0618 0000        CON(5)  =PAD
          0
835 E061D E5B0        CON(5)  =TWO+           ( PAD+2)
          E
836 E0622 0000        CON(5)  =DUP            ( PAD+2 PAD+2 )
          0
837 E0627 9AC0        CON(5)  =CAT            ( PAD+2 C-COUNT )
          E
838 E062C 0000        CON(5)  =SWAP
          0
839 E0631 E5B0        CON(5)  =TWO+            COUNT PAD+4
          E
840 E0636 0000        CON(5)  =SWAP
          0
841 E063B 0000        CON(5)  =SEMI       ;   all done, go home
          0
842
843             *
844             * RUNTIME ACTION COMPILED INTO WORD
845             *
846
847 E0640 0000 =QUOTC CON(5)  =DOCOL       :
          0
848 E0645 04A0        CON(5)  =R@         R@  return address
          E
849             *                         has already been incremented to
850             *                         point at the max len byte of string.
851
852 E064A 0000        CON(5)  =DUP        adr adr
          0
853 E064F 0D90        CON(5)  =FOUR+      adr adr+4  this gives address of actua
          E
854 E0654 0000        CON(5)  =SWAP       adr+4 adr
          0
855 E0659 9AC0        CON(5)  =CAT        adr+4 count   get current string lengt
          E
856 E065E 0000        CON(5)  =DUP        adr+4 count count
          0
857 E0663 E5B0        CON(5)  =TWO+       adr+4 count count+2  char count plus
```

```
          E
858            *                          2 length bytes
859 E0668 6DA0       CON(5)  =TWO*        adr+4 count 2*(count+2)
          E
860            *                          this gives us the nibble count of stri
861            *                          and length bytes
862 E066D 0F90       CON(5)  =R>          R>  pop addr of maxlen byte from RTN S
          E
863 E0672 C810       CON(5)  =ADD         +  point beyond string
          E
864 E0677 81A0       CON(5)  =>R          >R  push this addr as next addr to int
          E
865            *
866            * LEAVE ADR+4 COUNT on data stack...i.e.,the string
867            *
868 E067C 0000       CON(5)  =SEMI        done, go home!
          0
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
869                     STITLE  2_CHAR_WORDS
870                 ********************************************
871                 *                                          *
872                 *           START OF 2 CHAR WORDS          *
873                 *      ADD ADDITIONAL WORDS AT THIS END    *
874                 *                                          *
875                 ********************************************
876                 *
877                 ******************************
878                 *
879                 * FP    FRACTIONAL PART
880                 *       FLOATING POINT WORD,
881                 *       OPERATES ON X REGISTER
882                 *
883                 ******************************
884
885 E0681 0000             CON(5)  0
            0
886 E0686 28       =!FP     CON(2)  #82
887 E0688 64               NIBASC  \F\
888 E068A 0D               CON(2)  \P\+#80
889 E068C 1960     =FP      CON(5)  =$FP
            E
890 E0691 8E00     =$FP     GOSUBL  =NUMST          SAVEFP;X IN (A,B)
            00
891
892                 * Get the value stored in FORTRAM at (=oX) into
893                 * the CPU registers expected by mainframe routine.
894
895 E0697 822              SB=0
896 E069A 821              XM=0
897 E069D 8F00             GOSBVL  =FRAC15
            000
898 E06A4 6442             GOTO    =FEND           PUTABX;GETFP
899
900                 ********************************************
901                 *
902                 * IP            FLOATING POINT WORD
903                 *
904                 * INTEGER PART -- OPERATE ON X REGISTER
905                 *
906                 ********************************************
907
908 E06A8 6860             CON(5)  =!FP
            E
909 E06AD 28       =!IP     CON(2)  #82
910 E06AF 94               NIBASC  \I\
911 E06B1 0D               CON(2)  \P\+#80
912 E06B3 8B60     =IP      CON(5)  =$IP
            E
913 E06B8 8E00     =$IP     GOSUBL  =NUMST
            00
914 E06BE 822              SB=0
915 E06C1 821              XM=0
916 E06C4 8F00             GOSBVL  =CLRFRC
```

```
                000
    917 E06CB 6D12          GOTO    =FEND
```

```
                        EJECT
                ***********************************************
                *
                * .S   This word implements a non-destructive
                *      stack print.  NOTE: it does an unsigned
                *      stack display.
                *
                ***********************************************

E06CF DA60E     =!IP    CON(5)  =!IP
E06D4 28        =!DOTS  CON(2)  #82
E06D6 E2                CON(2)  \.\
E06D8 3D                CON(2)  \S\+#80
E06DA 00000     =DOTS   CON(5)  =DOCOL          :
E06DF C3F0E             CON(5)  =CR             ISSUE CARRIAGE RETURN
E06E4 00000             CON(5)  =DEPTH          FIND # ITEMS
E06E9 58A0E             CON(5)  =ZEQ            IF EMPTY STACK
E06EE 00000             CON(5)  =ABRT"X
E06F3 E0                CON(2)  =eEMPT          ABORT" empty stack"
E06F5 00000             CON(5)  =SP@            STACK LEVEL NOW
E06FA E3E0E             CON(5)  =S0             STACK START
E06FF 00000             CON(5)  =SWAP           SWITCH FOR LOOP
E0704 00000             CON(5)  =XDO            PREPARE LOOP
E0709 04A0E     DS00    CON(5)  =I              GET ADDR
E070E 1720E             CON(5)  =AT             CONTENTS OF ADDR
E0713 0920E             CON(5)  =ZERO           MAKE IT DOUBLE WORD
E0718 DBE0E             CON(5)  =D.             SHOW IT
E071D 00000             CON(5)  =LIT            INCREMENT BY 1 ADDR's WORTH
E0722 50000             CON(5)  5
E0727 00000             CON(5)  =<+LP>          +LOOP
E072C DDFFF             CON(5)  (DS00)-*
E0731 00000             CON(5)  =SEMI           ;
```

```
950                     EJECT
951                 ****************************************
952                 *
953                 * H.  (n --- ) Display n in base 16
954                 *      as an unsigned number.
955                 *
956                 ****************************************
957 E0736 4D60            CON(5)  =!DOTS
          E
958 E073B 28    =!H.     CON(2)  #82
959 E073D 84            CON(2)  \H\
960 E073F EA            CON(2)  \.\+#80
961 E0741 0000  =H.      CON(5)  =DOCOL
          0
962 E0746 0000           CON(5)  =BASE          GET CURRENT BASE
          0
963 E074B 1720           CON(5)  =AT
          E
964 E0750 0000           CON(5)  =SWAP          n TO TOP OF STACK
          0
965 E0755 0000           CON(5)  =HEX           SET HEX MODE
          0
966 E075A EA01           CON(5)  =U.            DISP AS UNSIGNED NUMBER
          E
967 E075F 0000           CON(5)  =BASE          RESTORE BASE
          0
968 E0764 C420           CON(5)  =STORE
          E
969 E0769 0000           CON(5)  =SEMI          ; DONE
          0
```

```
970                     EJECT
971                *********************************************
972                *
973                * LN  This word takes the natural log of
974                *     the value in the X register of the
975                *     floating point stack and puts the answer
976                *     into X and puts X into LASTX.
977                *
978                *********************************************
979 E076E B370           CON(5)  !H.
          E
980 E0773 28     =!LN    CON(2)  #82
981 E0775 C4             CON(2)  \L\
982 E0777 EC             CON(2)  \N\+#80
983 E0779 E770   =LN     CON(5)  $LN
          E
984 E077E 8E00   $LN     GOSUBL  =NUMST
          00
985 E0784 8F00           GOSBVL  =LN15          TAKE NATURAL LOG
          000
986 E078B 8CC5           GOLONG  =FEND          CLEAN UP
          10
987                *********************************************
988                *
989                * F.   ( --- )  This word TYPEs the contents
990                *        of the floating point X register.  It
991                *        unlike . it does not do a destructive
992                *        type.
993                *
994                *********************************************
995 E0791 3770           CON(5) !LN
          E
996 E0796 28     =!F.    CON(2) #82
997 E0798 64             CON(2) \F\
998 E079A EA             CON(2) \.\+#80
999 E079C 0000   =F.     CON(5) =DOCOL
          0
1000 E07A1 0B70          CON(5) =FF.            SHOW X REG
          E
1001 E07A6 0000          CON(5) =SPACE          ADD A SPACE
          0
1002 E07AB 0000          CON(5) =SEMI           DONE
          0
1003
1004               *
1005               * REAL F.
1006               *
1007
1008 E07B0 5B70   =FF.   CON(5) $F.
          E
1009 E07B5 7B00   =$F.   GOSUB  $XSTR$          see below
1010 E07B9 8C00          GOLONG =$TYPE         show user result
          00
1011
1012
```

```
1013                * This routine is used by F. and FSTR$.  It makes
1014                * a string from the contents of the X register.
1015
1016
1017 E07BF 4C70 =XSTR$   CON(5) $XSTR$
          E
1018 E07C4 8E00 $XSTR$   GOSUBL =SAVEFP        SAVE FORTH POINTERS
          00
1019 E07CA 8F00          GOSBVL =COLLAP        COLLAPSE MATH STACK
          000
1020 E07D1 1F00          D1=(5) =MTHSTK
          000
1021 E07D8 143           A=DAT1 A              A(A)=TOP OF STACK
1022 E07DB 131           D1=A                  D1-->T.O.S.
1023 E07DE 20            P=     0
1024 E07E0 3401          LC(5)  16
          000
1025 E07E7 EA            A=A-C  A
1026 E07E9 1B00          D0=(5) =AVMEMS        MAKE SURE THERE'S
          000
1027 E07F0 146           C=DAT0 A              ROOM FOR 16 NIBS
1028 E07F3 8B6           ?A>C   A              ROOM?
1029 E07F6 90            GOYES  F.0            YES
1030 E07F8 8D00          GOVLNG =MEMERR        NO, GIVE ERROR
          000
1031
1032 E07FF 1CF  F.0      D1=D1- 16
1033 E0802 1B0D          D0=(5) =oX
          BF2
1034 E0809 1567          C=DAT0 W              C(W)=X
1035 E080D 1557          DAT1=C W              WRITE X TO MATH STACK
1036 E0811 8F00          GOSBVL =STR$SB        CONVERT TO STRING
          000
1037 E0818 8F00          GOSBVL =REV$          REVERSE STRING
          000
1038 E081F 171           D1=D1+ 2
1039 E0822 AF2           C=0    W
1040 E0825 147           C=DAT1 A              READ LENGTH IN NIBS
1041 E0828 81E           CSRB                  LENGTH IN BYTES
1042 E082B 17D           D1=D1+ 14             D1-->STR
1043 E082E 06            RSTK=C                SAVE BYTE COUNT
1044 E0830 133           AD1EX
1045 E0833 8E00          GOSUBL =GETFP         RESTORE FORTH POINTERS
          00
1046 E0839 1C4           D1=D1- 5
1047 E083C 141           DAT1=A A              WRITE STR ADDR TO DATA STK
1048 E083F 1C4           D1=D1- 5
1049 E0842 07            C=RSTK
1050 E0844 145           DAT1=C A              WRITE BYTE CNT TO DATASTK
1051 E0847 01            RTN                   returns addr-cnt on stack
```

```
1052                    EJECT
1053              ************************************************
1054              *
1055              *  N@  ( addr --- n ) return the nibble quantity
1056              *       located at the given addr and put it on
1057              *       the stack.
1058              *
1059              ************************************************
1060 E0849 6970          CON(5) !F.
          E
1061 E084E 28    =!N@     CON(2) #82
1062 E0850 E4             NIBASC \N\
1063 E0852 0C             CON(2) \@\+#80
1064 E0854 9580  =N@      CON(5) $N@
          E
1065
1066 E0859 147   =$N@     C=DAT1 A              READ ADDR
1067 E085C 136            CD0EX                 ADDR TO D0
1068 E085F D0             A=0    A
1069 E0861 15A0           A=DAT0 1              READ NIBBLE
1070 E0865 134            D0=C                  RESTORE I
1071 E0868 141            DAT1=A A              WRITE NIBBLE
1072 E086B 03             RTNCC
1073
1074
1075              ************************************************
1076              *
1077              * N!  (n addr --- ) Store the nibble quantity n
1078              *     into the given addr.
1079              *
1080              ************************************************
1081 E086D E480           CON(5) =!N@
          E
1082 E0872 28    =!N!     CON(2) #82
1083 E0874 E4             NIBASC \N\
1084 E0876 1A             CON(2) \!\+#80
1085 E0878 D780  =N!      CON(5) $N!
          E
1086
1087 E087D 147   =$N!     C=DAT1 A              READ ADDR
1088 E0880 174            D1=D1+ 5
1089 E0883 15B0           A=DAT1 1              READ NIBBLE
1090 E0887 174            D1=D1+ 5              RTN NOTHING ON DATA STK
1091 E088A 136            CD0EX
1092 E088D 1580           DAT0=A 1              WRITE NIBBLE
1093 E0891 134            D0=C                  RESTORE I TO D0
1094 E0894 03             RTNCC
```

```
1095                    EJECT
1096                ************************************************
1097                *
1098                * F+            FLOATING POINT ADD
1099                *
1100                ************************************************
1101 E0896 2780            CON(5)  !N!
          E
1102 E089B 28      =!F+    CON(2)  #82
1103 E089D 64              NIBASC  \F\
1104 E089F BA              CON(2)  \+\+#80
1105 E08A1 6A80    =F+     CON(5)  =$F+
          E
1106 E08A6 7620    =$F+    GOSUB   FSTRT       SAVEFP;STKDRP;GETXLN;uMODES
1107 E08AA 8F00    NOWADD  GOSBVL  =AD15M      ADD 2 NUMBERS
          000
1108 E08B1 6730            GOTO    FEND        PUTABX;GETFP;RTNCC
1109
1110                ************************************************
1111                *
1112                * F-            FLOATING POINT SUBTRACT
1113                *
1114                ************************************************
1115 E08B5 B980            CON(5)  =!F+
          E
1116 E08BA 28      =!F-    CON(2)  #82
1117 E08BC 64              NIBASC  \F\
1118 E08BE DA              CON(2)  \-\+#80
1119 E08C0 5C80    =F-     CON(5)  =$F-
          E
1120 E08C5 7700    =$F-    GOSUB   FSTRT
1121 E08C9 BCE             C=-C-1  S               DECIMAL MODE SET BY GETXLN
1122 E08CC 6DDF            GOTO    NOWADD          IN FSTRT
1123
1124                ************************************
1125                * SUBROUTINES OF F+,F-,F*,F/         *
1126                ************************************
1127 E08D0 8E00    =FSTRT  GOSUBL  =SAVEFP     save FORTH pointers
          00
1128 E08D6 8F00            GOSBVL  =uMODES     set modes such as DEGREE/RADIAN,
          000
1129                *                           rounding,etc.
1130 E08DD 8E00            GOSUBL  =STKDRP     "drop" stack of simulated 41-C
          00
1131                *                           i.e. put Z in Y, etc.
1132 E08E3 8C00            GOLONG  =GETXLN     get contents of X in A&B, and
          00
1133                *                           put X in LASTX.
1134
1135 E08E9 8C00    =FEND   GOLONG  =PUTABX
          00
1136                * Put result of mainframe routine, left in CPU
1137                * registers A & B, back into location oX (the
1138                * "X-register"); restore FORTH pointers and return.
1139
```

```
1140            ****************************************
1141            *                                      *
1142            * F*            FLOATING POINT MULTIPLY *
1143            *                                      *
1144            ****************************************
1145 E08EF AB80         CON(5)  =!F-
           E
1146 E08F4 28   =!F*    CON(2)  #82
1147 E08F6 64           NIBASC  \F\
1148 E08F8 AA           CON(2)  \*\+#80
1149 E08FA FF80 =F*     CON(5)  =$F*
           E
1150 E08FF 7DCF =$F*    GOSUB   FSTRT
1151 E0903 8F00         GOSBVL  =MP2-15
           000
1152 E090A 6EDF         GOTO    FEND
1153
1154            ****************************************
1155            *
1156            * F/            FLOATING POINT DIVIDE
1157            *
1158            ****************************************
1159 E090E 4F80         CON(5)  =!F*
           E
1160 E0913 28   =!F/    CON(2)  #82
1161 E0915 64           NIBASC  \F\
1162 E0917 FA           CON(2)  \/\+#80
1163 E0919 E190 =F/     CON(5)  =$F/
           E
1164 E091E 7EAF =$F/    GOSUB   FSTRT
1165 E0922 8F00         GOSBVL  =DV2-15
           000
1166 E0929 6FBF         GOTO    FEND
1167
```

```
1168                    EJECT
1169              ************************
1170              * OF  --FROM CASE STMT   *
1171              ************************
1172
1173 E092D 3190          CON(5)  =!F/
          E
1174 E0932 2C    =!OF     CON(2)  #C2
1175 E0934 F4             NIBASC  \O\
1176 E0936 6C             CON(2)  \F\+#80
1177
1178              * Syntax check occurs to the extent that there must
1179              * be an 8 on the stack, as left at compile-time by CASE,
1180              * or a 7 as left by ENDOF. If there is an 8, it is assumed
1181              * that there are actually a pair of 8's and if 7, that the
1182              * 7 has an address with it: it is part of the general
1183              * scheme of control structures (including LEAVE) that things
1184              * on the stack at compile-time come in pairs.
1185              *
1186              * Note that there is no way to ensure that the value to
1187              * be matched at runtime has actually been compiled at this
1188              * point.
1189
1190 E0938 0000 =OF    CON(5)  =DOCOL        :
          0
1191 E093D 0000          CON(5)  =?COMP       ensure that we are in compile mode
          0
1192 E0942 0000          CON(5)   =DUP
          0
1193 E0947 0000          CON(5)   =LIT
          0
1194 E094C 8000          CON(5)   8           TO MATCH CASE'S 8
          0
1195 E0951 8C10           CON(5)  =EQUAL
          E
1196 E0956 0000           CON(5)  =ZBRNH          IF
          0
1197 E095B 4100           CON(5)  (OF01)-*
          0
1198 E0960 0000           CON(5)  =2DROP          DROP 2 8'S LEFT BY CASE
          0
1199 E0965 0000           CON(5)  =BRNCH         ELSE
          0
1200 E096A 0200           CON(5)  (OF02)-*
          0
1201              * MUST BE A 7 FROM ENDOF OR ABORT
1202 E096F 0000 OF01      CON(5)  =DUP            DUP POSSIBLE 7
          0
1203 E0974 0000           CON(5)  =LIT
          0
1204 E0979 7000           CON(5)  7
          0
1205 E097E 5801           CON(5)  =<>             not equal
          E
1206 E0983 0000           CON(5)  =ABORTW
```

```
      0
E0988 11          CON(2)  =eCOND      "conditionals not paired"
            * LEFT 7 AND ADDR FROM ENDOF IF WE SAW 7
            * (don't disturb them)

E098A 0000 0F02   CON(5)   =COMPL      COMPILE
      0
            *                                 (at runtime:)
E098F 0000        CON(5)   =OVER       OVER  get the index value
      0
E0994 0000        CON(5)   =COMPL      COMPILE
      0
E0999 8C10        CON(5)   =EQUAL      =     does it match value preceding t
      E
E099E 0000        CON(5)   =COMPL      COMPILE
      0
E09A3 0000        CON(5)   =ZBRNH      0BRANCH  if not jump to ENDOF or ENDC
      0
            *                                    (addr to be filled in later)
E09A8 0000        CON(5)   =HERE       HERE to be left on stack as pointer f
      0
            *                                ENDOF/ENDCASE to fill in their ad
E09AD 0920        CON(5)   =ZERO       0
      E
E09B2 CD20        CON(5)   =COMMA      ,   allot space for addr to be filled
      E
E09B7 0000        CON(5)   =COMPL      COMPILE
      0
E09BC 0000        CON(5)   =DROP       DROP  at runtime drop the index value
      0
            *                                  since we matched
E09C1 0000        CON(5)   =LIT
      0
E09C6 5000        CON(5)  5            5  leave 5 for syntax checking by END
      0
E09CB 0000        CON(5)   =SEMI       ;
      0

            ****************************************
            *
            * 4+  (n ---  n+4)
            *
            ****************************************

E09D0 5D90 =FOUR+ CON(5)  $four+
      E
E09D5 147  $four+ C=DAT1   A          read n
E09D8 E6          C=C+1    A          n+1
E09DA E6          C=C+1    A          n+2
E09DC E6          C=C+1    A          n+3
E09DE E6          C=C+1    A          n+4
E09E0 145         DAT1=C   A          write n+4
E09E3 03          RTNCC
```

```
1244                    EJECT
1245                ************************************************************
1246                *
1247                * R> ( -- n) transfer n from return stack to data stack
1248                *
1249                ************************************************************
1250
1251 E09E5 2390            CON(5)  =!OF
           E
1252 E09EA 28     =!R>     CON(2)  #82             R>
1253 E09EC 25              CON(2)  \R\
1254 E09EE EB              CON(2)  \>\+#80
1255 E09F0 5F90   =R>      CON(5)  =$R>
           E
1256
1257 E09F5 D9     =$R>     C=B     A               RTN STK TO C
1258 E09F7 137             CD1EX                   D1=RTN STK,  C=DATA STK
1259 E09FA 143             A=DAT1  A               A=n FROM RTN STK
1260 E09FD 174             D1=D1+  5
1261 E0A00 137             CD1EX                   D1=DATA STK, C=RTN STK
1262 E0A03 D5              B=C     A               RESTORE RTN STK TO B
1263 E0A05 1C4             D1=D1-  5
1264 E0A08 141             DAT1=A  A               PUSH VALUE TO DATA STK
1265 E0A0B 03              RTNCC
```

```
1266                    EJECT
1267                ****************************************************************
1268                *
1269                * >R  (n -- )  transfer n to return stack from data stack
1270                *
1271                ****************************************************************
1272
1273 E0A0D AE90         CON(5)  !R>
          E
1274 E0A12 28   =!>R    CON(2)  #82             >R
1275 E0A14 E3           CON(2)  \>\
1276 E0A16 2D           CON(2)  \R\+#80
1277 E0A18 D1A0 =>R     CON(5)  =$>R
          E
1278
1279 E0A1D D9   =$>R    C=B     A               RTN STK TO C
1280 E0A1F 143          A=DAT1  A               POP N TO A
1281 E0A22 174          D1=D1+  5
1282 E0A25 137          CD1EX                   DATA STK TO C, RTN STK TO D1
1283 E0A28 1C4          D1=D1-  5
1284 E0A2B 141          DAT1=A  A               PUSH N TO RTN STK
1285 E0A2E 137          CD1EX                   D1=DATA STK, C=RTN STK
1286 E0A31 D5           B=C     A               RESTORE RTN STK
1287 E0A33 03           RTNCC
```

```
1288                    EJECT
1289                ************************************************************
1290                *
1291                * R@  (  --  n)  copy top value from rtn stk to data stk
1292                *
1293                * FORTH word I does the same thing, except that it is
1294                * IMMEDIATE, compile-only.
1295                *
1296                ************************************************************
1297
1298 E0A35 21A0         CON(5)  =!>R
          E
1299 E0A3A 28   =!R@    CON(2)  #82             R@
1300 E0A3C 25          CON(2)  \R\
1301 E0A3E 0C          CON(2)  \@\+#80
1302 E0A40       =I
1303 E0A40 54A0 =R@     CON(5)  =$R@
          E
1304
1305 E0A45 D9   =$R@    C=B     A               RTN STK TO C
1306 E0A47 137         CD1EX                   C=DATA STK, D1=RTN STK
1307 E0A4A 143         A=DAT1  A               TOP ITEM FROM RTN STK
1308                *                           NOTE: ITS COPIED, NOT POPPED
1309 E0A4D 135         D1=C                    D1=DATA STK
1310 E0A50 1C4         D1=D1-  5
1311 E0A53 141         DAT1=A  A               PUSH ITEM TO DATA STK
1312 E0A56 03          RTNCC
```

```
1313                    EJECT
1314                ************************
1315                *
1316                * OR  (n1 n2 --- n3)
1317                *
1318                ************************
1319
1320 E0A58 A3A0           CON(5)  !R@
          E
1321 E0A5D 28     =!OR     CON(2)  #82             OR
1322 E0A5F F4              CON(2)  \O\
1323 E0A61 2D              CON(2)  \R\+#80
1324 E0A63 86A0 =OR       CON(5)  =$OR
          E
1325
1326 E0A68 147    =$OR     C=DAT1  A               POP n2
1327 E0A6B 174             D1=D1+  5
1328 E0A6E 143             A=DAT1  A               POP n1
1329 E0A71 0EFA            C=C!A   A               n1 OR n2
1330 E0A75 145             DAT1=C  A               PUSH RESULT
1331 E0A78 03              RTNCC
1332
1333                ********************************************************
1334                *
1335                * 0=  (n1  ---  t/f)    Returns 0 if n1 <> 0 (false)
1336                *                       else it returns -1 (true)
1337                *
1338                ********************************************************
1339
1340 E0A7A D5A0           CON(5)  =!OR
          E
1341 E0A7F 28     =!ZEQ    CON(2)  #82             0=
1342 E0A81 03              NIBASC  \0\
1343 E0A83 DB              CON(2)  \=\+#80
1344 E0A85 A8A0 =ZEQ      CON(5)  =$ZEQ
          E
1345
1346 E0A8A D0     =$ZEQ    A=0     A               PREPARE FALSE FLAG
1347 E0A8C 147             C=DAT1  A               POP FLAG
1348 E0A8F 8AE             ?C#0    A               NON-ZERO?
1349 E0A92 40              GOYES   ZEQ0            YES, RETURN FALSE FLAG
1350 E0A94 CC              A=A-1   A               MAKE IT ALL 1'S FOR TRUE
1351 E0A96 141  ZEQ0       DAT1=A  A               PUSH FLAG2
1352 E0A99 03              RTNCC
```

```
1353                    EJECT
1354                ***********************************************
1355                *
1356                * +!  (n addr ---  ) add n to value at addr
1357                *
1358                ***********************************************
1359
1360 E0A9B F7A0          CON(5)  !ZEQ
          E
1361 E0AA0 28    =!PSTOR CON(2)  #82             +!
1362 E0AA2 B2            CON(2)  \+\
1363 E0AA4 1A            CON(2)  \!\+#80
1364 E0AA6 BAA0 =PSTOR   CON(5)  =$PSTOR
          E
1365
1366 E0AAB 147   =$PSTOR C=DAT1  A               POP addr
1367 E0AAE 174           D1=D1+  5
1368 E0AB1 143           A=DAT1  A               POP n
1369 E0AB4 174           D1=D1+  5
1370 E0AB7 137           CD1EX                   DATA STK TO C, D1=ADDR
1371 E0ABA D7            D=C     A               SAVE DATA STK PTR
1372 E0ABC 147           C=DAT1  A               CONTENTS OF ADDR
1373 E0ABF C2            C=C+A   A               ADD
1374 E0AC1 145           DAT1=C  A               STORE NEW QUANTITY
1375 E0AC4 DB            C=D     A               RECOVER DATA STK
1376 E0AC6 135           D1=C                    RESTORE DATA STK
1377 E0AC9 03            RTNCC
```

```
1378                    EJECT
1379                ************************
1380                *
1381                * 2*    (n1 --- 2*n1)
1382                *
1383                ************************
1384 E0ACB 0AA0            CON(5)  !PSTOR
          E
1385 E0AD0 28      =!TWO*  CON(2)  #82             2*
1386 E0AD2 23              CON(2)  \2\
1387 E0AD4 AA              CON(2)  \*\+#80
1388 E0AD6 BDA0    =TWO*   CON(5)  =$TWO*
          E
1389
1390 E0ADB 147     =$TWO*  C=DAT1  A               POP n1
1391 E0ADE C6              C=C+C   A               n1+n1
1392 E0AE0 145             DAT1=C  A               PUSH 2*n1
1393 E0AE3 03              RTNCC
1394
1395                ****************************
1396                *
1397                * 2/    (n1 --- n1/2)
1398                *
1399                ****************************
1400
1401 E0AE5 0DA0            CON(5)  =!TWO*
          E
1402 E0AEA 28      =!TWO/  CON(2)  #82             2/
1403 E0AEC 23              CON(2)  \2\
1404 E0AEE FA              CON(2)  \/\+#80
1405 E0AF0 5FA0    =TWO/   CON(5)  =$TWO/
          E
1406
1407 E0AF5 8E00    =$TWO/  GOSUBL  =$ABS           ABS(n1), P=0 IF NEG
          00
1408 E0AFB AD2             C=0     M               CLEAR MANTISSA FOR SHIFT
1409                *                               CAN'T USE P TO CLEAR BECAUSE
1410                *                               ABS USES P AS A NEG FLAG
1411
1412 E0AFE 147             C=DAT1  A               READ ABS(n1)
1413 E0B01 81E             CSRB                    DIVIDE BY 2 (1 BIT SHIFT)
1414 E0B04 880             ?P#     0               WAS # POSITIVE?
1415 E0B07 40              GOYES   T/02           IF YES WE'RE DONE
1416 E0B09 FA              C=-C    A               RESTORE SIGN
1417 E0B0B 145     T/02    DAT1=C  A
1418 E0B0E 03              RTNCC
```

```
1419                    EJECT
1420                ************************************************************
1421                *
1422                * 5+     (n --- n+5)  handy for 20 bit address manipulations
1423                *
1424                ************************************************************
1425
1426 E0B10 AEA0             CON(5)  =!TWO/
           E
1427 E0B15 28     =!FIVE+   CON(2)  #82             5+
1428 E0B17 53               CON(2)  \5\
1429 E0B19 BA               CON(2)  \+\+#80
1430 E0B1B 02B0   =FIVE+    CON(5)  =$FIVE+
           E
1431
1432 E0B20 143    =$FIVE+   A=DAT1  A               POP n
1433 E0B23 20               P=      0
1434 E0B25 3450             LC(5)   5               C(A)=5
           000
1435 E0B2C CA     FV0       A=A+C   A               n+5
1436 E0B2E 141              DAT1=A  A               PUSH n+5
1437 E0B31 03               RTNCC
1438
1439                ************************************************************
1440                *
1441                * FIVE-  (n --- n-5) handy for 20 bit addr manipulations
1442                *
1443                ************************************************************
1444
1445 E0B33 51B0             CON(5)  !FIVE+
           E
1446 E0B38 28     =!FIVE-   CON(2)  #82             5-
1447 E0B3A 53               CON(2)  \5\
1448 E0B3C DA               CON(2)  \-\+#80
1449 E0B3E 34B0   =FIVE-    CON(5)  =$FIVE-
           E
1450
1451 E0B43 143    =$FIVE-   A=DAT1  A               POP n
1452 E0B46 20               P=      0
1453 E0B48 34BF             LC(5)   #FFFFB          2'S COMP OF -5
           FFF
1454 E0B4F 6CDF             GOTO    FV0             FINISH IN FIVE+
```

```
1455                    EJECT
1456
1457              ****************************
1458              *
1459              * TWO+   (n1 --- n1+2)
1460              *
1461              ****************************
1462
1463 E0B53 83B0           CON(5)  !FIVE-
          E
1464 E0B58 28     =!TWO+   CON(2)  #82              2+
1465 E0B5A 23              CON(2)  \2\
1466 E0B5C BA              CON(2)  \+\+#80
1467 E0B5E 36B0   =TWO+    CON(5)  =$TWO+
          E
1468
1469 E0B63 147    =$TWO+   C=DAT1 A                 READ n1
1470 E0B66 E6              C=C+1  A                 n1=n1+1
1471 E0B68 E6              C=C+1  A                 n1=n1+2
1472 E0B6A 145             DAT1=C A                 WRITE n1+2
1473 E0B6D 03              RTNCC
1474
1475              ************************
1476              *
1477              * ONE+   (n1 --- n1+1)
1478              *
1479              ************************
1480
1481 E0B6F 85B0           CON(5)  =!TWO+
          E
1482 E0B74 28     =!ONE+   CON(2)  #82              1+
1483 E0B76 13              CON(2)  \1\
1484 E0B78 BA              CON(2)  \+\+#80
1485 E0B7A F7B0   =ONE+    CON(5)  =$ONE+
          E
1486
1487 E0B7F 147    =$ONE+   C=DAT1  A                POP n1
1488 E0B82 E6              C=C+1   A                INCREMENT n1 BY 1
1489 E0B84 145             DAT1=C  A                PUSH n1+1
1490 E0B87 03              RTNCC
```

```
1491                    EJECT
1492                ************************
1493                *
1494                * TWO-  (n1 --- n1-2)
1495                *
1496                ************************
1497
1498 E0B89 47B0            CON(5)  =!ONE+
            E
1499 E0B8E 28      =!TWO-   CON(2)  #82              2-
1500 E0B90 23               CON(2)  \2\
1501 E0B92 DA               CON(2)  \-\+#80
1502 E0B94 99B0    =TWO-    CON(5)  =$TWO-
            E
1503
1504 E0B99 147     =$TWO-   C=DAT1 A                 READ n1
1505 E0B9C CE               C=C-1  A                 n1=n1-1
1506 E0B9E CE               C=C-1  A                 n1=n1-2
1507 E0BA0 145              DAT1=C A                 WRITE n1-2
1508 E0BA3 03               RTNCC
1509
1510                ******************************
1511                *
1512                * ONE-  (n1 --- n1-1)
1513                *
1514                ******************************
1515
1516 E0BA5 E8B0            CON(5)  =!TWO-
            E
1517 E0BAA 28      =!ONE-   CON(2)  #82              1-
1518 E0BAC 13               CON(2)  \1\
1519 E0BAE DA               CON(2)  \-\+#80
1520 E0BB0 5BB0    =ONE-    CON(5)  =$ONE-
            E
1521
1522 E0BB5 147     =$ONE-   C=DAT1  A                POP n1
1523 E0BB8 CE               C=C-1   A                DECREMENT n1 BY 1
1524 E0BBA 145              DAT1=C  A                PUSH n1-1
1525 E0BBD 03               RTNCC
```

```
1526                    EJECT
1527                ************************************************
1528                *
1529                * 0<  (n --- flag)
1530                *
1531                * Return true if n is negative else return false
1532                *
1533                ************************************************
1534
1535 E0BBF AAB0             CON(5)  =!ONE-
           E
1536 E0BC4 28     =!LTZ     CON(2)  #82             0<
1537 E0BC6 03               CON(2)  \0\
1538 E0BC8 CB               CON(2)  \<\+#80
1539 E0BCA FCB0 =LTZ        CON(5)  =$LTZ
           E
1540
1541 E0BCF 147    =$LTZ     C=DAT1  A               POP n
1542 E0BD2 D0               A=0     A               PREPARE FOR FALSE
1543 E0BD4 C6               C=C+C   A               CARRY IF NEGATIVE
1544 E0BD6 540              GONC    LTZ0            RETURN FALSE IF POSITIVE
1545 E0BD9 CC               A=A-1   A               NO, TRUE FLAG (ALL 1'S)
1546 E0BDB 141    LTZ0      DAT1=A  A               PUSH FLAG
1547 E0BDE 03               RTNCC
```

```
1548                    EJECT
1549                ************************************
1550                *
1551                * 0>  (n --- flag)
1552                *
1553                * Return true if n > 0 else false
1554                *
1555                ************************************
1556
1557 E0BE0 4CB0             CON(5)  =!LTZ
             E
1558 E0BE5 28     =!GTZ     CON(2)  #82             0>
1559 E0BE7 03               CON(2)  \0\
1560 E0BE9 EB               CON(2)  \>\+#80
1561 E0BEB 0FB0   =GTZ     CON(5)  =$GTZ
             E
1562
1563 E0BF0 147    =$GTZ     C=DAT1  A               POP n
1564 E0BF3 D0               A=0     A               PREPARE FALSE FLAG
1565 E0BF5 8AA              ?C=0    A               IF N=0 THEN FALSE
1566 E0BF8 90               GOYES   GTZ0            FALSE RETURN 0
1567 E0BFA C6               C=C+C   A               CARRY IF NEGATIVE
1568 E0BFC 440              GOC     GTZ0            NEGATIVE RETURN FALSE
1569 E0BFF CC               A=A-1   A               NO, TRUE FLAG (ALL 1'S)
1570 E0C01 141    GTZ0      DAT1=A  A               PUSH FLAG
1571 E0C04 03               RTNCC
```

```
1572                    EJECT
1573                ***********************************************
1574                *
1575                * U< (un1 un2 --- flag)  unsigned compare
1576                *
1577                ***********************************************
1578
1579 E0C06 5EB0            CON(5)  =!GTZ
              E
1580 E0C0B 28    =!U<      CON(2)  #82               U<
1581 E0C0D 55              CON(2)  \U\
1582 E0C0F CB              CON(2)  \<\+#80
1583 E0C11 61C0  =U<       CON(5)  =$U<
              E
1584
1585 E0C16 147   =$U<      C=DAT1  A                 POP un2
1586 E0C19 174             D1=D1+  5
1587 E0C1C 143             A=DAT1  A                 POP un1
1588 E0C1F 8B2             ?A<C    A                 un1 < un2?
1589 E0C22 90              GOYES   U<TR              YES
1590 E0C24 D0              A=0     A                 FALSE FLAG
1591 E0C26 141             DAT1=A  A                 STORE IT
1592 E0C29 03              RTNCC
1593 E0C2B D0    U<TR      A=0     A
1594 E0C2D CC              A=A-1   A                 TRUE = ALL 1'S
1595 E0C2F 141             DAT1=A  A                 WRITE FLAG
1596 E0C32 03              RTNCC
```

```
1597                    EJECT
1598                ******************************************************
1599                *
1600                * D- (d1 d2 --- d3) leave diff of 2 dbl #'s on stack
1601                *
1602                ******************************************************
1603
1604 E0C34 B0C0           CON(5)  =!U<
          E
1605 E0C39 28     =!D-     CON(2)  #82             D-
1606 E0C3B 44              CON(2)  \D\
1607 E0C3D DA              CON(2)  \-\+#80
1608 E0C3F 44C0   =D-      CON(5)  =$D-
          E
1609
1610 E0C44 8E00   =$D-     GOSUBL  =$DNGAT           MAKE D2= -D2
          00
1611 E0C4A 6310           GOTO    $D+
1612
1613                ************************************************************
1614                *
1615                * D+  (d1 d2 --- d3) leave sum of 2 double numbers on stack
1616                *
1617                ************************************************************
1618
1619 E0C4E 93C0           CON(5)  =!D-
          E
1620 E0C53 28     =!D+     CON(2)  #82
1621 E0C55 44              CON(2)  \D\
1622 E0C57 BA              CON(2)  \+\+#80
1623 E0C59 E5C0   =D+      CON(5)  =$D+
          E
1624
1625 E0C5E 1C4    =$D+     D1=D1-  5
1626 E0C61 15F9            C=DAT1  10              get MSDs of d2
1627 E0C65 179             D1=D1+  10
1628 E0C68 147             C=DAT1  A               get LSDs of d2
1629 E0C6B 15B9            A=DAT1  10              get MSDs of d1
1630 E0C6F 179             D1=D1+  10
1631 E0C72 143             A=DAT1  A               get LSDs of d1
1632 E0C75 29              P=      9
1633 E0C77 A12             C=C+A   WP              ADD
1634 E0C7A 145             DAT1=C  A               put LSDs of d3
1635 E0C7D 1C9             D1=D1-  10
1636 E0C80 15D9            DAT1=C  10              put MSDs of d3
1637 E0C84 174             D1=D1+  5
1638 E0C87 03              RTNCC
```

```
1639                    EJECT
1640                ******************************************************
1641                *
1642                * BL  ( -- " ") Push an ASCII blank on the DATA STK
1643                *
1644                ******************************************************
1645
1646 E0C89 35C0           CON(5)  =!D+
          E
1647 E0C8E 28    =!BL      CON(2)  #82               BL
1648 E0C90 24              CON(2)  \B\
1649 E0C92 CC              CON(2)  \L\+#80
1650 E0C94 0000  =BL       CON(5)  =DOCON
          0
1651 E0C99 0200           CON(5)  \ \
          0
```

```
1652                    EJECT
1653            ********************************************
1654            *
1655            * C@  (addr -- b)  Fetch byte from given addr.
1656            *                  NOTE: it puts 5 NIBS on the
1657            *                  DATA STK, the high order NIBS
1658            *                  ARE always 0
1659            *
1660            ************************************************
1661
1662 E0C9E E8C0         CON(5)  =!BL
        E
1663 E0CA3 28   =!CAT   CON(2)  #82             C@
1664 E0CA5 34           CON(2)  \C\
1665 E0CA7 0C           CON(2)  \@\+#80
1666 E0CA9 EAC0 =CAT    CON(5)  =$CAT
        E
1667
1668 E0CAE 147  =$CAT   C=DAT1  A       pop addr
1669 E0CB1 137          CD1EX           D1=addr, C=DATA STK
1670 E0CB4 D0           A=0     A       clear high nibbles
1671 E0CB6 14B          A=DAT1  B       read byte
1672 E0CB9 135          D1=C            D1=DATA STK
1673 E0CBC 141          DAT1=A  A       push byte
1674 E0CBF 03           RTNCC
1675
1676            ****************************************
1677            *
1678            * C!  (c addr --- ) store byte at addr.
1679            *
1680            ****************************************
1681
1682 E0CC1 3AC0         CON(5)  =!CAT
        E
1683 E0CC6 28   =!C!    CON(2)  #82
1684 E0CC8 34           NIBASC  \C\
1685 E0CCA 1A           CON(2)  \!\+#80
1686 E0CCC 1DC0 =C!     CON(5)  =$C!
        E
1687
1688 E0CD1 147  =$C!    C=DAT1  A       POP ADDR
1689 E0CD4 174          D1=D1+  5
1690 E0CD7 143          A=DAT1  A       POP c
1691 E0CDA 174          D1=D1+  5       RETURN NOTHING ON STACK
1692 E0CDD 137          CD1EX           ADDR TO D1, DATA STK TO C
1693 E0CE0 149          DAT1=A  B       STORE BYTE AT ADDR
1694 E0CE3 135          D1=C            RESTORE DATA STK TO C
1695 E0CE6 03           RTNCC
```

```
1696                    EJECT
1697                ******************************************************
1698                *
1699                * DOUSE    DOUSE is used to put the address of a User
1700                *          variable on the DATA STACK.
1701                *
1702                *         <USER VAR HEADER>
1703                *         <gosub DOUSE>
1704                *         <addr of User Var
1705                *          in User Var Table>
1706                *
1707                *
1708                ******************************************************
1709 E0CE8 07      =DOUSE  C=RSTK          POP ADDR OF OFFSET INTO UVAR
1710 E0CEA 136            CD0EX
1711 E0CED 142            A=DAT0  A       POP ADDR OF UVAR TO A(A)
1712 E0CF0 134            D0=C            RESTORE I TO D0
1713 E0CF3 1C4            D1=D1-  5
1714 E0CF6 141            DAT1=A  A       push addr to DATA STACK
1715 E0CF9 03             RTNCC
```

```
1716                    EJECT
1717                ***********************************
1718                *
1719                * DP ( --- addr)  addr of next free
1720                *       byte in user dictionary
1721                *
1722                ***********************************
1723
1724 E0CFB 00D0 =DP     CON(5)  =$DP
           E
1725 E0D00 74EF =$DP    GOSUB   DOUSE
1726 E0D04 39BF         CON(5)   (=oDP)
           2
```

```
1727                    EJECT
1728                ************************************************
1729                *
1730                * IF    compile time: ( - addr 2 )     immediate
1731                *
1732                * Puts ZBRNH code in word with a zero addr to be filled
1733                * in by THEN. It also leaves a 2 on the stack which
1734                * THEN knows to check for, just as a signal that
1735                * things match up.
1736                *
1737                ************************************************
1738
1739 E0D09 6CC0             CON(5)  =!C!
           E
1740 E0D0E 2C     =!IF      CON(2) #C2              IF
1741 E0D10 94               NIBASC \I\
1742 E0D12 6C               CON(2) \F\+#80
1743
1744 E0D14 0000   =IF       CON(5) =DOCOL
           0
1745 E0D19 0000             CON(5)  =COMPL          COMPILE
           0
1746 E0D1E 0000             CON(5)  =ZBRNH          0BRANCH
           0
1747 E0D23 0000             CON(5)  =HERE          leave pointer to addr to be filled
           0
1748                *                               in by THEN on stack
1749 E0D28 0920             CON(5)  =ZERO           0
           E
1750 E0D2D CD20             CON(5)  =COMMA        allot space for addr filled in later
           E
1751 E0D32 6B20             CON(5)  =TWO            2     for syntax checking by THEN
           E
1752 E0D37 0000             CON(5)  =SEMI           ;
           0
```

```
1753                    EJECT
1754                ********************************************
1755                *
1756                * DO   compile time: ( - addr 3 )   immediate
1757                *
1758                * compiles XDO
1759                *
1760                * The 3 left on stack is there to be checked by
1761                * LOOP, and to cause an error if there isn't
1762                * any LOOP.
1763                *
1764                ********************************************
1765
1766 E0D3C E0D0             CON(5) =!IF
           E
1767 E0D41 2C     =!DO      CON(2) #C2              IMMEDIATE
1768 E0D43 44                NIBASC \D\
1769 E0D45 FC                CON(2) \O\+#80
1770
1771 E0D47 0000 =DO         CON(5) =DOCOL
           0
1772 E0D4C 0000             CON(5)  =COMPL          COMPILE
           0
1773 E0D51 0000             CON(5)  =XDO            XDO
           0
1774 E0D56 0000             CON(5)  =HERE           leave ptr to beginning of
           0
1775                *                               loop for LOOP to branch back to
1776 E0D5B 9C20             CON(5)  =THREE          3  syntax check for LOOP
           E
1777 E0D60 0000             CON(5)  =SEMI           ;
           0
```

```
1778                    EJECT
1779                ********************************************************
1780                *
1781                * ."  (DOT-QUOTE)  compile the text up to but not including
1782                *     the delimiting "   When later executed display
1783                *     the text on the active display device.
1784                *
1785                *     According to the FORTH 83 Standard this word is
1786                *     legal ONLY during compile mode.  .( (dot paren) has
1787                *     taken the place of ."  in the execute mode.
1788                *
1789                *     IMMEDIATE
1790                *
1791                ********************************************************
1792
1793 E0D65 14D0             CON(5)  =!DO
           E
1794 E0D6A 2C     =!DOTQ    CON(2)  #C2
1795 E0D6C E2               NIBASC  \.\
1796 E0D6E 2A               CON(2)  \"\+#80
1797
1798 E0D70 0000   =DOTQ     CON(5) =DOCOL
           0
1799 E0D75 0000             CON(5)  =?COMP          enforce compile mode.
           0
1800 E0D7A 0000             CON(5)   =STRM          'STREAM   find source
           0
1801 E0D7F 9AC0             CON(5)   =CAT           C@  read next char
           E
1802 E0D84 0000             CON(5)   =LIT
           0
1803 E0D89 2200             CON(5)  34              \"\  see if its a quote
           0
1804 E0D8E 8C10             CON(5)   =EQUAL         =   if so
           E
1805 E0D93 0000             CON(5)   =ZBRNH         IF   we have a null string
           0
1806 E0D98 F000             CON(5)  (D0)-*               so just add
           0
1807 E0D9D 0000             CON(5)   =PT1+          2 >IN +!  adds 2 to input counter
           0
1808 E0DA2 0000             CON(5)   =SEMI          cheat and end here
           0
1809
1810 E0DA7 0000 D0          CON(5)   =LIT                 of the string
           0
1811 E0DAC 2200             CON(5)  34              \"\   delimited by a quote
           0
1812 E0DB1 0000             CON(5)   =COMPL         COMPILE   compile the cfa of
           0
1813 E0DB6 AFE0             CON(5)   =PDOTQ         <."">    runtime code for ."
           E
1814 E0DBB 0000             CON(5)   =GCHAR         move string to HERE, and make
           0
1815                *                                sure there's an ending "
```

```
1816              *                                  returns 1 if no ending "
1817 E0DC0 0000          CON(5)    =ABRT"X
           0
1818 E0DC5 50            CON(2)    =eNO"
1819              *      NIBASC    \no endin\
1820              *      NIBASC    \g  "\
1821 E0DC7 0000          CON(5)    =MOVDP       C@ 1+ 2* ALLOT
           0
1822 E0DCC 0000 D03      CON(5)    =SEMI        THEN THEN ;
           0
```

```
1823                    EJECT
1824                ************************************************************
1825                *
1826                * .(   (DOT-PAREN)  The characters up to but not including
1827                *       the delimiting ) (closing paren) are displayed
1828                *       regardless of mode.   FORTH 83 Standard
1829                *
1830                *       IMMEDIATE
1831                *
1832                ************************************************************
1833
1834 E0DD1 A6D0             CON(5)  =!DOTQ
          E
1835 E0DD6 2C     =!DOTP    CON(2)  #C2
1836 E0DD8 E2               NIBASC  \.\
1837 E0DDA 8A               CON(2)  \(\+#80
1838
1839 E0DDC 0000   =DOTP     CON(5) =DOCOL
          0
1840 E0DE1 0000             CON(5)   =STRM          'STREAM      find addr of input stre
          0
1841 E0DE6 9AC0             CON(5)   =CAT           C@           get 1st char
          E
1842 E0DEB 0000             CON(5)   =LIT
          0
1843 E0DF0 9200             CON(5)  41              \)\          see if its the delimiti
          0
1844 E0DF5 8C10             CON(5)   =EQUAL         =            paren,
          E
1845 E0DFA 0000             CON(5)   =ZBRNH         IF           if so we have a null
          0
1846 E0DFF F000             CON(5)  (PD0)-*                      string so
          0
1847 E0E04 0000             CON(5)   =PT1+          2 >IN +!     just add 2 to the input
          0
1848                *                                            nibble counter
1849 E0E09 0000             CON(5)   =SEMI          cheat and end here!
          0
1850
1851 E0E0E 0000 PD0         CON(5)   =LIT                        look for end of string
          0
1852 E0E13 9200             CON(5)  41              \)\          delimited by ending par
          0
1853 E0E18 0000             CON(5)   =GCHAR         move string to here, make sure that
          0
1854                *                               string ends with ), returns 1 if
1855                *                               ending ) is missing! and string add
1856 E0E1D 0000             CON(5)   =ABRT"X
          0
1857 E0E22 40               CON(2)   =eNOEP
1858                *       NIBASC   \no endin\
1859                *       NIBASC   \g  )\
1860 E0E24 0000             CON(5)   =COUNT         COUNT        get string params
          0
1861 E0E29 0000             CON(5)   =TYPE          TYPE         dispaly string
```

```
            0
   1862 E0E2E 0000 PD03    CON(5)   =SEMI        THEN ;
            0
```

```
1863                    EJECT
1864                ************************************************************
1865                *
1866                * S0 ( --- addr)  Returns addr of bottom of data stack.
1867                *
1868                ************************************************************
1869
1870 E0E33 6DD0            CON(5)  =!DOTP
           E
1871 E0E38 28      =!S0     CON(2)  #82             S0
1872 E0E3A 35               CON(2)  \S\
1873 E0E3C 0B               CON(2)  \0\+#80
1874 E0E3E 0000    =S0      CON(5)  =DOCOL          :
           0
1875 E0E43 0000             CON(5)   =SP0            SP0
           0
1876 E0E48 1720             CON(5)   =AT             @
           E
1877 E0E4D 0000             CON(5)   =SEMI           ;
           0
```

```
1878                    EJECT
1879                ****************************************************************
1880                *
1881                * M/  (d n1 --- n2 n3) Mixed magnitude operator, leaves the signe
1882                *       remainder, n2, and signed quotient, n3, the remainder tak
1883                *       its sign from the dividend.
1884                *
1885                ****************************************************************
1886
1887 E0E52 83E0             CON(5)  =!S0
           E
1888 E0E57 28       =!M/    CON(2)  #82             M/
1889 E0E59 D4               CON(2)  \M\
1890 E0E5B FA               CON(2)  \/\+#80
1891
1892 E0E5D 0000    =M/     CON(5)  =DOCOL          :
           0
1893 E0E62 0000             CON(5)   =OVER          d1 n1 d1
           0
1894 E0E67 81A0             CON(5)   =>R            d1 n1  :: d1
           E
1895 E0E6C 81A0             CON(5)   =>R            d1     :: n1 d1
           E
1896 E0E71 0000             CON(5)   =DABS          |d1|
           0
1897 E0E76 04A0             CON(5)   =R@            |d1| n1
           E
1898 E0E7B 0000             CON(5)   =ABS           |d1|  |n1|
           0
1899 E0E80 0000             CON(5)   =UDIV          urem uquot
           0
1900 E0E85 0F90             CON(5)   =R>            urem uquot n1
           E
1901 E0E8A 04A0             CON(5)   =R@            urem uquot n1 (high-nibs of d1)
           E
1902 E0E8F 0000             CON(5)   =XOR           XOR rtn 0 if n1 & high-nibs of sa
           0
1903 E0E94 0000             CON(5)   =?NEG          ?NEGATE  negate uquot if only one
           0
1904                *                               n1 & high-nibs were negative
1905 E0E99 0000             CON(5)   =SWAP          uquot urem
           0
1906 E0E9E 0F90             CON(5)   =R>            uquot urem (low-nibs of d1)
           E
1907 E0EA3 0000             CON(5)   =?NEG          negate urem if low-nibs negative
           0
1908 E0EA8 0000             CON(5)   =SWAP          urem uquot
           0
1909 E0EAD 0000             CON(5)   =SEMI           ;
           0
```

```
1910                    EJECT
1911                ****************************************************
1912                * D. (D-DOT)    (d --- ) Display d converted according to BASE
1913                *               in a free-field format, with one trailing blank.
1914                *               Display sign only if negative.
1915                *
1916                ****************************************************
1917
1918 E0EB2 75E0          CON(5)  =!M/
           E
1919 E0EB7 28    =!D.    CON(2)  #82             D.
1920 E0EB9 44            CON(2)  \D\
1921 E0EBB EA            CON(2)  \.\+#80
1922
1923 E0EBD 0000  =D.      CON(5)  =DOCOL          : D.
           0
1924 E0EC2 0920          CON(5)   =ZERO          0
           E
1925 E0EC7 0000          CON(5)   =D.R           D.R
           0
1926 E0ECC 0000          CON(5)   =SPACE         SPACE
           0
1927 E0ED1 0000          CON(5)   =SEMI          ;
           0
1928                ****************************************************
1929                *
1930                * */ (n1 n2 n3 -- n4)  Multiply n1 by n2 divide result
1931                *       by n3, leave quotient n4.
1932                *
1933                ************************************************
1934
1935 E0ED6 7BE0          CON(5)  =!D.
           E
1936 E0EDB 28    =!*/    CON(2)  #82
1937 E0EDD A2            NIBASC  \*\
1938 E0EDF FA            CON(2)  \/\+#80
1939
1940 E0EE1 0000  =*/      CON(5)  =DOCOL          :
           0
1941 E0EE6 0000          CON(5)   =*/MOD         rem quot
           0
1942 E0EEB 0000          CON(5)   =SWAP          quot rem
           0
1943 E0EF0 0000          CON(5)   =DROP          quot
           0
1944 E0EF5 0000          CON(5)   =SEMI           ;
           0
```

```
1945                    EJECT
1946                ********************************************
1947                *
1948                * ."    SEND A STRING TO THE DISPLAY
1949                *       COMPILED AFTER THE CFA FOR ." IS
1950                *       THE CHAR COUNT AND THE CHARS
1951                *
1952                ********************************************
1953
1954 E0EFA 0000 =PDOTQ  CON(5)   =DOCOL          :
          0
1955 E0EFF 04A0         CON(5)   =R@            R@  GET COPY FROM RTN STK
          E
1956 E0F04 0000         CON(5)   =COUNT         COUNT
          0
1957 E0F09 0000         CON(5)   =DUP           DUP
          0
1958 E0F0E A7B0         CON(5)   =ONE+          1+
          E
1959 E0F13 6DA0         CON(5)   =TWO*          2*  MAKE CHAR COUNT=NIBS
          E
1960 E0F18 0F90         CON(5)   =R>            R>
          E
1961 E0F1D C810         CON(5)   =ADD           +  ADDR OF NEXT RTNE
          E
1962 E0F22 81A0         CON(5)   =>R            >R RTN TO RTN STACK
          E
1963 E0F27 0000         CON(5)   =TYPE          TYPE STRING
          0
1964 E0F2C 0000         CON(5)   =SEMI          ;
          0
```

```
1965                    EJECT
1966                ************************************************************
1967                *
1968                * CR   Send a carriage return, line feed to the display
1969                *      device.
1970                *
1971                ************************************************************
1972 E0F31 BDE0           CON(5)  =!*/
             E
1973 E0F36 28     =!CR    CON(2)  #82
1974 E0F38 34             NIBASC  \C\
1975 E0F3A 2D             CON(2)  \R\+#80
1976 E0F3C 14F0   =CR     CON(5)  =$CR
             E
1977
1978 E0F41 8F00   =$CR    GOSBVL  =SAVEFP         SAVE FORTH POINTERS
             000
1979 E0F48 20             P=      0
1980 E0F4A 8F00           GOSBVL  =CRLFOF         CR LF TO DISPLAY
             000
1981 E0F51 8D00           GOVLNG  =GETFP          RESTORE FORTH POINTERS
             000
```

```
1982                    EJECT
1983                ****************************************************************
1984                *
1985                * #S (SHARP-S)  (ud --- 0 0 ) Convert all digits of an unsigned
1986                *               40 bit number ud, adding each to the pictured
1987                *               numeric output text, until remainder is zero.
1988                *               Use between <# and #>.
1989                *
1990                ****************************************************************
1991
1992 E0F58 63F0             CON(5)  =!CR
           E
1993 E0F5D 28       =!N#S   CON(2)  #82             #S
1994 E0F5F 32               CON(2)  \#\
1995 E0F61 3D               CON(2)  \S\+#80
1996 E0F63 0000     =N#S    CON(5)  =DOCOL          : #S
           0
1997                                                BEGIN
1998 E0F68 7830     N00     CON(5)   =N#            #
           E
1999 E0F6D 0000             CON(5)   =2DUP          2DUP
           0
2000 E0F72 36A0             CON(5)   =OR            OR
           E
2001 E0F77 58A0             CON(5)   =ZEQ           0=
           E
2002 E0F7C 0000             CON(5)   =ZBRNH         UNTIL
           0
2003 E0F81 7EFF             CON(5)  (N00)-*
           F
2004 E0F86 0000             CON(5)   =SEMI          ;
           0
2005
2006                ****************************************************************
2007                *
2008                * #>  (SHARP-GREATER)   (ud --- addr n)  End pictured numeric out
2009                *               conversion.  Drop ud, leaving text addr and char
2010                *               suitable for TYPE.
2011                *
2012                ****************************************************************
2013
2014 E0F8B D5F0             CON(5)  =!N#S
           E
2015 E0F90 28       =!GT#   CON(2)  #82             #>
2016 E0F92 32               CON(2)  \#\
2017 E0F94 EB               CON(2)  \>\+#80
2018
2019 E0F96 0000     =GT#    CON(5)  =DOCOL          : #>
           0
2020 E0F9B 0000             CON(5)   =2DROP         drop ud
           0
2021 E0FA0 0000             CON(5)   =HLD           get addr of last char
           0
2022 E0FA5 1720             CON(5)   =AT            converted
           E
```

```
2023 E0FAA 0000          CON(5)   =PAD           addr of PAD
           0
2024 E0FAF 0000          CON(5)   =OVER          <addr last char> pad <addr last c
           0
2025 E0FB4 AA10          CON(5)   =MINUS         get nibble difference
           E
2026 E0FB9 0FA0          CON(5)   =TWO/          divide by 2 for byte count of cha
           E
2027 E0FBE 0000          CON(5)   =SEMI          ;
           0
2028
2029               ****************************************************************
2030               *
2031               * <#  (LESS-SHARP)    ( --- ) Initialize pictured numeric
2032               *       output.
2033               *
2034               ****************************************************************
2035
2036 E0FC3 09F0            CON(5)  =!GT#
           E
2037 E0FC8 28    =!LT#     CON(2)  #82             <#
2038 E0FCA C3              CON(2)  \<\
2039 E0FCC 3A              CON(2)  \#\+#80
2040
2041 E0FCE 0000  =LT#      CON(5)  =DOCOL          : <#
           0
2042 E0FD3 0000            CON(5)   =PAD           set HLD to contain
           0
2043 E0FD8 0000            CON(5)   =HLD           addr of PAD as starting place
           0
2044 E0FDD C420            CON(5)   =STORE
           E
2045 E0FE2 0000            CON(5)   =SEMI          ;
           0
```

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THE READER AGREES NOT TO
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```
2046                    EJECT
2047                ************************
2048                *
2049                * D<  (d1  d2  --- f)
2050                *
2051                ********************************
2052
2053 E0FE7 8CF0              CON(5)  =!LT#
         E
2054 E0FEC 28      =!D<     CON(2)  #82             D<
2055 E0FEE 44              CON(2)  \D\
2056 E0FF0 CB              CON(2)  \<\+#80
2057
2058 E0FF2 7FF0    =D<      CON(5)  =$D<
         E
2059 E0FF7 1C4     =$D<     D1=D1-  5
2060 E0FFA 15B9             A=DAT1  10          GET N2 MSD IN A[5-9]
2061 E0FFE 179              D1=D1+  10
2062 E1001 143              A=DAT1  A           GET N2 LSD IN A[A]
2063 E1004 15F9             C=DAT1  10          GET N1 MSD IN C[5-9]
2064 E1008 179              D1=D1+  10
2065 E100B 147              C=DAT1  A           GET N1 LSD IN C[A]
2066 E100E 2A               P=      10
2067 E1010 A82              C=0     P
2068 E1013 A80              A=0     P           CLEAR FOR TEST
2069 E1016 A16              C=C+C   WP
2070 E1019 A14              A=A+A   WP          SHIFT HIGH BIT INTO NIB 10
2071 E101C 902              ?C=A    P           SAME SIGN? IF SO, TEST WORKS
2072 E101F 50               GOYES   SAMSIN
2073                *                           (BECAUSE BIGGER NEGATIVE NUMBER
2074                *                           IS SMALLER UNSIGNED NUMBER)
2075 E1021 A9E              ACEX    WP          ELSE EXCHANGE (SO FALSE IF N2 NEG)
2076 E1024 996     SAMSIN   ?A>C    WP          N2 > N1 ?
2077 E1027 90               GOYES   D<TRUE
2078 E1029 D0               A=0     A
2079 E102B 141     D<RES    DAT1=A  A           RETURN FALSE
2080 E102E 03               RTNCC
2081 E1030 D0      D<TRUE   A=0     A
2082 E1032 CC               A=A-1   A           TRUE FLAG
2083 E1034 66FF             GOTO    D<RES
2084
2085                ************************************
2086                *
2087                * M* (MIXED MULTIPLY)  (n1 n2 --- d)
2088                *
2089                ************************************
2090
2091 E1038 CEF0              CON(5)  =!D<
         E
2092 E103D 28      =!M*     CON(2)  #82             M*
2093 E103F D4               CON(2)  \M\
2094 E1041 AA               CON(2)  \*\+#80
2095
2096 E1043 0000    =M*      CON(5)  =DOCOL          :
         0
```

```
2097 E1048 0000 0        CON(5)   =2DUP          n1 n2 n1 n2
2098 E104D 0000 0        CON(5)   =XOR           produces neg # if 1 or other is
2099 E1052 81A0 E        CON(5)   =>R            save flag on rtn stk
2100 E1057 0000 0        CON(5)   =ABS           n1  |n2|
2101 E105C 0000 0        CON(5)   =SWAP          |n2| n1
2102 E1061 0000 0        CON(5)   =ABS           |n2|  |n1|
2103 E1066 0000 0        CON(5)   =U*            d1
2104 E106B 0F90 E        CON(5)   =R>            recover flag
2105 E1070 0000 0        CON(5)   =D?NEG         negate d1 if XOR answer is negat
2106 E1075 0000 0        CON(5)   =SEMI          ;
```

```
                    EJECT
            ***************************
            *
            * <>  ( n1  n2 --- n3)
            *
            * RETURN TRUE IF n1 # n2 ELSE
            * RETURN FALSE FLAG
            *
            ***************************

E107A D301          CON(5)  =!M*
      E
E107F 28    =!<>    CON(2)  #82             <>
E1081 C3            CON(2)  \<\
E1083 EB            CON(2)  \>\+#80

E1085 A801  =<>     CON(5)  $<>
      E
E108A 143   $<>     A=DAT1  A             read n2
E108D 174           D1=D1+  5
E1090 147           C=DAT1  A             read n1
E1093 E2            C=C-A   A
E1095 8AA           ?C=0    A             false flag
E1098 60            GOYES   <>0
E109A D2            C=0     A
E109C CE            C=C-1   A             true flag
E109E 145   <>0     DAT1=C  A             write flag
E10A1 03            RTNCC

            ***************************************************************
            *
            * U.  (un --- )  Display un converted according to BASE as an
            *       unsigned number.
            *
            ***************************************************************

E10A3 F701          CON(5)  =!<>
      E
E10A8 28    =!U.    CON(2)  #82             U.
E10AA 55            CON(2)  \U\
E10AC EA            CON(2)  \.\+#80

E10AE 0000  =U.     CON(5)  =DOCOL          :
      0
E10B3 0920          CON(5)   =ZERO          0
      E
E10B8 DBE0          CON(5)   =D.            D.
      E
E10BD 0000          CON(5)   =SEMI          ;
      0
```

```
2150                    EJECT
2151                ********************************************************
2152                *
2153                * C,  (n --- ) Store lower order 8 bits of n at next byte
2154                *       in dictionary, advancing dictionary pointer
2155                *
2156                * -----VECTORED WORD-----
2157                *
2158                ********************************************************
2159
2160 E10C2 8A01            CON(5)  =!U.
           E
2161 E10C7 28     =!C,     CON(2)  #82             C,
2162 E10C9 34              CON(2)  \C\
2163 E10CB CA              CON(2)  \,\+#80
2164
2165 E10CD 0000   =C,      CON(5)  =DOCOL          :
           0
2166 E10D2 0000            CON(5)  =LIT
           0
2167 E10D7 43CF            CON(5)  =oCCOMA         VECTOR FOR C,
           2
2168 E10DC 1720            CON(5)  =AT             CFA TO USE
           E
2169 E10E1 0000            CON(5)  =EXEC           EXECUTE IT
           0
2170 E10E6 0000            CON(5)  =SEMI
           0
2171
2172                *
2173                * DEFAULT C, ROUTINE
2174                *
2175
2176 E10EB 0000  =ICCOMA  CON(5)  =DOCOL          :
           0
2177 E10F0 0000            CON(5)   =HERE          addr of first free nib in diction
           0
2178 E10F5 CCC0            CON(5)   =C!            store byte there
           E
2179 E10FA 6B20            CON(5)   =TWO           2  (ALLOT WANTS NIBS)
           E
2180 E10FF 0000            CON(5)   =ALLOT         allot 2 nibs
           0
2181 E1104 0000            CON(5)   =SEMI          ;
           0
```

```
2182                    EJECT
2183              ********************************************
2184              *
2185              * S!                          ( str1 str2 -- )
2186              * Set value of string. Str1 may be a temporary
2187              * created by " .
2188              * If len(str1)>maxlen(str2), give error msg.
2189              *
2190              ********************************************
2191
2192 E1109 7C01          CON(5)  =!C,
          E
2193 E110E 28    =!S!     CON(2)  #82
2194 E1110 35            NIBASC  \S\
2195 E1112 1A            CON(2)  \!\+#80
2196 E1114 0000  =S!     CON(5)  =DOCOL        :
          0
2197 E1119 0000          CON(5)   =2DUP        COPY STR2
          0
2198 E111E 0000          CON(5)   =MXLEN       addr1 len1 addr2 len2 maxlen
          0
2199 E1123 0000          CON(5)   =SWAP        addr1 len1 addr2 maxlen len2
          0
2200 E1128 0000          CON(5)   =DROP        addr1 len1 addr2 maxlen
          0
2201
2202              *  addr1 len1 addr2 max2
2203
2204 E112D 9C20          CON(5)   =THREE
          E
2205 E1132 0000          CON(5)   =PICK
          0
2206              *  addr1 len1 addr2 max2 len1
2207 E1137 FE10           CON(5)  =LT             LEN1>MAX2?
          E
2208 E113C 0000           CON(5)  =ABORTW
          0
2209 E1141 53             CON(2)  =eSWF           "STRING WON'T FIT"
2210              *  addr1 len1 addr2
2211 E1143 0000          CON(5)   =2DUP        2DUP
          0
2212 E1148 49B0          CON(5)   =TWO-        2-
          E
2213 E114D CCC0          CON(5)   =C!          C!
          E
2214              * STORE LEN1 AS NEW CURLEN2
2215              * addr1 len1 addr2
2216 E1152 0000          CON(5)   =SWAP        addr1 addr2 len1
          0
2217 E1157 0000          CON(5)   =CMOVE       move string to addr2
          0
2218 E115C 0000          CON(5)   =SEMI        ;
          0
```

```
2219                    EJECT
2220              ************************************************
2221              *
2222              * S=                          ( str1 str2 -- t/f )
2223              * Tells whether two strings are equal, i.e. of
2224              * same length and having all same characters in
2225              * same order.
2226              *
2227              ************************************************
2228
2229 E1161 E011          CON(5)   =!S!
          E
2230 E1166 28    =!S=     CON(2)   #82
2231 E1168 35             NIBASC   \S\
2232 E116A DB             CON(2)   \=\+#80
2233 E116C 1711  =S=      CON(5)   =$S=
          E
2234
2235 E1171 8F00  =$S=     GOSBVL   =SAVEFP
          000
2236 E1178 7620           GOSUB    SETSTR        put lengths in scratch registers
2237 E117C 118            C=R0                   get len2
2238 E117F 112            A=R2                   len1
2239 E1182 8A6            ?C#A     A             strings of same length?
2240 E1185 51             GOYES    fail          if not return answer of false
2241 E1187 D7             D=C      A             D=len
2242 E1189 7830           GOSUB    RESET         D0&D1 point to strings
2243 E118D 7240           GOSUB    SAME          set carry if they are identical
2244 E1191 4C0            GOC      less          "less" will rtn true flag
2245 E1194 D1             B=0      A             sett B as false flag
2246 E1196 65C0           GOTO     MATCH         rtn B,= false
2247              *
2248 E119A 67C0  fail     GOTO     FAIL
2249 E119E 69B0  less     GOTO     LESS
2250
2251              * subroutines of S= , POS and S<
2252
2253 E11A2 147   =SETSTR C=DAT1  A
2254 E11A5 108           R0=C                   R0=len2
2255 E11A8 174           D1=D1+   5
2256 E11AB 147           C=DAT1   A
2257 E11AE 109           R1=C                   R1=addr2
2258 E11B1 174           D1=D1+   5
2259 E11B4 147           C=DAT1   A
2260 E11B7 10A           R2=C                   R2=len1
2261 E11BA 174           D1=D1+   5
2262 E11BD 147           C=DAT1   A
2263 E11C0 10B           R3=C                   R3=addr1
2264 E11C3 01            RTN
2265
2266 E11C5 119   =RESET C=R1
2267 E11C8 137           CD1EX
2268 E11CB 11B           C=R3
2269 E11CE 136           CD0EX
2270 E11D1 01            RTN
```

```
2271
2272            * TEST FOR EQUALITY, GIVEN: D1,D0 point to
2273            * two strings, D[A]=length of them both.
2274            *
2275
2276 E11D3 8AB  =SAME  ?D=0    A          done with strings?
2277 E11D6 B1          GOYES   SAMEY      (null strings match by definition)
2278 E11D8 14F         C=DAT1  B          get char
2279 E11DB 14A         A=DAT0  B          get char
2280 E11DE 966         ?C#A    B
2281 E11E1 E0          GOYES   SAMENO     some char didn't match
2282 E11E3 161         D0=D0+  2
2283 E11E6 171         D1=D1+  2          point to next chars
2284 E11E9 CF          D=D-1   A          count down length
2285 E11EB 67EF        GOTO    SAME
2286 E11EF 03   SAMENO RTNCC
2287 E11F1 02   SAMEY  RTNSC
```

```
2288                    EJECT
2289                ******************************************************
2290                *
2291                * S<                          ( str1 str2 -- t/f )
2292                * Test for str1<str2 (defined in terms of ASCII
2293                * values). A shorter string is < a longer one that
2294                * starts out the same.
2295                *
2296                ******************************************************
2297
2298 E11F3 6611         CON(5)  =!S=
           E
2299 E11F8 28    =!S<    CON(2)  #82
2300 E11FA 35          NIBASC  \S\
2301 E11FC CB          CON(2)  \<\+#80
2302 E11FE 3021 =S<     CON(5)  =$S<
           E
2303
2304 E1203 8F00 =$S<    GOSBVL  =SAVEFP
           000
2305 E120A 143         A=DAT1  A           A(A)=len2
2306 E120D 174         D1=D1+  5
2307 E1210 147         C=DAT1  A           get addr2
2308 E1213 136         CD0EX               D0--->addr2
2309 E1216 174         D1=D1+  5
2310 E1219 147         C=DAT1  A           C(A)=len1
2311 E121C 174         D1=D1+  5
2312 E121F D8          B=A     A           assume len1 > len2
2313 E1221 841         ST=0    1           flag for this condition
2314 E1224 8BA         ?A<=C   A           len2 <= len1?
2315 E1227 70          GOYES   S<01
2316 E1229 D5          B=C     A           len2 > len1
2317                * B is set to whichever length is less
2318 E122B 851         ST=1    1           flag len2 > len1
2319                * what's happening here is that if the first string is
2320                * longer, we need to remember that,in case it matches
2321                * up through the end of the second string (at which
2322                * point we say false).
2323 E122E 147  S<01    C=DAT1  A
2324 E1231 137         CD1EX               D1--->addr1
2325 E1234 CD    S<00    B=B-1   A           decrement counter
2326 E1236 4C1         GOC     S<02        done!
2327 E1239 14B         A=DAT1  B           str1
2328 E123C 14E         C=DAT0  B           str2
2329 E123F 9E2         ?A<C    B
2330 E1242 61          GOYES   LESS        return true
2331 E1244 9E6         ?A>C    B
2332 E1247 B1          GOYES   FAIL        return false
2333                * otherwise they are still identical
2334 E1249 171         D1=D1+  2           increment str1
2335 E124C 161         D0=D0+  2           increment str2
2336 E124F 64EF        GOTO    S<00        do another
2337
2338                * strings matched through end of the shorter one
2339 E1253 861  S<02    ?ST=0   1           len1>=len2?
```

```
2340 E1256 C0          GOYES   FAIL
2341
2342 E1258 D1    LESS  B=0     A
2343 E125A CD          B=B-1   A
2344 E125C 8C00  MATCH GOLONG  =fMATCH
           00
2345 E1262 8C00  FAIL  GOLONG  =fFAIL
           00
2346
2347 E1268       =REND1 END
```

```
=!*/     Abs  921307 #E0EDB -  1936  1972
=!/      Abs  918306 #E0322 -   473   492
=!<>     Abs  921727 #E107F -  2118  2141
=!>R     Abs  920082 #E0A12 -  1274  1298
=!ADD    Abs  917896 #E0188 -   238   257
 !ASC    Ext              -    19
=!AT     Abs  918125 #E026D -   368   386
=!BL     Abs  920718 #E0C8E -  1647  1662
=!C!     Abs  920774 #E0CC6 -  1683  1739
=!C,     Abs  921799 #E10C7 -  2161  2192
=!CAT    Abs  920739 #E0CA3 -  1663  1682
 !CLALL  Ext              -    24
=!COLON  Abs  918619 #E045B -   643   669
=!COMMA  Abs  918232 #E02D8 -   444   472
=!CR     Abs  921398 #E0F36 -  1973  1992
=!D+     Abs  920659 #E0C53 -  1620  1646
=!D-     Abs  920633 #E0C39 -  1605  1619
=!D.     Abs  921271 #E0EB7 -  1919  1935
=!D<     Abs  921580 #E0FEC -  2054  2091
 !DEFIN  Ext              -    27
=!DO     Abs  920897 #E0D41 -  1767  1793
=!DOT    Abs  918374 #E0366 -   510   528
=!DOTP   Abs  921046 #E0DD6 -  1835  1870
=!DOTQ   Abs  920938 #E0D6A -  1794  1834
=!DOTS   Abs  919252 #E06D4 -   928   957
 !END$   Ext              -    20
=!EQUAL  Abs  917956 #E01C4 -   276   297
=!F*     Abs  919796 #E08F4 -  1146  1159
=!F+     Abs  919707 #E089B -  1102  1115
=!F-     Abs  919738 #E08BA -  1116  1145
=!F.     Abs  919446 #E0796 -   996  1060
=!F/     Abs  919827 #E0913 -  1160  1173
 !FADJ   Ext              -    23
=!FIVE+  Abs  920341 #E0B15 -  1427  1445
=!FIVE-  Abs  920376 #E0B38 -  1446  1463
=!FP     Abs  919174 #E0686 -   886   908
=!GT     Abs  918061 #E022D -   332   347
=!GT#    Abs  921488 #E0F90 -  2015  2036
=!GTZ    Abs  920549 #E0BE5 -  1558  1579
=!H.     Abs  919355 #E073B -   958   979
=!I      Abs  917811 #E0133 -   190   213
=!IF     Abs  920846 #E0D0E -  1740  1766
 !IMMED  Ext              -    25
=!IP     Abs  919213 #E06AD -   909   927
=!J      Abs  917840 #E0150 -   214   237
=!L      Abs  917740 #E00EC -   145   158
=!LBRAC  Abs  918340 #E0344 -   493   509
 !LEFT$  Ext              -    21
=!LN     Abs  919411 #E0773 -   980   995
=!LT     Abs  917995 #E01EB -   298   331
=!LT#    Abs  921544 #E0FC8 -  2037  2053
=!LTZ    Abs  920516 #E0BC4 -  1536  1557
=!M*     Abs  921661 #E103D -  2092  2117
=!M/     Abs  921175 #E0E57 -  1888  1918
=!MINUS  Abs  917926 #E01A6 -   258   275
```

```
=!MULT   Abs  918507 #E03EB -   567   582
=!N!     Abs  919666 #E0872 -  1082  1101
=!N#     Abs  918403 #E0383 -   529   566
=!N#S    Abs  921437 #E0F5D -  1993  2014
=!N@     Abs  919630 #E084E -  1061  1081
=!OF     Abs  919858 #E0932 -  1174  1251
=!ONE    Abs  918175 #E029F -   400   413
=!ONE+   Abs  920436 #E0B74 -  1482  1498
=!ONE-   Abs  920490 #E0BAA -  1517  1535
=!OR     Abs  920157 #E0A5D -  1321  1340
=!PAREN  Abs  918722 #E04C2 -   686   727
=!PSTOR  Abs  920224 #E0AA0 -  1361  1384
=!QUEST  Abs  918693 #E04A5 -   670   685
=!QUOTE  Abs  918788 #E0504 -   728    17
=!R>     Abs  920042 #E09EA -  1252  1273
=!R@     Abs  920122 #E0A3A -  1299  1320
=!RBRAC  Abs  918580 #E0434 -   611   642
 !RITE$  Ext                 -    22
=!S!     Abs  921870 #E110E -  2193  2229
=!S0     Abs  921144 #E0E38 -  1871  1887
=!S<     Abs  922104 #E11F8 -  2299    18
=!S=     Abs  921958 #E1166 -  2230  2298
=!SEMIC  Abs  918536 #E0408 -   583   610
=!STORE  Abs  918088 #E0248 -   348   367
 !STRAR  Ext                 -    28
=!T      Abs  917715 #E00D3 -   130   144
=!THREE  Abs  918213 #E02C5 -   428   443
=!TIC    Abs  917765 #E0105 -   159   189
=!TWO    Abs  918194 #E02B2 -   414   427
=!TWO*   Abs  920272 #E0AD0 -  1385  1401
=!TWO+   Abs  920408 #E0B58 -  1464  1481
=!TWO-   Abs  920462 #E0B8E -  1499  1516
=!TWO/   Abs  920298 #E0AEA -  1402  1426
=!U.     Abs  921768 #E10A8 -  2142  2160
=!U<     Abs  920587 #E0C0B -  1580  1604
 !VOCAB  Ext                 -    26
=!X      Abs  917574 #E0046 -    50    16
=!XX     Abs  917640 #E0088 -    82    97
=!Y      Abs  917665 #E00A1 -    98   113
=!Z      Abs  917690 #E00BA -   114   129
=!ZEQ    Abs  920191 #E0A7F -  1341  1360
=!ZERO   Abs  918156 #E028C -   387   399
 $<>     Abs  921738 #E108A -  2123  2122
=$>R     Abs  920093 #E0A1D -  1279  1277
 $ABS    Ext                 -  1407
=$ADD    Abs  917905 #E0191 -   242   240
=$AT     Abs  918134 #E0276 -   372   370
=$C!     Abs  920785 #E0CD1 -  1688  1686
=$CAT    Abs  920750 #E0CAE -  1668  1666
=$CR     Abs  921409 #E0F41 -  1978  1976
=$D+     Abs  920670 #E0C5E -  1625  1611  1623
=$D-     Abs  920644 #E0C44 -  1610  1608
=$D<     Abs  921591 #E0FF7 -  2059  2058
 $DNGAT  Ext                 -  1610
=$DP     Abs  920832 #E0D00 -  1725  1724
```

```
=$EQUAL  Abs  917965 #E01CD -   280   278
=$F*     Abs  919807 #E08FF -  1150  1149
=$F+     Abs  919718 #E08A6 -  1106  1105
=$F-     Abs  919749 #E08C5 -  1120  1119
=$F.     Abs  919477 #E07B5 -  1009  1008
=$F/     Abs  919838 #E091E -  1164  1163
=$FIVE+  Abs  920352 #E0B20 -  1432  1430
=$FIVE-  Abs  920387 #E0B43 -  1451  1449
=$FP     Abs  919185 #E0691 -   890   889
=$GT     Abs  918070 #E0236 -   336   334
=$GTZ    Abs  920560 #E0BF0 -  1563  1561
=$IP     Abs  919224 #E06B8 -   913   912
 $JJ     Abs  917869 #E016D -   222   221
=$L      Abs  917749 #E00F5 -   149   147
 $LN     Abs  919422 #E077E -   984   983
=$LT     Abs  918004 #E01F4 -   302   300
=$LTZ    Abs  920527 #E0BCF -  1541  1539
=$MINUS  Abs  917935 #E01AF -   262   261
=$N!     Abs  919677 #E087D -  1087  1085
=$N@     Abs  919641 #E0859 -  1066  1064
=$ONE+   Abs  920447 #E0B7F -  1487  1485
=$ONE-   Abs  920501 #E0BB5 -  1522  1520
=$OR     Abs  920168 #E0A68 -  1326  1324
=$PSTOR  Abs  920235 #E0AAB -  1366  1364
=$R>     Abs  920053 #E09F5 -  1257  1255
=$R@     Abs  920133 #E0A45 -  1305  1303
=$S<     Abs  922115 #E1203 -  2304  2302
=$S=     Abs  921969 #E1171 -  2235  2233
=$STORE  Abs  918097 #E0251 -   352   350
=$T      Abs  917724 #E00DC -   134   132
=$TWO*   Abs  920283 #E0ADB -  1390  1388
=$TWO+   Abs  920419 #E0B63 -  1469  1467
=$TWO-   Abs  920473 #E0B99 -  1504  1502
=$TWO/   Abs  920309 #E0AF5 -  1407  1405
 $TYPE   Ext                -  1010
=$U<     Abs  920598 #E0C16 -  1585  1583
 $XSTR$  Abs  919492 #E07C4 -  1018  1009  1017
=$XX     Abs  917649 #E0091 -    86    84
=$Y      Abs  917674 #E00AA -   102   100
=$Z      Abs  917699 #E00C3 -   118   116
=$ZEQ    Abs  920202 #E0A8A -  1346  1344
 $four+  Abs  920021 #E09D5 -  1237  1236
=*/      Abs  921313 #E0EE1 -  1940
 */MOD   Ext                -  1941
 -FIND   Ext                -   162
=/       Abs  918310 #E0326 -   475
 /MOD    Ext                -   477
 2DROP   Ext                -  1198  2020
 2DUP    Ext                -  1999  2097  2197  2211
 <+LP>   Ext                -   947
=<>      Abs  921733 #E1085 -  2122  1205
 <>0     Abs  921758 #E109E -  2131  2128
=>R      Abs  920088 #E0A18 -  1277   864  1894  1895  1962  2099
 ?COMP   Ext                -  1191  1799
 ?NEG    Ext                -  1903  1907
```

```
 ABORTW   Ext                 -   167  1206  2208
 ABRT"X   Ext                 -    59   702   764   935  1817  1856
 ABS      Ext                 -  1898  2100  2102
 AD15M    Ext                 -  1107
=ADD      Abs  917900 #E018C  -   240   549   556   863  1961
 ALLOT    Ext                 -   462   741  2180
=AT       Abs  918129 #E0271  -   370    54    58   449   534   651   674   733
                               770   942   963  1876  2022  2168
 AVMEMS   Ext                 -  1026
 BASE     Ext                 -   533   962   967
=BL       Abs  920724 #E0C94  -  1650
 BLK      Ext                 -    53
 BRNCH    Ext                 -   755  1199
=C!       Abs  920780 #E0CCC  -  1686   753   777   827   828  2178  2213
=C,       Abs  921805 #E10CD  -  2165
=CAT      Abs  920745 #E0CA9  -  1666   774   794   809   837   855  1801  1841
 CLRFRC   Ext                 -   916
 CMOV>    Ext                 -   808
 CMOVE    Ext                 -  2217
 COLLAP   Ext                 -  1019
=COLON    Abs  918623 #E045F  -   646
=COMMA    Abs  918236 #E02DC  -   446  1222  1750
 COMPL    Ext                 -   193   217   592   738  1211  1214  1216  1223
                              1745  1772  1812
 CONTX    Ext                 -   652
 COUNT    Ext                 -  1860  1956
=CR       Abs  921404 #E0F3C  -  1976   932
 CREAT    Ext                 -   654
 CRLFOF   Ext                 -  1980
 CSP      Ext                 -   648
 CURR     Ext                 -   650
=D+       Abs  920665 #E0C59  -  1623
=D-       Abs  920639 #E0C3F  -  1608
=D.       Abs  921277 #E0EBD  -  1923   515   944  2148
 D.R      Ext                 -  1925
 D0       Abs  920999 #E0DA7  -  1810  1806
 D03      Abs  921036 #E0DCC  -  1822
=D<       Abs  921586 #E0FF2  -  2058
 D<RES    Abs  921643 #E102B  -  2079  2083
 D<TRUE   Abs  921648 #E1030  -  2081  2077
 D?NEG    Ext                 -  2105
 DABS     Ext                 -  1896
 DEPTH    Ext                 -   933
=DO       Abs  920903 #E0D47  -  1771
 DOCOL    Ext                 -    52   161   192   216   446   457   475   496
                               513   532   570   586   614   646   660   673
                               689   731   847   931   961   999  1190  1744
                              1771  1798  1839  1874  1892  1923  1940  1954
                              1996  2019  2041  2096  2146  2165  2176  2196
 DOCON    Ext                 -   390   403   417   431  1650
=DOT      Abs  918378 #E036A  -   513   675
=DOTP     Abs  921052 #E0DDC  -  1839
=DOTQ     Abs  920944 #E0D70  -  1798
=DOTS     Abs  919258 #E06DA  -   931
=DOUSE    Abs  920808 #E0CE8  -  1709    86   102   118   134   149  1725
```

```
=DP      Abs  920827 #E0CFB -  1724
 DROP    Ext                -    64   169   480   572   706  1224  1943  2200
 DS00    Abs  919305 #E0709 -   941   948
 DUP     Ext                -   773   788   810   836   852   856  1192  1202
                               1957
 DV2-15  Ext                -  1165
 EQ0     Abs  917985 #E01E1 -   288   286
=EQUAL   Abs  917960 #E01C8 -   278  1195  1215  1804  1844
 EXEC    Ext                -   450  2169
=F*      Abs  919802 #E08FA -  1149
=F+      Abs  919713 #E08A1 -  1105
=F-      Abs  919744 #E08C0 -  1119
=F.      Abs  919452 #E079C -   999
 F.0     Abs  919551 #E07FF -  1032  1029
=F/      Abs  919833 #E0919 -  1163
 FAIL    Abs  922210 #E1262 -  2345  2248  2332  2340
 FALSE   Abs  918040 #E0218 -   316
=FEND    Abs  919785 #E08E9 -  1135   898   917   986  1108  1152  1166
=FF.     Abs  919472 #E07B0 -  1008  1000
=FIVE+   Abs  920347 #E0B1B -  1430
=FIVE-   Abs  920382 #E0B3E -  1449
=FOUR+   Abs  920016 #E09D0 -  1236   800   853
=FP      Abs  919180 #E068C -   889
 FRAC15  Ext                -   897
=FSTRT   Abs  919760 #E08D0 -  1127  1106  1120  1150  1164
 FV0     Abs  920364 #E0B2C -  1435  1454
 GCHAR   Ext                -   698   759  1814  1853
 GETFP   Ext                -  1045  1981
 GETXLN  Ext                -  1132
=GI      Abs  918065 #E0231 -   334
=GI#     Abs  921494 #E0F96 -  2019
 GILT1   Abs  918013 #E01FD -   305   339
=GIZ     Abs  920555 #E0BEB -  1561
 GIZ0    Abs  920577 #E0C01 -  1570  1566  1568
=H.      Abs  919361 #E0741 -   961
 HERE    Ext                -   458   752   754  1219  1747  1774  2177
 HEX     Ext                -   965
 HLD     Ext                -  2021  2043
 HOLD    Ext                -   557
=I       Abs  920128 #E0A40 -  1302   941
=ICCOMA  Abs  921835 #E10EB -  2176
=ICOMMA  Abs  918266 #E02FA -   457
=IF      Abs  920852 #E0D14 -  1744
=II      Abs  917815 #E0137 -   192
 IN      Ext                -   692
=IP      Abs  919219 #E06B3 -   912
=J       Abs  917844 #E0154 -   216
=JJ      Abs  917864 #E0168 -   221   218
=L       Abs  917744 #E00F0 -   147
=LBRAC   Abs  918344 #E0348 -   496   599
 LESS    Abs  922200 #E1258 -  2342  2249  2330
 LIT     Ext                -   447   460   537   547   551   615   690   696
                               757   819   945  1193  1203  1226  1802  1810
                              1842  1851  2166
 LITR    Ext                -   171
```

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=LN      Abs  919417 #E0779 -   983
 LN15    Ext                 -   985
=LT      Abs  917999 #E01EF -   300   540  2207
=LT#     Abs  921550 #E0FCE -  2041
=LTZ     Abs  920522 #E0BCA -  1539
 LTZ0    Abs  920539 #E0BDB -  1546  1544
=M*      Abs  921667 #E1043 -  2096
=M/      Abs  921181 #E0E5D -  1892
 M/MOD   Ext                 -   535
 MATCH   Abs  922204 #E125C -  2344  2246
 MAX     Ext                 -   821
 MEMERR  Ext                 -  1030
=MINUS   Abs  917930 #E01AA -   261  2025
 MOVDP   Ext                 -   778  1821
 MP2-15  Ext                 -  1151
 MTHSTK  Ext                 -  1020
=MULT    Abs  918511 #E03EF -   570
 MXLEN   Ext                 -  2198
=N!      Abs  919672 #E0878 -  1085
=N#      Abs  918407 #E0387 -   532  1998
 N#00    Abs  918477 #E03CD -   551   542
=N#S     Abs  921443 #E0F63 -  1996
 N00     Abs  921448 #E0F68 -  1998  2003
=N@      Abs  919636 #E0854 -  1064
 NOWADD  Abs  919722 #E08AA -  1107  1122
 NQOT?   Ext                 -   743
 NUMST   Ext                 -   890   913   984
=OF      Abs  919864 #E0938 -  1190
 OF01    Abs  919919 #E096F -  1202  1197
 OF02    Abs  919946 #E098A -  1211  1200
=ONE     Abs  918179 #E02A3 -   403
=ONE+    Abs  920442 #E0B7A -  1485  1958
=ONE-    Abs  920496 #E0BB0 -  1520
=OR      Abs  920163 #E0A63 -  1324  2000
 OVER    Ext                 -   539   775   790   825  1213  1893  2024
 PAD     Ext                 -   795   823   834  2023  2042
=PAREN   Abs  918726 #E04C6 -   689
 PD0     Abs  921102 #E0E0E -  1851  1846
 PD03    Abs  921134 #E0E2E -  1862
=PDOTQ   Abs  921338 #E0EFA -  1954  1813
 PICK    Ext                 -  2205
=PSTOR   Abs  920230 #E0AA6 -  1364   693
 PT1+    Ext                 -   750  1807  1847
 PUTABX  Ext                 -  1135
 QCSP    Ext                 -   587
=QUEST   Abs  918697 #E04A9 -   673
 QUOT02  Abs  918887 #E0567 -   757   749
 QUOT2   Abs  918837 #E0535 -   743   737
 QUOT3   Abs  918964 #E05B4 -   788   772
 QUOT5   Abs  918909 #E057D -   769   756
=QUOTC   Abs  919104 #E0640 -   847   739
=QUOTE   Abs  918792 #E0508 -   731
=R>      Abs  920048 #E09F0 -  1255    63   862  1900  1906  1960  2104
=R@      Abs  920128 #E0A40 -  1303   194   848  1897  1901  1955
=RBRAC   Abs  918584 #E0438 -   614   658
```

```
=REND1   Abs  922216 #E1268 -  2347
=RESET   Abs  922053 #E11C5 -  2266  2242
 REV$    Ext                -  1037
 ROM;C   Ext                -   659
 ROT     Ext                -   536
=S!      Abs  921876 #E1114 -  2196
 S->D    Ext                -   514
=S0      Abs  921150 #E0E3E -  1874   938
=S<      Abs  922110 #E11FE -  2302
 S<00    Abs  922164 #E1234 -  2325  2336
 S<01    Abs  922158 #E122E -  2323  2315
 S<02    Abs  922195 #E1253 -  2339  2326
=S=      Abs  921964 #E116C -  2233
=SAME    Abs  922067 #E11D3 -  2276  2243  2285
 SAMENO  Abs  922095 #E11EF -  2286  2281
 SAMEY   Abs  922097 #E11F1 -  2287  2277
 SAMSGN  Abs  918035 #E0213 -   314   311
 SAMSIN  Abs  921636 #E1024 -  2076  2072
 SAVEFP  Ext                -  1018  1127  1978  2235  2304
 SEMI    Ext                -    65   175   195   219   451   463   481   500
                               516   558   573   593   601   619   676   707
                               781   841   868   949   969  1002  1228  1752
                              1777  1808  1822  1849  1862  1877  1909  1927
                              1944  1964  2004  2027  2045  2106  2149  2170
                              2181  2218
=SEMIC   Abs  918540 #E040C -   586
=SETSTR  Abs  922018 #E11A2 -  2253  2236
 SMUDG   Ext                -   595   655
 SP0     Ext                -  1875
 SP@     Ext                -   647   937
 SPACE   Ext                -  1001  1926
 STATE   Ext                -    57   498   617   732   769
 STKDRP  Ext                -  1130
=STORE   Abs  918092 #E024C -   350   459   499   618   649   653   968  2044
 STR$SB  Ext                -  1036
 STRM    Ext                -  1800  1840
 SWAP    Ext                -   479   801   822   824   838   840   854   939
                               964  1905  1908  1942  2101  2199  2216
=T       Abs  917719 #E00D7 -   132
 T/02    Abs  920331 #E0B0B -  1417  1415
=TABLE   Abs  917504 #E0000 -    16
=THREE   Abs  918217 #E02C9 -   431  1776  2204
=TIC     Abs  917769 #E0109 -   161
 TRUE    Abs  918047 #E021F -   320   315
=TWO     Abs  918198 #E02B6 -   417   740  1751  2179
=TWO*    Abs  920278 #E0AD6 -  1388   859  1959
=TWO+    Abs  920414 #E0B5E -  1467   789   826   835   839   857
=TWO-    Abs  920468 #E0B94 -  1502   776  2212
=TWO/    Abs  920304 #E0AF0 -  1405  2026
 TYPE    Ext                -  1861  1963
 U*      Ext                -   571  2103
=U.      Abs  921774 #E10AE -  2146   966
=U<      Abs  920593 #E0C11 -  1583
 U<TR    Abs  920619 #E0C2B -  1593  1589
 UDIV    Ext                -  1899
```

```
=X       Abs  917578 #E004A -    52
 X1      Abs  917620 #E0074 -    63    56
 XDO     Ext         #      -   940  1773
 XOR     Ext         #      -  1902  2098
=XSTR$   Abs  919487 #E07BF -  1017
=XX      Abs  917644 #E008C -    84
=Y       Abs  917669 #E00A5 -   100
=Z       Abs  917694 #E00BE -   116
 ZBRNH   Ext         #      -    55   541   736   748   771  1196  1217  1746
                                1805  1845  2002
=ZEQ     Abs  920197 #E0A85 -  1344   166   934  2001
 ZEQ0    Abs  920214 #E0A96 -  1351  1349
=ZERO    Abs  918160 #E0290 -   390   497   751   943  1221  1749  1924  2147
 fFAIL   Ext         #      -  2345
 fMATCH  Ext         #      -  2344
 fail    Abs  922010 #E119A -  2248  2240
 less    Abs  922014 #E119E -  2249  2244
 uMODES  Ext         #      -  1128
```

Input Parameters

  Source file name is MR&FT1

  Listing file name is MR/FT1

  Object file name is MR%FT1::65

                                  111111
                        0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News

```
 1                    TITLE  FT2:_3_&_4_CHAR_WORDS
 2                    RDSYMB MR%GTO
 3              *     RDSYMB MR%FT1
 4              *     ABS   REND1
 5
 6 E1300              ABS   #E1300
 7
 8              ************************************
 9              *                                  *
10              *     MR&FT2       <840608.1403>   *
11              *                                  *
12              * Re-released: 2/6/84              *
13              * to correct STD                   *
14              *                                  *
15              ************************************
16
17              ****************************************
18              *                                      *
19              *   START OF 3 CHAR WORDS              *
20              * ADD ADDITIONAL WORDS AT THIS END     *
21              *                                      *
22              ****************************************
```

```
                    EJECT
              ******************************************
              *
              * S<&            ( STR1 STR2 -- STR3 )
              *
              * STRING CONCATENATE
              * String2 is appended directly onto the end of
              * string1 (assuming string1's maxlen will permit
              * it). Str3 is the addr of str1, and the new
              * combined length.
              * When total length is too big to fit, give error.
              ********************************************
E1300 0000          CON(5)  0
      0
E1305 38    =!S<&   CON(2)  #83
E1307 35C3          NIBASC  \S<\
E130B 6A            CON(2)  \&\+#80
E130D 0000  =S<&    CON(5)  =DOCOL          STACK:
      0
E1312 B591          CON(5)  =DUP            AD1 L1 AD2 L2 L2
      E
E1317 45C1          CON(5)  =LIT            AD1 L1 AD2 L2 L2
      E
E131C 4000          CON(5)  4               AD1 L1 AD2 L2 L2 4
      0
E1321 1052          CON(5)  =PICK           AD1 L1 AD2 L2 L2 L1
      E
E1326 0000          CON(5)  =ADD            AD1 L1 AD2 L2 LEN3
      0
E132B 45C1          CON(5)  =LIT            AD1 L1 AD2 L2 LEN3
      E
E1330 5000          CON(5)  5               AD1 L1 AD2 L2 LEN3
      0
E1335 1052          CON(5)  =PICK           AD1 L1 AD2 L2 LEN3 AD1
      E
E133A B591          CON(5)  =DUP            AD1 L1 AD2 L2 LEN3 AD1 AD1
      E
E133F 0000          CON(5)  =>R             AD1 L1 AD2 L2 LEN3 AD1
      0
E1344 45C1          CON(5)  =LIT            AD1 L1 AD2 L2 LEN3 AD1
      E
E1349 4000          CON(5)  4               AD1 L1 AD2 L2 LEN3 AD1
      0
E134E 0000          CON(5)  =MINUS          AD1 L1 AD2 L2 LEN3 AD1-4
      0
E1353 0000          CON(5)  =CAT            AD1 L1 AD2 L2 LEN3 MAX1
      0
E1358 3352          CON(5)  =OVER           AD1 L1 AD2 L2 L3 MAX1 L3
      E
E135D 0000          CON(5)  =LT             AD1 L1 AD2 L2 L3 (MAX1<L3)
      0
E1362 0000          CON(5)  =ABORTW
      0
E1367 53            CON(2)  =eSWF           "STRING WON'T FIT"
              *
```

```
 59 E1369 0000          CON(5)  =>R             AD1 L1 AD2 L2:: L3 AD1
          0
 60 E136E 0000          CON(5)  =>R             AD1 L1 AD2 :: L2 L3 AD1
          0
 61 E1373 0000          CON(5)  =>R             AD1 L1 :: AD2 L2 L3 AD1
          0
 62 E1378 0000          CON(5)  =TWO*           CHARS-->NIBS
          0
 63 E137D 0000          CON(5)  =ADD            DEST :: AD2 L2 L3 AD1
          0
 64 E1382 0000          CON(5)  =R>             DEST AD2 :: L2 L3 AD1
          0
 65 E1387 9D42          CON(5)  =SWAP           AD2 DEST :: L2 L3 AD1
          E
 66 E138C 0000          CON(5)  =R>             AD2 DEST L2 :: L3 AD1
          0
 67 E1391 0000          CON(5)  =CMOVE          STRING MOVED
          0
 68 E1396 0000          CON(5)  =R>             L3
          0
 69 E139B 0000          CON(5)  =R>             L3 AD1
          0
 70 E13A0 5552          CON(5)  =2DUP           L3 AD1 L3 AD1
          E
 71 E13A5 0000          CON(5)  =TWO-           L3 AD1 L3 AD1-2
          0
 72 E13AA 0000          CON(5)  =C!             L3 AD1 (NEW LEN STORED)
          0
 73 E13AF 9D42          CON(5)  =SWAP           AD1 L3
          E
 74 E13B4 0000          CON(5)  =SEMI
          0
 75
 76                *********************************************
 77                *
 78                * S>&           ( STR1 STR2 -- STR3 )
 79                *
 80                * STRING CONCATENATE
 81                * Much like S<&, but the resulting string is
 82                * at the addr of str2. Str2 is first shifted
 83                * up and str1 is then copied into beginning
 84                * of str1's space.
 85                * When str1 won't all fit in, GIVE ERROR.
 86                *********************************************
 87 E13B9 5031          CON(5)  =!S<&
          E
 88 E13BE 38    =!S>&   CON(2)  #83
 89 E13C0 35E3          NIBASC  \S>\
 90 E13C4 6A            CON(2)  \&\+#80
 91 E13C6 0000  =S>&    CON(5)  =DOCOL
          0
 92 E13CB B591          CON(5)  DUP             AD1 L1 AD2 L2 L2
          E
 93 E13D0 45C1          CON(5)  =LIT            AD1 L1 AD2 L2 L2
          E
```

```
 94 E13D5 4000          CON(5)  4               AD1 L1 AD2 L2 L2 4
          0
 95 E13DA 1052          CON(5)  =PICK           AD1 L1 AD2 L2 L2 L1
          E
 96 E13DF 0000          CON(5)  =ADD            AD1 L1 AD2 L2 L3
          0
 97 E13E4 B591          CON(5)  =DUP            AD1 L1 AD2 L2 L3 L3
          E
 98 E13E9 0000          CON(5)  =>R             AD1 L1 AD2 L2 L3  :: L3
          0
 99 E13EE 45C1          CON(5)  =LIT            AD1 L1 AD2 L2 L3
          E
100 E13F3 3000          CON(5)  3               AD1 L1 AD2 L2 L3 3
          0
101 E13F8 1052          CON(5)  =PICK           AD1 L1 AD2 L2 L3 AD2
          E
102 E13FD 0000          CON(5)  =TWO-           AD1 L1 AD2 L2 L3 AD2-2
          0
103 E1402 0000          CON(5)  =TWO-           AD1 L1 AD2 L2 L3 AD2-4
          0
104 E1407 0000          CON(5)  =CAT            AD1 L1 AD2 L2 L3 MAX2
          0
105 E140C 0000          CON(5)  =GT             AD1 L1 AD2 L2 (L3>MAX2)
          0
106 E1411 0000          CON(5)  =ABORTW         IF (L3>MAX2)
          0
107 E1416 53            CON(2)  =eSWF           "STRING WON'T FIT"
108             *
109 E1418 8791          CON(5)  =ROT            AD1 AD2 L2 L1 :: L3
          E
110 E141D 8791          CON(5)  =ROT            AD1 L2 L1 AD2 :: L3
          E
111 E1422 B591          CON(5)  =DUP            AD1 L2 L1 AD2 AD2 :: L3
          E
112 E1427 0000          CON(5)  =>R             AD1 L2 L1 AD2 :: AD2 L3
          0
113 E142C B591          CON(5)  =DUP            AD1 L2 L1 AD2 AD2 :: AD2 L3
          E
114 E1431 8791          CON(5)  =ROT            AD1 L2 AD2 AD2 L1 :: AD2 L3
          E
115 E1436 B591          CON(5)  =DUP            AD1 L2 AD2 AD2 L1 L1 :: AD2 L3
          E
116 E143B 0000          CON(5)  =>R             AD1 L2 AD2 AD2 L1 :: L1 AD2 L3
          0
117 E1440 0000          CON(5)  =TWO*           AD1 L2 AD2 AD2 L1*2 :: L1 AD2 L3
          0
118 E1445 0000          CON(5)  =ADD            AD1 L2 AD2 DEST :: L1 AD2 L3
          0
119 E144A 8791          CON(5)  =ROT            AD1 AD2 DEST L2 :: L1 AD2 L3
          E
120 E144F 0000          CON(5)  =CMOV>          AD1  ::  L1 AD2 L3
          0
121 E1454 0000          CON(5)  =R>             AD1 L1 :: AD2 L3
          0
122 E1459 0000          CON(5)  =R@             AD1 L1 AD2 :: AD2 L3
```

```
           0
123 E145E 9D42         CON(5)  =SWAP          AD1 AD2 L1 :: AD2 L3
           E
124 E1463 0000         CON(5)  =CMOVE                 :: AD2 L3
           0
125 E1468 0000         CON(5)  =R>            AD2 ::  L3
           0
126 E146D 0000         CON(5)  =R>            AD2 L3
           0
127 E1472 5552         CON(5)  =2DUP          AD2 L3 AD2 L3
           E
128 E1477 9D42         CON(5)  =SWAP          AD2 L3 L3 AD2
           E
129 E147C 0000         CON(5)  =TWO-          AD2 L3 L3 AD2-2
           0
130 E1481 0000         CON(5)  =C!            AD2 L3 (NEW LEN STORED)
           0
131 E1486 0000         CON(5)  =SEMI          AD2 L3
           0
132
```

```
133                     EJECT
134                 ****************************************
135                 *
136                 * 4N@   (addr --- n)
137                 * Like @ and C@, but works on 4 nibbles.
138                 *
139                 ****************************************
140 E148B EB31            CON(5)  =!S>&
          E
141 E1490 38      =!4N@    CON(2)  #83
142 E1492 43E4            NIBASC  \4N\
143 E1496 0C              CON(2)  \@\+#80
144
145 E1498 0000    =4N@     CON(5) =DOCOL       :
          0
146 E149D 0000             CON(5)   =AT        @
          0
147 E14A2 45C1             CON(5)   =LIT
          E
148 E14A7 FFFF             CON(5)   #FFFF       FFFF
          0
149 E14AC 7A91             CON(5)   =AND        AND
          E
150 E14B1 0000             CON(5)   =SEMI       ;
          0
```

```
151                     EJECT
152                 ****************************************
153                 *
154                 * HEX   This word sets the current base
155                 *        to base 16
156                 *
157                 ****************************************
158 E14B6 0941          CON(5)  !4N@
          E
159 E14BB 38    =!HEX   CON(2)  #83
160 E14BD 8454          NIBASC  \HE\
161 E14C1 8D            CON(2)  \X\+#80
162 E14C3 0000  =HEX    CON(5)  =DOCOL          :
          0
163 E14C8 45C1          CON(5)  =LIT
          E
164 E14CD 0100          CON(5)  16              16
          0
165 E14D2 B562          CON(5)  =BASE           BASE
          E
166 E14D7 0000          CON(5)  =STORE          !
          0
167 E14DC 0000          CON(5)  =SEMI           ;
          0
```

```
168                     EJECT
169                 ****************************************
170                 *
171                 * LOG  This word takes the log base 10
172                 *      of the value in the floating point
173                 *      X register
174                 *
175                 ****************************************
176 E14E1 BB41           CON(5)  !HEX
          E
177 E14E6 38     =!LOG   CON(2)  #83
178 E14E8 C474           NIBASC  \LG\
179 E14EC 4D             CON(2)  \T\+#80
180 E14EE 3F41 =LOG      CON(5)  $LOG
          E
181 E14F3 8EF1 $LOG      GOSUBL  =NUMST      (see routine in this assembly)
          20
182 E14F9 8F00           GOSBVL  =LGT15
          000
183 E1500 8C00           GOLONG  =FEND
          00
```

```
184                     EJECT
185                 ********************************************
186                 *
187                 * CHS  - This word changes the sign of the
188                 *        value in the floating point X register.
189                 *        No stackdrop or change to LASTX.
190                 *
191                 ************************************************
192 E1506 6E41            CON(5)  !LOG          NO MORE 3 CHAR WORDS
          E
193 E150B 38    =!CHS     CON(2)  #83
194 E150D 3484            NIBASC  \CH\
195 E1511 3D              CON(2)  \S\+#80
196 E1513 8151  =CHS      CON(5)  $CHS
          E
197 E1518 34FD  $CHS      LC(5)   (=oX)+15
          BF2
198 E151F 136             CD0EX                 SAVE D0
199 E1522 1524            A=DAT0  S             GET X SIGN
200 E1526 05              SETDEC
201 E1528 BCC             A=-A-1  S             COMPLEMENT SIGN NIBBLE
202 E152B 04              SETHEX
203 E152D 1504            DAT0=A  S             PUT CHANGED X SIGN BACK
204 E1531 136             CD0EX                 RESTORE D0
205 E1534 03              RTNCC
```

```
206                     EJECT
207                 ************************************************************
208                 *
209                 * UM*  This is the new FORTH 83 name for the old U* word.
210                 *
211                 * U*  (un1 un2 --- ud3) perform unsigned multiplication of
212                 *     un1 by un2, leave the double number ud3 on stack
213                 *
214                 ************************************************************
215
216 E1536 B051          CON(5)  =!CHS
        E
217 E153B 38    =!U*    CON(2)  #83             UM*
218 E153D 55D4          NIBASC  \UM\
219 E1541 AA            CON(2)  \*\+#80
220 E1543 8451  =U*     CON(5)  =$U*
        E
221
222 E1548 AF0   =$U*    A=0     W
223 E154B 143           A=DAT1  A               A(A)=n1
224 E154E 174           D1=D1+  5
225 E1551 147           C=DAT1  A               C(A)=n2
226 E1554 AF3           D=0     W
227 E1557 D7            D=C     A               D(A)=n2
228 E1559 AF2           C=0     W
229
230 E155C 822   U*1     SB=0                    CLEAR STICKY BIT FOR TEST
231 E155F 81C           ASRB                    TEST LEAST SIG BIT
232 E1562 832           ?SB=0                   WAS IT A ZERO?
233 E1565 50            GOYES   U*0             YES, NO ADD
234 E1567 A7B           C=C+D   W               C=FINAL TOTAL
235 E156A A77   U*0     D=D+D   W               SHIFT LEFT FOR NEXT ADD
236 E156D 97C           ?A#0    W               ANY MORE DIGITS?
237 E1570 CE            GOYES   U*1             YES
238 E1572 145           DAT1=C  A               STORE LSDs
239 E1575 1C9           D1=D1-  10
240 E1578 15D9          DAT1=C  10              STORE MSDs
241 E157C 174           D1=D1+  5
242 E157F 03            RTNCC
```

```
                        EJECT
                *****************************************
                *
                * [']  (BRACKET TIC)  ( --- ) Used as:
                *
                *       ['] <name>
                *
                *       Used in colon definitions to
                *       compile the cfa of <name> as a
                *       literal.
                *
                *       IMMEDIATE
                *
                *****************************************

E1581 B351      =!BRACT CON(5) !U*              NO MORE 3 CHAR WORDS
      E
E1586 3C        =!BRACT CON(2) #C3
E1588 B572              NIBASC \['\
E158C DD                CON(2) \]\+#80
E158E 0000      =BRACT  CON(5) =DOCOL           :
      0
E1593 0000              CON(5) =?COMP           ?COMP  make sure we're compiling
      0
E1598 0000              CON(5) =TIC             compile CFA as literal into dictio
      0
E159D 0000              CON(5) =SEMI            ;  execute immediately
      0
```

```
266                     EJECT
267                 ****************************************
268                 *
269                 * STO   (addr --- ) Store the floating poit
270                 *       value contained in X at the addr
271                 *       specified.
272                 *
273                 ****************************************
274 E15A2 6851         CON(5) !BRACT
          E
275 E15A7 38    =!STO   CON(2) #83
276 E15A9 3545         NIBASC \ST\
277 E15AD FC           CON(2) \0\+#80
278 E15AF 4B51  =STO    CON(5) $STO
          E
279
280 E15B4 20    =$STO   P=     0
281 E15B6 340D         LC(5)  =oX
          BF2
282 E15BD 136          CD0EX                  D0-->X
283 E15C0 1527         A=DAT0 W               READ VALUE OF X
284 E15C4 136          CD0EX
285 E15C7 147          C=DAT1 A               READ ADDR
286 E15CA 174          D1=D1+ 5               RETURN NOTHING ON DATA STK
287 E15CD 136          CD0EX                  D0=ADDR
288 E15D0 1507         DAT0=A W               WRITE VALUE TO ADDR
289 E15D4 134          D0=C                   RESTORE I IN D0
290 E15D7 03           RTNCC
```

```
291                     EJECT
292                 ******************************************
293                 *
294                 * RCL  (addr --- ) Recall the floating point
295                 *      value contained at addr and push it
296                 *      into X on the floating point stack
297                 *      after first doing a stack lift.
298                 *
299                 ******************************************
300 E15D9 7A51         CON(5) !STO
        E
301 E15DE 38    =!RCL  CON(2) #83
302 E15E0 2534         NIBASC \RC\
303 E15E4 CC           CON(2) \L\+#80
304 E15E6 BE51 =RCL    CON(5) $RCL
        E
305
306 E15EB 8E00 =$RCL   GOSUBL =SAVEFP        SAVE FORTH POINTERS
        00
307 E15F1 147          C=DAT1 A              GET ADDR
308 E15F4 136          CD0EX
309 E15F7 1527         A=DAT0 W              RECALL VALUE
310 E15FB 100          R0=A
311 E15FE 8E00         GOSUBL =STKLFT        DO STACK LIFT
        00
312 E1604 110          A=R0                  RECALL VALUE
313 E1607 1B0D         D0=(5)  =oX
        BF2
314 E160E 1507         DAT0=A W              STORE VALUE AT X
315 E1612 8E00         GOSUBL =GETFP
        00
316 E1618 174          D1=D1+  5             THROW AWAY ADDR
317 E161B 03           RTNCC
```

```
                        EJECT
                *********************************************
                *                                           *
                * STD           SET STANDARD DISPLAY FORMAT *
                *                                           *
                *********************************************
E161D ED51E     !RCL    CON(5)  !RCL
E1622 38        =!STD   CON(2)  #83
E1624 3545      STD     NIBASC  \ST\
E1628 4C        STD     CON(2)  \D\+#80
E162A F261E     =STD    CON(5)  =$STD
E162F 20        =$STD   P=      0
E1631 30C       STD     LCHEX   C               STD CODE FOR SETFMT
E1634 6C10      STD     GOTO    SETGET          GOSBVL =SETFMT; RTNCC

                *****************************************
                *
                * FIX           DISPLAY FORMAT
                *               ( n -- )
                *       SET # OF DECIMAL PLACES
                *
                *****************************************
E1638 2261E     FIX     CON(5)  =!STD
E163D 38        =!FIX   CON(2)  #83
E163F 6494      FIX     NIBASC  \FI\
E1643 8D        FIX     CON(2)  \X\+#80
E1645 A461E     =FIX    CON(5)  =$FIX
E164A 7210      =$FIX   GOSUB   SETDGT
E164E 30D       FIX     LCHEX   D
                *       GOTO    SETGET          DROP THROUGH

E1651 8F000     SETGET  GOSBVL  =SETFMT
E1658 03        STD     RTNCC
                *
                * 2/6/84 fix to STD; need these nibbles
                * to ensure that nothing moves!
                *
E165A           STD     BSS     6
                *********************************************
                * SET # OF DIGITS IN FORMAT
                * MAX IS 11; IF PARAMETER IS GREATER, USE 11
                *********************************************
E1660 20        SETDGT  P=      0               part of 2/6/84 fix to STD
E1662 AD0       STD     A=0     M               clear out any possible garbage
                *                               for bit shift
E1665 143       STD     A=DAT1  A               GET PARAMETER
E1668 174       STD     D1=D1+  5
E166B 34B0      STD     LC(5)   11
                000
E1672 C4        STD     A=A+A   A               CHECK FOR NEGATIVES
```

```
367 E1674 550          GONC    DGT1
368 E1677 AF0          A=0     W           NEGATIVE PARAMETER-->0
369 E167A 81C  DGT1    ASRB                RESTORE N
370 E167D 8BA          ?A<=C   A           # <=11 ?
371 E1680 40           GOYES   DGT01
372 E1682 DA           A=C     A           SET TO 11
373 E1684 3400 DGT01   LC(5)   =DSPDGT
          000
374 E168B 137          CD1EX
375 E168E 1510         DAT1=A  P           SET SYSTEM REGISTER
376 E1692 135          D1=C                RESTORE D1
377 E1695 01           RTN
378             *
379             * 2/6/84 fix to STD, need this nibble to ensure
380             * that nothing moves!
381             *
382 E1697              BSS     1
383
384             ****************************************
385             *
386             * SCI           SET SCIENTIFIC FORMAT
387             *               ( n -- )
388             *
389             ****************************************
390 E1698 D361           CON(5)  =!FIX
          E
391 E169D 38   =!SCI    CON(2)  #83
392 E169F 3534         NIBASC  \SC\
393 E16A3 9C           CON(2)  \I\+#80
394 E16A5 AA61 =SCI    CON(5)  =$SCI
          E
395 E16AA 72BF =$SCI   GOSUB   SETDGT
396 E16AE 30E          LCHEX   E
397 E16B1 6F9F         GOTO    SETGET      GOSBVL =SETFMT; GETFP; RTNCC
398
399             ****************************************
400             *
401             * ENG           SET ENGINEER FORMAT
402             *               ( n -- )
403             *
404             ****************************************
405 E16B5 D961           CON(5)  =!SCI
          E
406 E16BA 38   =!ENG    CON(2)  #83
407 E16BC 54E4         NIBASC  \EN\
408 E16C0 7C           CON(2)  \G\+#80
409 E16C2 7C61 =ENG    CON(5)  =$ENG
          E
410 E16C7 759F =$ENG   GOSUB   SETDGT
411 E16CB 30F          LCHEX   F
412 E16CE 628F         GOTO    SETGET      GOSBVL =SETFMT; GETFP; RTNCC
413
```

```
414                     EJECT
415                 ************************************************
416                 *
417                 * SIN           FLOATING POINT WORD -- SINE
418                 *
419                 ************************************************
420 E16D2 AB61            CON(5)  =!ENG
        E
421 E16D7 38        =!SIN  CON(2)  #83
422 E16D9 3594            NIBASC  \SI\
423 E16DD EC              CON(2)  \N\+#80
424 E16DF 4E61      =SIN   CON(5)  =$SIN
        E
425 E16E4 7030      =$SIN  GOSUB   NUMST       SAVEFP;GETX+L;UMODES
426 E16E8 8F00            GOSBVL  =SIN15
        000
427 E16EF 8C00            GOLONG  =FEND        PUTABX;GETFP;RTNCC
        00
428
429                 ************************************************
430                 *
431                 * COS
432                 *
433                 ************************************************
434 E16F5 7D61            CON(5)  =!SIN
        E
435 E16FA 38        =!COS  CON(2)  #83
436 E16FC 34F4            NIBASC  \CO\
437 E1700 3D              CON(2)  \S\+#80
438 E1702 7071      =COS   CON(5)  =$COS
        E
439 E1707 7D00      =$COS  GOSUB   NUMST
440 E170B 8F00            GOSBVL  =COS15
        000
441 E1712 8C00            GOLONG  =FEND
        00
442
443                 ************************************************
444                 * SUBROUTINE OF MATH WORDS
445                 ************************************************
446 E1718 8F00      =NUMST GOSBVL  =uMODES     set various modes like ANGLE/RADIAN
        000
447 E171F 8E00            GOSUBL  =SAVEFP      save FORTH pointers
        00
448 E1725 8C00            GOLONG  =GETX+L      X IN (A,B); LASTX:=X
        00
449
450                 ************************************************
451                 *
452                 * TAN   GENT
453                 *
454                 ************************************************
455 E172B AF61            CON(5)  =!COS
        E
456 E1730 38        =!TAN  CON(2)  #83
```

```
457 E1732 4514          NIBASC  \TA\
458 E1736 EC            CON(2)  \N\+#80
459 E1738 D371 =TAN     CON(5)  =$TAN
          E
460 E173D 77DF =$TAN    GOSUB   NUMST
461 E1741 8F00          GOSBVL  =TAN15
          000
462 E1748 8C00          GOLONG  =FEND
          00
463
464             ************************************************
465             *
466             * X^2           X SQUARED
467             *
468             ************************************************
469 E174E 0371          CON(5)  =!TAN
          E
470 E1753 38    =!X^2   CON(2)  #83
471 E1755 85E5          NIBASC  \X^\
472 E1759 2B            CON(2)  \2\+#80
473 E175B 0671 =X^2     CON(5)  =$X^2
          E
474 E1760 74BF =$X^2    GOSUB   NUMST       SAVEFP;GETX+L
475 E1764 AF9           C=B     W
476 E1767 AF7           D=C     W
477 E176A AF6           C=A     W           COPY (A,B) TO (C,D)
478 E176D 8F00          GOSBVL  =MP2-15     X*X
          000
479 E1774 8C00          GOLONG  =FEND
          00
480
481             ************************************
482             *
483             * 1/X           RECIPROCAL
484             *
485             ************************************
486 E177A 3571          CON(5)  =!X^2
          E
487 E177F 38    =!1/X   CON(2)  #83
488 E1781 13F2          NIBASC  \1/\
489 E1785 8D            CON(2)  \X\+#80
490 E1787 C871 =1/X     CON(5)  =$1/X
          E
491 E178C 788F =$1/X    GOSUB   NUMST
492 E1790 8F00          GOSBVL  =1/X15
          000
493 E1797 8C00          GOLONG  =FEND
          00
494
495             ****************************************
496             *
497             * Y^X           Y TO THE XTH POWER
498             *
499             ****************************************
500 E179D F771          CON(5)  =!1/X
```

```
          E
501 E17A2 38    =!Y^X   CON(2)  #83
502 E17A4 95E5          NIBASC  \Y^\
503 E17A8 8D            CON(2)  \X\+#80
504 E17AA FA71  =Y^X    CON(5)  =$Y^X
          E
505 E17AF 8E00  =$Y^X   GOSUBL  =FSTRT      SAVEFP;STKDRP;GETXLN
          00
506 E17B5 8F00          GOSBVL  =YX2-15
          000
507 E17BC 8C00          GOLONG  =FEND
          00
508
509             ****************************************
510             *
511             * e^X
512             *
513             ****************************************
514 E17C2 2A71          CON(5)  =!Y^X
          E
515 E17C7 38    =!e^X   CON(2)  #83
516 E17C9 54E5          NIBASC  \E^\
517 E17CD 8D            CON(2)  \X\+#80
518 E17CF 4D71  =e^X    CON(5)  =$e^X
          E
519 E17D4 704F  =$e^X   GOSUB   NUMST
520 E17D8 8F00          GOSBVL  =EXP15
          000
521 E17DF 8C00          GOLONG  =FEND
          00
522
523             ****************************************
524             *
525             * RUP           ROLL UP 41C STACK
526             *
527             ****************************************
528 E17E5 7C71          CON(5)  =!e^X
          E
529 E17EA 38    =!RUP   CON(2)  #83
530 E17EC 2555          NIBASC  \RU\
531 E17F0 0D            CON(2)  \P\+#80
532 E17F2 7F71  =RUP    CON(5)  =$RUP
          E
533 E17F7 8E00  =$RUP   GOSUBL  =SAVEFP
          00
534 E17FD 1B00          D0=(5)  (=oT)
          CF2
535 E1804 1567          C=DAT0  W
536 E1808 10B           R3=C                SAVE T (R3 SAFE FROM NMOVE)
537 E180B 8E00          GOSUBL  =STKLFT     LIFT STACK
          00
538 E1811 1B0D          D0=(5)  (=oX)
          BF2
539 E1818 11B           C=R3
540 E181B 1547          DAT0=C  W           PUT OLD T IN X
```

```
541 E181F 8E00          GOSUBL  =GETFP
          00
542 E1825 03            RTNCC
543
544             ****************************************
545             *
546             * RDN           ROLL DOWN 41C STACK
547             *
548             ****************************************
549 E1827 AE71          CON(5)  =!RUP
          E
550 E182C 38    =!RDN   CON(2)  #83
551 E182E 2544          NIBASC  \RD\
552 E1832 EC            CON(2)  \N\+#80
553 E1834 9381  =RDN    CON(5)  =$RDN
          E
554 E1839 8E00  =$RDN   GOSUBL  =SAVEFP
          00
555 E183F 1B0C          D0=(5)  (=oLASTX)
          BF2
556 E1846 1567          C=DAT0  W           GET LASTX
557 E184A 10B           R3=C                    SAVE IT
558 E184D 8E00          GOSUBL  =STKDRP     DROP STACK
          00
559             * STKDRP ALSO PUTS X INTO LASTX
560 E1853 1B0C          D0=(5)  (=oLASTX)
          BF2
561 E185A 1527          A=DAT0  W           GET OLD X, NOW IN LASTX
562 E185E 11B           C=R3
563 E1861 1547          DAT0=C  W           REPLACE OLD LASTX
564 E1865 1B00          D0=(5)  (=oT)
          CF2
565 E186C 1507          DAT0=A  W               PUT OLD X IN T
566 E1870 8E00          GOSUBL  =GETFP
          00
567 E1876 03            RTNCC
568
569             ********************************************************
570             *
571             * SP@  (  -- addr)  return the addr of the top of the
572             *                   stack just before SP@ was executed
573             *
574             ********************************************************
575 E1878 C281          CON(5)  =!RDN
          E
576 E187D 38    =!SP@  CON(2)  #83             SP@
577 E187F 3505          NIBASC  \SP\
578 E1883 0C            CON(2)  \@\+#80
579 E1885 A881  =SP@    CON(5)  =$SP@
          E
580 E188A 137   =$SP@   CD1EX                  DATA STACK ADDR TO C
581 E188D 135           D1=C
582 E1890 1C4           D1=D1-  5              PUSH VALUE TO DATA
583 E1893 145           DAT1=C  A              STACK
584 E1896 03            RTNCC
```

```
585                     EJECT
586                 ****************************************
587                 *
588                 * C@+           ( STR -- STR+ CH )
589                 * GET CHARACTER AND INCREMENT ADDRESS
590                 * DECREMENT CHAR COUNT, ON NULL STRING
591                 * SIMPLY RETURN A 0
592                 *
593                 ****************************************
594 E1898 D781          CON(5)  =!SP@
          E
595 E189D 38    =!C@+   CON(2)  #83
596 E189F 3404          NIBASC  \C@\
597 E18A3 BA            CON(2)  \+\+#80
598 E18A5 0000 =C@+     CON(5)  =DOCOL
          0
599 E18AA B591          CON(5)  =DUP          IF NULL JUST RETURN 0
          E
600 E18AF 0000          CON(5)  =ZBRNH        IF
          0
601 E18B4 D200          CON(5)  (C@0)-*
          0
602 E18B9 3352          CON(5)  =OVER         (addr cnt addr)
          E
603 E18BE 8791          CON(5)  =ROT          (cnt addr addr)
          E
604 E18C3 0000          CON(5)  =TWO+         (cnt addr addr+2)
          0
605 E18C8 8791          CON(5)  =ROT          (addr addr+2 cnt)
          E
606 E18CD 0000          CON(5)  =ONE-         (addr addr+2 cnt-1)
          0
607 E18D2 8791          CON(5)  =ROT          (addr+2 cnt-1 addr)
          E
608 E18D7 0000          CON(5)  =CAT          (addr+2 cnt-1 char)
          0
609 E18DC 0000          CON(5)  =SEMI         ;   cheat!
          0
610 E18E1 0000 C@0      CON(5)  =ZERO         0
          0
611 E18E6 0000          CON(5)  =SEMI
          0
```

```
612                     EJECT
613
614               ****************************************************
615               *
616               * SP!  (  --  )  initialize the data stack pointer
617               *                from oS0
618               *
619               ****************************************************
620
621 E18EB D981          CON(5)   =!C@+
          E
622 E18F0 38    =!SP!   CON(2)   #83
623 E18F2 3505          NIBASC   \SP\
624 E18F6 1A            CON(2)   \!\+#80
625
626 E18F8 DF81  =SP!    CON(5)   =$SP!
          E
627 E18FD 1F11  =$SP!   D1=(5)   (=oS0)          PTR ADDR TO DATA STACK
          BF2
628 E1904 147           C=DAT1   A               C=TOP OF STACK
629 E1907 135           D1=C                     STACK INITIALIZED
630 E190A 03            RTNCC
```

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NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
631                     EJECT
632                 ******************************************************
633                 *
634                 * RP@  (  -- addr)  leaves current addr of return stack
635                 *                   pointer on the data stack
636                 *
637                 ******************************************************
638
639 E190C 0F81             CON(5)  =!SP!
          E
640 E1911 38       =!RP@    CON(2)  #83             RP@
641 E1913 2505             NIBASC  \RP\
642 E1917 0C               CON(2)  \@\+#80
643 E1919 E191     =RP@     CON(5)  =$RP@
          E
644 E191E D9       =$RP@    C=B     A               COPY RTN STK TO C
645 E1920 1C4              D1=D1-  5
646 E1923 145              DAT1=C  A               PUSH VALUE OF RTN STK
647 E1926 03               RTNCC                   TO DATA STACK
648
649                 ******************************************************************
650                 *
651                 * RP!  (  --  )  initialize the return stack pointer from oR0
652                 *
653                 ******************************************************************
654
655 E1928 1191             CON(5)  =!RP@
          E
656 E192D 38       =!RP!    CON(2)  #83
657 E192F 2505             NIBASC  \RP\
658 E1933 1A               CON(2)  \!\+#80
659
660 E1935 A391     =RP!     CON(5)  =@RP!
          E
661 E193A 137      =@RP!    CD1EX                   SAVE DATA STK PTR IN C
662 E193D 1F61             D1=(5)  (=oR0)          LOAD PTR TO TOP OF STACK ADDR
          BF2
663 E1944 143              A=DAT1  A               A=TOS (RETURN STK)
664 E1947 D8               B=A     A               SAVE IN B
665 E1949 135              D1=C                    RESTORE DATA STK PTR IN D1
666 E194C 03               RTNCC
```

```
667                     EJECT
668                 ******************************************************
669                 *
670                 * DUP  (n -- n n)  duplicate item on top of data stk
671                 *
672                 ******************************************************
673
674 E194E D291          CON(5)  =!RP!
        E
675 E1953 38    =!DUP   CON(2)  #83             DUP
676 E1955 4455          NIBASC  \DU\
677 E1959 0D            CON(2)  \P\+#80
678 E195B 0691  =DUP    CON(5)  =$DUP
        E
679
680 E1960 147   =$DUP   C=DAT1  A               READ TOP ITEM
681 E1963 1C4           D1=D1-  5
682 E1966 145           DAT1=C  A               PUSH ON AGAIN
683 E1969 03            RTNCC
684
685                 ************************************************************
686                 *
687                 * ROT  (n1 n2 n3 --- n2 n3 n1)  rotate top 3 items bringing
688                 *                               deepest to top
689                 *
690                 ************************************************************
691
692 E196B 3591          CON(5)  =!DUP
        E
693 E1970 38    =!ROT   CON(2)  #83             ROT
694 E1972 25F4          NIBASC  \RO\
695 E1976 4D            CON(2)  \T\+#80
696 E1978 D791  =ROT    CON(5)  =$ROT
        E
697
698 E197D 147   =$ROT   C=DAT1  A               POP n3
699 E1980 174           D1=D1+  5
700 E1983 143           A=DAT1  A               POP n2
701 E1986 145           DAT1=C  A               PUSH n3
702 E1989 174           D1=D1+  5
703 E198C 147           C=DAT1  A               POP n1
704 E198F 141           DAT1=A  A               PUSH n2
705 E1992 1C9           D1=D1-  10
706 E1995 145           DAT1=C  A               PUSH n1
707 E1998 03            RTNCC
```

```
                        EJECT
                *************************
                *
                * AND  (n1 n2 --- n3)
                *
                *************************

E199A 0791              CON(5)  =!ROT
      E
E199F 38        =!AND   CON(2)  #83              AND
E19A1 14E4              NIBASC  \AN\
E19A5 4C                CON(2)  \D\+#80
E19A7 CA91 =AND         CON(5)  =$AND
      E
E19AC 147       =$AND   C=DAT1  A                POP n2
E19AF 174               D1=D1+  5
E19B2 143               A=DAT1  A                POP n1
E19B5 0EF2              C=C&A   A                n1 AND n2
E19B9 145               DAT1=C  A                PUSH RESULT
E19BC 03                RTNCC

                *************************************************
                *
                * XOR  (n1 n2 --- n3)
                *
                * NOTE: This rtne uses 1 level of CPU rtn stk
                *
                *************************************************

E19BE F991              CON(5)  =!AND
      E
E19C3 38        =!XOR   CON(2)  #83              XOR
E19C5 85F4              NIBASC  \XO\
E19C9 2D                CON(2)  \R\+#80
E19CB 0D91 =XOR         CON(5)  =$XOR
      E

E19D0 143       =$XOR   A=DAT1  A                POP n2
E19D3 174               D1=D1+  5
E19D6 147               C=DAT1  A                POP n1
E19D9 0EFA              C=C!A   A                n1 OR n2
E19DD 06                RSTK=C                   SAVE ON CPU RTN STK
E19DF 147               C=DAT1  A                n1
E19E2 FE                C=-C-1  A                NOT n1
E19E4 FC                A=-A-1  A                NOT n2
E19E6 0EFE              A=A!C   A                NOT n1 OR NOT n2
E19EA 07                C=RSTK
E19EC 0EF2              C=C&A   A                n1 XOR n2
E19F0 145               DAT1=C  A                PUSH ON DATA STK
E19F3 03                RTNCC
```

```
754                     EJECT
755                 ************************************************
756                 *
757                 * NOT (n --- <1's compliment of n>
758                 *
759                 ************************************************
760
761 E19F5 3C91             CON(5)  =!XOR
            E
762 E19FA 38        =!NOT   CON(2)  #83
763 E19FC E4F4              NIBASC  \NO\
764 E1A00 4D                CON(2)  \T\+#80
765 E1A02 70A1      =NOT    CON(5)  =$NOT
            E
766 E1A07 143       =$NOT   A=DAT1  A               READ VALUE
767 E1A0A FC                A=-A-1  A               1'S COMPLEMENT
768 E1A0C 141               DAT1=A  A               write value
769 E1A0F 03                RTNCC
770
771                 **********************
772                 *
773                 * ABS (n1 -- |n1|)
774                 *
775                 **********************
776
777 E1A11 AF91             CON(5)  =!NOT
            E
778 E1A16 38        =!ABS   CON(2)  #83               ABS
779 E1A18 1424              NIBASC  \AB\
780 E1A1C 3D                CON(2)  \S\+#80
781 E1A1E 32A1      =ABS    CON(5)  =$ABS
            E
782
783 E1A23 143       =$ABS   A=DAT1  A                 # TO A
784 E1A26 24                P=      4                 SET HIGH BIT IN C(A)
785 E1A28 308               LC(1)   8                 FOR SIGN TEST
786 E1A2B 0E02              C=C&A   P                 0 IF POSITIVE
787 E1A2F 90A               ?C=0    P                 # POSITIVE?
788 E1A32 90                GOYES   AB01              CLEAR CARRY & RETURN
789 E1A34 20                P=      0                 FLAG FOR OTHER ROUTINES
790 E1A36 F8                A=-A    A                 2'S COMP OF NEG #
791 E1A38 141               DAT1=A  A                 STORE ABS VALUE
792 E1A3B 03        AB01    RTNCC
```

```
793                     EJECT
794                 ********************************************
795                 *
796                 * SP0 ( -- addr)  addr of var containing
797                 *                 addr of top of data stack
798                 *
799                 ************************************************
800 E1A3D 61A1             CON(5)  =!ABS
        E
801 E1A42 38       =!SP0    CON(2)  #83             SP0
802 E1A44 3505             NIBASC  \SP\
803 E1A48 0B               CON(2)  \0\+#80
804 E1A4A F4A1     =SP0     CON(5)  =$SP0
        E
805 E1A4F 8E00     =$SP0    GOSUBL  =DOUSE           START OF DATA STACK
        00
806 E1A55 11BF           CON(5)  (=UVAR)
        2
807
808                 ********************************************
809                 *
810                 * RP0  ( --- addr)  returns addr of addr of
811                 *      top of return stack
812                 *
813                 ********************************************
814
815 E1A5A 24A1           CON(5)  =!SP0
        E
816 E1A5F 38       =!RP0    CON(2)  #83             RP0
817 E1A61 2505             NIBASC  \RP\
818 E1A65 0B               CON(2)  \0\+#80
819 E1A67 C6A1     =RP0     CON(5)  =$RP0
        E
820
821 E1A6C 8E00     =$RP0    GOSUBL  =DOUSE           START OF RETURN STACK
        00
822 E1A72 61BF           CON(5)   (=oR0)
        2
823
824                 ************************************************
825                 *
826                 * TIB  ( -- addr)  returns addr of
827                 *       the terminal input buffer
828                 *
829                 ************************************************
830
831 E1A77 F5A1           CON(5)  =!RP0
        E
832 E1A7C 38       =!TIB    CON(2)  #83             TIB
833 E1A7E 4594             NIBASC  \TI\
834 E1A82 2C               CON(2)  \B\+#80
835 E1A84 98A1     =TIB     CON(5)  =$TIB
        E
836
837 E1A89 20       =$TIB    P=      0
```

```
838 E1A8B 34B1          LC(5)    =oTIB
          BF2
839 E1A92 136           CD0EX                 D0-->ADDR OF TIB, C=I
840 E1A95 142           A=DAT0   A            A(A)=TIB ADDR
841 E1A98 1C4           D1=D1-   5
842 E1A9B 141           DAT1=A   A            PUSH TO DATA STACK
843 E1A9E 134           D0=C                  RESTORE I TO D0
844 E1AA1 03            RTNCC
```

```
845                     EJECT
846                 ******************************************
847                 *
848                 * USE  ( --- addr ) returns the addr of the
849                 *       addr of the next data buffer to use
850                 *
851                 ******************************************
852
853 E1AA3 C7A1              CON(5)  =!TIB
          E
854 E1AA8 38    =!USE       CON(2)  #83             USE
855 E1AAA 5535              NIBASC  \US\
856 E1AAE 5C                CON(2)  \E\+#80
857 E1AB0 5BA1  =USE        CON(5)  =$USE
          E
858
859 E1AB5 8E00  =$USE       GOSUBL  =DOUSE
          00
860 E1ABB 02BF              CON(5)   (=oUSE)
          2
861
862                 ***********************************************
863                 *
864                 * BLK   ( --- addr) returns the addr of the
865                 *       variable holding the current line
866                 *       number being interpreted, or 0
867                 *
868                 ***********************************************
869
870 E1AC0 8AA1              CON(5)  =!USE
          E
871 E1AC5 38    =!BLK       CON(2)  #83             BLK
872 E1AC7 24C4              NIBASC  \BL\
873 E1ACB BC                CON(2)  \K\+#80
874 E1ACD 2DA1  =BLK        CON(5)  =$BLK
          E
875
876 E1AD2 8E00  =$BLK       GOSUBL  =DOUSE
          00
877 E1AD8 25BF              CON(5)   (=oBLK)
          2
878
879                 ************************************************
880                 *
881                 * >IN  ( --- addr)  returns the addr of the
882                 *       variable holding the current pointer
883                 *       into the line being interpreted
884                 *
885                 ************************************************
886
887 E1ADD 5CA1              CON(5)  =!BLK
          E
888 E1AE2 38    =!IN        CON(2)  #83             >IN
889 E1AE4 E394              NIBASC  \>I\
890 E1AE8 EC                CON(2)  \N\+#80
```

```
891 E1AEA FEA1 =IN     CON(5)  =$IN
          E
892
893 E1AEF 8E00 =$IN    GOSUBL  =DOUSE
          00
894 E1AF5 75BF         CON(5)   (=oIN)
          2
```

```
                        EJECT
                *********************************************
                *
                * DPL  ( --- addr) addr of a variable used
                *       in determining the number of digits
                *       to the right of the decimal point in
                *       double integer math
                *
                *********************************************

E1AFA FFA1 =DPL     CON(5)  =$DPL
      E
E1AFF 8E00 =$DPL    GOSUBL  =DOUSE
      00
E1B05 A7BF          CON(5)   (=oDPL)
      2

                *************************************
                *
                * FLD  ( --- addr) addr of a variable
                *       giving field length in formating
                *       a number for display
                *
                *************************************

E1B0A F0B1 =FLD     CON(5)  =$FLD
      E
E1B0F 8E00 =$FLD    GOSUBL  =DOUSE
      00
E1B15 F7BF          CON(5)   (=oFLD)
      2
```

```
                        EJECT
                ****************************************
                *
                * CSP ( --- addr)  addr of variable which
                *       contains stack addr at start of
                *       compilation.
                *
                ****************************************

E1B1A F1B1 =CSP     CON(5)   =$CSP
      E
E1B1F 8E00 =$CSP    GOSUBL    =DOUSE
      00
E1B25 48BF          CON(5)    (=oCSP)
      2

                ****************************************
                *
                * HLD  ( --- addr)  addr of variable which
                *       holds addr of latest char output
                *       during a numeric display
                *
                ****************************************

E1B2A F2B1 =HLD     CON(5)   =$HLD
      E

E1B2F 8E00 =$HLD    GOSUBL   =DOUSE
      00
E1B35 98BF          CON(5)    (=oHLD)
      2
```

```
945                     EJECT
946                 ************************************************
947                 *
948                 * BYE           exit FORTH
949                 *
950                 * Restore saved program status
951                 * Clear the ACTIVE flag
952                 * If an error has occurred (flag from ABORT if from FORTHX), then
953                 * set the system no-continue flag
954                 *
955                 * Save the current top of data stack in DSTKAD
956                 * and GO TO MAIN LOOP
957                 *
958                 ************************************************
959
960 E1B3A 2EA1          CON(5)  =!IN
          E
961 E1B3F 38    =!BYE   CON(2)  #83             BYE
962 E1B41 2495          NIBASC  \BY\
963 E1B45 5C            CON(2)  \E\+#80
964 E1B47 C4B1  =BYE    CON(5)  =$BYE
          E
965
966 E1B4C 7410  =$BYE   GOSUB   BYE1
967 E1B50 1BDF          DO=(5)  =DSTKAD         SAVE TOS
          AF2
968 E1B57 137           CD1EX
969 E1B5A 144           DAT0=C  A
970 E1B5D 8D00          GOVLNG  =MAINLP         goto to BASIC main loop code
          000
971
972                 * BYE1 called by FORTHX
973
974 E1B64 20    =BYE1   P=      0
975 E1B66 7B30          GOSUB   =GTSTAT     RESTORE SAVED PROGRAM STATUS
976 E1B6A 1BC0          DO=(5)  =ACTIVE
          BF2
977 E1B71 D2            C=0     A               CLEAR FORTH ACTIVE FLAG
978 E1B73 144           DAT0=C  A
979 E1B76 1BBB          DO=(5)  =oERR?          DID ERROR HAPPEN?
          BF2
980 E1B7D 146           C=DAT0  A
981 E1B80 8AA           ?C=0    A
982 E1B83 00            RTNYES                  no so just return
983 E1B85 85E           ST=1    14              NO CONTINUE (FOR BENEFIT
984 E1B88 01            RTN                     OF FORTHX "XYZ" IN PROGRAM)
985
986 E1B8A 1B38  =GTS13  DO=(5)  =oPSTAT
          CF2
987 E1B91 142           A=DAT0  A
988 E1B94 814           ASRC                ONLY ONE NIBBLE MATTERS
989 E1B97 84D           ST=0    13
990 E1B9A A44           A=A+A   S
991 E1B9D 550           GONC    GT1
992 E1BA0 85D           ST=1    13
```

```
 993 E1BA3 01    GT1     RTN
 994
 995             ********************************************************************
 996             *
 997             * RESTORE S13&S14 (PROG-RUNNING & NO-CONTINUE) TO THE WAY THEY
 998             * WERE WHEN BASIC WAS LAST RUNNING; TURN ON SUSP OR PRGM
 999             * ANNUNCIATORS IF THEY WERE ON AT THAT TIME.
1000             *
1001             ********************************************************************
1002 E1BA5 71EF =GTSTAT GOSUB   GTS13
1003 E1BA9 840          ST=0    =NoCont
1004 E1BAC A44          A=A+A   S
1005 E1BAF 550          GONC    GT2
1006 E1BB2 850          ST=1    =NoCont
1007 E1BB5 A44  GT2     A=A+A   S
1008 E1BB8 100          R0=A
1009 E1BBB 5D0          GONC    GT3
1010 E1BBE 3100         LC(2)   =f1PRGM
1011 E1BC2 8F00         GOSBVL  =SFLAGS
           000
1012 E1BC9 110  GT3     A=R0
1013 E1BCC A44          A=A+A   S
1014 E1BCF 501          GONC    GT4
1015 E1BD2 3100         LC(2)   =f1SUSP
1016 E1BD6 8F00         GOSBVL  =SFLAGS
           000
1017 E1BDD 850          ST=1    =NoCont     IF PRGM SUSPENDED, DON'T CONTINUE
1018 E1BE0 01   GT4     RTN
1019
```

```
1020                    EJECT
1021                ************************************************************
1022                *
1023                * KEY  ( --- n) return the key code of the key pressed
1024                *       on the data stack
1025                *
1026                ************************************************************
1027 E1BE2 F3B1            CON(5)   =!BYE
           E
1028 E1BE7 38     =!KEY    CON(2)   #83             KEY
1029 E1BE9 B454            NIBASC   \KE\
1030 E1BED 9D              CON(2)   \Y\+#80
1031 E1BEF 4FB1   =KEY     CON(5)   =$KEY
           E
1032
1033 E1BF4 8F00   =$KEY    GOSBVL   =SAVEFP         SAVE FORTH POINTERS
           000
1034 E1BFB 8F00            GOSBVL   =KEYRD
           000
1035
1036                *                                ADDR IN DEFADR+3
1037 E1C02 8F00            GOSBVL   =GETFP          RESTORE FORTH POINTERS
           000
1038 E1C09 137             CD1EX
1039 E1C0C 1F00            D1=(5)   (=DEFADR)+3     ADDR OF CHAR ADDR
           000
1040 E1C13 143             A=DAT1   A               READ CHAR ADDR
1041 E1C16 131             D1=A
1042 E1C19 D0              A=0      A
1043 E1C1B 14B             A=DAT1   B               READ CHAR TO A(A)
1044 E1C1E 135             D1=C
1045 E1C21 1C4             D1=D1-   5
1046 E1C24 141             DAT1=A   A               PUSH CHAR
1047 E1C27 03              RTNCC
```

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THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
1048                    EJECT
1049                ******************************************************
1050                *
1051                * PAD ( --- addr)  Address of scratch area used to hold
1052                *       char strings for intermediate processing.
1053                *
1054                *  NOTE: we allow space for 45 characters; this will
1055                *        cover the extreme case of a 40 bit number
1056                *        displayed in binary.
1057                *
1058                ******************************************************
1059
1060 E1C29 7EB1             CON(5)  !KEY
           E
1061 E1C2E 38     =!PAD     CON(2)  #83               PAD
1062 E1C30 0514             NIBASC  \PA\
1063 E1C34 4C               CON(2)  \D\+#80
1064
1065 E1C36 0000   =PAD      CON(5)  =DOCOL            :
           0
1066 E1C3B 95B2             CON(5)   =HERE             HERE
           E
1067 E1C40 45C1             CON(5)   =LIT              LIT
           E
1068 E1C45 A500             CON(5)  90                45 CHARS
           0
1069 E1C4A 0000             CON(5)   =ADD              +
           0
1070 E1C4F 0000             CON(5)   =SEMI             ;
           0
1071
1072                ******************************************************
1073                *
1074                * LIT  ( --- n) Pushes contents of next dictionary addr
1075                *       onto the data stack.
1076                *
1077                *        This word is a headerless primitive!
1078                *
1079                ******************************************************
1080
1081 E1C54 95C1 =LIT      CON(5)  =$LIT
           E
1082
1083 E1C59 146    =$LIT   C=DAT0  A                 C=VALUE
1084 E1C5C 164            D0=D0+  5                 INCREMENT I
1085 E1C5F 1C4            D1=D1-  5
1086 E1C62 145            DAT1=C  A                 PUSH VALUE TO DATA STK
1087 E1C65 03             RTNCC
```

```
1088                    EJECT
1089                ********************************************
1090                *
1091                * XDO  (limit index --- )
1092                *
1093                *       Runtime code for DO of DO-LOOP
1094                *
1095                ********************************************
1096 E1C67 C6C1E =XDO    CON(5)  =$XDO
1097 E1C6C D9    =$XDO   C=B     A
1098 E1C6E 136           CD0EX                   RTN STK TO D0
1099 E1C71 D5            B=C     A               SAVE I IN B
1100 E1C73 143           A=DAT1  A               POP INDEX
1101 E1C76 174           D1=D1+  5               PT TO LIMIT
1102 E1C79 147           C=DAT1  A               POP LIMIT
1103 E1C7C 174           D1=D1+  5               RTN NOTHING ON DATA STK
1104 E1C7F 184           D0=D0-  5
1105 E1C82 144           DAT0=C  A               PUSH LIMIT TO RTN STK
1106 E1C85 184           D0=D0-  5
1107 E1C88 140           DAT0=A  A               PUSH INDEX TO RTN STK
1108 E1C8B D9            C=B     A
1109 E1C8D 136           CD0EX                   D0=I, C=RTN STK
1110 E1C90 D5            B=C     A
1111 E1C92 03            RTNCC
```

```
1112                    EJECT
1113                ************************************************************
1114                *
1115                * MOD  (n1 n2 -- n3)  Divide n1 by n2 leave remainder n3
1116                *       with same sign as n1.
1117                *
1118                ************************************************************
1119
1120 E1C94 E2C1           CON(5)  =!PAD
          E
1121 E1C99 38     =!MOD    CON(2)  #83
1122 E1C9B D4F4           NIBASC  \MO\
1123 E1C9F 4C             CON(2)  \D\+#80
1124
1125 E1CA1 0000 =MOD      CON(5)  =DOCOL          :
          0
1126 E1CA6 C7B2           CON(5)   =/MOD          rem quot
          E
1127 E1CAB 0C42           CON(5)   =DROP          rem
          E
1128 E1CB0 0000           CON(5)   =SEMI           ;
          0
1129
```

```
1130                    EJECT
1131                ********************************************************
1132                *
1133                * D.R ( d n - ) Display d converted according to BASE,
1134                * right aligned in an n character field.  Display the
1135                * sign only if negative.
1136                *
1137                ********************************************************
1138 E1CB5 99C1           CON(5)  =!MOD
           E
1139 E1CBA 38    =!D.R    CON(2)  #83              D.R
1140 E1CBC 44E2           NIBASC  \D.\
1141 E1CC0 2D             CON(2)  \R\+#80
1142
1143 E1CC2 0000 =D.R      CON(5) =DOCOL
           0
1144 E1CC7 0000           CON(5)  =DEPTH           if depth is < 3 we have
           0
1145 E1CCC 0000           CON(5)  =THREE           an error condition, give
           0
1146 E1CD1 0000           CON(5)  =LT              empty stack message
           0
1147 E1CD6 0000           CON(5)  =ABRT"X
           0
1148 E1CDB E0             CON(2)  =eEMPT
1149 E1CDD 0000           CON(5)  =>R              push n to rtn stk
           0
1150 E1CE2 1BE2           CON(5)   =STR$           turn d into temp string
           E
1151 E1CE7 0000           CON(5)  =R>              addr len n
           0
1152 E1CEC 3352           CON(5)  =OVER            addr len n len
           E
1153 E1CF1 0000           CON(5)  =MINUS           addr len (diff n-len)
           0
1154 E1CF6 0000           CON(5)  =SPACS           put out spaces if diff is positive
           0
1155 E1CFB 29C2           CON(5)  =TYPE            type rest of string
           E
1156 E1D00 0000           CON(5)  =SEMI
           0
```

```
1157                    EJECT
1158                ***********************************
1159                *
1160                * MIN  (n1 n2 --- n3)
1161                *
1162                ***********************************
1163
1164 E1D05 ABC1             CON(5)  =!D.R
          E
1165 E1D0A 38     =!MIN     CON(2)  #83
1166 E1D0C D494             NIBASC  \MI\
1167 E1D10 EC               CON(2)  \N\+#80
1168
1169 E1D12 0000   =MIN      CON(5)  =DOCOL          :
          0
1170 E1D17 5552             CON(5)   =2DUP          n1 n2 n1 n2
          E
1171 E1D1C 0000             CON(5)   =GT            n1 n2 flag
          0
1172 E1D21 0000             CON(5)   =ZBRNH         IF n1>n2
          0
1173 E1D26 A000             CON(5)  (MIN1)-*
          0
1174 E1D2B 9D42             CON(5)   =SWAP          n2 n1
          E
1175                *                               THEN
1176 E1D30 0C42   MIN1     CON(5)   =DROP          DROP larger value
          E
1177 E1D35 0000             CON(5)   =SEMI           ;
          0
1178
1179                ****************************
1180                *
1181                * MAX  (n1 n2 --- n3)
1182                *
1183                ****************************
1184
1185 E1D3A A0D1             CON(5)  =!MIN
          E
1186 E1D3F 38     =!MAX     CON(2)  #83
1187 E1D41 D414             NIBASC  \MA\
1188 E1D45 8D               CON(2)  \X\+#80
1189
1190 E1D47 0000   =MAX      CON(5)  =DOCOL          :
          0
1191 E1D4C 5552             CON(5)   =2DUP          n1 n2  n1 n2
          E
1192 E1D51 0000             CON(5)   =LT            n1 n2 flag
          0
1193 E1D56 0000             CON(5)   =ZBRNH         IF n1<n2
          0
1194 E1D5B A000             CON(5)  (MAX1)-*
          0
1195 E1D60 9D42             CON(5)   =SWAP          n2 n1
          E
```

```
1196            *                                   THEN
1197 E1D65 0C42 MAX1    CON(5)   =DROP              DROP smaller
           E
1198 E1D6A 0000         CON(5)   =SEMI               ;
           0
```

```
1199                    EJECT
1200                ****************************************************************
1201                *
1202                * PFA  (nfa --- pfa)  Convert the name field addr of a compiled
1203                *       definition to its parameter field addr.
1204                *
1205                ****************************************************************
1206
1207 E1D6F 0000 =PFA    CON(5)  =DOCOL          :
           0
1208 E1D74 0000         CON(5)   =ONE           flag to TRAVERSE, move up memory
           0
1209 E1D79 0000         CON(5)   =TRAVS         move to end of name field
           0
1210 E1D7E 45C1         CON(5)   =LIT
           E
1211 E1D83 7000         CON(5)  7               2 NIBS FOR LAST CHAR, 5 FOR
           0
1212                *                            FOR CFA
1213 E1D88 0000         CON(5)   =ADD           we're pointing at PFA
           0
1214 E1D8D 0000         CON(5)   =SEMI          ;
           0
```

```
1215                    EJECT
1216                ************************************************************
1217                *
1218                * R/W     ( addr  line#  fib#   f --- )
1219                *         This routine reads a line number into a buffer. The
1220                *         file can be in the machine or out somewhere on HPIL
1221                *
1222                *       NO HEADER -- subroutine of BLOCK
1223                *
1224                * NOTE:   the addr is the buffer data addr and not the addr of
1225                *         the start of the buffer.
1226                *
1227                * NOTE:   Currently this routine does not write; it simply
1228                *         returns.
1229                *
1230                ************************************************************
1231
1232 E1D92 79D1 =R/W     CON(5)   =$R/W
       E
1233
1234                * this checking for read/write flag is no longer necessary since
1235                * this routine does not write to a file.  If we ever become press
1236                * for space we can get rid of this check, and get rid of code in
1237                * BUFFER etc. where we push this flag
1238
1239 E1D97 143  =$R/W  A=DAT1  A
1240 E1D9A 174         D1=D1+   5              POP FLAG
1241 E1D9D 8AC         ?A#0     A              IS THIS A WRITE?
1242 E1DA0 60          GOYES    READR          NO
1243 E1DA2 6F60        GOTO     WRITE          YES
1244 E1DA6 8E00 READR  GOSUBL   =SAVEFP        SAVE OUR FORTH POINTERS
       00
1245 E1DAC 133         AD1EX                   COPY DATA STK PTR TO A
1246 E1DAF 130         D0=A                    AND THEN TO D0
1247 E1DB2 AF0         A=0      W
1248 E1DB5 142         A=DAT0   A              A(A)=fib#, D0=DATA STK PTR
1249 E1DB8 164         D0=D0+   5
1250 E1DBB 136         CD0EX                   SAVE D0 IN R0
1251 E1DBE 108         R0=C
1252 E1DC1 8F00        GOSBVL   =FIBAD-        FIND THE fib# START ADDR
       000
1253                *                          SYS WILL RETURN ERROR IF
1254                *                          fib# NONEXISTENT
1255                *                          IT ALSO RESTORE D0 FROM R0
1256                * COMPARE LINE #'S
1257                *
1258 E1DC8 101         R1=A                    SAVE ADDR
1259 E1DCB 1FD9 ANOTH  D1=(5)    =oLINE#        CURRENT LINE# ADDR
       BF2
1260 E1DD2 143         A=DAT1   A              CLINE#
1261 E1DD5 146         C=DAT0   A              DESIRED LINE#
1262 E1DD8 164         D0=D0+   5              POINT TO BUFFER ADDR
1263 E1DDB 8A2         ?A=C     A              SAME NUMBERS?
1264 E1DDE E2          GOYES    ENDR
1265 E1DE0 8B2         ?A<C     A              CLINE# < DESIRED LINE# ?
```

```
1266 E1DE3 60          GOYES   NOTEND          YES, READ A LINE
1267 E1DE5 6B90        GOTO    REPOS           CLINE#>DESIRED LINE, REWIND
1268           *                               FILE & START READING
1269
1270
1271 E1DE9 E4   NOTEND A=A+1   A               UPDATE CLINE#
1272 E1DEB 141         DAT1=A  A               WRITE OUT NEW LINE#
1273 E1DEE 8A2         ?A=C    A               READ THIS ONE?
1274 E1DF1 62          GOYES   READIT          YES
1275 E1DF3 7AA0        GOSUB   REDREC          GET READY FOR FAKE READ
1276 E1DF7 541         GONC    ENDR            EOF, JUMP OUT
1277 E1DFA 490         GOC     NOREDO          SET UP FOR READ
1278 E1DFD 8F00 NORED  GOSBVL  =DO+2RD         READ BYTE OF RECORD
          000
1279
1280 E1E04 CD   NOREDO B=B-1   A               DECREMENT CHAR CNT OF REC
1281 E1E06 56F         GONC    NORED           NOT DONE, READ ANOTHER
1282 E1E09 4F4         GOC     TRAO            FINISH UP
1283
1284 E1E0C     ENDR
1285 E1E0C 8E00        GOSUBL  =GETFP          RECOVER FORTH POINTERS
          00
1286 E1E12 17E  WRITE  D1=D1+  15              DROP ITEMS FROM STACK
1287 E1E15 03          RTNCC
1288
1289 E1E17 7680 READIT GOSUB   REDREC          GET READY FOR REC READ
1290 E1E1B 50F         GONC    ENDR            EOF!
1291 E1E1E 3493        LC(5)   =oRSIZE         GET ADDR OF MAX REC LENGTH
          BF2
1292 E1E25 136         CDOEX                   ADDR TO DO
1293 E1E28 14A         A=DAT0  B               A(B)=MAX REC LENGTH ALLOWED
1294 E1E2B 134         DO=C                    RESTORE DO PTR TO SOURCE
1295 E1E2E 6310        GOTO    RDBYTO          SET UP FOR READ
1296
1297 E1E32 14E  RDBYT  C=DAT0  B               READ BYTE
1298 E1E35 14D         DAT1=C  B               WRITE BYTE
1299 E1E38 171         D1=D1+  2               INCREMENT DEST
1300 E1E3B 8F00        GOSBVL  =DO+2RD         INCREMENT SOURCE
          000
1301
1302 E1E42 CD   RDBYTO B=B-1   A               DECREMENT CHAR CNT
1303 E1E44 441         GOC     TRAO            DONE-OKAY
1304 E1E47 A6C         A=A-1   B               DECREMENT MAX CHAR CNT
1305 E1E4A 57E         GONC    RDBYT           DO ANOTHER
1306
1307           *
1308           * RECORD IS LONGER THAN ALLOWED: THROW AWAY EXTRA CHARS
1309           *
1310
1311 E1E4D 8F00 TRASH  GOSBVL  =DO+2RD         READ BYE FROM FILE
          000
1312 E1E54 CD          B=B-1   A               DEC CHAR COUNT
1313 E1E56 56F         GONC    TRASH           NOT DONE YET
1314 E1E59 DB   TRAO   C=D     A               TEST FOR ODD REC
1315 E1E5B 8AA         ?C=0    A
```

```
1316 E1E5E 90          GOYES    TRA00
1317 E1E60 8F00        GOSBVL   =D0+2RD        READ GARBAGE NULL
           000
1318 E1E67 D0   TRA00  A=0      A              WRITE 2 NULLS TO
1319 E1E69 1593        DAT1=A   4              END OF RECORD
1320 E1E6D 8F00        GOSBVL   =UPCPOS        UPDATE POSITION IN
           000
1321           *                               FIB FOR THIS FILE
1322
1323 E1E74 112  TRA1   A=R2
1324 E1E77 132         ADOEX                   DATA STK PTR IN D0
1325 E1E7A 184         D0=D0-   5              PT TO LINE#
1326 E1E7D 6D4F        GOTO     ANOTH          SEE IF WE'RE DONE YET
1327
1328 E1E81 132  REPOS  ADOEX
1329 E1E84 102         R2=A
1330 E1E87 111         A=R1                    A=fib#
1331 E1E8A 8F00        GOSBVL   =REWIND        RESET FILE TO BEGINNING
           000
1332 E1E91 1FD9        D1=(5)   =oLINE#
           BF2
1333 E1E98 D0          A=0      A              SET CURRENT LINE # TO 0
1334 E1E9A 141         DAT1=A   A              THIS WILL FORCE A READ
1335 E1E9D 66DF        GOTO     TRA1
1336
1337           *
1338           * This routine sets everything up to start reading a line
1339           * if it encounters EOF it will write set LINE# to the
1340           * desired line #, write 0 length to the byte count field
1341           * of the buffer, write 2 nulls of data to the buffer and
1342           * return with the carry clear.  Otherwise, it returns with
1343           * the carry set and B(A)=actual byte count for the current line.
1344           *
1345
1346 E1EA1 136  REDREC CDOEX                   C=DATA STK, D0-->BUFF
1347 E1EA4 10A         R2=C                    SAVE DATA STK PTR IN R2
1348 E1EA7 8E00        GOSUBL   =GETPTR        SET UP fib POINTERS FOR READ
           00
1349 E1EAD 112         A=R2                    A=DATA STK PTR
1350 E1EB0 132         ADOEX                   DATA STK PTR BACK IN D0
1351 E1EB3 146         C=DAT0   A              C(A)=BUFFER ADDR
1352 E1EB6 137         CD1EX                   D1-> BUFFER SPACE
1353 E1EB9 1C3         D1=D1-   4              D1-->BYTE CNT IN BUFFER
1354
1355           *
1356           * READ A RECORD
1357           *
1358 E1EBC 110         A=R0                    A=ABS POSITION IN FILE
1359 E1EBF 130         D0=A                    D0-->INTO FILE
1360 E1EC2 8F00        GOSBVL   =RDLNAS        READ RECORD LENGTH
           000
1361 E1EC9 23          P=       3
1362 E1ECB B14         A=A+1    WP
1363 E1ECE 523         GONC     RREC5          WILL CARRY IF EOF
1364 E1ED1 20          P=       0              SET P=0 THEN JUMP TO
```

```
1365                *                                   BACK2B WHICH WILL
1366                *                                   BACK UP 2 BYTES!
1367 E1ED3 8F00             GOSBVL   =BACK2B            BACK UP IF EOF
           000
1368 E1EDA 112              A=R2
1369 E1EDD 132              ADOEX                       GET DATA STK PTR INTO D0
1370 E1EE0 184              D0=D0-   5                  POINT TO LINE#
1371 E1EE3 146              C=DAT0   A                  C(A)=DESIRED LINE#
1372 E1EE6 1BD9             D0=(5)   =oLINE#
           BF2
1373 E1EED 144              DAT0=C   A                  SET LINE# TO DESIRED LINE
1374 E1EF0 D0               A=0      A
1375 E1EF2 1593             DAT1=A   4                  WRITE 2 BYTES OF 0 FOR BYTE COUNT
1376 E1EF6 173              D1=D1+   4                  PT TO DATA AREA IN BUFFER
1377
1378                *
1379                * END:  CLEAN UP & WRITE 2 NULLS TO END OF LINE
1380                *
1381
1382 E1EF9 D0               A=0      A
1383 E1EFB 1593             DAT1=A   4                  WRITE 2 NULLS TO BUFFER
1384 E1EFF 03               RTNCC                       RTN W/ CARRY CLEAR, FAILED
1385
1386 E1F01 A1C  RREC5       A=A-1    WP                 RESTORE BYTE COUNT
1387 E1F04 D3               D=0      A                  ODD BYTE FLAG: SET FOR EVEN
1388 E1F06 D1               B=0      A
1389 E1F08 A98              B=A      WP                  B(A)=REC LENGTH
1390 E1F0B 20               P=       0
1391 E1F0D 301              LC(1)    1                  MASK FOR EVEN REC LEN TEST
1392 E1F10 0E05             C=B&C    P
1393 E1F14 90A              ?C=0     P                  EVEN LENGTH?
1394 E1F17 40               GOYES    RREC10             YES
1395 E1F19 E7               D=D+1    A                  INCREMENT FOR ODD TRAILING BYTE
1396
1397                *
1398                * NOTE: WE WRITE THE ACTUAL RECORD BYTE COUNT TO THE BUFFER
1399                * INSTEAD OF THE ACTUAL BYTE COUNT READ.
1400                *
1401
1402 E1F1B D9   RREC10 C=B      A                       COPY BYTE COUNT TO C(A)
1403 E1F1D 15D3             DAT1=C   4                  WRITE BYTE COUNT TO BUFFER
1404 E1F21 173              D1=D1+   4                  PT TO DATA AREA IN BUFFER
1405 E1F24 02               RTNSC                       return w/ carry set for success
1406
```

```
1407                    EJECT
1408                ********************************************************
1409                *
1410                * EOF  ( --- f)  This routine examines the record length
1411                *   of the next record in the file accessed by the fib#
1412                *   in SCRFIB.  It assumes that the current pointer into
1413                *   the file is pointing at the next record length and
1414                *   that the file is a LIF1 type.
1415                *
1416                *   It returns a true if it is positioned at the end
1417                *   of file, else a false flag.
1418                *
1419                ********************************************************************
1420 E1F26 F3D1         CON(5)  =!MAX
          E
1421 E1F2B 38   =!EOF  CON(2) #83            EOF
1422 E1F2D 54F4        NIBASC \EO\
1423 E1F31 6C          CON(2) \F\+#80
1424 E1F33 83F1 =EOF   CON(5)  =$EOF
          E
1425
1426 E1F38 8F00 =$EOF GOSBVL  =SAVEFP         SAVE FORTH POINTERS
          000
1427 E1F3F 1B16       D0=(5)   =oSCFIB        GET fib#
          BF2
1428 E1F46 142        A=DAT0   A              ACTIVE FIB#
1429 E1F49 8F00       GOSBVL   =FIBAD-        GET START ADDR FOR fib
          000
1430 E1F50 8E00       GOSUBL   =GETPTR        set up cpu regs with fib pointers
          00
1431 E1F56 D2         C=0      A              D(A)=# bytes to EOF, if there are
1432 E1F58 E6         C=C+1    A              less than 2 we'll call it EOF
1433 E1F5A E6         C=C+1    A              otherwise we'll check for FFFF
1434 E1F5C 8B7        ?C>D     A              EOF marker
1435 E1F5F 02         GOYES    TRU            we are at EOF
1436
1437 E1F61 110        A=R0
1438 E1F64 130        D0=A                    D0--->INTO FILE
1439 E1F67 8F00       GOSBVL   =RDLNAS        read record length
          000
1440 E1F6E 23         P=       3
1441 E1F70 B14        A=A+1    WP             ADD 1 TEST FOR FFFF TO 0000 CARRY
1442 E1F73 20         P=       0
1443 E1F75 501        GONC     FALSE          NOT EOF
1444 E1F78 8F00       GOSBVL   =BACK2B        BACK UP FILE
          000
1445
1446 E1F7F D0   TRU   A=0      A
1447 E1F81 CC         A=A-1    A              EOF, RETURN TRUE FLAG
1448 E1F83 4B0        GOC      FAL1           FINISH
1449
1450 E1F86 8F00 FALSE GOSBVL   =BACK2B        BACK UP FILE
          000
1451 E1F8D D0         A=0      A
1452
```

```
1453 E1F8F 8F00 FAL1   GOSBVL   =GETFP          RESTORE FORTH POINTERS
             000
1454 E1F96 1C4         D1=D1-   5
1455 E1F99 141         DAT1=A   A               PUSH RESULT FLAG
1456 E1F9C 03          RTNCC
```

```
1457                    EJECT
1458                ****************************************************
1459                *
1460                * POS                          ( str1 str2 -- p )
1461                * Find position of str1 in str2; zero if no match.
1462                *
1463                ****************************************************
1464
1465 E1F9E B2F1          CON(5)  =!EOF
           E
1466 E1FA3 38    =!POS   CON(2)  #83          POS
1467 E1FA5 05F4          NIBASC  \PO\
1468 E1FA9 3D            CON(2)  \S\+#80
1469 E1FAB 0BF1 =POS     CON(5)  =$POS
           E
1470
1471 E1FB0 8F00 =$POS    GOSBVL  =SAVEFP
           000
1472 E1FB7 8E00          GOSUBL  =SETSTR      put lengths & addresses in R0-R3
           00
1473 E1FBD D1            B=0     A
1474 E1FBF E5            B=B+1   A            start counter at 1
1475 E1FC1 11A           C=R2                 first get len to check for null
1476 E1FC4 8AA           ?C=0    A            reject null (which otherwise
1477 E1FC7 63            GOYES   FAIL            would get past SAME)
1478                * loop through using SAME on each substring
1479 E1FC9 11A  TRY      C=R2                    length string1
1480 E1FCC D7            D=C     A            D=     "
1481 E1FCE 118           C=R0                 length target
1482 E1FD1 8B3           ?D>C    A            target now  smaller?
1483 E1FD4 92            GOYES   FAIL
1484 E1FD6 8E00          GOSUBL  =RESET       set D0&D1 to the two strings
           00
1485 E1FDC 8E00          GOSUBL  =SAME        set carry if they match (through
           00
1486 E1FE2 4C1           GOC     MATCH          end of the shorter)
1487 E1FE5 118           C=R0
1488 E1FE8 CE            C=C-1   A            decrement target
1489 E1FEA E5            B=B+1   A            increment position
1490 E1FEC 108           R0=C
1491 E1FEF 119           C=R1
1492 E1FF2 E6            C=C+1   A            move pointer into str2
1493 E1FF4 E6            C=C+1   A            by 2 nibbles
1494 E1FF6 109           R1=C
1495 E1FF9 6FCF          GOTO    TRY
1496
1497 E1FFD       =fFAIL
1498 E1FFD D1    FAIL    B=0     A            false
1499
1500 E1FFF       =fMATCH
1501 E1FFF D4    MATCH   A=B     A            save from GETFP
1502 E2001 8F00          GOSBVL  =GETFP
           000
1503 E2008 17E           D1=D1+  15           4 in, 1 out
1504 E200B 141           DAT1=A  A
```

```
1505 E200E 03          RTNCC
```

```
1506                    EJECT
1507                ****************************************
1508                *
1509                * VAL                          ( str -- d )
1510                * Return number equivalent of string.
1511                *
1512                ****************************************
1513
1514 E2010 3AF1            CON(5)  =!POS
            E
1515 E2015 38     =!VAL    CON(2)  #83           VAL
1516 E2017 6514            NIBASC  \VA\
1517 E201B CC              CON(2)  \L\+#80
1518
1519 E201D 0000   =VAL     CON(5)  =DOCOL        :
            0
1520 E2022 0C42            CON(5)  =DROP         DROP
            E
1521 E2027 0000            CON(5)  =TWO-         2-
            0
1522
1523                * drop count and point to count behind str
1524
1525 E202C 0000            CON(5)  =NUMB         let NUMBER translate string
            0
1526 E2031 0000            CON(5)  =SEMI         ;
            0
1527
1528                ************************************************
1529                *
1530                * ASC                          ( str -- ascii )
1531                * Give ascii value of first char of string.
1532                *
1533                *
1534                ************************************************
1535
1536 E2036 5102            CON(5)  =!VAL
            E
1537 E203B 38     =!ASC    CON(2)  #83
1538 E203D 1435            NIBASC  \AS\
1539 E2041 3C              CON(2)  \C\+#80
1540
1541 E2043 0000   =ASC     CON(5)  =DOCOL        :
            0
1542 E2048 0C42            CON(5)  =DROP         drop len
            E
1543 E204D 0000            CON(5)  =CAT          fetch 1st char
            0
1544 E2052 0000            CON(5)  =SEMI         ;
            0
```

```
1545                    STITLE  4 CHAR WORDS
1546                ********************************************
1547                *                                          *
1548                *        START OF 4 CHAR WORDS             *
1549                *   ADD ADDITIONAL WORDS AT THIS END       *
1550                *                                          *
1551                ********************************************
1552
1553                ********************************************
1554                *                                          *
1555                * FABS                                     *
1556                *                                          *
1557                * REPLACE X REGISTER BY ABSOLUTE VALUE OF X *
1558                *                                          *
1559                ********************************************
1560 E2057 0000          CON(5)  0
           0
1561 E205C 48    =!FABS  CON(2)  #84
1562 E205E 6414          NIBASC  \FAB\
           24
1563 E2064 3D            CON(2)  \S\+#80
1564 E2066 B602  =FABS   CON(5)  =$FABS
           E
1565 E206B 340D  =$FABS  LC(5)   =oX
           BF2
1566
1567                * PUT X IN LASTX (CAN'T CALL GETX+L BECAUSE OF
1568                * SIGNAL NAN'S WHICH MUST NOT BE CHECKED)
1569
1570 E2072 136           CD0EX
1571 E2075 1527          A=DAT0  W           GET X
1572 E2079 18F           D0=D0-  16          LASTX
1573 E207C 1507          DAT0=A  W           REPLACE WITH X
1574 E2080 16F           D0=D0+  16          BACK TO X
1575 E2083 16E           D0=D0+  15          POINT TO SIGN NIBBLE OF X
1576 E2086 AC0           A=0     S
1577 E2089 1504          DAT0=A  S           PUT IN 0 FOR POSITIVE
1578 E208D 134           D0=C                RESTORE D0
1579 E2090 03            RTNCC
1580                ********************************************
1581                *
1582                * CRLF   ( --- str)  This word returns
1583                *       a pointer to a string constant
1584                *       (constant because its in ROM) of
1585                *       a carriage return and linefeed.
1586                *       Handy for use with OUTPUT.
1587                *
1588                ********************************************
1589 E2092 C502            CON(5)  =!FABS
           E
1590 E2097 48    =!CRLF  CON(2)  #84
1591 E2099 3425          NIBASC  \CRL\
           C4
1592 E209F 6C            CON(2)  \F\+#80
1593 E20A1 0000  =CRLF   CON(5)  =DOCOL        :
```

```
                0
1594 E20A6 0000         CON(5)  =QUOTC      string runtime code
                0
1595 E20AB 20           CON(2)  2           max len
1596 E20AD 20           CON(2)  2           current len
1597 E20AF D0           CON(2)  13          carriage return
1598 E20B1 A0           CON(2)  10          line feed
1599 E20B3 0000         CON(5)  =SEMI       ;
                0
```

```
1600                    EJECT
1601                ********************************************
1602                *
1603                *  X=Y?  X>Y?  X=0?  X<Y?
1604                *
1605                *  Stack:  --- t/f
1606                *
1607                *  Perform the indicated test on X and Y of the
1608                *  floating point stack, if true push -1 to integer
1609                *  stack, else push 0 to integer stack.
1610                *
1611                ************************************************
1612 E20B8 7902            CON(5)  !CRLF
          E
1613 E20BD 48    =!X<Y?    CON(2)  #84
1614 E20BF 85C3            NIBASC  \X<Y\
          95
1615 E20C5 FB              CON(2)  \?\+#80
1616 E20C7 CC02  =X<Y?     CON(5)  $X<Y?
          E
1617 E20CC 7990  $X<Y?     GOSUB   CMPST-
1618 E20D0 21              P=      1               INDICATE OPERATION
1619 E20D2 6A50            GOTO    XXYY            FINISH THERE
1620
1621 E20D6 DB02            CON(5)  !X<Y?
          E
1622 E20DB 48    =!XE0?    CON(2)  #84
1623 E20DD 85D3            NIBASC  \X=0\
          03
1624 E20E3 FB              CON(2)  \?\+#80
1625 E20E5 AE02  =XE0?     CON(5)  $XE0?
          E
1626 E20EA 850   $XE0?     ST=1    0
1627 E20ED 7B70            GOSUB   CMPST
1628                *      C=0     W               SET C TO 0
1629 E20F1 6930            GOTO    X1YY            FINISH THERE
1630
1631 E20F5 BD02            CON(5)  !XE0?
          E
1632 E20FA 48    =!X>Y?    CON(2)  #84
1633 E20FC 85E3            NIBASC  \X>Y\
          95
1634 E2102 FB              CON(2)  \?\+#80
1635 E2104 9012  =X>Y?     CON(5)  $X>Y?
          E
1636 E2109 7C50  $X>Y?     GOSUB   CMPST-
1637 E210D 24              P=      4               P INDICATES TYPE OF TEST
1638 E210F 6D10            GOTO    XXYY            FINISH THERE
1639
1640 E2113 AF02            CON(5)  =!X>Y?
          E
1641 E2118 48    =!XEY?    CON(2)  #84
1642 E211A 85D3            NIBASC  \X=Y\
          95
1643 E2120 FB              CON(2)  \?\+#80
```

```
1644 E2122 7212 =XEY?   CON(5)  $XEY?
           E
1645 E2127 7E30 =$XEY?  GOSUB   CMPST-
1646 E212B 22   X1YY    P=      2             P INDICATES TYPE OF TEST
1647 E212D 8F00 =XXYY   GOSBVL  =uTEST
           000
1648 E2134 04           SETHEX
1649 E2136 D0           A=0     A             RETURN FALSE FLAG
1650 E2138 540          GONC    TR0
1651 E213B CC           A=A-1   A             TRUE FLAG
1652 E213D 8E00 TR0     GOSUBL  =GETFP        RESTORE FORTH ENVIRONMENT
           00
1653 E2143 1C4          D1=D1-  5
1654 E2146 141          DAT1=A  A             PUSH FLAG TO STACK
1655 E2149 03           RTNCC
1656
1657 E214B 8112         CON(5)  =!XEY?
           E
1658 E2150 48   =!X#Y?  CON(2)  #84
1659 E2152 8532         NIBASC  \X#Y\
           95
1660 E2158 FB           CON(2)  \?\+#80
1661 E215A F512 =X#Y?   CON(5)  =$X#Y?
           E
1662 E215F 7600 =$X#Y?  GOSUB   CMPST-
1663 E2163 2D           P=      13
1664 E2165 67CF         GOTO    XXYY
1665
1666            ************************************************
1667            *
1668            * CMPST:        Startup routine for comparison
1669            *               operators
1670            *               x=y? x=0? x<y? x#y? x<=y? x>=y? x>y?
1671            *
1672            * Entry: ST[0]=0 iff want both X and Y (i.e.not
1673            *        doing x=0?)
1674            *
1675            * Exit: If ST[0]=0 then A=X (packed) and C=Y (packed)
1676            *       If ST[0]=1 then A=X (packed) and C=0
1677            *       Signaling NaN's reported and replaced
1678            *       FORTH pointers saved
1679            *       D1=[MTHSTK]
1680            *
1681            * Stk levels: 4 max
1682            * Uses: A,B,C,D,P,R0,R3,D0,D1,ST[7..11]
1683            ************************************************
1684
1685 E2169 840  =CMPST- ST=0    0               Not doing X=0?
1686 E216C 8E00 =CMPST  GOSUBL  =SAVEFP
           00
1687 E2172 05           SETDEC
1688 E2174 1F00         D1=(5)  =MTHSTK
           000
1689 E217B 147          C=DAT1  A               C=[MTHSTK]
1690 E217E 135          D1=C                    SET D1 TO MTHSTK FOR ERRORS
```

```
1691 E2181 1B0D          D0=(5)   (=oX)
           BF2
1692 E2188 7C10          GOSUB    CMPSUB          A=X
1693 E218C 860           ?ST=0    0               DOING X=0?
1694 E218F 70            GOYES    CMPST+          JUMP IF NOT
1695 E2191 AF2           C=0      W               SET UP FOR X=0?
1696 E2194 01            RTN
1697 E2196 100   CMPST+  R0=A                     R0=X
1698 E2199 16F           D0=D0+   16              D0-->Y
1699 E219C 7800          GOSUB    CMPSUB          A=Y
1700 E21A0 AF6           C=A      W               C=Y
1701 E21A3 110           A=R0                     A=X
1702 E21A6 01            RTN
1703
1704 E21A8 1527  CMPSUB  A=DAT0   W               A=X OR Y
1705 E21AC 8F00          GOSBVL   =SIGTST         CHECK SIGNALING NAN'S
           000
1706 E21B3 500           RTNNC                    NO S.N.
1707 E21B6 8F00          GOSBVL   =uRES12         PACK UP S.N.
           000
1708 E21BD AFA           A=C      W
1709 E21C0 01            RTN
```

```
1710                    EJECT
1711                ****************************************
1712                *
1713                * SQRT          SQUARE ROOT OF X
1714                *
1715                ****************************************
1716 E21C2 0512            CON(5)  !X#Y?
             E
1717 E21C7 48      =!SQRTX CON(2)  #84
1718 E21C9 3515            NIBASC  \SQR\
             25
1719 E21CF 4D              CON(2)  \T\+#80
1720 E21D1 6D12 =SQRTX     CON(5)  =$SQRTX
             E
1721 E21D6 8EC3 =$SQRTX GOSUBL  =NUMST      SAVEFP;GETX+L
             5F
1722 E21DC 8F00            GOSBVL  =SQR15
             000
1723 E21E3 8C00            GOLONG  =FEND
             00
```

```
1724                    EJECT
1725                ********************************************
1726                *
1727                * ITOF   ( n --- )  This routine pops the
1728                *        top value on the FORTH data stack
1729                *        and pushes it onto the floating point
1730                *        stack.
1731                *
1732                ********************************************
1733 E21E9 7C12E          CON(5) !SQRTX          NO MORE 4 CHAR WORDS
1734 E21EE 48     =!ITOF   CON(2) #84
1735 E21F0 9445F4         NIBASC \ITO\
1736 E21F6 6C             CON(2) \F\+#80
1737 E21F8 DF12E  =ITOF    CON(5) $ITOF
1738
1739 E21FD 8ED57F $ITOF    GOSUBL =$DUP           DUP VALUE
1740 E2203 8EA18F         GOSUBL =$ABS           MAKE COPY |n|
1741 E2209 143            A=DAT1 A               READ VALUE
1742 E220C 174            D1=D1+ 5
1743 E220F 8E0000         GOSUBL =SAVEFP         SAVE FORTH ENVIRONMENT
1744 E2215 DC             ABEX   A               SAVE IN B(A)
1745 E2217 8E0000         GOSUBL =STKLFT         PREPARE FOR F.P. PUSH
1746 E221D DC             ABEX   A               RESTORE TO A(A)
1747 E221F 8F0000         GOSBVL =HDFLT          CHANGE TO FLOATING POINT
1748 E2226 04             SETHEX                 RESTORE HEX MODE
1749 E2228 8E0000         GOSUBL =GETFP          RESTORE FORTH POINTERS
1750 E222E 147            C=DAT1 A               GET ORIGINAL #
1751 E2231 1B0DBF2        D0=(5) =oX             SET UP FOR WRITE TO X
1752 E2238 C6             C=C+C  A
1753 E223A 590            GONC   ITOF0           # WAS POSITIVE, AOKAY
1754 E223D 05             SETDEC
1755 E223F A4C            A=A-1  S               MAKE IT NEGATIVE
1756 E2242 04             SETHEX
1757 E2244 1507 ITOF0     DAT0=A W               WRITE TO F.P. STACK
1758 E2248 8E0000         GOSUBL =GETFP          RESTORE FORTH & RTN
1759 E224E 174            D1=D1+ 5               OFFICIALLY DROP COPY
1760 E2251 03             RTNCC
```

```
1761                    EJECT
1762                ********************************************
1763                *
1764                * FTOI  ( --- n)  This routine copies the
1765                *       value in the floating point X register
1766                *       and pushes it to the FORTH data stack.
1767                *
1768                ********************************************
1769 E2253 EE12E           CON(5) !ITOF
1770 E2258 48    =!FTOI    CON(2) #84
1771 E225A 6445F4          NIBASC \FTO\
1772 E2260 9C              CON(2) \I\+#80
1773 E2262 7622E =FTOI     CON(5) $FTOI
1774
1775 E2267 8E0000 $FTOI    GOSUBL =SAVEFP        SAVE FORTH ENVIRONMENT
1776 E226D 1B0DBF2         D0=(5) =oX
1777 E2274 1527            A=DAT0 W              GET VALUE OF X REG
1778 E2278 8E0000          GOSUBL =FLTOH         CHANGE TO INTEGER
1779                *                            ERROR OUT IF OVERFLOW
1780 E227E 8E0000          GOSUBL =GETFP         RESTORE FORTH POINTERS
1781 E2284 1C4             D1=D1- 5
1782 E2287 141             DAT1=A A              PUSH NEW INTEGER
1783 E228A 03              RTNCC
```

```
1784                    EJECT
1785              ****************************************
1786              *
1787              * #TIB  ( --- addr)  This rtne returns the
1788              *       addr of a variable which contains
1789              *       the number of characters in the
1790              *       TIB.  It is set by Query.
1791              *
1792              ****************************************
1793 E228C 8522           CON(5) !FTOI
          E
1794 E2291 48    =!#TIB    CON(2) #84
1795 E2293 3245           NIBASC \#TI\
          94
1796 E2299 2C             CON(2) \B\+#80
1797 E229B 0A22  =#TIB    CON(5) $#TIB
          E
1798
1799 E22A0 8E00  =$#TIB   GOSUBL =DOUSE
          00
1800 E22A6 E3BF           CON(5) (=o#TIB)
          2
```

```
1801                    EJECT
1802                *****************************************
1803                *
1804                * SPAN  ( --- addr )  This rtne returns the
1805                *       addr of a variable which contains
1806                *       the number of characters read during
1807                *       the last execution of EXPECT96.
1808                *
1809                *****************************************
1810 E22AB 1922           CON(5)  !#TIB
            E
1811 E22B0 48     =!SPAN  CON(2)  #84
1812 E22B2 3505           NIBASC  \SPA\
            14
1813 E22B8 EC             CON(2)  \N\+#80
1814 E22BA FB22   =SPAN    CON(5)  $SPAN
            E
1815
1816 E22BF 8E00 $SPAN     GOSUBL  =DOUSE
            00
1817 E22C5 C5BF           CON(5)  (=oSPAN)
            2
```

```
1818                    EJECT
1819                ****************************************
1820                *
1821                * EXIT  ( --- ) Terminates execution of
1822                *       a colon-definition.  May not be
1823                *       used within a DO--LOOP
1824                *
1825                ****************************************
1826 E22CA 0B22          CON(5) !SPAN
          E
1827 E22CF 48    =!EXIT   CON(2) #84
1828 E22D1 5485          NIBASC \EXI\
          94
1829 E22D7 4D            CON(2) \T\+#80
1830 E22D9 0000  =EXXIT  CON(5) =DOCOL          :
          0
1831 E22DE 0000          CON(5) =R>
          0
1832 E22E3 0C42          CON(5) =DROP
          E
1833 E22E8 0000          CON(5) =SEMI           ;
          0
```

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THE READER AGREES NOT TO
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```
1834                    EJECT
1835                ****************************************
1836                *
1837                * FLIT    ( --- )  Pushes the next 16 nibs
1838                *         from the dictionary onto the
1839                *         floating point stack.
1840                *
1841                *         This word is a headerless
1842                *         primitive.
1843                *
1844                ****************************************
1845
1846 E22ED 2F22 =FLIT    CON(5) $FLIT
           E
1847
1848 E22F2 1527 $FLIT    A=DAT0 W                READ F.P. VALUE
1849 E22F6 100           R0=A                    SAVE IT
1850 E22F9 16F           D0=D0+ 16               UPDATE I
1851 E22FC 8E00          GOSUBL =SAVEFP          SAVE FORTH POINTERS
           00
1852 E2302 8E00          GOSUBL =STKLFT          READY FOR STORE
           00
1853 E2308 1B0D          D0=(5) =oX
           BF2
1854 E230F 110           A=R0
1855 E2312 1507          DAT0=A W                STORE VALUE IN X
1856 E2316 8C00          GOLONG =GETFP           RECOVER FORTH POINTERS
           00
1857
1858                ****************************************
1859                *
1860                * ASIN          ARC-SINE
1861                *
1862                ****************************************
1863 E231C FC22          CON(5)  !EXIT           NO MORE 4 CHAR WORDS
           E
1864 E2321 48    =!ASIN  CON(2)  #84
1865 E2323 1435          NIBASC  \ASI\
           94
1866 E2329 EC            CON(2)  \N\+#80
1867 E232B 0332  =ASIN   CON(5)  =$ASIN
           E
1868 E2330 8E2E  =$ASIN  GOSUBL  =NUMST     SAVEFP;GETX+L;UMODES
           3F
1869 E2336 8F00          GOSBVL  =ASIN15
           000
1870 E233D 8C00          GOLONG  =FEND       PUTABX;GETFP;RTNCC
           00
1871
1872                ****************************************
1873                *
1874                * ACOS          ARC-COSINE
1875                *
1876                ****************************************
1877 E2343 1232          CON(5)  =!ASIN
```

```
            E
1878 E2348  48    =!ACOS  CON(2)  #84
1879 E234A  1434          NIBASC  \ACO\
            F4
1880 E2350  3D            CON(2)  \S\+#80
1881 E2352  7532  =ACOS   CON(5)  =$ACOS
            E
1882 E2357  8EBB  =$ACOS  GOSUBL  =NUMST
            3F
1883 E235D  8F00          GOSBVL  =ACOS15
            000
1884 E2364  8C00          GOLONG  =FEND
            00
1885
1886              ****************************************
1887              *
1888              * ATAN            ARC-TANGENT
1889              *
1890              ****************************************
1891 E236A  8432          CON(5)  =!ACOS
            E
1892 E236F  48    =!ATAN  CON(2)  #84
1893 E2371  1445          NIBASC  \ATA\
            14
1894 E2377  EC            CON(2)  \N\+#80
1895 E2379  E732  =ATAN   CON(5)  =$ATAN
            E
1896 E237E  8E49  =$ATAN  GOSUBL  =NUMST
            3F
1897 E2384  8F00          GOSBVL  =ATAN15
            000
1898 E238B  8C00          GOLONG  =FEND
            00
1899
1900              ************************************************
1901              *
1902              * X<>Y            EXCHANGE X & Y  41C REGISTERS
1903              *
1904              ************************************************
1905 E2391  F632          CON(5)  =!ATAN
            E
1906 E2396  48    =!X<>Y  CON(2)  #84
1907 E2398  85C3          NIBASC  \X<>\
            E3
1908 E239E  9D            CON(2)  \Y\+#80
1909 E23A0  5A32  =X<>Y   CON(5)  =$X<>Y
            E
1910 E23A5  20    =$X<>Y  P=      0
1911 E23A7  340D          LC(5)   =oX
            BF2
1912 E23AE  136           CD0EX
1913 E23B1  109           R1=C                    SAVE D0
1914 E23B4  1567          C=DAT0  W               C=X
1915 E23B8  16F           D0=D0+  16              D0-->Y
1916 E23BB  1527          A=DAT0  W               A=Y
```

```
1917 E23BF 1547          DAT0=C  W               Y=X
1918 E23C3 18F           D0=D0-  16              D0-->X
1919 E23C6 1507          DAT0=A  W               X=Y
1920 E23CA 119           C=R1
1921 E23CD 134           D0=C                    RESTORE D0
1922 E23D0 03            RTNCC
1923              ****************************************
1924              *
1925              * 10^X          10 TO THE XTH POWER
1926              *
1927              ****************************************
1928 E23D2 6932          CON(5)  =!X<>Y
           E
1929 E23D7 48    =!10^X  CON(2)  #84
1930 E23D9 1303          NIBASC  \10^\
           E5
1931 E23DF 8D            CON(2)  \X\+#80
1932 E23E1 6E32  =10^X   CON(5)  =$10^X
           E
1933 E23E6 8EC2  =$10^X  GOSUBL  =NUMST       GET X INTO A(A,B), STORE IN LASTX
           3F
1934 E23EC AF9           C=B     W
1935 E23EF AF7           D=C     W
1936 E23F2 AF6           C=A     W            COPY X INTO (C,D)
1937 E23F5 AF0           A=0     W
1938 E23F8 E4            A=A+1   A
1939 E23FA AF1           B=0     W
1940 E23FD 2E            P=      14
1941 E23FF B05           B=B+1   P             (A,B)=10
1942 E2402 8F00          GOSBVL  =YX2-15       DO FUNCTION
           000
1943 E2409 8C00          GOLONG  =FEND
           00
```

```
1944                    EJECT
1945                ******************************************************
1946                *
1947                * GROW  ( n --- t/f)  Enlarge the user dictionary
1948                *        by n nibs.  If there is enough room, return
1949                *        a true flag (-1) else return a false flag (0).
1950                *
1951                * changed n to mean nibs instead of bytes
1952                * 12/12/83 B.M.
1953                ******************************************************
1954
1955
1956 E240F 7D32            CON(5) =!10^X
          E
1957 E2414 48    =!GROW     CON(2) #84
1958 E2416 7425            NIBASC \GRO\
          F4
1959 E241C 7D              CON(2) \W\+#80
1960 E241E 3242  =GROW     CON(5) $GROW
          E
1961
1962 E2423 7360  =$GROW    GOSUB  CHK          make sure n is legal
1963 E2427 06              RSTK=C              save #NIBS on CPU stk
1964 E2429 8F00            GOSBVL =MEMCKL      check free mem, leaves
          000
1965                *                           amount to check in B(A)
1966 E2430 417             GOC    WR0          not enough, rtn fail flag
1967 E2433 1B00            D0=(5) =MAINST
          000
1968 E243A 146             C=DAT0 A            C(A)=addr of file
1969 E243D 1B39            D0=(5) =oDP
          BF2
1970 E2444 142             A=DAT0 A            A(A)=addr of 1st free nib
1971
1972 E2447 8F00            GOSBVL =MVMEM+      move memory, adjust file chain
          000
1973
1974 E244E 07    =adj      C=RSTK              fetch #nibs from cpu rtn stack
1975 E2450 1B11            D0=(5) =oS0
          BF2
1976 E2457 DA              A=C    A            A(A)=# NIBS change in dictionary
1977 E2459 3160            LC(2)  6            7 entries (7-1) to adjust
1978 E245D AE5             B=C    B            store counter in B(B)
1979
1980 E2460 146   AD1       C=DAT0 A            read value
1981 E2463 C2              C=C+A  A            adjust value
1982 E2465 144             DAT0=C A            write new value
1983 E2468 164             D0=D0+ 5            adjust ptr to next value
1984 E246B A6D             B=B-1  B            decrement counter
1985 E246E 51F             GONC   AD1          we're done on carry
1986
1987 E2471 8E00            GOSUBL =GETFP       restore FORTH pointers
          00
1988
1989                * must also adjust data stk and rtn stk, A(A) still
```

```
1990            * has #NIBS adjusted after restoring FORTH pointers
1991
1992 E2477 C8            B=B+A  A          add amount to RTN STK
1993 E2479 137           CD1EX
1994 E247C C2            C=C+A  A          add amount to DATA STK
1995 E247E 135           D1=C
1996 E2481 D2            C=0    A
1997 E2483 CE            C=C-1  A          true flag
1998 E2485 145           DAT1=C A          push flag
1999 E2488 03            RTNCC
2000
2001 E248A 8E00 =CHK     GOSUBL =SAVEFP    save FORTH pointers
           00
2002 E2490 20            P=     0
2003 E2492 AF2           C=0    W
2004 E2495 147           C=DAT1 A          read # nibs
2005 E2498 C6            C=C+C  A          check for negative #s
2006 E249A 470           GOC    WR0        error if negative
2007 E249D 81E           CSRB              restore to nib count
2008 E24A0 01            RTN
2009
2010 E24A2 07   WR0      C=RSTK            throw away CHK rtn stk
2011
2012 E24A4 8E00 =WR1     GOSUBL =GETFP     restore FORTH pointers
           00
2013 E24AA D2            C=0    A
2014 E24AC 145           DAT1=C A          write false flag
2015 E24AF 03            RTNCC
```

```
2016                    EJECT
2017                ******************************************************
2018                *
2019                * DROP ( n -- )  drop the top number from the stack
2020                *
2021                ******************************************************
2022
2023 E24B1 4142             CON(5)  !GROW
           E
2024 E24B6 48       =!DROP  CON(2)  #84                 DROP
2025 E24B8 4425             NIBASC  \DRO\
           F4
2026 E24BE 0D               CON(2)  \P\+#80
2027 E24C0 5C42 =DROP       CON(5)  =$DROP
           E
2028
2029 E24C5 174  =$DROP      D1=D1+  5               THROW AWAY TOP ITEM
2030 E24C8 03               RTNCC
2031
2032
2033                ******************************************************
2034                *
2035                * SWAP  ( n1 n2 -- n2 n1 ) exchange order of top two
2036                *                          stack items
2037                *
2038                ******************************************************
2039
2040 E24CA 6B42             CON(5)  =!DROP
           E
2041 E24CF 48       =!SWAP  CON(2)  #84                 SWAP
2042 E24D1 3575             NIBASC  \SWA\
           14
2043 E24D7 0D               CON(2)  \P\+#80
2044 E24D9 ED42 =SWAP       CON(5)  =$SWAP
           E
2045
2046 E24DE 147  =$SWAP      C=DAT1  A               POP N2
2047 E24E1 174              D1=D1+  5
2048 E24E4 143              A=DAT1  A               POP N1
2049 E24E7 145              DAT1=C  A               PUSH N2
2050 E24EA 1C4              D1=D1-  5
2051 E24ED 141              DAT1=A  A               PUSH N1
2052 E24F0 03               RTNCC
```

```
2053                    EJECT
2054                ****************************************************************
2055                *
2056                * PICK  (n1 -- n2)  return contents of  n1-th stack value
2057                *                   not counting n1 itself. NO ERROR CHECKING!
2058                *
2059                ****************************************************************
2060
2061 E24F2 FC42           CON(5)  =!SWAP
              E
2062 E24F7 48     =!PICK  CON(2)  #84             PICK
2063 E24F9 0594           NIBASC  \PIC\
              34
2064 E24FF BC             CON(2)  \K\+#80
2065 E2501 6052 =PICK     CON(5)  =$PICK
              E
2066
2067 E2506 147  =$PICK    C=DAT1  A               C=n1
2068 E2509 DA             A=C     A
2069 E250B C6             C=C+C   A               (n1+1)*2
2070 E250D C6             C=C+C   A               (n1+1)*4
2071 E250F C2             C=C+A   A               (n1+1)*5=OFFSET INTO STACK
2072 E2511 133            AD1EX                   SAVE DATA STK IN A
2073 E2514 C2             C=C+A   A               ADDR OF DESIRED ITEM
2074 E2516 135            D1=C
2075 E2519 147            C=DAT1  A               C=DESIRED ITEM
2076 E251C 131            D1=A                    RESTORE DATA STACK
2077 E251F 145            DAT1=C  A               STORE ITEM ON TOP OF n1
2078 E2522 03             RTNCC
```

```
2079                    EJECT
2080                *****************************************************
2081                *
2082                * OVER  (n1 n2 -- n1 n2 n1) leave a copy of 2nd number
2083                *                           on data stack
2084                *
2085                *****************************************************
2086 E2524 7F42             CON(5)  =!PICK
          E
2087 E2529 48     =!OVER    CON(2)  #84             OVER
2088 E252B F465             NIBASC  \OVE\
          54
2089 E2531 2D               CON(2)  \R\+#80
2090 E2533 8352   =OVER     CON(5)  =$OVER
          E
2091
2092 E2538 174    =$OVER    D1=D1+  5
2093 E253B 147              C=DAT1  A               POP n1
2094 E253E 1C9              D1=D1-  10
2095 E2541 145              DAT1=C  A               PUSH n1
2096 E2544 03               RTNCC
2097
2098                *****************************************************
2099                *
2100                * 2DUP  (d --- d d) duplicate top double # on data stack
2101                *
2102                *****************************************************
2103
2104 E2546 9252               CON(5)  =!OVER
          E
2105 E254B 48     =!2DUP    CON(2)  #84             2DUP
2106 E254D 2344             NIBASC  \2DU\
          55
2107 E2553 0D               CON(2)  \P\+#80
2108 E2555 A552   =2DUP     CON(5)  =$2DUP
          E
2109
2110 E255A 15F9   =$2DUP    C=DAT1  10              POP D
2111 E255E 1C9              D1=D1-  10
2112 E2561 15D9             DAT1=C  10              STORE D AGAIN
2113 E2565 03               RTNCC
```

```
2114                    EJECT
2115                ****************************************************************
2116                *
2117                * FILL (addr u byte --- ) fill memory beginning at addr with
2118                *       n copies of byte, if quantity is  = 0 then
2119                *       take no action
2120                *
2121                ****************************************************************
2122
2123 E2567 B452           CON(5)   =!2DUP
             E
2124 E256C 48     =!FILL   CON(2)   #84              FILL
2125 E256E 6494           NIBASC   \FIL\
             C4
2126 E2574 CC             CON(2)   \L\+#80
2127 E2576 B752 =FILL     CON(5)   =$FILL
             E
2128
2129 E257B 143  =$FILL    A=DAT1   A               READ BYTE TO A
2130 E257E 174           D1=D1+   5
2131 E2581 147           C=DAT1   A               READ U
2132 E2584 174           D1=D1+   5
2133 E2587 D7            D=C      A               COPY U TO D
2134 E2589 8AB           ?D=0     A               ANY TO DO?
2135 E258C 81            GOYES    FIL1            NO, LETS FINISH
2136 E258E CF            D=D-1    A               PRIME FOR CARRY TEST
2137 E2590 147           C=DAT1   A               READ ADDR
2138 E2593 136           CD0EX                    D0=ADDR,C=I
2139 E2596 148  FIL0      DAT0=A   B               STORE BYTE AT ADDR
2140 E2599 161           D0=D0+   2               INCREMENT ADDR
2141 E259C CF            D=D-1    A               DECREMENT COUNT
2142 E259E 57F           GONC     FIL0            DO ANOTHER IF NO CARRY
2143 E25A1 134           D0=C                     RESTORE I TO D0
2144 E25A4 174  FIL1      D1=D1+   5               DROP ADDR FROM DATA STACK
2145 E25A7 03            RTNCC
```

```
2146                    EJECT
2147                ****************************************************************
2148                *
2149                * DABS  (d --- |d| ) absolute value of dbl # on data stack
2150                *
2151                ****************************************************************
2152
2153 E25A9 C652          CON(5)  =!FILL
              E
2154 E25AE 48    =!DABS   CON(2)  #84              DABS
2155 E25B0 4414          NIBASC  \DAB\
              24
2156 E25B6 3D            CON(2)  \S\+#80
2157 E25B8 DB52  =DABS   CON(5)  =$DABS
              E
2158
2159 E25BD 143   =$DABS  A=DAT1  A                 get MSDs for quick test
2160 E25C0 C4            A=A+A   A
2161 E25C2 500           RTNNC
2162
2163                * now we know it's negative
2164
2165 E25C5 1C4           D1=D1-  5
2166 E25C8 15B9          A=DAT1  10                get MSDs
2167 E25CC 179           D1=D1+  10
2168 E25CF 143           A=DAT1  A                 get LSDs
2169 E25D2 29            P=      9
2170 E25D4 B98           A=-A    WP
2171 E25D7 141           DAT1=A  A                 put LSDs
2172 E25DA 1C9           D1=D1-  10
2173 E25DD 1599          DAT1=A  10                put MSDs
2174 E25E1 174           D1=D1+  5
2175 E25E4 03            RTNCC
```

```
2176                    EJECT
2177                ********************************************************
2178                *
2179                * S->D  (n --- d)  sign extend a single # to form a dbl #
2180                *
2181                ********************************************************
2182
2183 E25E6 EA52E        CON(5)  =!DABS
2184 E25EB 48   =!S->D  CON(2)  #84             S->D
2185 E25ED 35D2E        NIBASC  \S->\
2186 E25F3 4C           CON(2)  \D\+#80
2187 E25F5 AF52E =S->D  CON(5)  =$S->D
2188
2189 E25FA 147  =$S->D  C=DAT1  A               POP N
2190 E25FD D0           A=0     A               CLEAR FOR POS #
2191 E25FF C6           C=C+C   A               CHECK SIGN BIT
2192 E2601 540          GONC    SD0             GO IF POSITIVE
2193 E2604 CC           A=A-1   A               ITS NEG MAKE ALL 1'S
2194 E2606 1C4  SD0     D1=D1-  5
2195 E2609 141          DAT1=A  A               PUSH SIGN EXTENSION
2196 E260C 03           RTNCC
2197
2198                ********************************************************
2199                *
2200                * WARN  ( --- addr)  addr of variable with warning
2201                *       flag
2202                *
2203                ********************************************************
2204
2205 E260E BE52E        CON(5)  =!S->D
2206 E2613 48   =!WARN  CON(2)  #84             WARN
2207 E2615 751425       NIBASC  \WAR\
2208 E261B EC           CON(2)  \N\+#80
2209 E261D 2262E =WARN  CON(5)  =$WARN
2210
2211 E2622 8E000 =$WARN GOSUBL  =DOUSE
2212 E2628 84BF2        CON(5)   (=oWARN)
2213
2214                ********************************************
2215                *
2216                * PREV  ( --- addr)  addr of variable having
2217                *       addr of last used disc buffer.
2218                *
2219                ********************************************
2220
2221 E262D 3162E        CON(5)  =!WARN
```

```
2222 E2632 48    =!PREV  CON(2)  #84             PREV
2223 E2634 0525          NIBASC  \PRE\
           54
2224 E263A 6D            CON(2)  \V\+#80
2225 E263C 1462  =PREV   CON(5)  =$PREV
           E
2226
2227 E2641 8E00  =$PREV  GOSUBL   =DOUSE
           00
2228 E2647 52BF          CON(5)   (=oPREV)
           2
```

```
2229                    EJECT
2230                ****************************************
2231                *
2232                * BASE  ( --- addr)  addr of variable
2233                *       containing the currently active
2234                *       base for interpreting and displaying
2235                *       numbers
2236                *
2237                ************************************************
2238
2239 E264C 2362         CON(5)  =!PREV
           E
2240 E2651 48   =!BASE  CON(2)  #84             BASE
2241 E2653 2414       NIBASC  \BAS\
           35
2242 E2659 5C         CON(2)  \E\+#80
2243 E265B 0662 =BASE  CON(5)  =$BASE
           E
2244
2245 E2660 8E00 =$BASE GOSUBL   =DOUSE
           00
2246 E2666 57BF       CON(5)   (=oBASE)
           2
```

```
2247                    EJECT
2248                ************************************
2249                *
2250                * THEN   compile time: ( addr 2 - )
2251                * no run-time action
2252                *
2253                * Check for syntax (i.e. that there was an IF as preceding
2254                * control=structure word; then fill in the offset from
2255                * here back to the IF after the ZBRNH (conditional jump)
2256                * which IF compiled.
2257                *
2258                ************************************
2259
2260 E266B 1562             CON(5)  =!BASE
           E
2261 E2670 4C     =!THEN    CON(2) #C4              THEN
2262 E2672 4584           NIBASC \THE\
           54
2263 E2678 EC             CON(2) \N\+#80
2264
2265 E267A 0000 *THEN      CON(5) =DOCOL
           0
2266 E267F 0000           CON(5)  =?COMP          ?COMP
           0
2267 E2684 0000           CON(5)  =TWO            2
           0
2268 E2689 0000           CON(5)  =?PAIR          ?PAIRS
           0
2269 E268E 95B2           CON(5)  =HERE           HERE
           E
2270 E2693 3352           CON(5)  =OVER          get addr of the IF which it left und
           E
2271 E2698 0000           CON(5)  =MINUS         get offset back from HERE to there
           0
2272 E269D 9D42           CON(5)  =SWAP          stack: offset addr
           E
2273 E26A2 0000           CON(5)  =STORE        store offset back at IF, i.e. after
           0
2274                *                             the ZBRNH which it compiled
2275 E26A7 0000           CON(5)  =SEMI           ;
           0
2276
2277
2278                ************************************************************
2279                *
2280                * ELSE   compile time: ( addr1 2 - addr2 2 )   immediate
2281                * compiles BRANCH ( - )
2282                *
2283                * ELSE works by compiling an unconditional branch which will
2284                * have its addr filled in by THEN (which will think that an IF
2285                * preceded it since we leave the same syntax-check code), and
2286                * executing THEN to fill in the addr for the conditional jump
2287                * compiled by IF.
2288                *
2289                ************************************************************
```

```
2290
2291 E26AC 0762E          CON(5)  =!THEN
2292 E26B1 4C    =!ELSE   CON(2) #C4          ELSE
2293 E26B3 54C435         NIBASC \ELS\
2294 E26B9 5C             CON(2) \E\+#80
2295
2296 E26BB 00000 =ELSE    CON(5) =DOCOL
2297 E26C0 00000          CON(5)  =?COMP      check for compile mode
2298 E26C5 00000          CON(5)  =TWO        2
2299 E26CA 00000          CON(5)  =?PAIR      ?PAIRS
2300 E26CF 00000          CON(5)  =COMPL      COMPILE
2301 E26D4 00000          CON(5)  =BRNCH      BRANCH
2302 E26D9 95B2E          CON(5)  =HERE       leave addr for THEN
2303 E26DE 00000          CON(5)  =ZERO       0
2304 E26E3 00000          CON(5)  =COMMA      ALLOT SPACE FOR ADDR TO BE FILLED I
2305 E26E8 9D42E          CON(5)  =SWAP       swap the HERE with the addr of the
2306 E26ED 00000          CON(5)  =TWO        2
2307 E26F2 A762E          CON(5)  =THEN       execute THEN to fill in previous ad
2308 E26F7 00000          CON(5)  =TWO        leave HERE and 2 for
2309 E26FC 00000          CON(5)  =SEMI       ;
```

```
2310                    EJECT
2311                ************************************************
2312                *
2313                * LOOP   compile time: ( addr 3 - )   immediate
2314                * compiles XLOOP
2315                *
2316                ************************************************
2317
2318 E2701 1B62E           CON(5) =!ELSE
2319 E2706 4C      =!LOOP    CON(2) #C4
2320 E2708 C4F4F4           NIBASC \LOO\
2321 E270E 0D              CON(2) \P\+#80
2322 E2710 00000 =LOOP     CON(5) =DOCOL
2323 E2715 00000           CON(5)  =?COMP        ensure compile mode
2324 E271A 00000           CON(5)  =THREE        3
2325 E271F 00000           CON(5)  =?PAIR        ?PAIRS
2326 E2724 00000           CON(5)  =COMPL        COMPILE
2327 E2729 00000           CON(5)  =XLOOP        XLOOP
2328 E272E 95B2E           CON(5)  =HERE         HERE
2329 E2733 00000           CON(5)  =MINUS        -
2330 E2738 00000           CON(5)  =COMMA        ,
2331 E273D 95B2E           CON(5)  =HERE         PASS THIS TO SETLEV
2332 E2742 C472E           CON(5)  =SETLEV       HANDLE ANY LEAVES
2333 E2747 00000           CON(5)  =SEMI         ;
2334
2335
2336 E274C 1572E =SETLEV   CON(5) $SETLV
2337 E2751 143   $SETLV    A=DAT1 A              GET HERE ADDR
2338 E2754 174             D1=D1+ 5              THROW AWAY IN ANY EVENT
2339 E2757 8E000           GOSUBL =SAVEFP        SAVE FORTH ENVIRONMENT, A(A) NOT CH
2340 E275D 1B48BF2         D0=(5) =oCSP          GET STK PTR VALUE FROM WHEN  WE BEG
2341 E2764 146             C=DAT0 A              COMPILE MODE,
2342 E2767 D7              D=C    A              SAVE IN D FOR LATER COMPARES
2343 E2769 3460000         LC(5)  6              LEAVE FLAG WE WILL LOOK FOR
2344 E2770 D8              B=A    A              SAVE HERE ADDR IN B
2345 E2772 179   SETL0     D1=D1+ 10             MAKE SURE THERE ARE 2 ITEMS ON
2346 E2775 137             CD1EX                 STK SO THAT WE DON'T GO BELOW
```

```
2347 E2778 8B7          ?C>D   A          CONTROLLED VALUE
2348 E277B 01           GOYES  NONE       NONE TO DO
2349 E277D 137          CD1EX
2350 E2780 1C9          D1=D1- 10         RESTORE STK PTR
2351
2352 E2783 143          A=DAT1 A          READ FLAG OF CONDITIONAL PAIR
2353 E2786 8A2          ?A=C   A          MATCH WITH LEAVE?
2354 E2789 80           GOYES  SETL1      YES!!
2355 E278B 8C00 NONE    GOLONG =GETFP     NO MORE LEAVES TO HANDLE
          00
2356            *                         RESTORE FORTH ENVIRONMENT
2357
2358 E2791 174  SETL1   D1=D1+ 5          THROW 6 AWAY
2359 E2794 143          A=DAT1 A          READ LEAVE ADDR
2360 E2797 130          D0=A
2361 E279A EC           A=B-A  A          HERE-LEAVE ADDR
2362 E279C 140          DAT0=A A          WRITE BRANCH OFFSET INTO LEAVE
2363 E279F 174          D1=D1+ 5          THROW AWAY LEAVE ADDR
2364 E27A2 1BDF         D0=(5) =DSTKAD    SET DATA STK PTR TO REFLECT
          AF2
2365 E27A9 137          CD1EX             LOSS OF LEAVE PAIR
2366 E27AC 144          DAT0=C A
2367 E27AF 137          CD1EX
2368 E27B2 6FBF         GOTO   SETL0      TRY FOR ANOTHER LEAVE
```

```
2369                    EJECT
2370                ************************************************
2371                *
2372                * ROLL  ( n --- ) Rotate items on stack to bring
2373                *       nth item to top of stack.
2374                *
2375                ************************************************
2376
2377 E27B6 6072             CON(5)  =!LOOP
           E
2378 E27BB 48     =!ROLL    CON(2)  #84             ROLL
2379 E27BD 25F4            NIBASC  \ROL\
           C4
2380 E27C3 CC              CON(2)  \L\+#80
2381 E27C5 0000   =ROLL    CON(5)  =DOCOL          :
           0
2382 E27CA B591            CON(5)   =DUP           if n is less than 1
           E
2383 E27CF 0000            CON(5)   =ONE           abort with less than 1
           0
2384 E27D4 0000            CON(5)   =LT            parameter message
           0
2385 E27D9 0000            CON(5)   =ABORTW
           0
2386 E27DE 60              CON(2)  =eLT1
2387 E27E0 0000            CON(5)   =ONE+          1+  add 1 to n
           0
2388 E27E5 B591            CON(5)   =DUP           DUP
           E
2389 E27EA 1052            CON(5)   =PICK          PICK
           E
2390 E27EF 9D42            CON(5)   =SWAP          SWAP
           E
2391 E27F4 45C1            CON(5)   =LIT
           E
2392 E27F9 5000            CON(5)   5              5
           0
2393 E27FE 0000            CON(5)   =MULT          *
           0
2394 E2803 5881            CON(5)   =SP@           SP@
           E
2395 E2808 0000            CON(5)   =ADD           +
           0
2396 E280D B591 ROLL1      CON(5)   =DUP           BEGIN DUP
           E
2397 E2812 0000            CON(5)   =FIVE-         5-
           0
2398 E2817 0000            CON(5)   =AT            @
           0
2399 E281C 3352            CON(5)   =OVER          OVER
           E
2400 E2821 0000            CON(5)   =STORE         !
           0
2401 E2826 0000            CON(5)   =FIVE-         5-
           0
```

```
2402 E282B 5881E        CON(5)   =SP@          SP@
2403 E2830 3352E        CON(5)   =OVER         OVER
2404 E2835 00000        CON(5)   =U<           U<
2405 E283A 00000        CON(5)   =ZEQ          0=
2406 E283F 00000        CON(5)   =ZBRNH        UNTIL
2407 E2844 9CFFF        CON(5)   (ROLL1)-*
2408 E2849 00000        CON(5)   =2DROP        2DROP  (OR DDROP)
2409 E284E 00000        CON(5)   =SEMI         ;
```

```
2410                    EJECT
2411                ****************************************************************
2412                *
2413                * FIND  addr1 --- addr2 n      Addr1 is the address of a counted
2414                *       string.  The string contains a word name to be located in
2415                *       the currently active search order.  If the word is found,
2416                *       addr2 is the compilation address and n is set to  1 if
2417                *       the word has the immediate attribute, or -1 if the word
2418                *       is non-immediate.  If the word is not found then
2419                *       add2=addr1 and n = 0.
2420                *
2421                ****************************************************************
2422
2423 E2853 BB72             CON(5)  =!ROLL
           E
2424 E2858 48     =!FIND    CON(2)  #84
2425 E285A 6494           NIBASC  \FIN\
           E4
2426 E2860 4C             CON(2)  \D\+#80
2427
2428 E2862 0000 =FIND      CON(5)  =DOCOL          :
           0
2429 E2867 B591           CON(5)  =DUP            (* ADDR1  ADDR1 *)
           E
2430 E286C 0000           CON(5)  =CONTX          CONTEXT
           0
2431 E2871 0000           CON(5)  =AT             @
           0
2432 E2876 0000           CON(5)  =AT             @  (* ADDR1 ADDR1  SEARCH-ADDR *)
           0
2433 E287B 0000           CON(5)  =FIND>          FIND> RETURNS TWO POSSIBLE SETS OF
           0
2434                *                             ADDR1  CFA-OF-WORD  LEN-OF-WORD  TR
2435                *                             ADDR1  FALSE
2436 E2880 0000           CON(5)  =ZBRNH          IF  WORD WAS FOUND
           0
2437 E2885 6400           CON(5)  (FND0)-*        DO THE FOLLOWING:
           0
2438                *                             len-of-word returned by FIND> is th
2439                *                             raw length from the word's NFA so i
2440                *                             includes the information we are loo
2441                *                             for, so . . .
2442
2443 E288A 45C1           CON(5)  =LIT
           E
2444 E288F 0400           CON(5)  #40             40 (HEX)
           0
2445 E2894 7A91           CON(5)  =AND            SEE IF IMMEDIATE BIT IS SET
           E
2446 E2899 0000           CON(5)  =ZBRNH          IF WORD WAS IMMEDIATE,
           0
2447 E289E 4100           CON(5)  (FND01)-*
           0
2448 E28A3 0000           CON(5)  =ONE            PUT 1 ON STACK
           0
```

```
2449 E28A8 0000          CON(5)  =BRNCH
           0
2450 E28AD F000          CON(5)  (FND02)-*
           0
2451 E28B2 45C1 FND01    CON(5)  =LIT          ELSE PUT -1 ON STACK
           E
2452 E28B7 FFFF          CON(5)  (0-1)
           F
2453 E28BC 8791 FND02    CON(5)  =ROT          (*CFA -1/1  ADDR1*)
           E
2454 E28C1 0C42          CON(5)  =DROP         (*CFA  -1/1 *)
           E
2455 E28C6 0000          CON(5)  =SEMI         CHEAT AND END HERE
           0
2456
2457 E28CB 0000 FND0     CON(5)  =ZERO         (* ADDR1  0 *)
           0
2458 E28D0 0000 FND03    CON(5)  =SEMI         ;
           0
```

```
2459                    EJECT
2460                ****************************************************************
2461                *
2462                * QUIT  ( --- ) Clear the return stack, set execution mode,
2463                *       and return control to the terminal. No message is
2464                *       given.
2465                *
2466                ****************************************************************
2467                *
2468
2469 E28D5 8582             CON(5)  =!FIND
            E
2470 E28DA 48     =!QUIT    CON(2)  #84             QUIT
2471 E28DC 1555             NIBASC  \QUI\
            94
2472 E28E2 4D               CON(2)  \T\+#80
2473
2474 E28E4 0000 =QUIT       CON(5)  =DOCOL          :
            0
2475 E28E9 0000             CON(5)   =ZERO          set BLK to 0 signalling
            0
2476 E28EE DCA1             CON(5)   =BLK           execution from terminal
            E
2477 E28F3 0000             CON(5)   =STORE         instead of a screen
            0
2478 E28F8 0000             CON(5)   =LBRAC         [ set execution mode
            0
2479 E28FD 0792 QUIT00      CON(5)   =CR?            CR IF NEEDED
            E
2480                *                               peculiarity of mainframe--one cr doe
2481                *                               clear LCD (with OK in it), but 2nd c
2482
2483 E2902 5391 QUIT01      CON(5)   =RP!              reset return stack
            E
2484 E2907 0000             CON(5)   =QUERY            get user input
            0
2485 E290C 0000             CON(5)   =INTRP            interpret user input
            0
2486 E2911 0000             CON(5)   =?STK              ?STACK  CHECK STACK DEPTH!
            0
2487 E2916 0000             CON(5)   =OKFLG
            0
2488 E291B 0000             CON(5)   =AT
            0
2489 E2920 0000             CON(5)   =STATE
            0
2490 E2925 0000             CON(5)   =AT
            0
2491 E292A 0000             CON(5)   =OR
            0
2492                *
2493                * IF THE CONTENTS OF BOTH STATE AND THE OKFLAG
2494                * ARE ZERO THEN WE CAN GIVE THE OK MESSAGE
2495                *
2496 E292F 0000             CON(5)   =ZEQ               0=
```

```
           0
2497 E2934 0000          CON(5)   =ZBRNH          0BRANCH
           0
2498 E2939 D200          CON(5)  (QUIT0)-*
           0
2499 E293E 0000 QUITX    CON(5)   =PDOTQ          ."
           0
2500 E2943 60            CON(2)  6
2501 E2945 02F4          NIBASC  \ OK { \
           B402
           B702
2502 E2951 0000          CON(5)   =DEPTH          DEPTH
           0
2503 E2956 0000          CON(5)   =DOT            .
           0
2504 E295B 0000          CON(5)   =PDOTQ          ."
           0
2505 E2960 20            CON(2)  2
2506 E2962 D702          NIBASC  \} \
2507 E2966 0000 QUIT0    CON(5)   =BRNCH          BRANCH
           0
2508 E296B 29FF          CON(5)  (QUIT00)-*
           F
2509
2510             * DO CR IF NEEDED
2511 E2970 5792 =CR?     CON(5)  =$CR?
           E
2512 E2975 8E00 =$CR?    GOSUBL  =SAVEFP
           00
2513 E297B 1B00          D0=(5)  (=DSPSTA)+3   POINT TO STATUS BITS
           000
2514 E2982 1563          C=DAT0  X             READ STATUS BITS TO C(X)
2515 E2986 0B            CSTEX                 PUT INFO INTO STATUS BITS
2516 E2988 870           ?ST=1   =Clear       CR ALREADY SENT?
2517 E298B 90            GOYES   CRDONE
2518 E298D 8F00          GOSBVL  =FINLIN
           000
2519 E2994 8E00 CRDONE   GOSUBL  =GETFP
           00
2520 E299A 03            RTNCC
2521
2522             * ROUTINE TO WAKE UP WITH OK PROMPT;(ALTERNATIVE
2523             * OUTER LOOP, used when waking up from deep sleep -- want
2524             * to see OK without resetting stack
2525 E299C 0000 =WAKE     CON(5)  =DOCOL
           0
2526 E29A1 0000          CON(5)  =BRNCH
           0
2527 E29A6 89FF          CON(5)  (QUITX)-*
           F
```

```
2528                    EJECT
2529                ******************************************************
2530                *
2531                * WORD (char --- addr) Receive chars from input stream
2532                *       until non-zero delimiting char is encountered or
2533                *       the input stream exhausted, ignoring leading
2534                *       delimiters.  The chars are moved to HERE in the
2535                *       form:
2536                *       (HERE) <char cnt> <chars>
2537                *       If input stream is exhausted as WORD is called,
2538                *       then a zero length is left at HERE
2539                *
2540                ************************************************************
2541
2542 E29AB AD82     E        CON(5)  =!QUIT
2543 E29B0 48       =!WORD   CON(2)  #84             WORD
2544 E29B2 75F4     25       NIBASC  \WOR\
2545 E29B8 4C               CON(2)  \D\+#80
2546
2547 E29BA 0000     0        CON(5)  =DOCOL          :
2548 E29BF B591     E  WRD0  CON(5)   =DUP           DUP CHAR TO MATCH
2549 E29C4 0000     0        CON(5)   =STRM          get addr to find next word at
2550 E29C9 9D42     E        CON(5)   =SWAP          char addr char
2551 E29CE 0000     0        CON(5)   =ENCL          returns addr and 3 offsets
2552 E29D3 5552     E        CON(5)   =2DUP          dup 2 flags for null test
2553 E29D8 0000     0        CON(5)   =GT            >
2554 E29DD 0000     0        CON(5)   =ZBRNH         IF null then
2555 E29E2 8200     0        CON(5)  (WD)-*
2556 E29E7 0000     0        CON(5)   =2DROP         clear items off stack
2557 E29EC 0000     0        CON(5)   =2DROP
2558 E29F1 0000     0        CON(5)   =ZERO          store a 0 (meaning null word)
2559 E29F6 95B2     E        CON(5)   =HERE          and HERE
2560 E29FB 0000     0        CON(5)   =STORE
2561 E2A00 0000     0        CON(5)   =BRNCH         ELSE
2562 E2A05 0500     0        CON(5)  (WD0)-*
2563 E2A0A AEA1     E  WD    CON(5)   =IN            >IN  use n3 from enclose
```

```
2564 E2A0F 0000          CON(5)   =PSTOR          +!    to update pointer into TIB
           0
2565 E2A14 3352          CON(5)   =OVER                 next get the # nibs involve
           E
2566 E2A19 0000          CON(5)   =MINUS         -      this word
           0
2567 E2A1E B591          CON(5)   =DUP           DUP    put a copy on the rtn stack
           E
2568 E2A23 0000          CON(5)   =>R            >R
           0
2569 E2A28 0000          CON(5)   =TWO/          2/     turn nibbles to bytes
           0
2570 E2A2D 95B2          CON(5)   =HERE          HERE store byte count of word at
           E
2571 E2A32 0000          CON(5)   =C!            C!
           0
2572 E2A37 0000          CON(5)   =ADD           +      compute source
           0
2573 E2A3C 95B2          CON(5)   =HERE          HERE
           E
2574 E2A41 0000          CON(5)   =TWO+          2+     destination
           0
2575 E2A46 0000          CON(5)   =R>            R>     # nibs to move
           0
2576 E2A4B 0000          CON(5)   =TWO+          TWO+
           0
2577 E2A50 0000          CON(5)   =NMOVE         NMOVE  move them
           0
2578 E2A55 95B2 WD0      CON(5)   =HERE          HERE   word is now at HERE
           E
2579
2580             *
2581             * AT THIS POINT WE HAVE AN ADDR AND A CHAR ON STACK
2582             *
2583
2584 E2A5A B591            CON(5)  =DUP           DUP ADDR
           E
2585 E2A5F 0000          CON(5)   =TWO+          POINT TO 1ST CHAR IN WORD
           0
2586 E2A64 0000          CON(5)   =CAT           C@ GET 1ST CHAR
           0
2587 E2A69 0000          CON(5)   =ZEQ           0= TEST FOR NULL
           0
2588 E2A6E 0000          CON(5)   =ZBRNH         BRANCH IF NOT NULL
           0
2589 E2A73 A500          CON(5)   (WD00)-*
           0
2590 E2A78 DCA1          CON(5)   =BLK           BLK
           E
2591 E2A7D 0000          CON(5)   =AT            @   SEE IF WE'RE LOADING
           0
2592 E2A82 0000          CON(5)   =ZBRNH         BRANCH IF EXECUTING
           0
2593 E2A87 6400          CON(5)   (WD00)-*
           0
```

```
2594 E2A8C 33F1E        CON(5)  =EOF            WE'RE LOADING, IS IT EOF?
2595 E2A91 00000        CON(5)  =ZEQ            0=
2596 E2A96 00000        CON(5)  =ZBRNH          BRANCH IF EOF
2597 E2A9B 23000        CON(5)  (WD00)-*
2598 E2AA0 00000        CON(5)  =ONE            1
2599 E2AA5 DCA1E        CON(5)  =BLK            BLK    INCR LINE NUMBER
2600 E2AAA 00000        CON(5)  =PSTOR          +!
2601 E2AAF 00000        CON(5)  =ZERO           0
2602 E2AB4 AEA1E        CON(5)  =IN             >IN   RESET TIB POINTER
2603 E2AB9 00000        CON(5)  =STORE          !
2604 E2ABE 0C42E        CON(5)  =DROP           DROP  ADDR
2605 E2AC3 00000        CON(5)  =BRNCH          GO AGAIN  LOOK FOR WORD
2606 E2AC8 7FEEF        CON(5)  (WRD0)-*        IN NEXT LINE OF FILE
2607 E2ACD 9D42E WD00   CON(5)  =SWAP           CHAR TO TOP OF STACK
2608 E2AD2 0C42E        CON(5)  =DROP           DROP CHAR, LEAVE ADDR
2609 E2AD7 00000        CON(5)   =SEMI            ;
```

```
2610                    EJECT
2611                ****************************************************************
2612                *
2613                * EMIT (c --- ) Transmit a char to the current output device.
2614                *
2615                ****************************************************************
2616 E2ADC 0B92      =!WORD  CON(5)  =!WORD
         E
2617 E2AE1 48      =!EMIT  CON(2)  #84             EMIT
2618 E2AE3 54D4    94      NIBASC  \EMI\
2619 E2AE9 4D              CON(2)  \T\+#80
2620 E2AEB 0FA2    E       CON(5)  =$EMIT
2621
2622 E2AF0 8F00    000 =$EMIT  GOSBVL  =SAVEFP         SAVE FORTH PTRS
2623 E2AF7 D0              A=0     A
2624 E2AF9 E4              A=A+1   A                   A=1=# OF CHARS
2625                    * D1 ALREADY POINTS TO THE "OUTPUT BUFFER", I.E. THE CHAR
2626 E2AFB 101             R1=A
2627 E2AFE 137             CD1EX
2628 E2B01 10B             R3=C                        SAVE D1 FROM CKINF
2629                    *
2630 E2B04 7C00            GOSUB   DSPSUB
2631                    *
2632 E2B08 8F00    000     GOSBVL  =GETFP              RESTORE FORTH POINTERS
2633 E2B0F 174             D1=D1+  5                   RETURN NOTHING
2634 E2B12 03              RTNCC
2635
2636 E2B14 8F00    000 DSPSUB  GOSBVL  =CKINF-         SET UP FOR SENDWD
2637 E2B1B 11B             C=R3
2638 E2B1E 135             D1=C
2639 E2B21 111             A=R1
2640 E2B24 854             ST=1    4
2641 E2B27 8F00    000     GOSBVL  =SENDWD
2642                    *
2643                    * WHEN THERE HAS BEEN NO POLL HANDLED IN CKINF- OR SENDWD,
2644                    * FOLLOWING AMOUNTS TO A GOVLNG =DOSCRL (SCROLL)
2645                    *
2646 E2B2E 1F00    000     D1=(5)  (=STMTR0)+1         POINT TO "PART2" OF DSP STUFF
2647 E2B35 147             C=DAT1  A                   GET ADDR OF IT
2648 E2B38 135             D1=C
2649 E2B3B 1C4             D1=D1-  5                "PART 3" OFFSET IS IN FRONT OF IT
2650 E2B3E 147             C=DAT1  A                GET OFFSET
2651 E2B41 133             AD1EX
2652 E2B44 C2              C=C+A   A                ADD ADDR
2653 E2B46 06              RSTK=C                   PUT ON RSTK
2654 E2B48 03              RTNCC                    GO THERE
```

```
                        EJECT
                ************************************************************
                *
                * HERE  ( --- addr) Returns addr of next available dict.
                *       location.
                *
                ************************************************************

E2B4A 1EA2          CON(5)  =!EMIT
      E
E2B4F 48    =!HERE  CON(2)  #84
E2B51 8454          NIBASC  \HER\
      25
E2B57 5C            CON(2)  \E\+#80

E2B59 0000  =HERE   CON(5)  =DOCOL          :
      0
E2B5E 0000          CON(5)   =DP             DP
      0
E2B63 0000          CON(5)   =AT             @
      0
E2B68 0000          CON(5)   =SEMI           ;
      0
```

```
2672                    EJECT
2673                ************************************************************
2674                *
2675                * /MOD  (n1 n2 --- n3 n4) Divide n1 by n2 leave remainder
2676                *       n3 and quotient n4
2677                *
2678                ************************************************************
2679
2680 E2B6D F4B2             CON(5)  =!HERE
           E
2681 E2B72 48     =!/MOD    CON(2)  #84             /MOD
2682 E2B74 F2D4             NIBASC  \/MO\
           F4
2683 E2B7A 4C               CON(2)  \D\+#80
2684
2685 E2B7C 0000 =/MOD       CON(5)  =DOCOL          :
           0
2686 E2B81 0000             CON(5)   =>R            n1 :: n2
           0
2687 E2B86 5F52             CON(5)   =S->D          d1 :: n2
           E
2688 E2B8B 0000             CON(5)   =R>            d1 n2
           0
2689 E2B90 0000             CON(5)   =M/            rem quot
           0
2690 E2B95 0000             CON(5)   =SEMI           ;
           0
2691
2692                ************************************************************
2693                *
2694                * HOLD  (char --- )  Insert char into pictured numeric output str
2695                *       Use between <# and #>
2696                *
2697                ************************************************************
2698
2699 E2B9A 27B2             CON(5)  =!/MOD
           E
2700 E2B9F 48   =!HOLD      CON(2)  #84             HOLD
2701 E2BA1 84F4             NIBASC  \HOL\
           C4
2702 E2BA7 4C               CON(2)  \D\+#80
2703
2704 E2BA9 0000 =HOLD       CON(5)  =DOCOL          : HOLD
           0
2705 E2BAE 45C1             CON(5)   =LIT          decrement addr by 2 inorder to
           E
2706 E2BB3 EFFF             CON(5)  (0-2)          to insert this char
           F
2707 E2BB8 A2B1             CON(5)   =HLD          HLD
           E
2708 E2BBD 0000             CON(5)   =PSTOR        +!
           0
2709 E2BC2 A2B1             CON(5)   =HLD          HLD   store char at this new
           E
2710 E2BC7 0000             CON(5)   =AT           @     addr
```

```
                0
   2711 E2BCC 0000          CON(5)    =C!             C!
                0
   2712 E2BD1 0000          CON(5)    =SEMI           ;
                0
```

```
                        EJECT
                *********************************************
                *
                * ?DUP   (n --- [n] n)  dup if non-zero
                *
                *********************************************

E2BD6 F9B2E             CON(5)  =!HOLD
E2BDB 48        =!?DUP  CON(2)  #84             ?DUP
E2BDD F34455            NIBASC  \?DU\
E2BE3 0D                CON(2)  \P\+#80
E2BE5 AEB2E     =?DUP   CON(5)  $?DUP
E2BEA 143       $?DUP   A=DAT1  A               READ n
E2BED 8A8               ?A=0    A               0?
E2BF0 00                RTNYES                  RETURN IF YES (CARRY IS SET)
E2BF2 1C4               D1=D1-  5               n <> 0 SO DUP IT
E2BF5 141               DAT1=A  A
E2BF8 03                RTNCC

                *********************************************************************
                *
                * SIGN ( n - ) Insert the ASCII "-" (minus sign) into the picture
                * numeric output string, if n is negative.
                *
                *********************************************************************

E2BFA BDB2E             CON(5)  !?DUP
E2BFF 48        =!SIGN  CON(2)  #84              SIGN
E2C01 359474            NIBASC  \SIG\
E2C07 EC                CON(2)  \N\+#80

E2C09 00000     =SIGN   CON(5) =DOCOL
E2C0E 00000             CON(5) =LTZ             if n < 0 then
E2C13 00000             CON(5) =ZBRNH           store a minus sign
E2C18 41000             CON(5) (SIGN00)-*       in the HOLD area
E2C1D 45C1E             CON(5) =LIT             (area between HERE and
E2C22 D2000             CON(5) \-\              PAD)
E2C27 9AB2E             CON(5) =HOLD
E2C2C 00000 SIGN00      CON(5) =SEMI
```

```
2752                    EJECT
2753                ********************************************************
2754                *
2755                * ?CSP  Issue error message if stack position differs from
2756                *       value saved in CSP.
2757                *
2758                ********************************************************
2759
2760 E2C31 0000 =QCSP   CON(5)  =DOCOL          :
             0
2761 E2C36 5881         CON(5)   =SP@           get current top of stack
             E
2762 E2C3B A1B1         CON(5)   =CSP           get stack level stored in CSP
             E
2763 E2C40 0000         CON(5)   =AT            @
             0
2764 E2C45 0000         CON(5)   =MINUS         -  error if diff # 0
             0
2765 E2C4A 0000         CON(5)   =ABRT"X        ABORT"
             0
2766 E2C4F 70           CON(2)  =eNDEF
2767                *    NIBASC  \ definit\
2768                *    NIBASC  \ion not \
2769                *    NIBASC  \finished\
2770 E2C51 0000         CON(5)   =SEMI          ;
             0
```

```
2771                    EJECT
2772                ********************************************************
2773                *
2774                * CASE
2775                *  Implements words to allow, e.g.:
2776                *                  CASE n1 OF action1 ENDOF action2
2777                *                       n2 OF action3  ENDOF action4
2778                *                       ...
2779                *                  ENDCASE
2780                *
2781                * The word CASE itself does nothing except make a syntactic
2782                * requirement, i.e. OF won't work unless there has been a CASE.
2783                * I guess this has an aesthetic appeal as providing symmetry
2784                * for the ENDCASE.
2785                ********************************************************
2786
2787 E2C56 FFB2             CON(5)  =!SIGN
           E
2788 E2C5B 4C     =!CASE    CON(2)  #C4
2789 E2C5D 3414             NIBASC  \CAS\
           35
2790 E2C63 5C               CON(2)  \E\+#80
2791
2792 E2C65 0000   =CASE     CON(5) =DOCOL       :
           0
2793 E2C6A 0000            CON(5)   =?COMP      ?COMP
           0
2794 E2C6F 45C1            CON(5)   =LIT            JUST LEAVE 8 FOR
           E
2795 E2C74 8000            CON(5)  8                SYNTAX CHECK BY OF
           0
2796 E2C79 B591             CON(5)  =DUP            2 8'S SO EVERYTHING
           E
2797 E2C7E 0000            CON(5)   =SEMI           IS IN PAIRS AT COMPILE TIME
           0
```

```
2798                    EJECT
2799                ************************************************************
2800                *
2801                * TYPE  (addr  n --- )  transmit n chars to output device.
2802                *       No action if n < = 0
2803                *
2804                ************************************************************
2805 E2C83 B5C2           CON(5)  =!CASE
             E
2806 E2C88 48     =!TYPE  CON(2)  #84             TYPE
2807 E2C8A 4595           NIBASC  \TYP\
             05
2808 E2C90 5C             CON(2)  \E\+#80
2809 E2C92 79C2   =TYPE   CON(5)  =$TYPE
             E
2810
2811 E2C97 143    =$TYPE  A=DAT1  A               POP N
2812 E2C9A 8A8            ?A=0    A               BAD?
2813 E2C9D D2             GOYES   TP0             YES
2814 E2C9F C4             A=A+A   A               NEQ #?
2815 E2CA1 482            GOC     TP0             YES
2816 E2CA4 143            A=DAT1  A               N
2817 E2CA7 174            D1=D1+  5               PT TO ADDR
2818 E2CAA 147            C=DAT1  A               C=ADDR
2819 E2CAD 174            D1=D1+  5               RETURN NOTHING ON DATA STK
2820 E2CB0 10B            R3=C                    SAVE ADDR
2821 E2CB3 8F00           GOSBVL  =SAVEFP         SAVE FORTH POINTERS, A UNTOUCHED
             000
2822 E2CBA 101            R1=A                    SAVE SIZE
2823 E2CBD 735E           GOSUB   DSPSUB
2824                *
2825 E2CC1 8F00           GOSBVL  =GETFP          RECOVER FORTH POINTERS
             000
2826 E2CC8 03             RTNCC
2827 E2CCA 179  TP0       D1=D1+  10              RETURN NOTHING
2828 E2CCD 03             RTNCC
```

```
2829                    EJECT
2830                ************************************
2831                *
2832                * ADVANCE IN PTR ONE CHARACTER
2833                *
2834                ************************************
2835
2836 E2CCF 0000 =PT1+  CON(5)   =DOCOL       :
             0
2837 E2CD4 0000        CON(5)    =TWO        2
             0
2838 E2CD9 AEA1        CON(5)    =IN         >IN
             E
2839 E2CDE 0000        CON(5)    =PSTOR      +!
             0
2840 E2CE3 0000        CON(5)    =SEMI       ;
             0
```

```
1                EJECT
2             ****************************************************************
3             *
4             * +BUF (addr1 --- addr2  f)  This routine advances the disc
5             *      buffer address, addr1 to address of next buffer.  f is
6             *      false when addr2 is buffer presently pointed to by PREV
7             *
8             ****************************************************************
9
0 E2CE8 88C2           CON(5)  =!TYPE
        E
1 E2CED 48    =!PBUF   CON(2) #84              +BUF
2 E2CEF B224           NIBASC \+BU\
        55
3 E2CF5 6C             CON(2) \F\+#80
4
5 E2CF7 0000 =PBUF     CON(5)  =DOCOL           :
        0
6 E2CFC 0000           CON(5)    =BSIZE         BFSIZE   get buffer size in NIBS
        0
7 E2D01 0000           CON(5)    =AT            @
        0
8 E2D06 0000           CON(5)    =ADD           +     add it to current buffer ad
        0
9 E2D0B B591           CON(5)    =DUP           DUP   duplicate it
        E
0 E2D10 0000           CON(5)    =LIMIT         LIMIT get addr of 1st byte beyond
        0
1 E2D15 0000           CON(5)    =AT            @      last buffer
        0
2 E2D1A 0000           CON(5)    =EQUAL         =     compare the 2,
        0
3 E2D1F 0000           CON(5)    =ZBRNH         IF    if they're the same
        0
4 E2D24 4100           CON(5)   (PBUF0)-*             then we've gone too far
        0
5 E2D29 0C42           CON(5)    =DROP          DROP  drop this addr
        E
6 E2D2E 0000           CON(5)    =FIRST         FIRST    get addr of 1st buffer
        0
7 E2D33 0000           CON(5)    =AT            @
        0
8 E2D38 B591 PBUF0     CON(5)    =DUP           THEN DUP   duplicate it
        E
9 E2D3D C362           CON(5)    =PREV          PREV     fetch addr of PREV
        E
0 E2D42 0000           CON(5)    =AT            @      buffer
        0
1 E2D47 0000           CON(5)    =<>            if same return 0 else return -1
        0
2 E2D4C 0000           CON(5)    =SEMI          ;     status!
        0
```

```
2873                    EJECT
2874                ************************************************************
2875                *
2876                * SUB$                          ( str pos1 pos2 -- substr )
2877                * Return temporary string which is a copy of
2878                * the given string from the pos1 character to the
2879                * pos2 character.
2880                *
2881                ************************************************************
2882
2883 E2D51 DEC2             CON(5)  =!PBUF
           E
2884 E2D56 48     =!SUB$    CON(2)  #84
2885 E2D58 3555            NIBASC  \SUB\
           24
2886 E2D5E 4A              CON(2)  \$\+#80
2887
2888 E2D60 0000 =SUB$      CON(5)  =DOCOL
           0
2889 E2D65 0000            CON(5)  =DEPTH
           0
2890 E2D6A 0000            CON(5)  =THREE
           0
2891 E2D6F 0000            CON(5)  =GT             DEPTH MUST BE >3
           0
2892 E2D74 0000            CON(5)  =ZEQ
           0
2893 E2D79 0000            CON(5)  =ZBRNH
           0
2894 E2D7E 1100            CON(5)  (SUB$1)-*
           0
2895 E2D83 0000            CON(5)  =ONE
           0
2896 E2D88 0000            CON(5)  =ABORTW
           0
2897 E2D8D E2              CON(2)  =eBADPM     "bad parameters"
2898                    ** * * * * * * * * * * * * * * * * * * * * *
2899                    * ADR LEN P1 P2
2900 E2D8F 8791 SUB$1     CON(5)   =ROT        ROT
           E
2901                    *
2902                    * ADR P1 P2 LEN
2903                    *
2904                    * NOW MAKE LEN MOD 256 -- THIS PROTECTS AGAINST
2905                    * HORRIBLE RESULTS WHICH CAN EASILY BE SET UP BY, E.G.,
2906                    * TYPING IN "5 STR END$" WHEN YOU MEANT "STR 5 END$"
2907 E2D94 45C1            CON(5)   =LIT
           E
2908 E2D99 FF00            CON(5)   255
           0
2909 E2D9E 7A91            CON(5)   =AND
           E
2910                    * ADR P1 P2 LEN
2911 E2DA3 21D1            CON(5)   =MIN        MIN
           E
```

```
2912                * use pos2 or len of str, whichever is less
2913 E2DA8 0000        CON(5)   =>R
           0
2914                * ADR P1       --     MIN(P2,LEN)
2915 E2DAD 0000        CON(5)   =ONE
           0
2916 E2DB2 74D1        CON(5)   =MAX
           E
2917                * use p1 or 1, whichever is greater
2918 E2DB7 0000        CON(5)   =R>
           0
2919                * ADR P1 P2  (GOOD P1 & P2)
2920 E2DBC 5552        CON(5)   =2DUP       2DUP
           E
2921 E2DC1 9D42        CON(5)   =SWAP       SWAP
           E
2922 E2DC6 0000        CON(5)   =LT         <
           0
2923                * compare pos1 and last pos
2924 E2DCB 0000        CON(5)   =ZEQ        0=
           0
2925                * if pos1 > lastpos then return null string
2926 E2DD0 0000        CON(5)   =ZBRNH      IF
           0
2927 E2DD5 B900        CON(5)  (SUB01)-*
           0
2928 E2DDA 9D42        CON(5)   =SWAP       adr p2 p1
           E
2929 E2DDF B591        CON(5)   =DUP        adr p2 p1 p1
           E
2930 E2DE4 8791        CON(5)   =ROT        adr p1 p1 p2
           E
2931 E2DE9 9D42        CON(5)   =SWAP       adr p1 p2 p1
           E
2932 E2DEE 0000        CON(5)   =MINUS      adr p1 (p2-p1)
           0
2933 E2DF3 0000        CON(5)   =ONE+       1+
           0
2934                * got # of chars in substring
2935 E2DF8 8791        CON(5)   =ROT        p1 count adr
           E
2936 E2DFD 8791        CON(5)   =ROT        count adr p1
           E
2937 E2E02 0000        CON(5)   =ONE-       count adr p1-1
           0
2938 E2E07 0000        CON(5)   =TWO*       2*
           0
2939                * chars-->nibs
2940 E2E0C 0000        CON(5)   =ADD        count pos
           0
2941                * position of first character of substring
2942 E2E11 3352        CON(5)   =OVER       count pos count
           E
2943 E2E16 63C1        CON(5)   =PAD        count pos count pad
           E
```

```
2944 E2E18 5552E        CON(5)   =2DUP       c pos c pad c pad
2945 E2E20 3352E        CON(5)   =OVER       c pos c pad c pad c
2946 E2E25 45C1E        CON(5)   =LIT
2947 E2E2A 05000        CON(5)   80            MAXLEN=80
2948 E2E2F 74D1E        CON(5)   =MAX        c pos c pad c pad max(c,80)
2949 E2E34 63C1E        CON(5)   =PAD
2950 E2E39 00000        CON(5)   =C!         store max(len,80) at pad
2951 E2E3E 00000        CON(5)   =TWO+       c pos c pad c pad+2
2952 E2E43 00000        CON(5)   =C!         store char-count at pad+2
2953            * stored maxlen & len at PAD
2954 E2E48 00000        CON(5)   =FOUR+      c pos c pad+4
2955 E2E4D 9D42E        CON(5)   =SWAP       c pos pad+4 c
2956 E2E52 00000        CON(5)   =CMOVE      move c chars from pos to pad+4
2957 E2E57 63C1E        CON(5)   =PAD        c pad
2958 E2E5C 00000        CON(5)   =FOUR+      c pad+4
2959 E2E61 9D42E        CON(5)   =SWAP       pad+4 c  = the string
2960 E2E66 00000        CON(5)   =BRNCH      ELSE
2961 E2E6B 41000        CON(5)  (SUB02)-*
2962            * leave null string
2963 E2E70 0C42E SUB01  CON(5)   =DROP       DROP
2964 E2E75 00000        CON(5)   =2DROP      2DROP
2965 E2E7A 00000        CON(5)   =NULL$      NULL$
2966 E2E7F 00000 SUB02  CON(5)   =SEMI       ;
```

```
2967                    EJECT
2968                ****************************************
2969                *
2970                * STR$                        ( D -- str )
2971                * Convert number to string.
2972                * ((=STR$ is also the guts of D.R ))
2973                * STR$U is the user entry point, which
2974                * calls the secondary used by D.R,et.al.
2975                * <# builds string below PAD -- this string
2976                * would get trashed by other calls to D.R,
2977                * notably the one which prints out depth in
2978                * the OK prompt. So STR$U calls STR$ and then
2979                * moves result above PAD where it is a safe
2980                * temporary string.
2981                *
2982                ****************************************
2983
2984 E2E84 65D2E            CON(5)  =!SUB$
2985 E2E89 48      =!STR$   CON(2)  #84          STR$
2986 E2E8B 354525           NIBASC  \STR\
2987 E2E91 4A               CON(2)  \$\+#80
2988 E2E93 00000 =STR$U     CON(5)  =DOCOL
2989 E2E98 1BE2E            CON(5)  =STR$           make string
2990 E2E9D 00000            CON(5)  =ONE
2991 E2EA2 3352E            CON(5)  =OVER
2992                * STR 1 LEN
2993 E2EA7 06D2E            CON(5)  =SUB$
2994 E2EAC 00000            CON(5)  =SEMI
2995
2996 E2EB1 6BE2E =STR$      CON(5)  $STR$
2997
2998 E2EB6 143  $STR$       A=DAT1  A               read high nibs of D1
2999 E2EB9 101              R1=A                    save copy for neg test
3000 E2EBC C4               A=A+A   A               if neg # will set carry
3001 E2EBE 580              GONC    STR00           its positive
3002 E2EC1 8E000            GOSUBL  =$DNGAT         negate D1
3003 E2EC7 20    STR00      P=      0
3004 E2EC9 3439BF2          LC(5)   =oDP
3005 E2ED0 136              CD0EX
3006 E2ED3 108              R0=C                    save I in R0
3007 E2ED6 142              A=DAT0  A               addr 1st free nib in dictionary
3008 E2ED9 34A5000          LC(5)   90              PAD is 45 bytes away
3009 E2EE0 CA               A=A+C   A               A(A)=addr PAD
```

```
3010 E2EE2 1B57          D0=(5)   =oBASE
           BF2
3011 E2EE9 146           C=DAT0   A
3012 E2EEC 10B           R3=C                 save (BASE) in R3
3013 E2EEF 130           D0=A                 set D0-->PAD
3014 E2EF2 102           R2=A                 save start addr--PAD addr
3015
3016 E2EF5 11B  STR01    C=R3                 C=base
3017 E2EF8 1C4           D1=D1-   5           write base to stack
3018 E2EFB 145           DAT1=C   A           D1  base  on stack
3019 E2EFE 8E00          GOSUBL   =$M/MOD     rtns Remainder, Dbl Quotient (R,
           00
3020 E2F04 AC3           D=0      S           done flag
3021 E2F07 15F9          C=DAT1   10          read DQ
3022 E2F0B 179           D1=D1+   10          point to R
3023 E2F0E 143           A=DAT1   A           read R
3024 E2F11 1C4           D1=D1-   5
3025 E2F14 15D9          DAT1=C   10          write DQ back
3026 E2F18 29            P=       9
3027 E2F1A 91E           ?C#0     WP          any quotient left?
3028 E2F1D 50            GOYES    STR02       yes
3029 E2F1F B47           D=D+1    S           no, flag it
3030 E2F22 20   STR02    P=       0
3031 E2F24 D2            C=0      A           if R > 9 we must add 7 to move
3032 E2F26 309           LC(1)    9           beyond non-displayable symbols
3033 E2F29 8BA           ?A<=C    A           R <=9 ?
3034 E2F2C 70            GOYES    STR03       if so, no problem
3035 E2F2E 307           LC(1)    7
3036 E2F31 CA            A=A+C    A
3037 E2F33 3103 STR03    LC(2)    #30         add 30 to make it ASCII digit
3038 E2F37 CA            A=A+C    A           ASCII digit
3039 E2F39 181           D0=D0-   2           decrement for char store
3040 E2F3C 148           DAT0=A   B           write char out
3041 E2F3F 94B           ?D=0     S           any more to do?
3042 E2F42 3B            GOYES    STR01       yes
3043 E2F44 111           A=R1                 recover high nibs of D1
3044 E2F47 C4            A=A+A    A           test for neg #
3045 E2F49 5C0           GONC     STR04       pos #
3046 E2F4C 181           D0=D0-   2           decrement for sign store
3047 E2F4F 31D2          LC(2)    #2D         "-"
3048 E2F53 14C           DAT0=C   B           write out neg sign
3049 E2F56 118  STR04    C=R0                 C(A)=I
3050 E2F59 136           CD0EX                D0=I, C=end addr
3051            *                             D1-->Q which = 0
3052 E2F5C 174           D1=D1+   5           point to lower order nibs
3053 E2F5F 145           DAT1=C   A           write out str start addr
3054 E2F62 112           A=R2                 A(A)=addr of PAD
3055 E2F65 EA            A=A-C    A           A(A)=#nibs in string
3056 E2F67 AD0           A=0      M
3057 E2F6A 81C           ASRB                 divide by 2 for bytes
3058 E2F6D 1C4           D1=D1-   5           we assume count is positive!
3059 E2F70 141           DAT1=A   A           write out byte count
3060 E2F73 03            RTNCC
```

```
3061                    EJECT
3062                ***********************************************
3063                *
3064                * CHR$                          ( ascii -- str )
3065                * Make a 1-char string out of an ascii value.
3066                *
3067                ***********************************************
3068
3069 E2F75 98E2            CON(5)  =!STR$
           E
3070 E2F7A 48     =!CHR$   CON(2)  #84
3071 E2F7C 3484           NIBASC  \CHR\
           25
3072 E2F82 4A             CON(2)  \$\+#80
3073
3074 E2F84 0000   =CHR$   CON(5)  =DOCOL        :
           0
3075 E2F89 0000           CON(5)   =ONE         1
           0
3076 E2F8E 63C1           CON(5)   =PAD         PAD
           E
3077 E2F93 5552           CON(5)   =2DUP        1 pad 1 pad
           E
3078 E2F98 0000           CON(5)   =C!          store 1 at pad as maxlen
           0
3079 E2F9D 0000           CON(5)   =TWO+        2+
           0
3080 E2FA2 0000           CON(5)   =C!          store 1 at pad+2 as curlen
           0
3081 E2FA7 63C1           CON(5)   =PAD         PAD
           E
3082 E2FAC 0000           CON(5)   =FOUR+       4+
           0
3083 E2FB1 0000           CON(5)   =C!          store character
           0
3084 E2FB6 63C1           CON(5)   =PAD         PAD
           E
3085 E2FBB 0000           CON(5)   =FOUR+       4+
           0
3086 E2FC0 0000           CON(5)   =ONE         1
           0
3087 E2FC5 0000           CON(5)   =SEMI        ;
           0
```

```
3088                    EJECT
3089                ************************************************
3090                *
3091                * END$                          ( str pos -- str )
3092                * Return substring from pos to end.
3093                *
3094                * Same as saying SUB$ from pos to end(=len of string).
3095                * So since we have addr len pos we just need to do
3096                * OVER to get addr len pos len and call SUB$.
3097                *
3098                ************************************************
3099
3100 E2FCA A7F2          CON(5)  =!CHR$
           E
3101 E2FCF 48    =!END$   CON(2)  #84
3102 E2FD1 54E4          NIBASC  \END\
           44
3103 E2FD7 4A            CON(2)  \$\+#80
3104
3105 E2FD9 0000  =END$   CON(5)  =DOCOL        :
           0
3106 E2FDE 3352          CON(5)   =OVER        OVER
           E
3107 E2FE3 06D2          CON(5)   =SUB$        SUB$
           E
3108 E2FE8 0000          CON(5)   =SEMI        ;
           0
3109
3110 E2FED       =REND2  END
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
=!#TIB   Abs  926353 #E2291 -  1794  1810
=!/MOD   Abs  928626 #E2B72 -  2681  2699
=!1/X    Abs  923519 #E177F -   487   500
=!10^X   Abs  926679 #E23D7 -  1929  1956
=!2DUP   Abs  927051 #E254B -  2105  2123
=!4N@    Abs  922768 #E1490 -   141   158
=!?DUP   Abs  928731 #E2BDB -  2721  2739
=!ABS    Abs  924182 #E1A16 -   778   800
=!ACOS   Abs  926536 #E2348 -  1878  1891
=!AND    Abs  924063 #E199F -   716   735
=!ASC    Abs  925755 #E203B -  1537
=!ASIN   Abs  926497 #E2321 -  1864  1877
=!ATAN   Abs  926575 #E236F -  1892  1905
=!BASE   Abs  927313 #E2651 -  2240  2260
=!BLK    Abs  924357 #E1AC5 -   871   887
=!BRACT  Abs  923014 #E1586 -   259   274
=!BYE    Abs  924479 #E1B3F -   961  1027
=!C@+    Abs  923805 #E189D -   595   621
=!CASE   Abs  928859 #E2C5B -  2788  2805
=!CHR$   Abs  929658 #E2F7A -  3070  3100
=!CHS    Abs  922891 #E150B -   193   216
=!COS    Abs  923386 #E16FA -   435   455
=!CRLF   Abs  925847 #E2097 -  1590  1612
=!D.R    Abs  924858 #E1CBA -  1139  1164
=!DABS   Abs  927150 #E25AE -  2154  2183
=!DROP   Abs  926902 #E24B6 -  2024  2040
=!DUP    Abs  923987 #E1953 -   675   692
=!ELSE   Abs  927409 #E26B1 -  2292  2318
=!EMIT   Abs  928481 #E2AE1 -  2617  2663
=!END$   Abs  929743 #E2FCF -  3101
=!ENG    Abs  923322 #E16BA -   406   420
=!EOF    Abs  925483 #E1F2B -  1421  1465
=!EXIT   Abs  926415 #E22CF -  1827  1863
=!FABS   Abs  925788 #E205C -  1561  1589
=!FILL   Abs  927084 #E256C -  2124  2153
=!FIND   Abs  927832 #E2858 -  2424  2469
=!FIX    Abs  923197 #E163D -   341   390
=!FTOI   Abs  926296 #E2258 -  1770  1793
=!GROW   Abs  926740 #E2414 -  1957  2023
=!HERE   Abs  928591 #E2B4F -  2664  2680
=!HEX    Abs  922811 #E14BB -   159   176
=!HOLD   Abs  928671 #E2B9F -  2700  2720
=!IN     Abs  924386 #E1AE2 -   888   960
=!ITOF   Abs  926190 #E21EE -  1734  1769
=!KEY    Abs  924647 #E1BE7 -  1028  1060
=!LOG    Abs  922854 #E14E6 -   177   192
=!LOOP   Abs  927494 #E2706 -  2319  2377
=!MAX    Abs  924991 #E1D3F -  1186  1420
=!MIN    Abs  924938 #E1D0A -  1165  1185
=!MOD    Abs  924825 #E1C99 -  1121  1138
=!NOT    Abs  924154 #E19FA -   762   777
=!OVER   Abs  927017 #E2529 -  2087  2104
=!PAD    Abs  924718 #E1C2E -  1061  1120
=!PBUF   Abs  929005 #E2CED -  2851  2883
=!PICK   Abs  926967 #E24F7 -  2062  2086
```

```
=!POS    Abs  925603 #E1FA3 -  1466  1514
=!PREV   Abs  927282 #E2632 -  2222  2239
=!QUIT   Abs  927962 #E28DA -  2470  2542
=!RCL    Abs  923102 #E15DE -   301   324
=!RDN    Abs  923692 #E182C -   550   575
=!ROLL   Abs  927675 #E27BB -  2378  2423
=!ROT    Abs  924016 #E1970 -   693   715
=!RP!    Abs  923949 #E192D -   656   674
=!RP0    Abs  924255 #E1A5F -   816   831
=!RP@    Abs  923921 #E1911 -   640   655
=!RUP    Abs  923626 #E17EA -   529   549
=!S->D   Abs  927211 #E25EB -  2184  2205
=!S<&    Abs  922373 #E1305 -    36    87
=!S>&    Abs  922558 #E13BE -    88   140
=!SCI    Abs  923293 #E169D -   391   405
=!SIGN   Abs  928767 #E2BFF -  2740  2787
=!SIN    Abs  923351 #E16D7 -   421   434
=!SP!    Abs  923888 #E18F0 -   622   639
=!SP0    Abs  924226 #E1A42 -   801   815
=!SP@    Abs  923773 #E187D -   576   594
=!SPAN   Abs  926384 #E22B0 -  1811  1826
=!SQRTX  Abs  926151 #E21C7 -  1717  1733
=!STD    Abs  923170 #E1622 -   325   340
=!STO    Abs  923047 #E15A7 -   275   300
=!STR$   Abs  929417 #E2E89 -  2985  3069
=!SUB$   Abs  929110 #E2D56 -  2884  2984
=!SWAP   Abs  926927 #E24CF -  2041  2061
=!TAN    Abs  923440 #E1730 -   456   469
=!THEN   Abs  927344 #E2670 -  2261  2291
=!TIB    Abs  924284 #E1A7C -   832   853
=!TYPE   Abs  928904 #E2C88 -  2806  2850
=!U*     Abs  922939 #E153B -   217   258
=!USE    Abs  924328 #E1AA8 -   854   870
=!VAL    Abs  925717 #E2015 -  1515  1536
=!WARN   Abs  927251 #E2613 -  2206  2221
=!WORD   Abs  928176 #E29B0 -  2543  2616
=!X#Y?   Abs  926032 #E2150 -  1658  1716
=!X<>Y   Abs  926614 #E2396 -  1906  1928
=!X<Y?   Abs  925885 #E20BD -  1613  1621
=!X>Y?   Abs  925946 #E20FA -  1632  1640
=!XE0?   Abs  925915 #E20DB -  1622  1631
=!XEY?   Abs  925976 #E2118 -  1641  1657
=!XOR    Abs  924099 #E19C3 -   736   761
=!X^2    Abs  923475 #E1753 -   470   486
=!Y^X    Abs  923554 #E17A2 -   501   514
=!e^X    Abs  923591 #E17C7 -   515   528
=#TIB    Abs  926363 #E229B -  1797
=$#TIB   Abs  926368 #E22A0 -  1799  1797
=$1/X    Abs  923532 #E178C -   491   490
=$10^X   Abs  926694 #E23E6 -  1933  1932
=$2DUP   Abs  927066 #E255A -  2110  2108
 $?DUP   Abs  928746 #E2BEA -  2725  2724
=$ABS    Abs  924195 #E1A23 -   783   781  1740
=$ACOS   Abs  926551 #E2357 -  1882  1881
=$AND    Abs  924076 #E19AC -   720   719
```

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=$ASIN   Abs  926512 #E2330 -  1868  1867
=$ATAN   Abs  926590 #E237E -  1896  1895
=$BASE   Abs  927328 #E2660 -  2245  2243
=$BLK    Abs  924370 #E1AD2 -   876   874
=$BYE    Abs  924492 #E1B4C -   966   964
 $CHS    Abs  922904 #E1518 -   197   196
=$COS    Abs  923399 #E1707 -   439   438
=$CR?    Abs  928117 #E2975 -  2512  2511
=$CSP    Abs  924447 #E1B1F -   930   929
=$DABS   Abs  927165 #E25BD -  2159  2157
 $DNGAT  Ext                 -  3002
=$DPL    Abs  924415 #E1AFF -   906   905
=$DROP   Abs  926917 #E24C5 -  2029  2027
=$DUP    Abs  924000 #E1960 -   680   678  1739
=$EMIT   Abs  928496 #E2AF0 -  2622  2620
=$ENG    Abs  923335 #E16C7 -   410   409
=$EOF    Abs  925496 #E1F38 -  1426  1424
=$FABS   Abs  925803 #E206B -  1565  1564
=$FILL   Abs  927099 #E257B -  2129  2127
=$FIX    Abs  923210 #E164A -   345   344
=$FLD    Abs  924431 #E1B0F -   918   917
 $FLIT   Abs  926450 #E22F2 -  1848  1846
 $FTOI   Abs  926311 #E2267 -  1775  1773
=$GROW   Abs  926755 #E2423 -  1962  1960
=$HLD    Abs  924463 #E1B2F -   943   941
=$IN     Abs  924399 #E1AEF -   893   891
 $ITOF   Abs  926205 #E21FD -  1739  1737
=$KEY    Abs  924660 #E1BF4 -  1033  1031
=$LIT    Abs  924761 #E1C59 -  1083  1081
 $LOG    Abs  922867 #E14F3 -   181   180
 $M/MOD  Ext                 -  3019
=$NOT    Abs  924167 #E1A07 -   766   765
=$OVER   Abs  927032 #E2538 -  2092  2090
=$PICK   Abs  926982 #E2506 -  2067  2065
=$POS    Abs  925616 #E1FB0 -  1471  1469
=$PREV   Abs  927297 #E2641 -  2227  2225
=$R/W    Abs  925079 #E1D97 -  1239  1232
=$RCL    Abs  923115 #E15EB -   306   304
=$RDN    Abs  923705 #E1839 -   554   553
=$ROT    Abs  924029 #E197D -   698   696
=$RP0    Abs  924268 #E1A6C -   821   819
=$RP@    Abs  923934 #E191E -   644   643
=$RUP    Abs  923639 #E17F7 -   533   532
=$S->D   Abs  927226 #E25FA -  2189  2187
=$SCI    Abs  923306 #E16AA -   395   394
 $SETLV  Abs  927569 #E2751 -  2337  2336
=$SIN    Abs  923364 #E16E4 -   425   424
=$SP!    Abs  923901 #E18FD -   627   626
=$SP0    Abs  924239 #E1A4F -   805   804
=$SP@    Abs  923786 #E188A -   580   579
 $SPAN   Abs  926399 #E22BF -  1816  1814
=$SQRTX  Abs  926166 #E21D6 -  1721  1720
=$STD    Abs  923183 #E162F -   329   328
=$STO    Abs  923060 #E15B4 -   280   278
 $STR$   Abs  929462 #E2EB6 -  2998  2996
```

```
=$SWAP   Abs  926942 #E24DE -  2046  2044
=$TAN    Abs  923453 #E173D -   460   459
=$TIB    Abs  924297 #E1A89 -   837   835
=$TYPE   Abs  928919 #E2C97 -  2811  2809
=$U*     Abs  922952 #E1548 -   222   220
=$USE    Abs  924341 #E1AB5 -   859   857
=$WARN   Abs  927266 #E2622 -  2211  2209
=$X#Y?   Abs  926047 #E215F -  1662  1661
=$X<>Y   Abs  926629 #E23A5 -  1910  1909
 $X<Y?   Abs  925900 #E20CC -  1617  1616
 $X>Y?   Abs  925961 #E2109 -  1636  1635
=$XDO    Abs  924780 #E1C6C -  1097  1096
 $XEQ?   Abs  925930 #E20EA -  1626  1625
=$XEY?   Abs  925991 #E2127 -  1645  1644
=$XOR    Abs  924112 #E19D0 -   741   739
=$X^2    Abs  923488 #E1760 -   474   473
=$Y^X    Abs  923567 #E17AF -   505   504
=$e^X    Abs  923604 #E17D4 -   519   518
=/MOD    Abs  928636 #E2B7C -  2685  1126
=1/X     Abs  923527 #E1787 -   490
 1/X15   Ext          -      492
=10^X    Abs  926689 #E23E1 -  1932
 2DROP   Ext          -     2408  2556  2557  2964
=2DUP    Abs  927061 #E2555 -  2108    70   127  1170  1191  2552  2920  2944
                              3077
=4N@     Abs  922776 #E1498 -   145
 <>      Ext          -     2871
 >R      Ext          -       49    59    60    61    98   112   116  1149
                              2568  2686  2913
 ?COMP   Ext          -      263  2266  2297  2323  2793
=?DUP    Abs  928741 #E2BE5 -  2724
 ?PAIR   Ext          -     2268  2299  2325
 ?STK    Ext          -     2486
=@RP!    Abs  923962 #E193A -   661   660
 AB01    Abs  924219 #E1A3B -   792   788
 ABORTW  Ext          -       56   106  2385  2896
 ABRT"X  Ext          -     1147  2765
=ABS     Abs  924190 #E1A1E -   781
=ACOS    Abs  926546 #E2352 -  1881
 ACOS15  Ext          -     1883
 AD1     Abs  926816 #E2460 -  1980  1985
 ADD     Ext          -       44    63    96   118  1069  1213  2395  2572
                              2858  2940
=AND     Abs  924071 #E19A7 -   719   149  2445  2909
 ANOTH   Abs  925131 #E1DCB -  1259  1326
=ASC     Abs  925763 #E2043 -  1541
=ASIN    Abs  926507 #E232B -  1867
 ASIN15  Ext          -     1869
 AT      Ext          -      146  2398  2431  2432  2488  2490  2591  2670
                              2710  2763  2857  2861  2867  2870
=ATAN    Abs  926585 #E2379 -  1895
 ATAN15  Ext          -     1897
 BACK2B  Ext          -     1367  1444  1450
=BASE    Abs  927323 #E265B -  2243   165
=BLK     Abs  924365 #E1ACD -   874  2476  2590  2599
```

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=BRACT   Abs  923022 #E158E -   262
 BRNCH   Ext                -  2301  2449  2507  2526  2561  2605  2960
 BSIZE   Ext                -  2856
=BYE     Abs  924487 #E1B47 -   964
=BYE1    Abs  924516 #E1B64 -   974   966
 C!      Ext                -    72   130  2571  2711  2950  2952  3078  3080
                             3083
=C@+     Abs  923813 #E18A5 -   598
 C@0     Abs  923873 #E18E1 -   610   601
=CASE    Abs  928869 #E2C65 -  2792
 CAT     Ext                -    53   104   608  1543  2586
=CHK     Abs  926858 #E248A -  2001  1962
=CHR$    Abs  929668 #E2F84 -  3074
=CHS     Abs  922899 #E1513 -   196
 CKINF-  Ext                -  2636
 CMOV>   Ext                -   120
 CMOVE   Ext                -    67   124  2956
=CMPST   Abs  926060 #E216C -  1686  1627
 CMPST+  Abs  926102 #E2196 -  1697  1694
=CMPST-  Abs  926057 #E2169 -  1685  1617  1636  1645  1662
 CMPSUB  Abs  926120 #E21A8 -  1704  1692  1699
 COMMA   Ext                -  2304  2330
 COMPL   Ext                -  2300  2326
 CONTX   Ext                -  2430
=COS     Abs  923394 #E1702 -   438
 COS15   Ext                -   440
=CR?     Abs  928112 #E2970 -  2511  2479
 CRDONE  Abs  928148 #E2994 -  2519  2517
=CRLF    Abs  925857 #E20A1 -  1593
=CSP     Abs  924442 #E1B1A -   929  2762
 Clear   Ext                -  2516
=D.R     Abs  924866 #E1CC2 -  1143
 D0+2RD  Ext                -  1278  1300  1311  1317
=DABS    Abs  927160 #E25B8 -  2157
 DEFADR  Ext                -  1039
 DEPTH   Ext                -  1144  2502  2889
 DGT01   Abs  923268 #E1684 -   373   371
 DGT1    Abs  923258 #E167A -   369   367
 DOCOL   Ext                -    39    91   145   162   262   598  1065  1125
                             1143  1169  1190  1207  1519  1541  1593  1830
                             2265  2296  2322  2381  2428  2474  2525  2547
                             2668  2685  2704  2744  2760  2792  2836  2855
                             2888  2988  3074  3105
 DOT     Ext                -  2503
 DOUSE   Ext                -   805   821   859   876   893   906   918   930
                              943  1799  1816  2211  2227  2245
 DP      Ext                -  2669
=DPL     Abs  924410 #E1AFA -   905
=DROP    Abs  926912 #E24C0 -  2027  1127  1176  1197  1520  1542  1832  2454
                             2604  2608  2865  2963
 DSPDGT  Ext                -   373
 DSPSTA  Ext                -  2513
 DSPSUB  Abs  928532 #E2B14 -  2636  2630  2823
=DUP     Abs  923995 #E195B -   678    40    48    92    97   111   113   115
                              599  2382  2388  2396  2429  2548  2567  2584
```

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                                        2796  2859  2868  2929
=ELSE    Abs  927419 #E26BB -  2296
=EMIT    Abs  928491 #E2AEB -  2620
 ENCL    Ext                -  2551
=END$    Abs  929753 #E2FD9 -  3105
 ENDR    Abs  925196 #E1E0C -  1284  1264  1276  1290
=ENG     Abs  923330 #E16C2 -   409
=EOF     Abs  925491 #E1F33 -  1424  2594
 EQUAL   Ext                -  2862
 EXP15   Ext                -   520
=EXXIT   Abs  926425 #E22D9 -  1830
=FABS    Abs  925798 #E2066 -  1564
 FAIL    Abs  925693 #E1FFD -  1498  1477  1483
 FAL1    Abs  925583 #E1F8F -  1453  1448
 FALSE   Abs  925574 #E1F86 -  1450  1443
 FEND    Ext                -   183   427   441   462   479   493   507   521
                                1723  1870  1884  1898  1943
 FIBAD-  Ext                -  1252  1429
 FIL0    Abs  927126 #E2596 -  2139  2142
 FIL1    Abs  927140 #E25A4 -  2144  2135
=FILL    Abs  927094 #E2576 -  2127
=FIND    Abs  927842 #E2862 -  2428
 FIND>   Ext                -  2433
 FINLIN  Ext                -  2518
 FIRST   Ext                -  2866
 FIVE-   Ext                -  2397  2401
=FIX     Abs  923205 #E1645 -   344
=FLD     Abs  924426 #E1B0A -   917
=FLIT    Abs  926445 #E22ED -  1846
 FLTOH   Ext                -  1778
 FND0    Abs  927947 #E28CB -  2457  2437
 FND01   Abs  927922 #E28B2 -  2451  2447
 FND02   Abs  927932 #E28BC -  2453  2450
 FND03   Abs  927952 #E28D0 -  2458
 FOUR+   Ext                -  2954  2958  3082  3085
 FSTRT   Ext                -   505
=FTOI    Abs  926306 #E2262 -  1773
 GETFP   Ext                -   315   541   566  1037  1285  1453  1502  1652
                                1749  1758  1780  1856  1987  2012  2355  2519
                                2632  2825
 GETPTR  Ext                -  1348  1430
 GETX+L  Ext                -   448
=GROW    Abs  926750 #E241E -  1960
 GT      Ext                -   105  1171  2553  2891
 GT1     Abs  924579 #E1BA3 -   993   991
 GT2     Abs  924597 #E1BB5 -  1007  1005
 GT3     Abs  924617 #E1BC9 -  1012  1009
 GT4     Abs  924640 #E1BE0 -  1018  1014
=GTS13   Abs  924554 #E1B8A -   986  1002
=GTSTAT  Abs  924581 #E1BA5 -  1002   975
 HDFLT   Ext                -  1747
=HERE    Abs  928601 #E2B59 -  2668  1066  2269  2302  2328  2331  2559  2570
                                2573  2578
=HEX     Abs  922819 #E14C3 -   162
=HLD     Abs  924458 #E1B2A -   941  2707  2709
```

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=HOLD    Abs  928681 #E2BA9 -  2704  2750
=IN      Abs  924394 #E1AEA -   891  2563  2602  2838
 INTRP   Ext                 -  2485
=ITOF    Abs  926200 #E21F8 -  1737
 ITOF0   Abs  926276 #E2244 -  1757  1753
=KEY     Abs  924655 #E1BEF -  1031
 KEYRD   Ext                 -  1034
 LBRAC   Ext                 -  2478
 LGT15   Ext                 -   182
 LIMIT   Ext                 -  2860
=LIT     Abs  924756 #E1C54 -  1081    41    45    50    93    99   147   163
                            -  1067  1210  2391  2443  2451  2705  2748  2794
                            -  2907  2946
=LOG     Abs  922862 #E14EE -   180
=LOOP    Abs  927504 #E2710 -  2322
 LT      Ext                 -    55  1146  1192  2384  2922
 LTZ     Ext                 -  2745
 M/      Ext                 -  2689
 MAINLP  Ext                 -   970
 MAINST  Ext                 -  1967
 MATCH   Abs  925695 #E1FFF -  1501  1486
=MAX     Abs  924999 #E1D47 -  1190  2916  2948
 MAX1    Abs  925029 #E1D65 -  1197  1194
 MEMCKL  Ext                 -  1964
=MIN     Abs  924946 #E1D12 -  1169  2911
 MIN1    Abs  924976 #E1D30 -  1176  1173
 MINUS   Ext                 -    52  1153  2271  2329  2566  2764  2932
=MOD     Abs  924833 #E1CA1 -  1125
 MP2-15  Ext                 -   478
 MTHSTK  Ext                 -  1688
 MULT    Ext                 -  2393
 MVMEM+  Ext                 -  1972
 NMOVE   Ext                 -  2577
 NONE    Abs  927627 #E278B -  2355  2348
 NORED   Abs  925181 #E1DFD -  1278  1281
 NORED0  Abs  925188 #E1E04 -  1280  1277
=NOT     Abs  924162 #E1A02 -   765
 NOTEND  Abs  925161 #E1DE9 -  1271  1266
 NULL$   Ext                 -  2965
 NUMB    Ext                 -  1525
=NUMST   Abs  923416 #E1718 -   446   181   425   439   460   474   491   519
                            -  1721  1868  1882  1896  1933
 NoCont  Ext                 -  1003  1006  1017
 OKFLG   Ext                 -  2487
 ONE     Ext                 -  1208  2383  2448  2598  2895  2915  2990  3075
                            -  3086
 ONE+    Ext                 -  2387  2933
 ONE-    Ext                 -   606  2937
 OR      Ext                 -  2491
=OVER    Abs  927027 #E2533 -  2090    54   602  1152  2270  2399  2403  2565
                            -  2942  2945  2991  3106
=PAD     Abs  924726 #E1C36 -  1065  2943  2949  2957  3076  3081  3084
=PBUF    Abs  929015 #E2CF7 -  2855
 PBUF0   Abs  929080 #E2D38 -  2868  2864
 PDOTQ   Ext                 -  2499  2504
```

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=PFA     Abs  925039 #E1D6F -  1207
=PICK    Abs  926977 #E2501 -  2065   43   47   95  101 2389
=POS     Abs  925611 #E1FAB -  1469
=PREV    Abs  927292 #E263C -  2225 2869
 PSTOR   Ext         -      2564 2600 2708 2839
=PI1+    Abs  928975 #E2CCF -  2836
=QCSP    Abs  928817 #E2C31 -  2760
 QUERY   Ext         -      2484
=QUIT    Abs  927972 #E28E4 -  2474
 QUIT0   Abs  928102 #E2966 -  2507 2498
 QUIT00  Abs  927997 #E28FD -  2479 2508
 QUIT01  Abs  928002 #E2902 -  2483
 QUITX   Abs  928062 #E293E -  2499 2527
 QUOTC   Ext         -      1594
=R/W     Abs  925074 #E1D92 -  1232
 R>      Ext         -        64   66   68   69  121  125  126 1151
                              1831 2575 2688 2918
 R@      Ext         -       122
=RCL     Abs  923110 #E15E6 -   304
 RDBYT   Abs  925234 #E1E32 -  1297 1305
 RDBYT0  Abs  925250 #E1E42 -  1302 1295
 RDLNAS  Ext         -      1360 1439
=RDN     Abs  923700 #E1834 -   553
 READIT  Abs  925207 #E1E17 -  1289 1274
 READR   Abs  925094 #E1DA6 -  1244 1242
 REDREC  Abs  925345 #E1EA1 -  1346 1275 1289
=REND2   Abs  929773 #E2FED -  3110
 REPOS   Abs  925313 #E1E81 -  1328 1267
 RESET   Ext         -      1484
 REWIND  Ext         -      1331
=ROLL    Abs  927685 #E27C5 -  2381
 ROLL1   Abs  927757 #E280D -  2396 2407
=ROT     Abs  924024 #E1978 -   696  109  110  114  119  603  605  607
                              2453 2900 2930 2935 2936
=RP!     Abs  923957 #E1935 -   660 2483
=RP0     Abs  924263 #E1A67 -   819
=RP@     Abs  923929 #E1919 -   643
 RREC10  Abs  925467 #E1F1B -  1402 1394
 RREC5   Abs  925441 #E1F01 -  1386 1363
=RUP     Abs  923634 #E17F2 -   532
=S->D    Abs  927221 #E25F5 -  2187 2687
=S<&     Abs  922381 #E130D -    39
=S>&     Abs  922566 #E13C6 -    91
 SAME    Ext         -      1485
 SAVEFP  Ext         -       306  447  533  554 1033 1244 1426 1471
                              1686 1743 1775 1851 2001 2339 2512 2622
                              2821
=SCI     Abs  923301 #E16A5 -   394
 SD0     Abs  927238 #E2606 -  2194 2192
 SEMI    Ext         -        74  131  150  167  265  609  611 1070
                              1128 1156 1177 1198 1214 1526 1544 1599
                              1833 2275 2309 2333 2409 2455 2458 2609
                              2671 2690 2712 2751 2770 2797 2840 2872
                              2966 2994 3087 3108
 SENDWD  Ext         -      2641
```

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 SETDGT  Abs  923232 #E1660 -   360   345   395   410
 SETFMT  Ext                -   349
 SETGET  Abs  923217 #E1651 -   349   331   397   412
 SETL0   Abs  927602 #E2772 -  2345  2368
 SETL1   Abs  927633 #E2791 -  2358  2354
=SETLEV  Abs  927564 #E274C -  2336  2332
 SETSTR  Ext                -  1472
 SFLAGS  Ext                -  1011  1016
=SIGN    Abs  928777 #E2C09 -  2744
 SIGN00  Abs  928812 #E2C2C -  2751  2747
 SIGTST  Ext                -  1705
=SIN     Abs  923359 #E16DF -   424
 SIN15   Ext                -   426
=SP!     Abs  923896 #E18F8 -   626
=SP0     Abs  924234 #E1A4A -   804
=SP@     Abs  923781 #E1885 -   579  2394  2402  2761
 SPACS   Ext                -  1154
=SPAN    Abs  926394 #E22BA -  1814
 SQR15   Ext                -  1722
=SQRTX   Abs  926161 #E21D1 -  1720
 STATE   Ext                -  2489
=STD     Abs  923178 #E162A -   328
 STKDRP  Ext                -   558
 STKLFT  Ext                -   311   537  1745  1852
 STMTR0  Ext                -  2646
=STO     Abs  923055 #E15AF -   278
 STORE   Ext                -   166  2273  2400  2477  2560  2603
=STR$    Abs  929457 #E2EB1 -  2996  1150  2989
=STR$U   Abs  929427 #E2E93 -  2988
 STR00   Abs  929479 #E2EC7 -  3003  3001
 STR01   Abs  929525 #E2EF5 -  3016  3042
 STR02   Abs  929570 #E2F22 -  3030  3028
 STR03   Abs  929587 #E2F33 -  3037  3034
 STR04   Abs  929622 #E2F56 -  3049  3045
 STRM    Ext                -  2549
=SUB$    Abs  929120 #E2D60 -  2888  2993  3107
 SUB$1   Abs  929167 #E2D8F -  2900  2894
 SUB01   Abs  929392 #E2E70 -  2963  2927
 SUB02   Abs  929407 #E2E7F -  2966  2961
=SWAP    Abs  926937 #E24D9 -  2044    65    73   123   128  1174  1195  2272
                            2305  2390  2550  2607  2921  2928  2931  2955
                            2959
=TAN     Abs  923448 #E1738 -   459
 TAN15   Ext                -   461
=THEN    Abs  927354 #E267A -  2265  2307
 THREE   Ext                -  1145  2324  2890
=TIB     Abs  924292 #E1A84 -   835
 TIC     Ext                -   264
 TP0     Abs  928970 #E2CCA -  2827  2813  2815
 TR0     Abs  926013 #E213D -  1652  1650
 TRA0    Abs  925273 #E1E59 -  1314  1282  1303
 TRA00   Abs  925287 #E1E67 -  1318  1316
 TRA1    Abs  925300 #E1E74 -  1323  1335
 TRASH   Abs  925261 #E1E4D -  1311  1313
 TRAVS   Ext                -  1209
```

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 TRU      Abs  925567 #E1F7F -  1446  1435
 TRY      Abs  925641 #E1FC9 -  1479  1495
 TWO      Ext         -  2267  2298  2306  2308  2837
 TWO*     Ext         -    62   117  2938
 TWO+     Ext         -   604  2574  2576  2585  2951  3079
 TWO-     Ext         -    71   102   103   129  1521
 TWO/     Ext         -  2569
=TYPE     Abs  928914 #E2C92 -  2809  1155
=U*       Abs  922947 #E1543 -   220
 U*0      Abs  922986 #E156A -   235   233
 U*1      Abs  922972 #E155C -   230   237
 U<       Ext         -  2404
 UPCPOS   Ext         -  1320
=USE      Abs  924336 #E1AB0 -   857
=VAL      Abs  925725 #E201D -  1519
=WAKE     Abs  928156 #E299C -  2525
=WARN     Abs  927261 #E261D -  2209
 WD       Abs  928266 #E2A0A -  2563  2555
 WD0      Abs  928341 #E2A55 -  2578  2562
 WD00     Abs  928461 #E2ACD -  2607  2589  2593  2597
=WORD     Abs  928186 #E29BA -  2547
 WR0      Abs  926882 #E24A2 -  2010  1966  2006
=WR1      Abs  926884 #E24A4 -  2012
 WRD0     Abs  928191 #E29BF -  2548  2606
 WRITE    Abs  925202 #E1E12 -  1286  1243
=X#Y?     Abs  926042 #E215A -  1661
 X1YY     Abs  925995 #E212B -  1646  1629
=X<>Y     Abs  926624 #E23A0 -  1909
=X<Y?     Abs  925895 #E20C7 -  1616
=X>Y?     Abs  925956 #E2104 -  1635
=XD0      Abs  924775 #E1C67 -  1096
=XE0?     Abs  925925 #E20E5 -  1625
=XEY?     Abs  925986 #E2122 -  1644
 XLOOP    Ext         -  2327
=XOR      Abs  924107 #E19CB -   739
=XXYY     Abs  925997 #E212D -  1647  1619  1638  1664
=X^2      Abs  923483 #E175B -   473
 YX2-15   Ext         -   506  1942
=Y^X      Abs  923562 #E17AA -   504
 ZBRNH    Ext         -   600  1172  1193  2406  2436  2446  2497  2554
                      2588  2592  2596  2746  2863  2893  2926
 ZEQ      Ext         -  2405  2496  2587  2595  2892  2924
 ZERO     Ext         -   610  2303  2457  2475  2558  2601
=adj      Abs  926798 #E244E -  1974
=e^X      Abs  923599 #E17CF -   518
=fFAIL    Abs  925693 #E1FFD -  1497
=fMATCH   Abs  925695 #E1FFF -  1500
 flPRGM   Ext         -  1010
 flSUSP   Ext         -  1015
 uMODES   Ext         -   446
 uRES12   Ext         -  1707
 uTEST    Ext         -  1647
```

Input Parameters

  Source file name is MR&FT2

  Listing file name is MR/FT2

  Object file name is MR%FT2::65

                                  111111
                        0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News

```
 1                    TITLE  FT3:_5_CHAR_WORDS
 2                    RDSYMB MR%GTO
 3
 4             *      ABS    REND2
 5
 6 E3050              ABS    #E3050
 7
 8             pENTER EQU    #12       !!!!!TEMPORARY MEASURE!!!
 9             MFERsp EQU    #940D
10
11
12             ******************************************************
13             *
14             * MR&FT3      <840608.1403>
15             *
16             *
17             *  START OF 5 CHAR WORDS
18             * ADD ADDITIONAL WORDS AT THIS END
19             *
20             ******************************************************
```

```
21                      EJECT
22                    ****************************************************************
23                    *
24                    * NFILL (addr u nib --- ) fill memory beginning at addr with
25                    *       n copies of nib, if quantity is  = 0 then
26                    *       take no action
27                    *
28                    ****************************************************************
29
30 E3050 0000         CON(5)  0               NO MORE 5 CHAR WORDS
         0
31 E3055 58   =!NFILL CON(2)  #85             NFILL
32 E3057 E464         NIBASC  \NFIL\
         94C4
33 E305F CC           CON(2)  \L\+#80
34 E3061 6603 =NFILL  CON(5)  =$NFILL
         E
35
36 E3066 143  =$NFILL A=DAT1  A               READ nib  TO A
37 E3069 174          D1=D1+  5
38 E306C 147          C=DAT1  A               READ U
39 E306F 174          D1=D1+  5
40 E3072 D7           D=C     A               COPY U TO D
41 E3074 147          C=DAT1  A               READ ADDR
42 E3077 174          D1=D1+  5               RETURN NOTHING ON STACK
43 E307A 8AB          ?D=0    A               ANY TO DO?
44 E307D 61           GOYES   NFIL1           NO, GO HOME
45 E307F CF           D=D-1   A               PRIME FOR CARRY TEST
46 E3081 136          CD0EX                   D0=ADDR,C=I
47 E3084 1580 NFIL0   DAT0=A  1               STORE nib  AT ADDR
48 E3088 160          D0=D0+  1               INCREMENT ADDR
49 E308B CF           D=D-1   A               DECREMENT COUNT
50 E308D 56F          GONC    NFIL0           DO ANOTHER IF NO CARRY
51 E3090 134          D0=C                    RESTORE I TO D0
52 E3093 03   NFIL1   RTNCC
```

```
53                      EJECT
54                  ***********************************************
55                  *
56                  * FSTR$  ( --- str)  This word creates a string
57                  *       at PAD to represent the current contents
58                  *       of the X register.  The string is created
59                  *       according to the current display format.
60                  *
61                  ***********************************************
62 E3095 5503              CON(5)  !NFILL
         E
63 E309A 58    =!FSTR$     CON(2)  #85
64 E309C 6435              NIBASC  \FSTR\
         4525
65 E30A4 4A                CON(2)  \$\+#80
66 E30A6 0000  =FSTR$      CON(5)  =DOCOL
         0
67 E30AB 0000              CON(5)  =XSTR$          ( addr cnt )
         0
68 E30B0 0000              CON(5)  =ONE            ( addr cnt 1 )
         0
69 E30B5 0000              CON(5)  =OVER           ( addr cnt 1 cnt )
         0
70 E30BA 0000              CON(5)  =SUB$           ( addr cnt of str at pad )
         0
71 E30BF 0000              CON(5)  =SEMI
         0
```

```
72                      EJECT
73                  ****************************************
74                  *
75                  * VARID         ( -- N )
76                  *
77                  * System user variable used by assembler.
78                  * The general purpose buffer identified
79                  * by the contents of this variable will
80                  * be preserved when the system cleans up
81                  * memory.
82                  *
83                  ****************************************
84 E30C4 A903              CON(5)  !FSTR$
       E
85 E30C9 58      =!VARID   CON(2)  #85
86 E30CB 6514              NIBASC  \VARI\
       2594
87 E30D3 4C                CON(2)  \D\+#80
88 E30D5 AD03    =VARID    CON(5)  =$VARID
       E
89 E30DA 8E00    =$VARID   GOSUBL  =DOUSE
       00
90 E30E0 34CF              CON(5)  (=oVARID)
       2
91
92
```

```
 93                     EJECT
 94                 ****************************************
 95                 *
 96                 * FDROP   ( --- )  This word does a stack
 97                 *       drop on the floating point stack.
 98                 *       Its purpose is to replace CLX by
 99                 *       allowing you to drop the contents
100                 *       of the X register.
101                 *
102                 ****************************************
103 E30E5 9C03           CON(5)  =!VARID
         E
104 E30EA 58     =!FDROP CON(2)  #85
105 E30EC 6444           NIBASC  \FDRO\
         25F4
106 E30F4 0D             CON(2)  \P\+#80
107 E30F6 BF03 =FROP     CON(5)  $FDROP
         E
108 E30FB 8E00 $FDROP    GOSUBL  =SAVEFP        SAVE FORTH ENVIRONMENT
         00
109 E3101 1B0C           D0=(5)  =oLASTX
         BF2
110 E3108 1567           C=DAT0  W
111 E310C 10B            R3=C                   save LASTX
112 E310F 8E00           GOSUBL  =STKDRP        DROP STACK
         00
113 E3115 1B0C           D0=(5)  =oLASTX
         BF2
114 E311C 11B            C=R3
115 E311F 1547           DAT0=C  W              restore old LASTX
116 E3123 8C00           GOLONG  =GETFP         RESTORE FORTH ENVIRONMENT
         00
```

```
                        EJECT
                ****************************************************
                *
                * Renamed FINDF (from FFIND)
                * 12/18/83
                *
                * FINDF          ( str -- addr,or 0 if not found )
                *
                * Return the address of the file in RAM with
                * given name.
                *
                ****************************************************
E3129 AE03              CON(5)  !FDROP
      E
E312E 58        =!FFIND CON(2)  #85
E3130 6494              NIBASC  \FIND\
      E444
E3138 6C                CON(2)  \F\+#80
E313A 0000      =FFIND  CON(5)  =DOCOL
      0
E313F 0000              CON(5)  =SETNAM         PUT NAME IN STMTR0 FOR FSYNTX
      0
E3144 0000              CON(5)  =FSYNTX         CHECK SYNTAX & SET UP FNAME
      0

                * essentially calls routine FSPECx -- if name is legal it
                * is returned blank-filled; this is stored in FNAME

E3149 0000              CON(5)  =ZBRNH          IF OK
      0
E314E 4100              CON(5)  (FSX)-*
      0
E3153 0000              CON(5)  =FNAME          PROPER FNAME ON STACK
      0
E3158 AA13              CON(5)  =FILFND      return addr of file
      E
E315D 0000              CON(5)  =SEMI
      0

E3162 0000      FSX     CON(5)  =FNAME          addr of 8 char name
      0
E3167 0000              CON(5)  =LIT
      0
E316C 8000              CON(5)  8
      0
E3171 D713              CON(5)  =ABORTN         move name to HERE for msg
      E
E3176 22E3              CON(5)  =ABORTW
      E
E317B 31                CON(2)  =eBFIL

                * This is a tricky way to make the MSG: "FTH ERR: <str>
                * REST OF MESSAGE" ; it assumes a string and moves it to
                * HERE as a counted string for ABORTW

```

```
157 E317D 0000 =ABORTN CON(5)  =DOCOL
          0
158 E3182 0000         CON(5)  =DUP          LEN
          0
159 E3187 0000         CON(5)  =HERE
          0
160 E318C 0000         CON(5)  =C!           PUT IN LEN
          0
161 E3191 0000         CON(5)  =HERE
          0
162 E3196 0000         CON(5)  =TWO+
          0
163 E319B 1454         CON(5)  =SMOVE        MOVE STR TO HERE FOR ABORTW
          E
164 E31A0 0000         CON(5)  =ONE          TRUE, GO ABORT
          0
165 E31A5 0000         CON(5)  =SEMI
          0
166
167
168 E31AA FA13 =FILFND CON(5)  =$FILF
          E
169 E31AF 8E00 =$FILF  GOSUBL  =SAVEFP
          00
170 E31B5 143          A=DAT1  A              GET ADDR OF FNAME
171 E31B8 131          D1=A
172 E31BB 1537         A=DAT1  W              GET NAME
173 E31BF 8F00         GOSBVL  =FINDF         FIND IT!
          000
174 E31C6 841          ST=0    1              USE S1 FOR FOUND FLAG
175 E31C9 450          GOC     FF1            CARRY SET=NOT FOUND
176 E31CC 851          ST=1    1              FLAG FOUND
177 E31CF 133  FF1     AD1EX                  ADDR TO A
178 E31D2 8E00         GOSUBL  =GETFP
          00
179 E31D8 871          ?ST=1   1
180 E31DB 40           GOYES   FF2            IF FOUND LEAVE ADDR IN A
181 E31DD D0           A=0     A
182 E31DF 141  FF2     DAT1=A  A              REPLACE FNAME BY ADDR
183 E31E2 03           RTNCC
```

```
184                     EJECT
185                 ********************************************************
186                 *
187                 *  X=>Y?  X<>Y?  X<=Y?    ( --- t/f)
188                 *
189                 * These words compare the contents of the X & Y registers
190                 * in the floating point stack and if the specified test
191                 * is true they return a true flag on the integer data stack
192                 * else they return a false flag.
193                 *
194                 ********************************************************
195 E31E4 E213      =!FFIND CON(5)  =!FFIND
          E
196 E31E9 58      =!X<=Y? CON(2)  #85
197 E31EB 85C3            NIBASC  \X<=Y\
          D395
198 E31F3 FB            CON(2)  \?\+#80
199 E31F5 AF13    =X<=Y?  CON(5)  $X<=Y?
          E
200 E31FA 8E00    $X<=Y?  GOSUBL  =CMPST-
          00
201 E3200 23            P=      3               P INDICATES TEST
202 E3202 8C00          GOLONG  =XXYY           FINISH IN MR&FT2
          00
203
204
205 E3208 9E13          CON(5)  !X<=Y?
          E
206 E320D 58      =!X=>Y? CON(2)  #85
207 E320F 85E3          NIBASC  \X>=Y\
          D395
208 E3217 FB            CON(2)  \?\+#80
209 E3219 E123    =X=>Y?  CON(5)  $X=>Y?
          E
210 E321E 8E00    $X=>Y?  GOSUBL  =CMPST-
          00
211 E3224 26            P=      6               P INDICATES TEST
212 E3226 8C00          GOLONG  =XXYY           FINISH IN MR&FT2
          00
```

```
213                     EJECT
214                 ************************************************
215                 *
216                 * CONBF  (n1 n2 --- t/f) This word will contract
217                 *       the I/O buffer identified by the ID#, n2,
218                 *       by the number of nibs, n1, specified.  If
219                 *       successful it returns a true flag, else
220                 *       it returns a false flag.
221                 *
222                 * n1 changed to mean nibs instead of bytes
223                 * 12/12/83 B.M.
224                 ************************************************
225 E322C D023      E       CON(5)  !X=>Y?
226 E3231 58        =!IOCON CON(2)  #85
227 E3233 34F4      E424    NIBASC  \CONB\
228 E323B 6C              CON(2)  \F\+#80
229 E323D 2423      E       CON(5)  $IOCON
230
231 E3242 D0        $IOCON  A=0     A
232 E3244 E4              A=A+1   A               CONTRACT FLAG
233 E3246 5A1             GONC    IOECO
234
235                 ************************************************
236                 *
237                 * EXPBF  ( n1 n2 --- t/f)  This word will expand
238                 *       the I/O buffer identified by the ID#, n2,
239                 *       by the number of nibs, n1, specified.  If
240                 *       successful it returns a true flag, else
241                 *       it returns a false flag.
242                 *
243                 * n1 changed to mean nibs instead of bytes
244                 * 12/12/83
245                 ************************************************
246 E3249 1323      E       CON(5)  !IOCON
247 E324E 58        =!IOEXP CON(2)  #85
248 E3250 5485      0524    NIBASC  \EXPB\
249 E3258 6C              CON(2)  \F\+#80
250 E325A F523      E       CON(5)  $IOEXP
251
252 E325F D0        $IOEXP  A=0     A               EXPAND FLAG
253
254 E3261 174       IOECO   D1=D1+  5
255 E3264 8E00      00      GOSUBL  =SAVEFP         SAVE FORTH ENVIRONMENT
256                 *
257                 * 2/6/84 changed from ABEX  A; A=DAT1 A to B=A  A;
258                 * A=DAT1 X, ensures that when we do a B=A  A,  A(A)
259                 * = 0 or 1 which is overwritten when we do a A=DAT1 X
260                 *
```

```
261 E326A D8           B=A     A          save exp/con flag in B(A)
262 E326C 1533         A=DAT1  X          read nib count (FFF max, 2/6/84)
263 E3270 1C4          D1=D1-  5
264 E3273 15F2         C=DAT1  3          READ BUFFER ID#
265 E3277 DC           ABEX    A          NIB COUNT TO B(A)
266 E3279 8AC          ?A#0    A          DOING CONTRACT?
267 E327C B1           GOYES   IOEC1      YES
268 E327E 8F00         GOSBVL  =I/OEXP    EXPAND BUFFER
          000
269 E3285 5B1          GONC    IOFAIL     DIDN'T WORK!
270 E3288 D0    SUCC   A=0     A
271 E328A CC           A=A-1   A          TRUE FLAG
272 E328C 8E00 IOEC2   GOSUBL  =GETFP     RESTORE FORTH ENVIRONMENT
          00
273 E3292 141          DAT1=A  A          WRITE FLAG TO STACK
274 E3295 03           RTNCC
275 E3297 8F00 IOEC1   GOSBVL  =I/OCON    CONTRACT BUFFER
          000
276 E329E 49E          GOC     SUCC       SUCCESSFUL
277
278 E32A1 D0   IOFAIL  A=0     A
279 E32A3 58E          GONC    IOEC2        B.E.T.  (2/6/84)
```

```
280                     EJECT
281                 ******************************************************
282                 *
283                 * FLUSH  ( --- ) Unassigns all block buffers.
284                 *
285                 ******************************************************
286 E32A6 E423             CON(5)  !IOEXP
          E
287 E32AB 58       =!FLUSH CON(2)  #85
288 E32AD 64C4             NIBASC  \FLUS\
          5535
289 E32B5 8C               CON(2)  \H\+#80
290 E32B7 0000     =FLUSH  CON(5)  =DOCOL          :
          0
291 E32BC D383             CON(5)  =FIRST          FIRST       get addr of first
          E
292 E32C1 0000             CON(5)  =AT             @           buffer,
          0
293 E32C6 0000             CON(5)  =DUP                        make a copy
          0
294 E32CB 0000             CON(5)  =PREV           PREV        set PREV=FIRST for
          0
295 E32D0 0000             CON(5)  =STORE          !           +BUF in BEGIN UNTIL
          0
296 E32D5 0000 FLU0        CON(5)  =ZERO           BEGIN 0     set fib field to 0
          0
297 E32DA 0000             CON(5)  =OVER           OVER        to unassign buffer
          0
298 E32DF 0000             CON(5)  =C!             C!
          0
299 E32E4 0000             CON(5)  =PBUF           +BUF
          0
300 E32E9 0000             CON(5)  =ZEQ            0=
          0
301 E32EE 0000             CON(5)  =ZBRNH          UNTIL
          0
302 E32F3 2EFF             CON(5)  (FLU0)-*
          F
303 E32F8 0000             CON(5)  =DROP           DROP
          0
304 E32FD 0000             CON(5)  =SEMI           ;           throw away unwanted buf
          0
```

```
305                     EJECT
306                 ******************************************************
307                 *
308                 * >BODY  (addr1 --- addr2)  FORTH 83 Standard
309                 *       This rtne expects that addr1 is the cfa
310                 *       of a word.  It adds five to it to get the
311                 *       pfa which it returns as addr2.
312                 *
313                 ******************************************************
314 E3302 BA23E             CON(5)  !FLUSH
315 E3307 58      =!>BODY  CON(2)  #85
316 E3309 E324F444          NIBASC  \>BOD\
317 E3311 9D                CON(2)  \Y\+#80
318 E3313 8133E     =>BODY  CON(5)  $>BODY
319
320 E3318 20        $>BODY  P=      0
321 E331A 3450000           LC(5)   5               LOAD C WITH 5
322 E3321 143               A=DAT1  A               READ CFA
323 E3324 CA                A=A+C   A               ADD 5 TO GET PFA
324 E3326 141               DAT1=A  A               WRITE BACK TO STACK
325 E3329 03                RTNCC                   RETURN TO USER
```

```
326                     EJECT
327                 ************************************************
328                 *
329                 * LASTX ( --- ) Puts the contents of LASTX into
330                 *       X after doing a stack lift.
331                 *
332                 ************************************************
333 E332B 7033         CON(5) !>BODY
          E
334 E3330 58    =!LASTX CON(2) #85
335 E3332 C414          NIBASC \LAST\
          3545
336 E333A 8D            CON(2) \X\+#80
337 E333C 0000  =LASTX  CON(5) =DOCOL          put address of
          0
338 E3341 0000          CON(5) =LIT            LASTX variable on stack
          0
339 E3346 0CBF          CON(5) =oLASTX         then call RCL to do a
          2
340 E334B 0000          CON(5) =RCL            stack lift and to put
          0
341 E3350 0000          CON(5) =SEMI           LASTX into X
          0
```

```
342                     EJECT
343                 ***********************************************
344                 *
345                 * ENTER  (addr n c 0 ---  addr n )
346                 *        (addr n --- addr n)
347                 *
348                 *  ENTER  This word will work if the HPIL
349                 *       module is plugged in.  Otherwise it
350                 *       will give an "HPIL ERROR"
351                 *
352                 *  CASE1: 1st parameter on stack is a 0,
353                 *   ENTER will then terminate on receipt of a
354                 *   specific character which it expects to be
355                 *   the second argument on the stack.  The 3rd
356                 *   argument is the maximum number of chars
357                 *   that the user wants to be transferred to the
358                 *   FORTH environment (i.e., a user expects no
359                 *   more than 10 chars from a device before seeing
360                 *   the stop char, however the device sends 1000 chars,
361                 *   if the user had specified 10 as the max # of chars
362                 *   to be brought into the FORTH environment he is
363                 *   protected from having his memory corrupted).
364                 *   The last parameter is the address at which the
365                 *   string is to be stored in the FORTH environment.
366                 *
367                 *  CASE2: 1st parameter on the stack is non-zero.
368                 *   ENTER assumes that this is the number of chars
369                 *   it should read from the specified device. The 2nd
370                 *   parameter is the address at which the string is
371                 *   to be stored in the FORTH environment.
372                 *
373                 *   The device is specified by the 3 user variables:
374                 *   HPIL-LOOP, SECONDARY and PRIMARY.
375                 *
376                 *   If the user sets system flag -23 (from BASIC)
377                 *   ENTER will terminate with receipt of an ETO.
378                 *
379                 ***********************************************
380 E3355 0333          CON(5) !LASTX
          E
381 E335A 58      =!ENTER CON(2) #85
382 E335C 54E4          NIBASC \ENTE\
          4554
383 E3364 2D            CON(2) \R\+#80
384
385 E3366 0000  =ENTER   CON(5) =DOCOL          :
          0
386 E336B E833          CON(5) =ENT            DO ENTERING
          E
387 E3370 0000          CON(5) =PILERR         REPORT ANY ERROR
          0
388 E3375 0000          CON(5) =SEMI
          0
389
390 E337A 20    ERR     P=     0
```

```
391 E337C 864          ?ST=0  4            plain old error?
392 E337F 80           GOYES  ERR1         yes
393 E3381 3300         LC(4)  =eMEM        otherwise we've run out of memory
          00
394
395 E3387 8D00 ERR1    GOVLNG =BSERR       report error
          000
396
397
398 E338E 3933 =ENT    CON(5) =$ENT
          E
399
400 E3393 8E00 =$ENT   GOSUBL =NIB7        COMPUTE 7 NIB ADDR
          00
401             *                          FROM HPIL-LOOP, PRIMARY
402             *                          AND SECONDARY AND RETURN
403             *                          IT IN A(7), SAVE FORTH
404             *                          POINTERS & COPY DATA STK PTR
405             *                          ONTO CPU RTN STK
406
407             * SET ENTRY CONDITIONS FOR ENTER POLL
408
409 E3399 04           SETHEX
410 E339B 20           P=     0
411 E339D 847          ST=0   7
412 E33A0 846          ST=0   6
413 E33A3 101          R1=A                COPY 7 NIB ADDR TO R1
414 E33A6 855          ST=1   5            READ BY BYTE COUNT
415
416 E33A9 07           C=RSTK
417 E33AB 134          D0=C                RECOVER DATA STK PTR
418 E33AE 142          A=DAT0 A            READ 1ST ITEM
419 E33B1 164          D0=D0+ 5
420 E33B4 8AC          ?A#0   A            GET BYTE COUNT?
421 E33B7 61           GOYES  ENT0         NEXT PART
422
423             *                          we have to ensure that we
424             *                          will read an arbitrary #
425             *                          of chars; we do this by
426             *                          setting the nibble at
427             *                          S-R0-3 to 0; A=0 from read
428
429 E33B9 1F00           D1=(5)  =S-R0-3
          000
430 E33C0 1590         DAT1=A  1
431
432 E33C4 14A          A=DAT0 B            read stop char from data stk
433 E33C7 169          D0=D0+ 10           point to addr not max count
434 E33CA 845          ST=0   5            not reading for byte count
435
436 E33CD 136  ENT0     CD0EX              SAVE UPDATED FORTH DATA
437 E33D0 06           RSTK=C              STK PTR ON CPU RTN STK
438 E33D2 1B00         D0=(5) =FORSTK      SET AVMEME=FORSTK
          000
439 E33D9 146          C=DAT0 A            AS PART OF POLL'S ENTRY
```

```
440 E33DC 1B00          D0=(5) =AVMEME      CONDITIONS
          000
441 E33E3 144           DAT0=C A
442
443 E33E6 8F00          GOSBVL =POLL        ISSUE POLL
          000
444 E33ED 21            CON(2) =pENTER
445 E33EF 4A8           GOC    ERR          CHECK FOR ERROR FIRST
446
447 E33F2 831           ?XM=0               IF XM=0 THEN HANDLED
448 E33F5 41            GOYES ENT1
449 E33F7 8E00          GOSUBL =GETFP       POLL WAS NOT HANDLED,
          00
450 E33FD 07            C=RSTK              RECOVER UPDATED DATA STK PTR
451 E33FF 137           CD1EX
452 E3402 D2            C=0    A            RTN FALSE FLAG, SO "HPIL
453 E3404 145           DAT1=C A            ERROR" MSG WILL BE GIVEN
454 E3407 03            RTNCC
455
456 E3409 1F00 ENT1     D1=(5) =AVMEME      END OF DATA RECEIVED
          000
457 E3410 1B00          D0=(5) =FORSTK      START OF DATA RECEIVED
          000
458 E3417 AF0           A=0    W
459 E341A 147           C=DAT1 A
460 E341D 142           A=DAT0 A
461 E3420 130           D0=A                 SOURCE TO D0
462 E3423 EA            A=A-C  A            #NIBS RECEIVED
463 E3425 81C           ASRB                NIBS TO BYTES
464 E3428 D8            B=A    A            COPY OF # BYTES IN B
465 E342A 8A8           ?A=0   A            ANY RECEIVED?
466 E342D 93            GOYES  ENT2         NO
467 E342F 07            C=RSTK              RECOVER FORTH DATA STK PTR
468 E3431 06            RSTK=C              AND PUSH RIGHT BACK ON
469 E3433 135           D1=C
470 E3436 1C4           D1=D1-  5           point to max bytes to be
471             *                           transferred to FORTH
472 E3439 147           C=DAT1  A           read max bytes
473 E343C 8BA           ?C>=A   A           did we get less than or equal max b
474 E343F 60            GOYES   ENT02       yes, so use byte count in B(A) and
475 E3441 D5            B=C     A
476 E3443 DA            A=C     A           else revise max byte count
477 E3445 174 ENT02     D1=D1+  5           now point to addr
478
479 E3448 147           C=DAT1 A            DESTINATION ADDR
480 E344B 135           D1=C                TO D1
481 E344E 181           D0=D0-  2            POINT TO REAL 1ST CHAR!
482 E3451 CC  ENT01     A=A-1  A            DECREMENT COUNT
483 E3453 421           GOC    ENT2          DONE
484 E3456 14E           C=DAT0  B            READ CHAR
485 E3459 14D           DAT1=C  B            STORE CHAR
486 E345C 181           D0=D0-  2            DECR. SOURCE
487 E345F 171           D1=D1+  2            INCR. DEST.
488 E3462 6EEF          GOTO    ENT01
489
```

```
490 E3466 07    ENT2    C=RSTK              RECOVER PTR TO DATA STK
491 E3468 134           D0=C
492 E346B D9            C=B    A            C(A)=# bytes received
493 E346D 184           D0=D0- 5
494 E3470 144           DAT0=C A            PUSH STRING LEN
495 E3473 D2            C=0    A
496 E3475 CE            C=C-1  A            TRUE FLAG
497 E3477 184           D0=D0- 5
498 E347A 144           DAT0=C A            PUSH TRUE FLAG
499 E347D 132           AD0EX               SAVE CURRENT DATA STK PTR IN A(A)
500 E3480 8E00          GOSUBL =GETFP       RESTORE FORTH POINTERS
          00
501 E3486 133           AD1EX               REAL DATA STK PTR TO D1
502 E3489 03            RTNCC
503             ********************************************
504             *
505             * F.AND     Special Purpose Assembler Word
506             *
507             ********************************************
508
509 E348B 0000  =F.AND  CON(5)  =DOCOL       :
          0
510 E3490 0000          CON(5)  =ZEQ         0=
          0
511 E3495 0000          CON(5)  =SWAP        SWAP
          0
512 E349A 0000          CON(5)  =ZEQ         0=
          0
513 E349F 0000          CON(5)  =OR          OR
          0
514 E34A4 0000          CON(5)  =ZEQ         0=
          0
515 E34A9 0000          CON(5)  =SEMI        ;
          0
```

```
                    EJECT
            ******************************************************
            *
            * <FIND>   ( addr1  addr2 -- cfa  b  tf)   (ok)
            *                         -- ff            (bad)
            *
            * This routine will search through RAM and ROM headers
            * to find a dictionary entry.  RAM is always searched
            * first, and it is assumed that there is always at least
            * one RAM dictionary entry.
            * In searching ROM we use the jump table pointing to
            * the linked list of words of the length we are trying
            * to match.
            *
            * addr2:  points to the header field addr at which to
            *         start search
            *
            * If a match is found it returns the cfa addr, the
            * number of BYTES in the name, and a true flag.
            *
            * If a match is not found, it simply returns a false flag.
            *
            *
            * (High Mem)
            *  --------
            *
            *             <code field addr>
            *             <name>
            *  addr2--->  <# bytes in name>
            *             <link to next word>
            *
            *                       <name>
            *  addr1--->        <# bytes in name>
            * (addr1 points to the word which usually has been set up at
            *  the end of the dictionary by WORD)
            * (addr2 depends on the current vocabulary -- usually it points
            *  to FORTH)
            *  --------
            * (Low Mem)
            *
            *
            *
            *

E34AE 3B43 =FIND>  CON(5) =$FIND>
        E

E34B3 147  =$FIND> C=DAT1  A                READ ADDR2
E34B6 DA           A=C     A                COPY OF ADDR2 TO A(A)
E34B8 136          CD0EX                    D0=ADDR2
E34BB 108          R0=C                     SAVE I IN R0
E34BE 174          D1=D1+  5
E34C1 147          C=DAT1  A                READ ADDR1
E34C4 D7           D=C     A                SAVE COPY OF ADDR1 IN D
E34C6 137          CD1EX                    D1=ADDR1
```

```
570 E34C9 109          R1=C                    SAVE DATA STK IN R1
571 E34CC AC1          B=0     S               B(S) is our RAM/ROM flag
572            *                               when B(S)=0 we are searching
573            *                               RAM, B(S)=F when we are
574            *                               searching ROM
575
576            *
577            * FND000  RAM SEARCH
578            *
579 E34CF 20   FND000  P=      0
580 E34D1 D2           C=0     A               CLEAR FOR LENGTH ADD
581 E34D3 31F1         LC(2)   31              SET MASK, MAX NAME LENGTH
582            *                               IS 31 CHARS
583 E34D7 DA           A=C     A               MASK TO A(B)
584 E34D9 14E          C=DAT0  B               LENGTH FROM ADDR2
585 E34DC 10A          R2=C                    SAVE RAW LENGTH
586 E34DF 0E66         A=A&C   B               LENGTH ALONE
587 E34E3 14F          C=DAT1  B               LENGTH FROM ADDR1
588 E34E6 962          ?A=C    B               CHARS THE SAME?
589 E34E9 41           GOYES   MATCH1          YES!
590            *
591 E34EB 184  FND001  D0=D0-  5               BACK UP TO LINK
592 E34EE 146          C=DAT0  A               READ LINK TO C(A)
593 E34F1 8AA          ?C=0    A               OUT OF RAM ENTRIES?
594 E34F4 42           GOYES   SETROM          YES! NOW DO ROM ENTRIES
595 E34F6 134          D0=C                    SET NEW ADDR2
596 E34F9 65DF         GOTO    FND000
597
598            * THE FOLLOWING CODE ENSURES THAT WE DON'T FIND
599            * DICTIONARY ENTRIES THAT ARE SMUDGED (I.E., IN THE
600            * PROCESS OF BEING DEFINED
601
602
603 E34FD 3102 MATCH1  LC(2)   #20             0010 0000  SMUDGE BIT MASK
604 E3501 14A          A=DAT0  B               READ LENGTH FROM ADDR2
605 E3504 0E66         A=A&C   B               "AND" WITH MASK
606 E3508 14F          C=DAT1  B               GET LENGTH ALONE FROM ADDR1
607 E350B 968          ?A=0    B               NOT SMUDGED?
608 E350E E5           GOYES   MATCH           YES
609 E3510 D0           A=0     A
610 E3512 AEA          A=C     B               GET LENGTH ALONE TO A(A)
611 E3515 55D          GONC    FND001            INTERMEDIATE JUMP
612
613            *
614 E3518 D0   SETROM  A=0     A
615 E351A 14B          A=DAT1  B                 WORD LENGTH
616 E351D 31C0         LC(2)   12                NONE GREATER THAN 12
617 E3521 9E6          ?A>C    B
618 E3524 53           GOYES   FAIL              BAD LENGTH!
619 E3526 D9           C=B     A                 SAVE RTNSTK
620 E3528 D8           B=A     A                 COPY LENGTH
621 E352A C4           A=A+A   A                 LENGTH*2
622 E352C C4           A=A+A   A                 LENGTH*4
623 E352E C0           A=A+B   A                 LENGTH*5
624 E3530 D5           B=C     A                 RESTORE B
```

```
625 E3532 3400          LC(5)   =TABLE
          000
626 E3539 C2            C=C+A   A               FIND JUMP-TABLE ENTRY
627 E353B 134           D0=C                    POINT TO ENTRY
628 E353E 146           C=DAT0  A               GET ADDR2
629 E3541 134           D0=C
630 E3544 A4D           B=B-1   S               SET ROM FLAG
631 E3547 6420          GOTO    MATCH
632             *
633
634 E354B 184   FND01   D0=D0-  5               POINT TO LINK
635 E354E 146           C=DAT0  A               GET LINK
636 E3551 134           D0=C                    SET D0 TO NEXT ITEM
637 E3554 8AE           ?C#0    A               IS IT A REAL LINK?
638 E3557 51            GOYES   MATCH
639 E3559 D0    FAIL    A=0     A               FALSE FLAG
640 E355B 118           C=R0
641 E355E 134           D0=C                    RECOVER I
642 E3561 119           C=R1
643 E3564 135           D1=C                    RECOVER RTN STK
644 E3567 141           DAT1=A  A               PUSH FAIL FLAG
645 E356A 03            RTNCC
646
647 E356C 136   MATCH   CD0EX
648 E356F 06            RSTK=C                  SAVE ADDR2 ON CPU RTN STK
649 E3571 134           D0=C                    RESTORE ADDR2 TO D0
650 E3574 D2            C=0     A
651 E3576 14E           C=DAT0  B               READ RAW LENGTH
652 E3579 10A           R2=C
653
654 E357C 171   MAT00   D1=D1+  2               point addr1 to 1st char
655 E357F 161           D0=D0+  2               point addr2 to 1st char
656 E3582 14B           A=DAT1  B               char from addr1
657 E3585 A64           A=A+A   B               *2
658 E3588 14E           C=DAT0  B               char from addr2
659 E358B A66           C=C+C   B               *2 set carry if high bit set
660 E358E 4A1           GOC     LSTCHR          last char!
661 E3591 962           ?C=A    B               chars equal?
662 E3594 8E            GOYES   MAT00           yes, do another
663             *
664             * WE WERE MATCHING CHARS, NOW WE'VE FAILED. NEED TO
665             * DETERMINE WHETHER WE'RE SEARCHING RAM OR ROM
666             *
667 E3596 DB    FND1    C=D     A
668 E3598 135           D1=C                    RESTORE ADDR1
669 E359B 07            C=RSTK                  POP ADDR2
670 E359D 136           CD0EX                   RESET D0 TO ADDR2
671 E35A0 94D           ?B#0    S               DOING ROM?
672 E35A3 8A            GOYES   FND01           YES
673 E35A5 654F          GOTO    FND001          NO, DOING ROM
674
675 E35A9 966   LSTCHR  ?C#A    B               chars unequal?
676 E35AC AE            GOYES   FND1            YES try another
677
678 E35AE 161   SUCESS  D0=D0+  2               point to cfa
```

```
679 E35B1 136          CD0EX          GET IT IN C[A]
680               *
681 E35B4 111  SUC01   A=R1
682 E35B7 131          D1=A           RESTORE DATA STACK PTR
683 E35BA 145          DAT1=C  A      WRITE CFA TO STACK
684 E35BD 1C4          D1=D1-  5
685 E35C0 11A          C=R2           length of name
686 E35C3 145          DAT1=C  A      PUSH LENGTH
687 E35C6 1C4          D1=D1-  5
688 E35C9 D0           A=0     A
689 E35CB CC           A=A-1   A      TRUE=ALL ONE'S
690 E35CD 141          DAT1=A  A      PUSH FLAG
691 E35D0 07           C=RSTK         throw away addr2
692 E35D2 118          C=R0
693 E35D5 134          D0=C           RESTORE I TO D0
694 E35D8 03           RTNCC
695
696
```

```
697                     EJECT
698                 ********************************
699                 *
700                 * 2OVER (d1 d2 --- d1 d2 d1)
701                 *
702                 ********************************
703
704 E35DA A533             CON(5)   =!ENTER
          E
705 E35DF 58       =!OVER2 CON(2)   #85              2OVER
706 E35E1 23F4             NIBASC   \2OVE\
          6554
707 E35E9 2D               CON(2)   \R\+#80
708 E35EB 0F53     =OVER2  CON(5)   =$OVER2
          E
709
710 E35F0 179      =$OVER2  D1=D1+  10               POINT TO D1
711 E35F3 15F9             C=DAT1   10               READ D1
712 E35F7 1C9              D1=D1-   10
713 E35FA 1C9              D1=D1-   10
714 E35FD 15D9             DAT1=C   10               WRITE D1 AGAIN
715 E3601 03               RTNCC
```

```
716                     EJECT
717                 ************************************************************
718                 *
719                 * NMOVE (addr1 addr2 u --- ) NOTE: THIS RTNE REPLACES
720                 *       CMOVE IN THE FORTH79 STANDARD, IT MOVES
721                 *       NIBBLES RATHER THAN BYTES.
722                 *
723                 * If u=0 do nothing, otherwise treat u as an unsigned
724                 * number.
725                 * move n nibbles from addr1 to addr2, start at addr1 and
726                 * move toward higher memory.
727                 *
728                 * Copying is done in blocks of 16 nibbles until there are
729                 * less than 16 left to do, then one at a time.
730                 *
731                 * It uses 1 additional sublevel, R1,R2, C, A, D0, D1, P
732                 *
733                 ************************************************************
734 E3603 FD53          CON(5)  =!OVER2
        E
735 E3608 58    =!NMOVE CON(2)  #85             NMOVE
736 E360A E4D4          NIBASC  \NMOV\
        F465
737 E3612 5C            CON(2)  \E\+#80
738 E3614 9163  =NMOVE  CON(5)  =$NMOVE
        E
739
740 E3619 AF0   =$NMOVE A=0     W               CLEAR FOR SHIFT IN MOVSET
741 E361C 143           A=DAT1  A               GET #OF NIBS
742 E361F 7340  NMOVE0  GOSUB   MOVSET          A[A]=#WORDS;A[S]=#NIBS+
743                 *                           D1=FROM D0=TO
744                 * If zero nibs to move, MOVSET pops a return, cleans up
745                 * data stack and whole word is done.
746                 *
747 E3623 8A8   =NMOVE1 ?A=0     A               NO MORE WORDS?
748 E3626 61            GOYES   NMOVE2
749 E3628 1577          C=DAT1  W               GET A WORD
750 E362C 1547          DAT0=C  W               WRITE ONE
751 E3630 17F           D1=D1+  16              INCREMENT FROM (ADDR1)
752 E3633 16F           D0=D0+  16                  INCREMENT ADDR2
753 E3636 CC            A=A-1   A                   DECREMENT COUNT
754 E3638 6AEF          GOTO    NMOVE1
755 E363C 810   NMOVE2  ASLC                    GET NIBS INTO A[A]
756 E363F 8A8   NMOVE3  ?A=0    A
757 E3642 61            GOYES   CM3
758 E3644 15F0          C=DAT1  1
759 E3648 15C0          DAT0=C  1
760 E364C 170           D1=D1+  1
761 E364F 160           D0=D0+  1
762 E3652 CC            A=A-1   A
763 E3654 6AEF          GOTO    NMOVE3
764 E3658 119   =CM3    C=R1
765 E365B 134           D0=C                        RECOVER I
766 E365E 11A           C=R2
767 E3661 135           D1=C                        RECOVER DATA STACK
```

```
768 E3664 03          RTNCC
769
770           *
771           * Set up counter for number of words (16-nibble blocks) plus
772           * odd number of nibbles; set D0 & D1 to the target and destinatio
773           *
774 E3666 8AC  =MOVSET ?A#0    A              ANY TO DO?
775 E3669 90          GOYES   MVCN1          YES
776 E366B 17E         D1=D1+  15             NO, THROW AWAY 2 ADDRS
777 E366E 07          C=RSTK                 DO A 2 LEVEL RETURN
778 E3670 03          RTNCC
779 E3672 814  MVCN1  ASRC                   DIVIDE BY 16,REMAINDER IN A[S]
780 E3675 174         D1=D1+  5
781 E3678 147         C=DAT1  A              POP ADDR 2
782 E367B 136         CD0EX                  D0=ADDR2
783 E367E 109         R1=C                   SAVE I IN R1
784 E3681 174         D1=D1+  5
785 E3684 147         C=DAT1  A              POP ADDR1
786 E3687 174         D1=D1+  5              NOTHING RETURNED
787 E368A 137         CD1EX                  D1=ADDR1
788 E368D 10A         R2=C                   SAVE DATA STK IN R2
789 E3690 03          RTNCC
```

```
790                     EJECT
791                 ************************************************************
792                 *
793                 * 2DROP  (d --- ) drop double number from top of data stack
794                 *
795                 ************************************************************
796
797 E3692 8063             CON(5)  =!NMOVE
            E
798 E3697 58    =!2DROP     CON(2)  #85             2DROP
799 E3699 2344              NIBASC  \2DRO\
            25F4
800 E36A1 0D                CON(2)  \P\+#80
801 E36A3 8A63  =2DROP      CON(5)  =$2DROP
            E
802
803 E36A8 179   =$2DROP     D1=D1+ 10
804 E36AB 03                RTNCC
```

```
805                     EJECT
806                 ************************************************************
807                 *
808                 * DIGIT  (c n1 --- n2 flag )  ok
809                 *        (c n1 --- flag    )  bad
810                 *
811                 * converts the ASCII char c (using base n1) to its binary
812                 * equivalent n2, accompanied by a true flag. If conversion
813                 * is invalid, leaves only a false flag.
814                 *
815                 ************************************************************
816 E36AD 7963          CON(5)  =!2DROP
      E
817 E36B2 58    =!DIGIT CON(2)  #85             DIGIT
818 E36B4 4494        NIBASC  \DIGI\
      7494
819 E36BC 4D          CON(2)  \T\+#80
820 E36BE 3C63 =DIGIT  CON(5)  =$DIGIT
      E
821
822 E36C3 174  =$DIGIT D1=D1+  5
823 E36C6 AF0         A=0     W
824 E36C9 14B         A=DAT1  B               READ CHAR
825 E36CC 20          P=      0
826 E36CE 31A3        LC(2)   #3A             ':'
827 E36D2 B6E         C=A-C   B               CHAR <= 9?
828 E36D5 413         GOC     DIG30           YES!
829 E36D8 3114        LC(2)   #41             'A'
830 E36DC B6E         C=A-C   B               CHAR < A?
831 E36DF 413         GOC     DIG40           YES, THEN ERROR
832 E36E2 3173        LC(2)   #37
833 E36E6 B6A         A=A-C   B               MAKE 'A'=10
834 E36E9 1C4  DIG20  D1=D1-  5
835 E36EC 14F         C=DAT1  B               READ BASE
836 E36EF 174         D1=D1+  5
837 E36F2 B6E         C=A-C   B               CHAR > BASE?
838 E36F5 5B1         GONC    DIG40           YES, ERROR
839 E36F8 141         DAT1=A  A               WRITE CHAR
840 E36FB 1C4         D1=D1-  5
841 E36FE D2          C=0     A
842 E3700 CE          C=C-1   A               TRUE=ALL 1'S
843 E3702 145  DIG25  DAT1=C  A               PUSH FLAG
844 E3705 03          RTNCC
845 E3707 3103 DIG30  LC(2)   #30
846 E370B B6A         A=A-C   B               CHAR < 0?
847 E370E 5AD         GONC    DIG20           NO, CHAR OKAY
848 E3711 D2   DIG40  C=0     A               FALSE FLAG
849 E3713 6EEF        GOTO    DIG25
```

```
850                     EJECT
851                 ********************************************************
852                 *
853                 * 2SWAP  (d1 d2 --- d2 d1)  swap order of 2 dbl #s
854                 *
855                 ********************************************************
856
857 E3717 2B63             CON(5)  =!DIGIT
           E
858 E371C 58       =!SWAP2 CON(2)  #85             SWAP2
859 E371E 2335             NIBASC  \2SWA\
           7514
860 E3726 0D               CON(2)  \P\+#80
861 E3728 D273     =SWAP2  CON(5)  =$SWAP2
           E
862
863 E372D 15B9     =$SWAP2 A=DAT1  10              POP D2
864 E3731 179              D1=D1+  10
865 E3734 15F9             C=DAT1  10              POP D1
866 E3738 1599             DAT1=A  10              PUSH D2
867 E373C 1C9              D1=D1-  10
868 E373F 15D9             DAT1=C  10              PUSH D1
869 E3743 03               RTNCC
```

```
870                     EJECT
871                 ********************************************************************
872                 *
873                 * COUNT  (addr --- addr+1 n) leave on data stack the address, add
874                 *        and the char count of text beginning at addr.  1st byte
875                 *        must contain the char count, n.
876                 ********************************************************************
877
878 E3745 C173             CON(5)  =!SWAP2
            E
879 E374A 58     =!COUNT   CON(2)  #85               COUNT
880 E374C 34F4             NIBASC  \COUN\
            55E4
881 E3754 4D               CON(2)  \T\+#80
882 E3756 B573   =COUNT    CON(5)  =$COUNT
            E
883
884 E375B 143    =$COUNT   A=DAT1  A                 POP ADDR
885 E375E 132              ADOEX                     DO=ADDR, A=I
886 E3761 D2               C=0     A
887 E3763 14E              C=DAT0  B                 GET CHAR CNT AT ADDR
888 E3766 161              DO=DO+  2                 ADDR+1
889 E3769 132              ADOEX                     DO=I, A=ADDR+1
890 E376C 141              DAT1=A  A                 PUSH ADDR+1
891 E376F 1C4              D1=D1-  5
892 E3772 145              DAT1=C  A                 PUSH COUNT
893 E3775 03               RTNCC
```

```
894                     EJECT
895                 ******************************************************
896                 *
897                 * WIDTH  ( --- addr)  addr of variable with max
898                 *       name length.
899                 *
900                 ******************************************************
901
902 E3777 A473         CON(5)  =!COUNT
           E
903 E377C 58    =!WIDTH CON(2)  #85             WIDTH
904 E377E 7594         NIBASC  \WIDT\
           4445
905 E3786 8C           CON(2)  \H\+#80
906 E3788 D873  =WIDTH  CON(5)  =$WIDTH
           E
907
908 E378D 8E00  =$WIDTH GOSUBL  =DOUSE           MAX NAME LENGTH
           00
909 E3793 34BF         CON(5)   (=oWIDTH)
           2
910
911                 ******************************************
912                 *
913                 * FENCE  ( --- addr) addr of variable with
914                 *       addr of protected dictionary entries
915                 *
916                 ******************************************
917 E3798 C773         CON(5)  =!WIDTH
           E
918 E379D 58    =!FENCE CON(2)  #85             FENCE
919 E379F 6454         NIBASC  \FENC\
           E434
920 E37A7 5C           CON(2)  \E\+#80
921 E37A9 EA73  =FENCE  CON(5)  =$FENCE
           E
922
923 E37AE 8E00  =$FENCE GOSUBL  =DOUSE
           00
924 E37B4 E8BF         CON(5)   (=oFENCE)
           2
```

```
                        EJECT
                ***********************************************
                *
                * VOC-L  ( --- addr)  addr of variable with
                *       addr of the parent-vocabulary-field of
                *       the most recently created vocabulary.
                *
                ***********************************************

E37B9 EB73E =VOC-L  CON(5)  =$VOC-L
E37BE 8E0000 =$VOC-L GOSUBL  =DOUSE
E37C4 43BF2         CON(5)   (=oVOC-L)

                ****************************************
                *
                * OKFLG  ( --- ) addr of variable with
                *       flag:  0=show OK, 1=suppress OK
                *
                ****************************************

E37C9 D973E         CON(5)  =!FENCE
E37CE 58    =!OKFLG CON(2)  #85             OKFLG
E37D0 F4B464C4      NIBASC  \OKFL\
E37D8 7C            CON(2)  \G\+#80
E37DA FD73E =OKFLG  CON(5)  =$OKFLG

E37DF 8E0000 =$OKFLG GOSUBL  =DOUSE
E37E5 D4BF2         CON(5)   (=oOKFLG)
```

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THE READER AGREES NOT TO
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```
953                     EJECT
954
955                 ********************************************
956                 *
957                 * ONERR
958                 *
959                 * FLAG TO SAY IF ON ERROR IS SET -- IF
960                 * SO IT HAS THE EXECUTION ADDRESS OF THE
961                 * ROUTINE TO GO TO.
962                 *
963                 * ONERR is zeroed every time you enter FORTH,
964                 * and everytime you do an INIT1
965                 *
966                 ********************************************
967 E37EA EC73          CON(5)  =!OKFLG
          E
968 E37EF 58    =!ONERR CON(2)  #85
969 E37F1 F4E4          NIBASC  \ONER\
          5425
970 E37F9 2D            CON(2)  \R\+#80
971 E37FB 0083 =ONERR   CON(5)  =$ONERR
          E
972 E3800 8E00 =$ONERR GOSUBL  =DOUSE
          00
973 E3806 6BBF          CON(5)  (=oONERR)
          2
974
975                 ********************************************
976                 *
977                 * STATE  ( --- addr) addr of variable with
978                 *       flag showing current state: execute (0)
979                 *       or compile (C0)
980                 *
981                 ********************************************
982
983 E380B FE73          CON(5)  =!ONERR
          E
984 E3810 58    =!STATE CON(2)  #85             STATE
985 E3812 3545          NIBASC  \STAT\
          1445
986 E381A 5C            CON(2)  \E\+#80
987 E381C 1283 =STATE   CON(5)  =$STATE
          E
988
989 E3821 8E00 =$STATE GOSUBL  =DOUSE
          00
990 E3827 07BF          CON(5)   (=oSTATE)
          2
991
992
993                 ********************************************
994                 *
995                 * FIRST  ( --- addr)  addr of variable with
996                 *       addr of 1st disc buffer
997                 *
```

```
 998            ********************************************
 999
1000 E382C 0183          CON(5)  =!STATE
           E
1001 E3831 58    =!FIRST CON(2) #85            FIRST
1002 E3833 6494          NIBASC \FIRS\
           2535
1003 E383B 4D            CON(2) \T\+#80
1004 E383D 2483 =FIRST   CON(5)  =$FIRST
           E
1005
1006 E3842 8E00 =$FIRST GOSUBL =DOUSE
           00
1007 E3848 A2BF          CON(5) (=oFIRST)
           2
1008
1009
1010            ************************************************
1011            *
1012            * LIMIT  ( --- addr)  addr of variable with
1013            *       addr of 1st byte beyond disc buffer
1014            *       area
1015            *
1016            ************************************************
1017
1018 E384D 1383          CON(5)  =!FIRST
           E
1019 E3852 58    =!LIMIT CON(2) #85            LIMIT
1020 E3854 C494          NIBASC \LIMI\
           D494
1021 E385C 4D            CON(2) \T\+#80
1022 E385E 3683 =LIMIT   CON(5)  =$LIMIT
           E
1023
1024 E3863 8E00 =$LIMIT GOSUBL =DOUSE
           00
1025 E3869 F2BF          CON(5) (=oLIMIT)
           2
1026
1027            ******************************************
1028            *
1029            * LINE#  ( --- addr)  addr of variable with
1030            *       line# associated with current buffer
1031            *       (usually PREV buffer)
1032            *
1033            ******************************************
1034
1035 E386E 2583          CON(5)  =!LIMIT
           E
1036 E3873 58    =!LINE# CON(2) #85            LINE#
1037 E3875 C494          NIBASC \LINE\
           E454
1038 E387D 3A            CON(2) \#\+#80
1039 E387F 4883 =LINE#   CON(5)  =$LINE#
           E
```

```
1040
1041 E3884 8E00 =$LINE# GOSUBL  =DOUSE
           00
1042 E388A D9BF         CON(5) (=oLINE#)
           2
```

```
1043                    EJECT
1044                ***********************************************
1045                *
1046                * LEAVE  ( --- ) force termination of a LOOP or +LOOP
1047                *         by setting loop limit = to current index value
1048                *
1049                * IMMEDIATE, COMPILE
1050                *
1051                ***************************************************
1052
1053 E388F 3783             CON(5)  =!LINE#
          E
1054 E3894 5C     =!LEAVE   CON(2)  #C5              LEAVE
1055 E3896 C454           NIBASC  \LEAV\
          1465
1056 E389E 5C             CON(2)  \E\+#80
1057 E38A0 0000   =LEV     CON(5)  =DOCOL          :
          0
1058 E38A5 0000           CON(5)  =COMPL          compile next word into dictionary
          0
1059 E38AA 0000           CON(5)  =R>             RECOVER LOOP INDEX
          0
1060 E38AF 0000           CON(5)  =COMPL          compile next word into dictionary
          0
1061 E38B4 0000           CON(5)  =R>             RECOVER LOOP LIMIT
          0
1062 E38B9 0000           CON(5)  =COMPL          compile next word into dictionary
          0
1063 E38BE 3A63           CON(5)  =2DROP          THROW AWAY LOOP LIMIT AND INDEX
          E
1064 E38C3 0000           CON(5)  =COMPL          compile next word into dictionary
          0
1065 E38C8 0000           CON(5)  =BRNCH
          0
1066 E38CD 0193           CON(5)  =DOLEV          HANDLE SETTING STACK WITH LEAVES
          E
1067 E38D2 22E3           CON(5)  =ABORTW         GIVE "no DO before LEAVE"
          E
1068 E38D7 B3             CON(2) =eNODO           MESSAGE
1069 E38D9 0000           CON(5) =HERE            LEAVE ITEMS AT, HERE GIVES ADDR TO
          0
1070 E38DE 0000           CON(5) =OVER
          0
1071 E38E3 0000           CON(5) =STORE           ADDR PART OF LEAVE STORED
          0
1072 E38E8 0000           CON(5) =FIVE-           DROP ADJ STK POINTER TO STORE LEAVE
          0
1073 E38ED 0000           CON(5) =LIT
          0
1074 E38F2 6000           CON(5) 6
          0
1075 E38F7 0000           CON(5) =SWAP
          0
1076 E38FC 0000           CON(5) =STORE           STORE 6
          0
```

```
1077 E3901 00000          CON(5) =ZERO          PUT 0 IN DICTIONARY TO SAVE PLACE
           0
1078 E3906 00000          CON(5) =COMMA         FOR BRNCH TO BE FILLED IN  AT LOOP,
           0
1079 E390B 00000          CON(5) =SEMI          DONE!
           0
1080
1081 E3910 5193 DOLEV     CON(5) $DOLEV
           E
1082
1083 E3915 8E00 $DOLEV    GOSUBL =SAVEFP        SAVE FORTH ENVIRONMENT
           00
1084 E391B 1B48           D0=(5) =oCSP          RECOVER VALUE OF STK PTR WHEN
           BF2
1085 E3922 146            C=DAT0 A              COMPILATION STARTED
1086 E3925 D7             D=C    A              SAVE IN D FOR LATER TESTS
1087 E3927 3430           LC(5)  3              LOOKING FOR 3 LEFT BY 'DO' CONSTRUC
           000
1088 E392E DA             A=C    A              PUT 3 IN A
1089 E3930 137            CD1EX
1090 E3933 134            D0=C                  SET D0 TO CURRENT TOS-10 (ADDING 2
1091 E3936 189            D0=D0- 10             WE WILL MOVE PAIRS AS WE GO
1092 E3939 135            D1=C                  RESTORE TOS TO D1
1093
1094 E393C 179  DOLEV0    D1=D1+ 10             CHECK TO SEE THAT THERE ARE AT LEAS
1095 E393F 137            CD1EX                 2 ITEMS ON STACK BEFORE SHIFTING ST
1096 E3942 8B7            ?C>D   A              TOS LESS 2 ITEMS BEYOND MARKER?
1097 E3945 34             GOYES  BAD            YES, DO BAD EXIT
1098 E3947 135            D1=C
1099 E394A 1C9            D1=D1- 10             RESTORE TOS
1100
1101 E394D 147            C=DAT1 A              READ FLAG FROM PAIR
1102 E3950 8A6            ?A#C   A              IS THIS A 'DO' FLAG?
1103 E3953 40             GOYES  DOLEV1         NO,
1104 E3955 D3             D=0    A              YES, MAKE D FLAG THIS
1105 E3957 144  DOLEV1    DAT0=C A              WRITE CONDITIONAL FLAG UP 2
1106 E395A 174            D1=D1+ 5              POINT TO CONDITIONAL ADDR
1107 E395D 164            D0=D0+ 5
1108 E3960 147            C=DAT1 A              READ ADDR
1109 E3963 144            DAT0=C A              WRITE CONDITIONAL ADDR UP 2
1110 E3966 174            D1=D1+ 5
1111 E3969 164            D0=D0+ 5              SET PTRS FOR NEXT PAIR
1112 E396C 8AF            ?D#0   A              ARE WE STILL LOOKING FOR A 'DO' FLA
1113 E396F DC             GOYES  DOLEV0         YES TRY AGAIN
1114
1115 E3971 1C4            D1=D1- 5              POINT TO ADDR PART OF PAIR JUST MOV
1116 E3974 133            AD1EX                 PASS THIS BACK TO REST OF LEAVE
1117 E3977 8E00           GOSUBL =GETFP         A(A) IS NOT DISTURBED BY THIS
           00
1118 E397D 1CE            D1=D1- 15             MUST ALLOW FOR 2 ITEMS ADDED AND
1119 E3980 141            DAT1=A A              PUSH ADDR TO PUT LEAVE PAIR
1120 E3983 D0             A=0    A              FALSE FLAG FOR ABORT
1121 E3985 5C0            GONC   BAD0           B.E.T.
1122
1123 E3988 8E00 BAD       GOSUBL =GETFP         RESTORE FORTH ENVIRONMENT
```

```
            00
1124 E398E D0           A=0    A        TRUE FLAG FOR  ABORT
1125 E3990 CC           A=A-1  A
1126 E3992 1C4  BAD0    D1=D1- 5
1127 E3995 141          DAT1=A A         PUSH FLAG
1128 E3998 03           RTNCC
```

```
1129                    EJECT
1130                ******************************************************
1131                *
1132                * DOES> ( - ) This is an immediate word used in the
1133                * construction of new defining words.
1134                * Since it is immediate, its run-time is the compile-time
1135                * of the new defining word.
1136                * The action of DOES> is to enclose
1137                *       CON(5)  =<;CODE>
1138                *       GOSBVL =DODOES
1139                * in the definition of the defining word.
1140                *
1141                ******************************************************
1142
1143 E399A 4983             CON(5)  =!LEAVE
           E
1144 E399F 5C    =!DOES>     CON(2)  #C5             DOES>
1145 E39A1 44F4             NIBASC  \DOES\
           5435
1146 E39A9 EB               CON(2)  \>\+#80
1147
1148 E39AB 0000  =DOES>     CON(5) =DOCOL
           0
1149 E39B0 0000             CON(5)  =QCSP           ?CSP   give error if stack is not
           0
1150                *                                   same as when compile started
1151 E39B5 0000             CON(5)  =COMPL          COMPILE
           0
1152 E39BA 0000             CON(5)  =<;COD          <;CODE>
           0
1153 E39BF 0000             CON(5)  =LIT            insert
           0
1154 E39C4 8F00             CON(5) #F8              op code for GOSBVL
           0
1155 E39C9 0000             CON(5)  =C,             C,
           0
1156 E39CE 0000             CON(5)  =LIT
           0
1157 E39D3 0000             CON(5) =DODOES          dodoes
           0
1158 E39D8 0000             CON(5)  =COMMA          ,
           0
1159 E39DD 0000             CON(5)  =SEMI           ;
           0
```

```
1160                    EJECT
1161                ***************************************************
1162                *
1163                * BEGIN   compile time: ( - addr 1 )    immediate
1164                * no run-time action
1165                *
1166                ***************************************************
1167
1168 E39E2 F993           CON(5) =!DOES>
           E
1169 E39E7 5C     =!BEGIN CON(2) #C5              BEGIN
1170 E39E9 2454           NIBASC \BEGI\
           7494
1171 E39F1 EC             CON(2) \N\+#80
1172
1173 E39F3 0000   =BEGIN  CON(5) =DOCOL
           0
1174 E39F8 0EB3           CON(5)  =?COMP          error if we're no compiling
           E
1175 E39FD 0000           CON(5)  =HERE           addr to branch to later
           0
1176 E3A02 0000           CON(5)  =ONE            1 BEGIN's flag
           0
1177 E3A07 0000           CON(5)  =SEMI           ;
           0
1178
1179                ***************************************************
1180                *
1181                * AGAIN   compile time: ( addr 1 - )   immediate
1182                * compiles BRANCH ( - )
1183                *
1184                *  MADE HEADERLESS 10/10/83
1185                ***************************************************
1186
1187 E3A0C 0000 =AGAIN  CON(5) =DOCOL
           0
1188 E3A11 0000           CON(5)  =ONE            1   look for BEGIN's 1
           0
1189 E3A16 0000           CON(5)  =?PAIR          error if not there
           0
1190 E3A1B 0000           CON(5)  =COMPL          COMPILE  unconditional
           0
1191 E3A20 0000           CON(5)  =BRNCH          BRANCH
           0
1192 E3A25 0000           CON(5)  =HERE           get offset; old HERE - new HERE
           0
1193 E3A2A 0000           CON(5)  =MINUS          -
           0
1194 E3A2F 0000           CON(5)  =COMMA          ,
           0
1195 E3A34 0000           CON(5)  =SEMI           ;
           0
```

```
1196                    EJECT
1197                ************************************************
1198                *
1199                * UNTIL   compile time: ( addr 1 - )   immediate
1200                * compiles 0BRANCH ( f - )
1201                * with jump back to addr of BEGIN which it left
1202                * on the stack
1203                *
1204                ************************************************
1205
1206 E3A39 7E93         CON(5)  =!BEGIN
           E
1207 E3A3E 5C    =!UNTIL CON(2) #C5            UNTIL
1208 E3A40 55E4         NIBASC \UNTI\
           4594
1209 E3A48 CC           CON(2) \L\+#80
1210
1211 E3A4A 0000 =UNTIL  CON(5) =DOCOL
           0
1212 E3A4F 0EB3         CON(5)  =?COMP        ensure compile mode
           E
1213 E3A54 0000         CON(5)  =ONE          1
           0
1214 E3A59 0000         CON(5)  =?PAIR        error if BEGIN flag absent
           0
1215 E3A5E 0000         CON(5)  =COMPL        COMPILE conditional
           0
1216 E3A63 0000         CON(5)  =ZBRNH        0BRANCH
           0
1217 E3A68 0000         CON(5)  =HERE         old HERE - new HERE
           0
1218 E3A6D 0000         CON(5)  =MINUS        get offset back to BEGIN
           0
1219 E3A72 0000         CON(5)  =COMMA        store into dictionary as
           0
1220 E3A77 0000         CON(5)  =SEMI          offset for the ZBRNH
           0
1221
1222                ************************************************
1223                *
1224                * WHILE   compile time: ( - addr 4 )    immediate
1225                * compiles 0BRANCH ( f - )
1226                * with offset to be filled in later by REPEAT
1227                *
1228                ************************************************
1229
1230 E3A7C E3A3         CON(5)  =!UNTIL
           E
1231 E3A81 5C    =!WHILE CON(2) #C5            WHILE
1232 E3A83 7584         NIBASC \WHIL\
           94C4
1233 E3A8B 5C           CON(2) \E\+#80
1234
1235 E3A8D 0000 =WHILE  CON(5) =DOCOL
           0
```

```
1236 E3A92 0000          CON(5)  =IF          same action as IF, compiling
           0
1237             *                            ZBRNH and allotting space for
1238             *                            offset to be filled in later
1239 E3A97 0000          CON(5)  =TWO+       except we leave 4 instead of 2
           0
1240 E3A9C 0000          CON(5)  =SEMI       as syntax-check code for REPEAT
           0
```

```
1241                    EJECT
1242                ************************************************************
1243                *
1244                * +LOOP  (n --- )  Add the signed increment to the loop
1245                *                  index and compare the new total to the loop
1246                *                  limit.
1247                *
1248                ************************************************************
1249
1250 E3AA1 18A3          CON(5)   =!WHILE
           E
1251 E3AA6 5C    =!PLOOP CON(2)   #C5            +LOOP
1252 E3AA8 B2C4          NIBASC   \+LOO\
           F4F4
1253 E3AB0 0D            CON(2)   \P\+#80
1254
1255 E3AB2 0000  =PLOOP   CON(5)   =DOCOL        :
           0
1256 E3AB7 0EB3          CON(5)   =?COMP         ensure compile mode
           E
1257 E3ABC 0000          CON(5)    =THREE        3
           0
1258 E3AC1 0000          CON(5)    =?PAIR        error if DO flag is absent
           0
1259 E3AC6 0000          CON(5)    =COMPL        COMPILE
           0
1260 E3ACB 18F3          CON(5)    =<+LP>        <+LOOP>
           E
1261 E3AD0 0000          CON(5)    =HERE         old HERE - new HERE
           0
1262 E3AD5 0000          CON(5)    =MINUS        -
           0
1263 E3ADA 0000          CON(5)    =COMMA        ,
           0
1264 E3ADF 0000          CON(5)    =HERE         INPUT FOR SETLEV
           0
1265 E3AE4 0000          CON(5)    =SETLEV       SET UP LEAVE BRANCHES IF ANY
           0
1266 E3AE9 0000          CON(5)    =SEMI         ;
           0
```

```
1267                    EJECT
1268                ****************************************************************
1269                *
1270                * CMOVE  (addr1 addr2 n --- )  Move u BYTES starting at addr1
1271                *        to addr2. if u=0 do nothing.
1272                *
1273                ****************************************************************
1274
1275 E3AEE 6AA3             CON(5)  =!PLOOP
           E
1276 E3AF3 58     =!CMOVE   CON(2)  #85             CMOVE
1277 E3AF5 34D4             NIBASC  \CMOV\
           F465
1278 E3AFD 5C               CON(2)  \E\+#80
1279
1280 E3AFF 40B3 =CMOVE      CON(5)  $CMOVE
           E
1281 E3B04 AF0  $CMOVE      A=0     W               CLEAR FOR SHIFT IN MOVSET
1282 E3B07 143              A=DAT1  A               GET #OF BYTES TO MOVE
1283 E3B0A C4               A=A+A   A               MAKE NIBS
1284 E3B0C 621B             GOTO    NMOVE0
```

```
1285                    EJECT
1286                ******************************************************
1287                *
1288                * QUERY  ( --- )  Accepts input from the terminal.
1289                *        EXPECT calls mainframe rtne CHEDIT to get
1290                *        user input so, the input is not limited to
1291                *        a certain char count here.  The input is
1292                *        moved to the terminal input buffer.
1293                *
1294                *        Also, as per FORTH 83 Standard, the user
1295                *        variable #TIB is set to reflect the number
1296                *        of characters put into the Terminal Input
1297                *        Buffer.  #TIB is set from SPAN which is
1298                *        set by EXPECT96
1299                *
1300                ******************************************************
1301
1302 E3B10 3FA3             CON(5)  =!CMOVE
            E
1303 E3B15 58     =!QUERY  CON(2)  #85              QUERY
1304 E3B17 1555           NIBASC  \QUER\
            5425
1305 E3B1F 9D             CON(2)  \Y\+#80
1306
1307 E3B21 0000   =QUERY   CON(5)  =DOCOL           :
            0
1308 E3B26 0000           CON(5)   =TIB                      addr of TIB
            0
1309 E3B2B 0000           CON(5)   =EXPCT          EXPECT    for EXPECT to put input
            0
1310 E3B30 0000           CON(5)   =ZERO           0         set pointer into
            0
1311 E3B35 0000           CON(5)   =IN             IN        input at 0 chars
            0
1312 E3B3A 0000           CON(5)   =STORE          !
            0
1313 E3B3F 0000           CON(5)   =SPAN           SPAN      get # chars read
            0
1314 E3B44 0000           CON(5)   =AT             @         by EXPECT96 and
            0
1315 E3B49 0000           CON(5)   =#TIB           #TIB      put in #TIB
            0
1316 E3B4E 0000           CON(5)   =STORE          !
            0
1317 E3B53 0000           CON(5)   =SEMI           ;
            0
```

```
1318                    EJECT
1319                ******************************************************
1320                *
1321                * ALLOT  (n --- )  Add n bytes to the parameter field
1322                *        of the most recently defined word.
1323                *
1324                *        Although its not standard FORTH we have
1325                * changed ALLOT to try and protect users from ruining
1326                * their dictionary and data stack.  Before alloting
1327                * any additional space in the dictionary we make sure
1328                * that the current DP setting allows for the entire
1329                * data stack (40 entries or 200 nibs) and the PAD area
1330                * (90 nibs) plus the # nibs to be alloted.
1331                *
1332                ******************************************************
1333
1334 E3B58 51B3             CON(5)  =!QUERY
          E
1335 E3B5D 58     =!ALOTB   CON(2)  #85             ALLOT
1336 E3B5F 14C4             NIBASC  \ALLO\
          C4F4
1337 E3B67 4D               CON(2)  \T\+#80
1338
1339 E3B69 0000 =ALOTB     CON(5)  =DOCOL          :
          0
1340 E3B6E 0000             CON(5)  =TWO*           TURN BYTES TO NIBS
          0
1341 E3B73 0000             CON(5)  =ALLOT          DO ALLOT
          0
1342 E3B78 0000             CON(5)  =SEMI           ;
          0
1343
1344                *
1345                * DEFAULT ALLOT ROUTINE
1346                *
1347
1348 E3B7D 0000 =IALLOT    CON(5)  =DOCOL          :
          0
1349 E3B82 0000             CON(5)  =DUP
          0
1350 E3B87 0000             CON(5)  =>R
          0
1351 E3B8C 0000             CON(5)   =DP             DP
          0
1352 E3B91 0000             CON(5)  =DUP            DUP copy of DP
          0
1353 E3B96 0000             CON(5)  =AT             @   current value of DP
          0
1354 E3B9B 0000             CON(5)  =R>
          0
1355 E3BA0 0000             CON(5)  =ADD            DP+#NIBS to ALLOT
          0
1356 E3BA5 0000             CON(5)  =S0             S0  start of DATA STK
          0
1357 E3BAA 0000             CON(5)  =LIT                now subtract off
```

```
            0
1358 E3BAF AC10         CON(5)  458             448 nibs.
            0
1359            *                               200 nibs for data stack,
1360            *                               168 (84 bytes) for PAD
1361            *                               90 nibs for DP-PAD buffer
1362            *
1363 E3BB4 0000         CON(5)  =MINUS          -
            0
1364 E3BB9 0000         CON(5)  =GT             > see if DP > S0-458
            0
1365 E3BBE 78C3         CON(5)  =ABRT"X         if so give error message
            E
1366 E3BC3 80           CON(2)  =eDFUL          ABORT"dictionary full"
1367 E3BC5 0000         CON(5)   =PSTOR          +!
            0
1368 E3BCA 0000         CON(5)   =SEMI           ;
            0
```

```
1369                    EJECT
1370                ************************************************
1371                *
1372                * ?COMP  ( --- ) Issue an error message if not
1373                *        compiling.
1374                *
1375                ************************************************
1376
1377 E3BCF D5B3         CON(5)  =!ALOTB
          E
1378 E3BD4 58    =!?COMP CON(2)  #85             ?COMP
1379 E3BD6 F334         NIBASC  \?COM\
          F4D4
1380 E3BDE 0D           CON(2)  \P\+#80
1381
1382 E3BE0 0000   =?COMP CON(5)  =DOCOL          :
          0
1383 E3BE5 C183         CON(5)   =STATE          STATE
          E
1384 E3BEA 0000         CON(5)   =AT             @
          0
1385 E3BEF 0000         CON(5)   =ZEQ            0=
          0
1386 E3BF4 22E3         CON(5)   =ABORTW         ABORT"_
          E
1387 E3BF9 90           CON(2)  =eCOMP
1388               *    NIBASC  \ compil\
1389               *    NIBASC  \e only\
1390 E3BFB 0000         CON(5)   =SEMI           ;
          0
```

```
1391                    EJECT
1392                ****************************************************************
1393                *
1394                * -FIND  ( --- cfa  b tf) if found
1395                *        ( --- ff       ) if not found
1396                *
1397                * Accepts the next word, delimited by blanks, in the
1398                * input stream to HERE and searches the CONTEXT and then
1399                * the FORTH vocabularies for a matching entry.  NOTE:
1400                * in this rendition of -FIND we return the CFA and NOT the
1401                * PFA
1402                *
1403                * MADE HEADERLESS 10/10/83
1404                ****************************************************************
1405
1406
1407 E3C00 0000 =-FIND  CON(5)  =DOCOL          :
               0
1408 E3C05 0000         CON(5)   =BL            BL
               0
1409 E3C0A 0000         CON(5)   =WORD          WORD
               0
1410 E3C0F 0000         CON(5)   =CONTX         CONTEXT
               0
1411 E3C14 0000         CON(5)   =AT            @
               0
1412 E3C19 0000         CON(5)   =AT            @
               0
1413 E3C1E EA43         CON(5)   =FIND>         <FIND>
               E
1414 E3C23 0000         CON(5)   =SEMI          ;
               0
```

```
1415                    EJECT
1416
1417              ****************************************
1418              *
1419              * Utility routines for FORTH ABORT rtnes
1420              *
1421              ****************************************
1422
1423 E3C28 0000 =CLEANX CON(5)   =DOCOL
          0
1424 E3C2D 0000         CON(5)   =SP!           reset data stack
          0
1425 E3C32 E9CF         CON(5)  (=FRTHHD)+12    reset FORTH as context
          2
1426 E3C37 0000         CON(5)   =DEFIN         and current vocabulary
          0
1427 E3C3C 0000         CON(5)   =CLALL         close all open files
          0
1428 E3C41 E9E3         CON(5)   =CLEAN         clean up last entry if smudged
          E
1429 E3C46 7B23         CON(5)   =FLUSH         flush disc buffers
          E
1430 E3C4B 0000         CON(5)   =SEMI
          0
1431
1432 E3C50 0000 =ERRTST CON(5)   =DOCOL       This rtne tests for FORTH ON ERRORs
          0
1433 E3C55 BF73         CON(5)   =ONERR       If contents of ONERR <> 0 then
          E
1434 E3C5A 0000         CON(5)   =AT          execute the contents of ONERR as
          0
1435 E3C5F 0000         CON(5)   =?DUP        the user's ON ERROR rtne.  Just
          0
1436 E3C64 0000         CON(5)   =ZBRNH       in case they don't get it right
          0
1437 E3C69 F000         CON(5)   (ET0)-*      and return to here, we'll QUIT.
          0
1438 E3C6E 0000         CON(5)   =EXEC
          0
1439 E3C73 0000         CON(5)   =QUIT
          0
1440 E3C78 0000 ET0     CON(5)   =SEMI
          0
1441
1442
1443 E3C7D 82C3 AB04    CON(5)   =CLEANX
          E
1444 E3C82 0000         CON(5)   =QUIT
          0
1445
1446              ********************************************
1447              *
1448              * ABRT"X  This rtne is a FORTH abort for
1449              *         issuing error messages without
1450              *         appending anything to them (i.e.,
```

```
1451            *         FTH ERR: no ending "  )
1452            *
1453            ********************************************
1454
1455 E3C87 0000 =ABRT"X CON(5)   =DOCOL
          0
1456 E3C8C 0000         CON(5)   =ZBRNH     IF
          0
1457 E3C91 C300         CON(5)   (ABXX)-*
          0
1458 E3C96 0000         CON(5)  =R@         POINT TO ERR#
          0
1459 E3C9B 0000         CON(5)  =CAT        GET IT
          0
1460 E3CA0 E0D3         CON(5)  =SETERN     SET SYSTEM LOCATION ERR# IN CASE
          E
1461            *                           WE JUMP OUT TO ON-ERROR NEXT
1462 E3CA5 05C3         CON(5)   =ERRTST        TEST FOR (& do) ON ERROR
          E
1463            *                           continue if noi ON-ERROR
1464 E3CAA 0000         CON(5)   =ZERO          LEAVE FLAG FOR EMSG
          0
1465            *                           saying no word to insert (ABORTW)
1466 E3CAF 0000 AB01    CON(5)   =R@
          0
1467 E3CB4 0000         CON(5)   =CAT            GET ERROR NUMBER (again...we did
          0
1468            *                           save it so ON-ERROR routine wouldn't
1469            *                           have yet another thing on stack
1470 E3CB9 A6D3         CON(5)   =EMSG      Actually generate the message (and po
          E
1471 E3CBE 1EC3         CON(5)   =BASIC?
          E
1472            * If from FORTHX, BASIC? will go BYE.
1473 E3CC3 0000         CON(5)   =BRNCH
          0
1474 E3CC8 5BFF         CON(5)   (AB04)-*
          F
1475            *                           ELSE just move I past compiled msg#
1476 E3CCD 0000 ABXX    CON(5)   =R>
          0
1477 E3CD2 0000         CON(5)   =TWO+           SKIP THE MSG#
          0
1478 E3CD7 0000         CON(5)   =>R
          0
1479 E3CDC 0000         CON(5)   =SEMI
          0
1480
1481            * IF FROM BASIC, GO BYE-BYE
1482 E3CE1 0000 =BASIC? CON(5)   =DOCOL
          0
1483 E3CE6 1B54         CON(5)   =BASIC
          E
1484 E3CEB 0000         CON(5)   =AT
          0
```

```
1485 E3CF0 0000          CON(5)   =ZBRNH          IF from BASIC
          0
1486 E3CF5 4100          CON(5)   (BASEND)-*
          0
1487 E3CFA 0000          CON(5)   =SP!            reset data stack
          0
1488 E3CFF A3D3          CON(5)   =BTFERR     set flag (oERR?) for BYE;clear (oBASI
          E
1489             *                            put return address (in oBASIC) on sta
1490             *                            BSCRTN
1491 E3D04 0000          CON(5)   =BSCRTN     jump to addr on stack
          0
1492 E3D09 0000 BASEND   CON(5)   =SEMI
          0
1493
1494
1495             * SET ERRN in mainframe
1496 E3D0E 31D3 =SETERN  CON(5)   =$STERN
          E
1497 E3D13 3400 =$STERN  LC(5)    =ERR#          SYSTEM LOCATION
          000
1498 E3D1A 136           CD0EX
1499 E3D1D 108           R0=C                     SAVE D0
1500 E3D20 14F           C=DAT1   B               GET OUR ERROR# ON STACK
1501 E3D23 174           D1=D1+   5               DROP IT
1502 E3D26 22            P=       2
1503 E3D28 31F2          LC(2)    =ID             C HAS ID + ERR#
1504 E3D2C 20            P=       0
1505 E3D2E 15C3          DAT0=C   4               STORE FOR SYSTEM
1506 E3D32 118           C=R0                     GET BACK D0
1507 E3D35 134           D0=C
1508 E3D38 03            RTNCC
1509
1510
1511 E3D3A F3D3 =BTFERR  CON(5)   =$BTFER
          E
1512 E3D3F 132  =$BTFER  AD0EX
1513 E3D42 1BBB          D0=(5)   =oERR?          BYE SETS NOCONT IF ERR? SET
          BF2
1514 E3D49 D2            C=0      A
1515 E3D4B E6            C=C+1    A
1516 E3D4D 144           DAT0=C   A                   SET oERR? FLAG
1517 E3D50 1B2A          D0=(5)   =oBASIC             GET RTN ADDR
          BF2
1518 E3D57 146           C=DAT0   A
1519 E3D5A 1C4           D1=D1-   5
1520 E3D5D 145           DAT1=C   A                   PUT RTN ON STACK FOR BSCRTN
1521 E3D60 D2            C=0      A
1522 E3D62 144           DAT0=C   A                   CLEAR BASIC FLAG
1523 E3D65 132           AD0EX                        RESTORE D0
1524 E3D68 03            RTNCC
1525             *
1526             * Error number is on the stack. Generate its error message.
1527             * Stack also has flag to indicate simple ABORT or ABORTW (with
1528             * word at HERE embedded in message).
```

```
1529 E3D6A F6D3 =EMSG   CON(5)   =$EMSG
          E
1530 E3D6F 8E00 =$EMSG  GOSUBL   =SAVEFP
          00
1531 E3D75 AF2          C=0      W
1532 E3D78 14F          C=DAT1   B              GET ERROR #
1533 E3D7B AE7          D=C      B              SAVE IT
1534 E3D7E 20           P=       0
1535 E3D80 174          D1=D1+   5              POINT TO WHERE-FLAG
1536 E3D83 143          A=DAT1   A              GET IT
1537 E3D86 8A8          ?A=0     A              SIMPLE ABORT?
1538 E3D89 03           GOYES    EMS01
1539 E3D8B 174          D1=D1+   5              GET "HERE"
1540 E3D8E 143          A=DAT1   A               TO GET WORD IN DICTIONARY
1541 E3D91 131          D1=A
1542 E3D94 E4           A=A+1    A
1543 E3D96 E4           A=A+1    A              POINT PAST COUNT
1544 E3D98 D6           C=A      A              SAVE TEMPORARILY
1545 E3D9A AF0          A=0      W
1546 E3D9D 14B          A=DAT1   B              GET MSG LEN
1547 E3DA0 A6C          A=A-1    B              CHAR-1 FOR MFWRN
1548 E3DA3 814          ASRC
1549 E3DA6 814          ASRC                    PUT IN A[15-14]
1550 E3DA9 DA           A=C      A              GET BACK MSG ADDR
1551 E3DAB 102          R2=A                    R2=INSERT ADDR FOR MFWRN
1552 E3DAE AF2          C=0      W
1553 E3DB1 AEB          C=D      B              GET BACK MSG #
1554 E3DB4 2D           P=       13
1555 E3DB6 B06          C=C+1    P              C[13]=1
1556 E3DB9 22   EMS01   P=       2
1557 E3DBB 31F2         LC(2)    =ID            LEX ID
1558 E3DBF 108          R0=C
1559            * SET ERR? TO TELL ERROR-POLL-HANDLER TO RETURN
1560 E3DC2 1BBB         D0=(5)   =oERR?
          BF2
1561 E3DC9 144          DAT0=C   A
1562 E3DCC 8F00         GOSBVL   =POLL
          000
1563 E3DD3 00           CON(2)   =pERROR
1564 E3DD5 80FF         CPEX     15
1565 E3DD9 2C           P=       12
1566 E3DDB 32F0         LCHEX    00F
          0
1567 E3DE0 480          GOC      EMS02          ERR IN POLL
1568 E3DE3 118          C=R0
1569 E3DE6 30F          LCHEX    F
1570 E3DE9 8E00 EMS02   GOSUBL   =GTS13        SET S13 IF PROGRAM IS RUNNING
          00
1571            *                               SO ON-ERROR CAN HAPPEN
1572            *                               ONLY A&D0 CHANGED (&S13)
1573 E3DEF AF7          D=C      W             SAVE MSG INFO
1574 E3DF2 8E00         GOSUBL   =GETFP        GET D1,D0,B
          00
1575 E3DF8 8E00         GOSUBL   =$SP!         RESET D1 TO EMPTY STACK
          00
```

```
1576            *                           (WOULD BE DONE LATER, UNLESS
1577            *                            ON-ERROR TAKES OVER NOW)
1578 E3DFE 8E00         GOSUBL  =SAVEFP     NEW TOS IN DSTKAD
          00
1579 E3E04 AFB          C=D     W           RESTORE MSG INFO
1580 E3E07 D0           A=0      A
1581 E3E09 1BBB         D0=(5)   =oERR?
          BF2
1582 E3E10 140          DAT0=A   A              CLEAR ERR?
1583            *       GOSBVL   =MFERsp        SHOW MSG
1584 E3E13 8F           NIBHEX   8F
1585 E3E15 D049         CON(5)   MFERsp
          0
1586 E3E1A 8E00         GOSUBL   =GETFP
          00
1587 E3E20 03           RTNCC
1588
1589            ******************************************
1590            *
1591            * ABORTW  is a FORTH internal abort for
1592            *         use in cases where we wish to
1593            * preface an error message with the current
1594            * word (i.e.,  FTH ERR: XYZ not recognized)
1595            *
1596            ******************************************
1597
1598 E3E22 0000 =ABORTW CON(5)   =DOCOL       if zero flag skip this
          0
1599 E3E27 0000         CON(5)   =ZBRNH       abort routine
          0
1600 E3E2C 1AEF         CON(5)   (ABXX)-*
          F
1601 E3E31 0000         CON(5)  =R@         POINT TO ERROR#
          0
1602 E3E36 0000         CON(5)  =CAT        GET IT
          0
1603 E3E3B E0D3         CON(5)  =SETERN     SET SYSTEM VARIABLE
          E
1604 E3E40 05C3         CON(5)   =ERRTST       TEST FOR (& DO) ON ERROR
          E
1605 E3E45 0000         CON(5)   =HERE         ADDR OF COUNTED STRING FOR DISPLAY
          0
1606            *                           used by EMSG
1607 E3E4A 0000         CON(5)   =ONE          SIGNAL TO EMSG that string to inse
          0
1608 E3E4F 0000         CON(5)   =BRNCH        REPLICATE CODE IN ABRT"X
          0
1609 E3E54 B5EF         CON(5)   (AB01)-*
          F
1610
1611            * get addr of variable, just like with DOUSE, simplified for
1612            * call from within primitive
1613 E3E59 E5E3 =ACTIV  CON(5)   =$ACTIV
          E
1614 E3E5E 20   =$ACTIV P=       0
```

```
1615 E3E60 34C0          LC(5)    =ACTIVE
           BF2
1616 E3E67 1C4           D1=D1-   5
1617 E3E6A 145           DAT1=C   A
1618 E3E6D 03            RTNCC
1619
1620              ********************************************************
1621              *
1622              * ABORT Clears the data and return stacks, setting
1623              *       execution mode. Closes all open files, flushes
1624              *       disc buffers, but does not clear SCRFIB or LINE#
1625              *       so that they may be used for error tracking
1626              *       purposes. Returns control to
1627              *       the terminal.
1628              *
1629              *       If ONERR is non-zero will use contents of ONERR
1630              * as CFA of ON ERROR routine, will not reset data or rtn
1631              * stacks, user must take care of that.
1632              *
1633              *       Although not standard FORTH ABORT also checks
1634              * to see if the last word in the dictionary is still
1635              * smudged.  If it is smudged it is a bad definition and
1636              * so ABORT by way of CLEAN will clean this stuff out of
1637              * the dictionary by resetting the DP.
1638              *
1639              ********************************************************
1640 E3E6F 4DB3   E           CON(5)   =!?COMP
1641 E3E74 58     =!ABORT     CON(2)   #85
1642 E3E76 1424   F425        NIBASC   \ABOR\
1643 E3E7E 4D                CON(2)   \T\+#80
1644
1645 E3E80 0000   0     =ABORT  CON(5)  =DOCOL          :
1646 E3E85 05C3   E             CON(5)  =ERRTST         TEST FOR (& DO) ON ERROR RTNE
1647 E3E8A 82C3   E             CON(5)  =CLEANX
1648 E3E8F 1EC3   E     ABR00   CON(5)   =BASIC?         IF COMING FROM BASIC
1649                  *                                 NEVER RETURN
1650 E3E94 0000   0     ABRT1   CON(5)   =QUIT
1651 E3E99 0000   0             CON(5)   =SEMI           ;
1652
1653
1654
1655 E3E9E 0000   0     =CLEAN  CON(5)   =DOCOL          :
1656 E3EA3 0000   0             CON(5)   =LATE           LATEST  get NFA of
1657 E3EA8 0000   0             CON(5)   =DUP            DUP     latest word, copy it
```

```
1658 E3EAD 0000          CON(5)   =CAT          C@      get 1st byte of name fiel
           0
1659 E3EB2 0000          CON(5)   =LIT                  and in hex #20 to see
           0
1660 E3EB7 0200          CON(5)   #20           #20     if word is smudged.
           0
1661 E3EBC 0000          CON(5)   =AND          AND     If so
           0
1662 E3EC1 0000          CON(5)   =ZBRNH        IF      its garbage so lets recla
           0
1663 E3EC6 2300          CON(5)   (ABRT0)-*             this space for the user
           0
1664 E3ECB 0000          CON(5)   =FIVE-        5-      back up NFA addr to point
           0
1665 E3ED0 0000          CON(5)   =DUP          DUP     save copy for CURRENT bac
           0
1666 E3ED5 0000          CON(5)   =DP           DP      link field and store this
           0
1667 E3EDA 0000          CON(5)   =STORE        !       as the new dictionary poi
           0
1668 E3EDF 0000          CON(5)   =AT           @       now get last link
           0
1669 E3EE4 0000          CON(5)   =CURR         CURRENT get addr of current voca
           0
1670 E3EE9 0000          CON(5)   =AT           @        pointer
           0
1671 E3EEE 0000          CON(5)   =STORE        !        reset current vocab to 1
           0
1672 E3EF3 0000          CON(5)   =ONE          1       phoney value which is dro
           0
1673               *                                    it just saves time and co
1674 E3EF8 0000 ABRT0    CON(5)   =DROP         DROP    drop copy of NFA
           0
1675 E3EFD 0000          CON(5)   =SEMI
           0
1676
```

```
1677                    EJECT
1678                ********************************************************
1679                *
1680                * WHERE   Display the last char string parsed by the text
1681                *
1682                ********************************************************
1683
1684 E3F02 0000 =WHERE  CON(5)  =DOCOL          :
               0
1685 E3F07 0000         CON(5)   =CR            CR
               0
1686 E3F0C 0000         CON(5)   =HERE          HERE
               0
1687 E3F11 0000         CON(5)   =DUP           here here
               0
1688 E3F16 0000         CON(5)   =TWO+          here here+2
               0
1689 E3F1B 0000         CON(5)   =SWAP          here+2 here
               0
1690 E3F20 0000         CON(5)   =CAT           here+2 char-count
               0
1691 E3F25 0000         CON(5)   =ZERO          here+2 count 0
               0
1692 E3F2A 0000         CON(5)   =XDO           lenght-of-string 0 DO
               0
1693 E3F2F 0000 WH01    CON(5)   =DUP           char-ptr char-ptr
               0
1694 E3F34 0000         CON(5)   =CAT           char-ptr char
               0
1695 E3F39 0000         CON(5)   =EMIT          EMIT
               0
1696 E3F3E 0000         CON(5)   =TWO+          2+      MOVE TO NEXT CHAR
               0
1697 E3F43 1FF3         CON(5)   =XLOOP         LOOP
               E
1698 E3F48 7EFF         CON(5)  (WH01)-*
               F
1699 E3F4D 0000         CON(5)   =DROP          drop char-ptr
               0
1700 E3F52 D6F3         CON(5)   =SPACE         SPACE
               E
1701 E3F57 0000         CON(5)   =SEMI          ;
               0
```

```
1702                    EJECT
1703                ****************************************************************
1704                *
1705                * SPACE  Transmit an ASCII blank to the current output device.
1706                *
1707                ****************************************************************
1708 E3F5C 47E3          CON(5)   =!ABORT
          E
1709 E3F61 56      =!SPACE CON(2)  #86             SPACE
1710 E3F63 3505          NIBASC   \SPAC\
          1434
1711 E3F6B 5C            CON(2)   \E\+#80
1712
1713 E3F6D 0000  =SPACE   CON(5)   =DOCOL          :
          0
1714 E3F72 0000           CON(5)    =BL            BL
          0
1715 E3F77 0000           CON(5)    =EMIT          EMIT
          0
1716 E3F7C 0000           CON(5)    =SEMI          ;
          0
```

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NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
1717                    EJECT
1718                ****************************************************************
1719                *
1720                * <+LP>  Runtime code for +LOOP    (n --- )
1721                *
1722                *  The loop is supposed to continue until I crosses
1723                *  the boundary between L-1 and L.  However in +LOOP
1724                *  it can cross the boundary in either direction.
1725                *  The cases break down, however, in the following fashion:
1726                *
1727                *  On entry to <+LP> code:
1728                *
1729                *  INDEX >= LIMIT    If INDEX < LIMIT after increment then
1730                *                    stop loop
1731                *
1732                *  INDEX < LIMIT     If INDEX >= LIMIT after increment then
1733                *                    stop loop
1734                *
1735                ****************************************************************
1736
1737 E3F81 68F3 =<+LP>  CON(5) =$<+LP>
          E
1738
1739 E3F86 143  =$<+LP> A=DAT1  A          READ n TO A(A)
1740 E3F89 101         R1=A               SAVE INCREMENT IN R1
1741 E3F8C 174         D1=D1+  5          RTN NOTHING ON DATA STK
1742 E3F8F D9          C=B     A
1743 E3F91 137         CD1EX              D1=RTN STK
1744 E3F94 D7          D=C     A          SAVE DATA STK PTR IN D(A)
1745 E3F96 147         C=DAT1  A          C(A)=LOOP INDEX
1746 E3F99 174         D1=D1+  5
1747 E3F9C 143         A=DAT1  A          A(A)=LOOP LIMIT
1748 E3F9F 1C4         D1=D1-  5          PT TO INDEX FOR UPDATE LATER
1749 E3FA2 7A20        GOSUB   LT         SEE IF INDEX < LIMIT
1750 E3FA6 5D0         GONC    I>=L       NO, I >= L
1751 E3FA9 7210        GOSUB   BEFLT      RESTORE I,L; ADD INCR AND TEST
1752 E3FAD 446         GOC     CONT       I STILL < L SO CONTINUE LOOP
1753 E3FB0 6970        GOTO    STOP       ELSE I>=L SO STOP LOOP
1754
1755 E3FB4 7700 I>=L   GOSUB   BEFLT      RESTORE I,L; ADD INCR AND TEST
1756 E3FB8 595         GONC    CONT       I STILL >=L SO CONTINUE LOOP
1757 E3FBB 6E60        GOTO    STOP       ELSE I < L SO STOP LOOP
1758
1759 E3FBF 81E  BEFLT  CSRB               SHIFT INDEX INTO C(A)
1760 E3FC2 81C         ASRB               SHIFT LIMIT INTO A(A)
1761 E3FC5 121         AR1EX              R1=LIMIT, A(A)=INCREMENT
1762 E3FC8 C2          C=C+A   A          NEW INDEX VALUE
1763 E3FCA 145         DAT1=C  A          STORE NEW INDEX VALUE TO RTN STK
1764 E3FCD 111         A=R1               A(A)=LIMIT
1765
1766 E3FD0 25   LT     P=      5
1767 E3FD2 A80         A=0     P          CLEAR FOR NEGATIVE TEST
1768 E3FD5 A82         C=0     P
1769 E3FD8 A14         A=A+A   WP         IF LIMIT NEG THEN A(5)=1
1770 E3FDB A16         C=C+C   WP         IF INDEX NEG THEN A(5)=1
```

```
1771 E3FDE 902          ?C=A    P           ARE SIGNS THE SAME?
1772 E3FE1 90           GOYES   SAMSGN      IF SO GO HERE
1773 E3FE3 992          ?A<C    WP
1774 E3FE6 00           RTNYES              DIFFERENT SIGNS, SWITCH SENSE OF TE
1775 E3FE8 03           RTNCC
1776
1777 E3FEA 996  SAMSGN  ?A>C    WP          IS C<A?
1778 E3FED 00           RTNYES              IF SO RTN WITH CARRY SET
1779 E3FEF 03           RTNCC               ELSE RTN WITH CARRY CLEAR
1780
1781            **********************************
1782            *
1783            * XLOOP Runtime code for LOOP
1784            *
1785            **********************************
1786
1787 E3FF1 6FF3 =XLOOP  CON(5) =$XLOOP
          E
1788
1789 E3FF6 D9   =$XLOOP C=B     A
1790 E3FF8 137          CD1EX                 RTN STK TO D1
1791 E3FFB D7           D=C     A             SAVE DATA STK IN D
1792 E3FFD 143          A=DAT1  A             A=INDEX
1793 E4000 E4           A=A+1   A             INCREMENT INDEX
1794
1795 E4002 141  XLP00   DAT1=A  A             PUSH NEW INDEX
1796 E4005 174          D1=D1+  5             PT TO LIMIT
1797 E4008 147          C=DAT1  A             LIMIT
1798 E400B E2           C=C-A   A             LIMIT-INDEX
1799 E400D 8AA          ?C=0    A             DONE?
1800 E4010 D1           GOYES   XLP0          YES
1801 E4012 142  CONT    A=DAT0  A             READ OFFSET
1802 E4015 136          CD0EX                 I TO C
1803 E4018 C2           C=C+A   A             NEW I
1804 E401A 134          D0=C                  RESTORE I
1805 E401D DB           C=D     A
1806 E401F 135          D1=C                  RESTORE DATA STK PTR
1807 E4022 8E00         GOSUBL  =DOATN        CHECK FOR ATTN KEY
          00
1808 E4028 03           RTNCC
1809
1810 E402A 174  STOP    D1=D1+  5
1811
1812 E402D DB   XLP0    C=D     A             RECOVER DATA STK PTR TO C(A)
1813 E402F 174          D1=D1+  5             DROP LIMIT FROM RTN STK
1814 E4032 137          CD1EX                 D1=DATA STK, C=RTN STK
1815 E4035 D5           B=C     A             RESTORE RTN STK
1816 E4037 164          D0=D0+  5             NEW I
1817 E403A 8E00         GOSUBL  =DOATN        CHECK FOR ATTN KEY
          00
1818 E4040 03           RTNCC                 DOATN REQUIRES GOSUB/RTNCC
```

```
1819                    EJECT
1820                ************************************************************
1821                *
1822                * DEPTH ( --- n) Leave # of entries on stack, before DEPTH
1823                *       was executed.
1824                *
1825                ************************************************************
1826
1827 E4042 16F3            CON(5)  =!SPACE
            E
1828 E4047 58      =!DEPTH  CON(2)  #85             DEPTH
1829 E4049 4454            NIBASC  \DEPT\
            0545
1830 E4051 8C              CON(2)  \H\+#80
1831
1832 E4053 0000    =DEPTH   CON(5)  =DOCOL          :
            0
1833 E4058 0000            CON(5)   =S0             S0    stack bottom
            0
1834 E405D 0000            CON(5)   =SP@            SP@   current stack position
            0
1835 E4062 0000            CON(5)   =MINUS          -     get difference
            0
1836 E4067 0000            CON(5)   =LIT
            0
1837 E406C 5000            CON(5)   5               5     get # addresses
            0
1838 E4071 0000            CON(5)   =/              /
            0
1839 E4076 0000            CON(5)   =ONE-           1-    we were 1 off due to S0
            0
1840 E407B 0000            CON(5)   =SEMI           ;
            0
1841
1842
1843                ************************************************************
1844                *
1845                * */MOD (n1 n2 n3 --- n4 n5) Multiply n1 by n2, divide the
1846                *       result by n3, leave the remainder n4 and quotient n5.
1847                *
1848                ************************************************************
1849
1850 E4080 7404            CON(5)  =!DEPTH
            E
1851 E4085 58      =!*/MOD  CON(2)  #85             */MOD
1852 E4087 A2F2            NIBASC  \*/MO\
            D4F4
1853 E408F 4C              CON(2)  \D\+#80
1854
1855 E4091 0000    =*/MOD   CON(5)  =DOCOL          :
            0
1856 E4096 0000            CON(5)   =>R             >R
            0
1857 E409B 0000            CON(5)   =M*             M*
            0
```

```
1858 E40A0 0000          CON(5)   =R>            R>
           0
1859 E40A5 0000          CON(5)   =M/            M/
           0
1860 E40AA 0000          CON(5)   =SEMI          ;
           0
```

```
1861                    EJECT
1862                ****************************************************************
1863                *
1864                * M/MOD  (ud1 u2 --- u3 ud4) Unsigned mixed magnitude math
1865                *       operation. Leaves remainder u3 and double quotient ud4.
1866                *
1867                ****************************************************************
1868 E40AF 5804            CON(5)  =!*/MOD
             E
1869 E40B4 58    =!M/MOD   CON(2)  #85             M/MOD
1870 E40B6 D4F2            NIBASC  \M/MO\
             D4F4
1871 E40BE 4C              CON(2)  \D\+#80
1872
1873 E40C0 5C04 =M/MOD    CON(5)  $M/MOD
             E
1874 E40C5 8E00 =$M/MOD   GOSUBL   =$UDIV     WRITES REMAINDER & LSD OF QUOTIENT
             00
1875 E40CB 1C9             D1=D1-   10
1876 E40CE 15D9            DAT1=C   10         WRITE MSD OF QUOTIENT
1877 E40D2 174             D1=D1+   5
1878 E40D5 03              RTNCC
```

```
1879                    EJECT
1880                ****************************************************
1881                *
1882                * <;CODE> (FOR ROM PROVIDED DEFINING WORDS)
1883                *         This word stores the runtime address of
1884                *         the appropriate prologue.
1885                *
1886                ****************************************************
1887
1888 E40D7 0000 =ROM;C  CON(5)  =DOCOL          :
           0
1889 E40DC 0000         CON(5)   =R>            R>
           0
1890 E40E1 0000         CON(5)   =AT            @
           0
1891 E40E6 0000         CON(5)   =LATE          LATEST
           0
1892 E40EB 0000         CON(5)   =PFA           PFA
           0
1893 E40F0 0000         CON(5)   =LIT
           0
1894 E40F5 5000         CON(5)  5               5
           0
1895 E40FA 0000         CON(5)   =MINUS         -
           0
1896 E40FF 0000         CON(5)   =STORE         !
           0
1897 E4104 0000         CON(5)   =SEMI          ;
           0
```

```
1898                    EJECT
1899                ********************************************
1900                *
1901                * ENDOF  (FROM CASE  OF  ENDOF  ENDCASE)
1902                *
1903                ************************************************
1904
1905 E4109 4B04          CON(5)  =!M/MOD
          E
1906 E410E 5C     =!ENDOF CON(2)  #C5
1907 E4110 54E4          NIBASC  \ENDO\
          44F4
1908 E4118 6C            CON(2)  \F\+#80
1909
1910 E411A 0000 =ENDOF CON(5) =DOCOL       :
          0
1911 E411F 0EB3          CON(5)   =?COMP     ensure compile mode
          E
1912
1913                * start with ADDR 5 left by of
1914
1915 E4124 0000          CON(5)   =LIT
          0
1916 E4129 5000          CON(5)  5           from OF
          0
1917 E412E 0000          CON(5)   =?PAIR     error if no 5 on stack
          0
1918 E4133 0000          CON(5)   =COMPL     COMPILE
          0
1919 E4138 0000          CON(5)   =BRNCH     BRANCH
          0
1920 E413D 0000          CON(5)   =HERE      HERE
          0
1921                * ADDR HERE
1922 E4142 0000          CON(5)   =ZERO      0
          0
1923 E4147 0000          CON(5)   =COMMA     allot space for jump to be filled in
          0
1924 E414C 0000          CON(5)   =SWAP      HERE ptr-to-IF
          0
1925                * HERE ADDR
1926 E4151 0000          CON(5)   =TWO       TWO
          0
1927                *        CON(5)   =[CMP]     [COMPILE]
1928 E4156 0000          CON(5)   =THEN      fill in HERE at ptr left by IF to its
          0
1929                * HERE
1930 E415B 0000          CON(5)   =LIT
          0
1931 E4160 7000          CON(5)   7          leave 7 for syntax checking
          0
1932 E4165 0000          CON(5)   =SEMI      ;
          0
```

```
                    EJECT
              ***************************************************************
              *
              * BLOCK  (n --- addr)  This routine leaves the address of the
              *        first byte in line# n from the file identified by the
              *        fib# contained in SCRFIB. If the line is not already in
              *        a buffer it is transferred from the file (which may be
              *        in RAM or on mass storage).
              *
              ***************************************************************

E416A E014          CON(5)  =!ENDOF
      E
E416F 58    =!BLOCK CON(2) #85            BLOCK
E4171 24C4          NIBASC \BLOC\
      F434
E4179 BC            CON(2) \K\+#80

E417B 0000 =BLOCK   CON(5)  =DOCOL          :
      0
E4180 0000         CON(5)    =>R            >R      save line# on rtn stk
      0
E4185 0000         CON(5)    =PREV          PREV    get addr of previously
      0
E418A 0000         CON(5)    =AT            @       used buffer
      0
E418F 0000         CON(5)    =DUP           DUP     duplicate it
      0
E4194 0000         CON(5)    =CAT           C@      get its fib#
      0
E4199 0000         CON(5)    =SCFIB         SCRFIB  get the currently
      0
E419E 0000         CON(5)    =AT            @       active fib#
      0
E41A3 0000         CON(5)    =MINUS         -       if they are not
      0
E41A8 0000         CON(5)    =ZBRNH         IF      the same then
      0
E41AD 6900         CON(5)   (BLK1)-*
      0
E41B2 0000 BLK00   CON(5)    =PBUF          BEGIN +BUF  get addr of next
      0
E41B7 0000         CON(5)    =ZEQ           0=      buffer, if its the
      0
E41BC 0000         CON(5)    =ZBRNH         IF      same as the PREV buffer
      0
E41C1 B400         CON(5)   (BLK10)-*
      0
E41C6 0000         CON(5)    =DROP          DROP    then drop PREV buff addr
      0
E41CB 0000         CON(5)    =R@            R@      get line # from rtn stk
      0
E41D0 0000         CON(5)    =SCFIB         SCRFIB  get active fib#
      0
E41D5 0000         CON(5)    =AT            @
```

```
                0
1968 E41DA 0000         CON(5)    =BUFFR          BUFFER  and get a buffer for this
                0
1969 E41DF 0000         CON(5)    =DUP            DUP     duplicate buffer DATA add
                0
1970 E41E4 0000         CON(5)    =R@             R@      get line # from rtn stk
                0
1971 E41E9 0000         CON(5)    =SCFIB          SCRFIB  get active fib#
                0
1972 E41EE 0000         CON(5)    =AT             @
                0
1973 E41F3 0000         CON(5)    =ONE            1       set read flag
                0
1974 E41F8 0000         CON(5)    =R/W            R/W     read this line#
                0
1975 E41FD 0000         CON(5)    =LIT
                0
1976 E4202 B000         CON(5)   11               11
                0
1977 E4207 0000         CON(5)    =MINUS          -       get buffer start addr
                0
1978 E420C 0000 BLK10   CON(5)    =DUP            DUP     duplicate it
                0
1979 E4211 0000         CON(5)    =CAT            C@      fetch its fib#
                0
1980 E4216 0000         CON(5)    =SCFIB          SCRFIB  get current fib#
                0
1981 E421B 0000         CON(5)    =AT             @
                0
1982 E4220 0000         CON(5)    =MINUS          -       compare and if
                0
1983 E4225 0000         CON(5)    =ZEQ            0=      not the same go again
                0
1984 E422A 0000         CON(5)    =ZBRNH          UNTIL
                0
1985 E422F 38FF         CON(5)   (BLK00)-*
                F
1986 E4234 0000         CON(5)    =DUP            DUP     duplicate buffer addr
                0
1987 E4239 0000         CON(5)    =PREV           PREV    store it in PREV
                0
1988 E423E 0000         CON(5)    =STORE          !
                0
1989 E4243 0000 BLK1    CON(5)    =DUP            THEN DUP   duplicate buffer addr
                0
1990 E4248 0000         CON(5)    =TWO+           2+      get line# addr in buffer
                0
1991 E424D 0000         CON(5)    =AT             @       get line#
                0
1992 E4252 0000         CON(5)    =R@             R@      get desired line# from rt
                0
1993 E4257 0000         CON(5)    =MINUS          -       compare
                0
1994 E425C 0000         CON(5)    =ZBRNH          IF      if not the same
                0
```

```
1995 E4261 B400        CON(5)   (BLK2)-*              then dup buffer addr
           0
1996            *
1997            * In other FORTHs where a block is the whole file, BUFFER updates
1998            * the block number in the buffer.  Here where we have an unknown
1999            * number of lines per file and a block is a line we must update
2000            * the buffer in BLOCK to show the current line in the buffer.
2001            *
2002 E4266 0000        CON(5)    =DUP
           0
2003 E426B 0000        CON(5)    =TWO+                get line# addr in buffer
           0
2004 E4270 0000        CON(5)    =R@                  get desired line#
           0
2005 E4275 0000        CON(5)    =SWAP
           0
2006 E427A 0000        CON(5)    =STORE               set buffer for desired li
           0
2007 E427F 0000        CON(5)    =DUP          DUP
           0
2008 E4284 0000        CON(5)    =LIT                  make it buff data addr
           0
2009 E4289 B000        CON(5)   11             11
           0
2010 E428E 0000        CON(5)    =ADD          +
           0
2011 E4293 0000        CON(5)    =R@           R@      get desired line #
           0
2012 E4298 0000        CON(5)    =SCFIB        SCRBIF  get active fib#
           0
2013 E429D 0000        CON(5)    =AT           @
           0
2014 E42A2 0000        CON(5)    =ONE          1        set for read
           0
2015 E42A7 0000        CON(5)    =R/W          R/W THEN   read that line
           0
2016 E42AC 0000 BLK2   CON(5)    =R>           R>   get line# off rtn stk
           0
2017 E42B1 F783        CON(5)    =LINE#        this is necessary in case we had
           E
2018 E42B6 0000        CON(5)    =STORE        line we were looking for, already
           0
2019            *                              a buffer and R/W (which usually s
2020            *                              LINE#) was not called.
2021
2022 E42BB 0000        CON(5)    =LIT          buffer start addr still on data s
           0
2023 E42C0 B000        CON(5)   11             11    make it buffer data addr
           0
2024 E42C5 0000        CON(5)    =ADD          +
           0
2025 E42CA 0000        CON(5)    =SEMI         ;    return!
           0
```

```
2026                    EJECT
2027                ****************************************************************
2028                *
2029                * LOADF   (addr  length ---- )  This routine assumes that
2030                *       the stack contains a character count and an address of
2031                *       a string describing the file to be loaded.
2032                *
2033                ****************************************************************
2034 E42CF F614          CON(5)  =!BLOCK
           E
2035 E42D4 58    =!LOADF CON(2) #85              LOADF
2036 E42D6 C4F4          NIBASC \LOAD\
           1444
2037 E42DE 6C            CON(2) \F\+#80
2038
2039
2040 E42E0 0000 =LOADF CON(5)   =DOCOL          :
           0
2041 E42E5 0000        CON(5)   =ABS            ABS VALUE OF LENGTH
           0
2042 E42EA 0000        CON(5)   =LIT
           0
2043 E42EF 2300        CON(5)   50
           0
2044 E42F4 0000        CON(5)   =MIN            allow max len name of 50 chars
           0
2045 E42F9 0000        CON(5)    =BLK           BLK     save current block#
           0
2046 E42FE 0000        CON(5)    =AT            @       on rtn stk
           0
2047 E4303 0000        CON(5)    =>R            >R
           0
2048 E4308 0000        CON(5)    =IN            >IN     save current pointer into
           0
2049 E430D 0000        CON(5)    =AT            @       input stream on rtn stk
           0
2050 E4312 0000        CON(5)    =>R            >R
           0
2051 E4317 0000        CON(5)    =SCFIB         SCRFIB   save current active fib#
           0
2052 E431C 0000        CON(5)    =AT            @        on rtn stk
           0
2053 E4321 0000        CON(5)    =>R            >R
           0
2054 E4326 F783        CON(5)    =LINE#         also save LINE# on rtn stk
           E
2055 E432B 0000        CON(5)    =AT
           0
2056 E4330 0000        CON(5)    =>R
           0
2057 E4335 0000        CON(5)    =ZERO          0       set pointer into input
           0
2058 E433A 0000        CON(5)    =IN            >IN     stream to 0
           0
2059 E433F 0000        CON(5)    =STORE         !
```

```
            0
 2060 E4344 0000        CON(5)    =ONE          1       set desired line# to 1
            0
 2061 E4349 0000        CON(5)    =BLK          BLK
            0
 2062 E434E 0000        CON(5)    =STORE        !
            0
 2063 E4353 0000        CON(5)    =ZERO         0
            0
 2064 E4358 F783        CON(5)    =LINE#        LINE#   set line# associated with
            E
 2065 E435D 0000        CON(5)    =STORE        !       active fib# to 0
            0
 2066
 2067 E4362 0144        CON(5)    =OPNF         OPENF    file, (it sets SCRFIB)
            E
 2068 E4367 0000        CON(5)    =ZEQ          0=       if open was
            0
 2069 E436C 0000        CON(5)    =ZBRNH        IF       unsuccessful then
            0
 2070 E4371 1100        CON(5)   (LOD0)-*
            0
 2071 E4376 D713        CON(5)    =ABORTN       move name to HERE supply 1
            E
 2072 E437B 22E3        CON(5)    =ABORTW       for abort
            E
 2073 E4380 73          CON(2)    =eCNLD        <name>  :cannot load
 2074
 2075 E4382 0000 LOD0   CON(5)    =EOF          don`t INTERPRET if empty file
            0
 2076 E4387 0000        CON(5)    =ZEQ          reverse sense of EOF flag for 0BR
            0
 2077 E438C 0000        CON(5)    =ZBRNH
            0
 2078 E4391 A000        CON(5)    (LOD1)-*
            0
 2079 E4396 0000        CON(5)    =INTRP        INTERPRET     interpret line
            0
 2080 E439B 0000 LOD1   CON(5)    =SCFIB              let`s close this file
            0
 2081 E43A0 0000        CON(5)    =AT
            0
 2082 E43A5 0000        CON(5)    =CLOSF
            0
 2083 E43AA 0000        CON(5)    =ZERO         and let's set this buffer to 0 fi
            0
 2084 E43AF 0000        CON(5)    =PREV
            0
 2085 E43B4 0000        CON(5)    =AT
            0
 2086 E43B9 0000        CON(5)    =STORE
            0
 2087 E43BE 0000        CON(5)    =R>           R>       now we'll restore old
            0
 2088 E43C3 F783        CON(5)    =LINE#        LINE#   line # for old loadf
```

```
            E
2089 E43C8 0000        CON(5)    =STORE        !
            0
2090 E43CD 0000        CON(5)    =R>           R>     we're done, restore old fi
            0
2091 E43D2 0000        CON(5)    =SCFIB        SCRFIB
            0
2092 E43D7 0000        CON(5)    =STORE        !
            0
2093 E43DC 0000        CON(5)    =R>           R>    restore old pointer into
            0
2094 E43E1 0000        CON(5)    =IN           >IN   input stream
            0
2095 E43E6 0000        CON(5)    =STORE        !
            0
2096 E43EB 0000        CON(5)    =R>           R>     restore old desired line
            0
2097 E43F0 0000        CON(5)    =BLK          BLK    #
            0
2098 E43F5 0000        CON(5)    =STORE        !
            0
2099 E43FA 0000        CON(5)    =SEMI         ;
            0
```

```
2100                    EJECT
2101                ****************************************************************
2102                *
2103                * OPENF  (addr cnt --- t)
2104                *        (addr  cnt --- addr cnt f)
2105                *      This routine will open an fib entry
2106                *      for an already existing file. It will set the USER VAR
2107                *      oSCFIB to reflect the fib# assigned to the file.
2108                *      Returns fail flag: can't find file, wrong type file,
2109                *                         file already open
2110                *      Errors out to system: bad file spec
2111                *
2112                ****************************************************************
2113
2114 E43FF 4D24          CON(5)  =!LOADF
          E
2115 E4404 58    =!OPENF CON(2) #85              OPENF
2116 E4406 F405          NIBASC \OPEN\
          54E4
2117 E440E 6C            CON(2) \F\+#80
2118 E4410 5144  =OPNF    CON(5)  =$OPNF
          E
2119
2120 E4415 8E00  =$OPNF GOSUBL    =SAVEFP          SAVE FORTH POINTERS
          00
2121 E441B 20             P=      0
2122 E441D 143            A=DAT1  A                A(A)=COUNT
2123 E4420 174            D1=D1+  5
2124 E4423 147            C=DAT1  A                C(A)=STRING ADDR
2125 E4426 137            CD1EX                    D1--->STRING
2126 E4429 1B00           D0=(5)  =SCRTCH
          000
2127 E4430 3122           LCASC   \"\              DELIMIT STRING WITH "
2128 E4434 14C            DAT0=C  B
2129 E4437 161   GET01    D0=D0+  2                INCREMENT DEST
2130 E443A CC             A=A-1   A                DECREMENT COUNT
2131 E443C 4F0            GOC     GTDONE           ALL DONE
2132 E443F 14F            C=DAT1  B                READ CHAR
2133 E4442 14C            DAT0=C  B                WRITE CHAR
2134 E4445 171            D1=D1+  2                INCREMENT SOURCE
2135 E4448 6EEF           GOTO    GET01            TRY ANOTHER
2136 E444C 3322  GTDONE   LCHEX   FF22             DELIMIT STRING WITH "FF
          FF
2137 E4452 144            DAT0=C  A
2138 E4455 24             P=      4
2139 E4457 8F00           GOSBVL  =R<RSTK          SAVE 5 STACK LEVELS
          000
2140 E445E 1B00           D0=(5)  =SCRTCH          D0--->STRING
          000
2141 E4465 8F00           GOSBVL  =OPENF           OPEN FILE
          000
2142 E446C 4B1            GOC     FOK              NO ERROR
2143
2144                *
2145                * THIS SECTION OF CODE IS FOR AN UNSUCCESSFUL FILE OPEN
```

```
2146                * FOR WHATEVER REASON.
2147                *
2148 E446F 24    FAL    P=       4
2149 E4471 8F00          GOSBVL   =RSTK<R
           000
2150 E4478 8E00          GOSUBL   =GETFP
           00
2151 E447E D0            A=0      A              SET FAILED FLAG
2152 E4480 1C4           D1=D1-   5
2153 E4483 141           DAT1=A   A              PUSH FAILED FLAG ON STACK
2154 E4486 03            RTNCC
2155
2156
2157 E4488 101   FOK      R1=A                    SAVE FIB#
2158 E448B 8F00          GOSBVL   =LOCFIL        GET FILE INFO
           000
2159 E4492 DD            BCEX     A
2160 E4494 136           CD0EX                   GET ADDR OF FIB ENTRY
2161 E4497 164           D0=D0+   5              POINT TO FILE TYPE
2162 E449A D0            A=0      A
2163 E449C 15A3          A=DAT0   4              READ FILE TYPE
2164 E44A0 CC            A=A-1    A              IF LIF1 IT =1
2165 E44A2 CC            A=A-1    A
2166 E44A4 401           GOC      OKFOK          WRONG TYPE
2167 E44A7 111           A=R1
2168 E44AA 8F00          GOSBVL   =CLOSEF        CLOSE FOR BAD TYPE
           000
2169 E44B1 6DBF          GOTO     FAL
2170
2171 E44B5 111   OKFOK    A=R1                    RECOVER FILE TYPE
2172 E44B8 1B16          D0=(5)   =oSCFIB
           BF2
2173 E44BF D2            C=0      A
2174 E44C1 144           DAT0=C   A
2175 E44C4 148           DAT0=A   B              WRITE fib# TO oSCFIB
2176 E44C7 24            P=       4
2177 E44C9 8F00          GOSBVL   =RSTK<R        RESTORE STACK LEVELS
           000
2178 E44D0 8E00          GOSUBL   =GETFP         RESTORE FORTH POINTERS
           00
2179 E44D6 174           D1=D1+   5              POP COUNT OFF STK
2180 E44D9 D0            A=0      A              OVERWRITE ADDR WITH TRUE FLAG
2181 E44DB CC            A=A-1    A              A(A)=TRUE FLAG
2182 E44DD 141           DAT1=A   A              WRITE TRUE FLAG TO DATA STK
2183 E44E0 03            RTNCC                   ALL DONE!
2184
2185              Random   EQU      9
2186              I/Obuf   EQU      10
2187              Iram     EQU      11
2188
2189 E44E2 849   =GETPTR  ST=0     Random
2190 E44E5 84A             ST=0     I/Obuf
2191 E44E8 84B             ST=0     Iram
2192 E44EB 8D00            GOVLNG   =GTPTRX
           000
```

2193

```
2194                    EJECT
2195                ***********************************************
2196                *
2197                * NULL$                         ( -- str )
2198                * Return temporary string of length zero.
2199                *
2200                ***********************************************
2201
2202 E44F2 4044            CON(5)  =!OPENF
           E
2203 E44F7 58    =!NULL$   CON(2)  #85
2204 E44F9 E455            NIBASC  \NULL\
           C4C4
2205 E4501 4A              CON(2)  \$\+#80
2206
2207 E4503 0000  =NULL$   CON(5)  =DOCOL       :
           0
2208 E4508 0000           CON(5)  =LIT
           0
2209 E450D 0500           CON(5)  80
           0
2210 E4512 0000           CON(5)  =PAD         PAD
           0
2211 E4517 0000           CON(5)  =STORE
           0
2212                * EFFECT IS TO MAKE MAXLEN=80, LEN=0
2213 E451C 0000           CON(5)  =PAD         PAD
           0
2214 E4521 0000           CON(5)  =FOUR+       4+
           0
2215 E4526 0000           CON(5)  =ZERO        0
           0
2216 E452B 0000           CON(5)  =SEMI        ;
           0
```

OFFICIALLY UNOFFICIAL



THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
2217                    EJECT
2218                ********************************************
2219                *
2220                * SMOVE                         ( str addr -- )
2221                * Store a string at any given address.
2222                *
2223                ********************************************
2224
2225 E4530 7F44             CON(5)  =!NULL$
           E
2226 E4535 58     =!SMOVE CON(2)  #85
2227 E4537 35D4           NIBASC  \SMOV\
           F465
2228 E453F 5C             CON(2)  \E\+#80
2229
2230 E4541 0000   =SMOVE CON(5)  =DOCOL       :
           0
2231 E4546 0000           CON(5)   =ROT       LEN AD2 AD1
           0
2232 E454B 0000           CON(5)   =2DUP      LEN AD2 AD1 AD2 AD1
           0
2233 E4550 0DF3           CON(5)   =LT        LEN AD2 AD1 (AD2<AD1)
           E
2234 E4555 0000           CON(5)   =ZBRNH     IF moving up
           0
2235 E455A 9100           CON(5)   (SMOV1)-*
           0
2236 E455F 0000           CON(5)   =SWAP      LEN AD1 AD2
           0
2237 E4564 0000           CON(5)   =ROT       AD1 AD2 LEN
           0
2238 E4569 FFA3           CON(5)   =CMOVE     CMOVE
           E
2239 E456E 0000           CON(5)   =SEMI      ELSE moving down
           0
2240                * ELSE CALL CMOV> TO AVOID PROPAGATING COPY
2241 E4573 0000 SMOV1  CON(5)   =SWAP       LEN AD1 AD2
           0
2242 E4578 0000           CON(5)   =ROT       AD1 AD2 LEN
           0
2243 E457D 0000           CON(5)   =CMOV>
           0
2244 E4582 0000           CON(5)   =SEMI      ;
           0
```

```
2245                    EJECT
2246                ***********************************************
2247                *
2248                * LEFT$                        ( str pos -- str )
2249                * Return string from start to pos.
2250                *
2251                ***********************************************
2252 E4587 5354             CON(5)  =!SMOVE
           E
2253 E458C 58     =!LEFT$ CON(2)  #85
2254 E458E C454            NIBASC  \LEFT\
           6445
2255 E4596 4A              CON(2)  \$\+#80
2256
2257 E4598 0000   =LEFT$ CON(5)  =DOCOL       :
           0
2258 E459D 0000             CON(5)   =ONE        1
           0
2259 E45A2 0000             CON(5)   =SWAP       STR 1 POS
           0
2260 E45A7 0000             CON(5)   =SUB$       get substring from start to pos
           0
2261 E45AC 0000             CON(5)   =SEMI       ;
           0
2262
2263                *
2264                * BASIC
2265                *
2266                * USER VARIABLE
2267                * IN THE NORMAL FORTH ENVIRONMENT IT IS ZERO.
2268                * WHEN EXECUTING FORTHX, IT HAS THE
2269                * RETURN ADDRESS TO THE BASIC KEYWORD.
2270                * THUS IT ALSO HAS THE MEANING OF "IN BASIC?",
2271                * TRUE/FALSE.
2272
2273 E45B1 6B54 =BASIC  CON(5)  =$BASIC
           E
2274 E45B6 8E00 =$BASIC GOSUBL  =DOUSE
           00
2275 E45BC 2ABF             CON(5)  (=oBASIC)
           2
2276 E45C1         =REND3  END
```

```
=!*/MOD   Abs  934021 #E4085 -  1851  1868
=!2DROP   Abs  931479 #E3697 -   798   816
=!>BODY   Abs  930567 #E3307 -   315   333
=!?COMP   Abs  932820 #E3BD4 -  1378  1640
=!ABORT   Abs  933492 #E3E74 -  1641  1708
=!ALOTB   Abs  932701 #E3B5D -  1335  1377
=!BEGIN   Abs  932327 #E39E7 -  1169  1206
=!BLOCK   Abs  934255 #E416F -  1945  2034
=!CMOVE   Abs  932595 #E3AF3 -  1276  1302
=!COUNT   Abs  931658 #E374A -   879   902
 !DEPTH   Abs  933959 #E4047 -  1828  1850
=!DIGIT   Abs  931506 #E36B2 -   817   857
=!DOES>   Abs  932255 #E399F -  1144  1168
=!ENDOF   Abs  934158 #E410E -  1906  1944
 !ENTER   Abs  930650 #E335A -   381   704
=!FDROP   Abs  930026 #E30EA -   104   129
=!FENCE   Abs  931741 #E379D -   918   945
=!FFIND   Abs  930094 #E312E -   130   195
=!FIRST   Abs  931889 #E3831 -  1001  1018
=!FLUSH   Abs  930475 #E32AB -   287   314
=!FSTR$   Abs  929946 #E309A -    63    84
 !IOCON   Abs  930353 #E3231 -   226   246
=!IOEXP   Abs  930382 #E324E -   247   286
=!LASTX   Abs  930608 #E3330 -   334   380
=!LEAVE   Abs  931988 #E3894 -  1054  1143
=!LEFT$   Abs  935308 #E458C -  2253
=!LIMIT   Abs  931922 #E3852 -  1019  1035
 !LINE#   Abs  931955 #E3873 -  1036  1053
=!LOADF   Abs  934612 #E42D4 -  2035  2114
=!M/MOD   Abs  934068 #E40B4 -  1869  1905
=!NFILL   Abs  929877 #E3055 -    31    62
=!NMOVE   Abs  931336 #E3608 -   735   797
=!NULL$   Abs  935159 #E44F7 -  2203  2225
=!OKFLG   Abs  931790 #E37CE -   946   967
=!ONERR   Abs  931823 #E37EF -   968   983
=!OPENF   Abs  934916 #E4404 -  2115  2202
=!OVER2   Abs  931295 #E35DF -   705   734
=!PLOOP   Abs  932518 #E3AA6 -  1251  1275
=!QUERY   Abs  932629 #E3B15 -  1303  1334
=!SMOVE   Abs  935221 #E4535 -  2226  2252
=!SPACE   Abs  933729 #E3F61 -  1709  1827
=!STATE   Abs  931856 #E3810 -   984  1000
=!SWAP2   Abs  931612 #E371C -   858   878
=!UNTIL   Abs  932414 #E3A3E -  1207  1230
=!VARIB   Abs  929993 #E30C9 -    85   103
=!WHILE   Abs  932481 #E3A81 -  1251  1280
=!WIDTH   Abs  931708 #E377C -   903   917
=!X<=Y?   Abs  930281 #E31E9 -   196   205
=!X=>Y?   Abs  930317 #E320D -   206   225
 #TIB     Ext                 -  1315
=$2DROP   Abs  931496 #E36A8 -   803   801
=$?+LP>   Abs  933766 #E3F86 -  1739  1737
 $>BODY   Abs  930584 #E3318 -   320   318
=$ACTIV   Abs  933470 #E3E5E -  1614  1613
=$BASIC   Abs  935350 #E45B6 -  2274  2273
```

```
=$BTFER  Abs  933183 #E3D3F -  1512  1511
 $CMOVE  Abs  932612 #E3B04 -  1281  1280
=$COUNT  Abs  931675 #E375B -   884   882
=$DIGIT  Abs  931523 #E36C3 -   822   820
 $DOLEV  Abs  932117 #E3915 -  1083  1081
=$EMSG   Abs  933231 #E3D6F -  1530  1529
=$ENT    Abs  930707 #E3393 -   400   398
 $FDROP  Abs  930043 #E30FB -   108   107
=$FENCE  Abs  931758 #E37AE -   923   921
=$FILF   Abs  930223 #E31AF -   169   168
=$FIND>  Abs  930995 #E34B3 -   562   560
=$FIRST  Abs  931906 #E3842 -  1006  1004
 $IOCON  Abs  930370 #E3242 -   231   229
 $IOEXP  Abs  930399 #E325F -   252   250
=$LIMIT  Abs  931939 #E3863 -  1024  1022
=$LINE#  Abs  931972 #E3884 -  1041  1039
=$M/MOD  Abs  934085 #E40C5 -  1874  1873
=$NFILL  Abs  929894 #E3066 -    36    34
=$NMOVE  Abs  931353 #E3619 -   740   738
=$OKFLG  Abs  931807 #E37DF -   951   949
=$ONERR  Abs  931840 #E3800 -   972   971
=$OPNF   Abs  934933 #E4415 -  2120  2118
=$OVER2  Abs  931312 #E35F0 -   710   708
 $SP!    Ext                -  1575
=$STATE  Abs  931873 #E3821 -   989   987
=$STERN  Abs  933139 #E3D13 -  1497  1496
=$SWAP2  Abs  931629 #E372D -   863   861
 $UDIV   Ext                -  1874
=$VARID  Abs  930010 #E30DA -    89    88
=$VOC-L  Abs  931774 #E37BE -   935   934
=$WIDTH  Abs  931725 #E378D -   908   906
 $X<=Y?  Abs  930298 #E31FA -   200   199
 $X=>Y?  Abs  930334 #E321E -   210   209
=$XLOOP  Abs  933878 #E3FF6 -  1789  1787
=*/MOD   Abs  934033 #E4091 -  1855
=-FIND   Abs  932864 #E3C00 -  1407
 /       Ext                -  1838
=2DROP   Abs  931491 #E36A3 -   801  1063
 2DUP    Ext                -  2232
=<+LP>   Abs  933761 #E3F81 -  1737  1260
 <;COD   Ext                -  1152
=>BODY   Abs  930579 #E3313 -   318
 >R      Ext                -  1350  1478  1856  1950  2047  2050  2053  2056
=?COMP   Abs  932832 #E3BE0 -  1382  1174  1212  1256  1911
 ?DUP    Ext                -  1435
 ?PAIR   Ext                -  1189  1214  1258  1917
 AB01    Abs  933039 #E3CAF -  1466  1609
 AB04    Abs  932989 #E3C7D -  1443  1474
=ABORT   Abs  933504 #E3E80 -  1645
=ABORTN  Abs  930173 #E317D -   157   149  2071
=ABORTW  Abs  933410 #E3E22 -  1598   150  1067  1386  2072
 ABR00   Abs  933519 #E3E8F -  1648
=ABRT"X  Abs  932999 #E3C87 -  1455  1365
 ABRT0   Abs  933624 #E3EF8 -  1674  1663
 ABRT1   Abs  933524 #E3E94 -  1650
```

```
 ABS      Ext                    -  2041
 ABXX     Abs  933069 #E3CCD     -  1476  1457  1600
=ACTIV    Abs  933465 #E3E59     -  1613
 ADD      Ext                    -  1355  2010  2024
=AGAIN    Abs  932364 #E3A0C     -  1187
 ALLOT    Ext                    -  1341
=ALOTB    Abs  932713 #E3B69     -  1339
 AND      Ext                    -  1661
 AT       Ext                    -   292  1314  1353  1384  1411  1412  1434  1484
                                    1668  1670  1890  1952  1956  1967  1972  1981
                                    1991  2013  2046  2049  2052  2055  2081  2085
 AVMEME   Ext                    -   440   456
 BAD      Abs  932232 #E3988     -  1123  1097
 BAD0     Abs  932242 #E3992     -  1126  1121
 BASEND   Abs  933129 #E3D09     -  1492  1486
=BASIC    Abs  935345 #E45B1     -  2273  1483
=BASIC?   Abs  933089 #E3CE1     -  1482  1471  1648
 BEFLT    Abs  933823 #E3FBF     -  1759  1751  1755
=BEGIN    Abs  932339 #E39F3     -  1173
 BL       Ext                    -  1408  1714
 BLK      Ext                    -  2045  2061  2097
 BLK00    Abs  934322 #E41B2     -  1960  1985
 BLK1     Abs  934467 #E4243     -  1989  1959
 BLK10    Abs  934412 #E420C     -  1978  1963
 BLK2     Abs  934572 #E42AC     -  2016  1995
=BLOCK    Abs  934267 #E417B     -  1949
 BRNCH    Ext                    -  1065  1191  1473  1608  1919
 BSCRTN   Ext                    -  1491
 BSERR    Ext                    -   395
=BTFERR   Abs  933178 #E3D3A     -  1511  1488
 BUFFR    Ext                    -  1968
 C!       Ext                    -   160   298
 C,       Ext                    -  1155
 CAT      Ext                    -  1459  1467  1602  1658  1690  1694  1954  1979
 CLALL    Ext                    -  1427
=CLEAN    Abs  933534 #E3E9E     -  1655  1428
=CLEANX   Abs  932904 #E3C28     -  1423  1443  1647
 CLOSEF   Ext                    -  2168
 CLOSF    Ext                    -  2082
=CM3      Abs  931416 #E3658     -   764   757
 CMOV>    Ext                    -  2243
=CMOVE    Abs  932607 #E3AFF     -  1280  2238
 CMPST-   Ext                    -   200   210
 COMMA    Ext                    -  1078  1158  1194  1219  1263  1923
 COMPL    Ext                    -  1058  1060  1062  1064  1151  1190  1215  1259
                                    1918
 CONT     Abs  933906 #E4012     -  1801  1752  1756
 CONTX    Ext                    -  1410
=COUNT    Abs  931670 #E3756     -   882
 CR       Ext                    -  1685
 CURR     Ext                    -  1669
 DEFIN    Ext                    -  1426
=DEPTH    Abs  933971 #E4053     -  1832
 DIG20    Abs  931561 #E36E9     -   834   847
 DIG25    Abs  931586 #E3702     -   843   849
```

```
 DIG30    Abs  931591 #E3707 -   845   828
 DIG40    Abs  931601 #E3711 -   848   831   838
=DIGIT    Abs  931518 #E36BE -   820
 DOATN    Ext              -  1807  1817
 DOCOL    Ext              -    66   133   157   290   337   385   509  1057
                            1148  1173  1187  1211  1235  1255  1307  1339
                            1348  1382  1407  1423  1432  1455  1482  1598
                            1645  1655  1684  1713  1832  1855  1888  1910
                            1949  2040  2207  2230  2257
 DODOES   Ext              -  1157
=DOES>    Abs  932267 #E39AB -  1148
 DOLEV    Abs  932112 #E3910 -  1081  1066
 DOLEV0   Abs  932156 #E393C -  1094  1113
 DOLEV1   Abs  932183 #E3957 -  1105  1103
 DOUSE    Ext              -    89   908   923   935   951   972   989  1006
                            1024  1041  2274
 DP       Ext              -  1351  1666
 DROP     Ext              -   303  1674  1699  1964
 DUP      Ext              -   158   293  1349  1352  1657  1665  1687  1693
                            1953  1969  1978  1986  1989  2002  2007
 EMIT     Ext              -  1695  1715
 EMS01    Abs  933305 #E3DB9 -  1556  1538
 EMS02    Abs  933353 #E3DE9 -  1570  1567
=EMSG     Abs  933226 #E3D6A -  1529  1470
=ENDOF    Abs  934170 #E411A -  1910
=ENT      Abs  930702 #E338E -   398   386
 ENT0     Abs  930765 #E33CD -   436   421
 ENT01    Abs  930897 #E3451 -   482   488
 ENT02    Abs  930885 #E3445 -   477   474
 ENT1     Abs  930825 #E3409 -   456   448
 ENT2     Abs  930918 #E3466 -   490   466   483
=ENTER    Abs  930662 #E3366 -   385
 EOF      Ext              -  2075
 ERR      Abs  930682 #E337A -   390   445
 ERR#     Ext              -  1497
 ERR1     Abs  930695 #E3387 -   395   392
=ERRTST   Abs  932944 #E3C50 -  1432  1462  1604  1646
 ET0      Abs  932984 #E3C78 -  1440  1437
 EXEC     Ext              -  1438
 EXPCT    Ext              -  1309
=F.AND    Abs  930955 #E348B -   509
 FAIL     Abs  931161 #E3559 -   639   618
 FAL      Abs  935023 #E446F -  2148  2169
=FENCE    Abs  931753 #E37A9 -   921
 FF1      Abs  930255 #E31CF -   177   175
 FF2      Abs  930271 #E31DF -   182   180
=FFIND    Abs  930106 #E313A -   133
=FILFND   Abs  930218 #E31AA -   168   143
=FIND>    Abs  930990 #E34AE -   560  1413
 FINDF    Ext              -   173
=FIRST    Abs  931901 #E383D -  1004   291
 FIVE-    Ext              -  1072  1664
 FLU0     Abs  930517 #E32D5 -   296   302
=FLUSH    Abs  930487 #E32B7 -   290  1429
 FNAME    Ext              -   142   146
```

```
 FND000   Abs  931023 #E34CF -   579   596
 FND001   Abs  931051 #E34EB -   591   611   673
 FND01    Abs  931147 #E354B -   634   672
 FND1     Abs  931222 #E3596 -   667   676
 FOK      Abs  935048 #E4488 -  2157  2142
 FORSTK   Ext                -   438   457
 FOUR+    Ext                -  2214
=FROP     Abs  930038 #E30F6 -   107
=FSTR$    Abs  929958 #E30A6 -    66
 FSX      Abs  930146 #E3162 -   146   141
 FSYNTX   Ext                -   135
 GET01    Abs  934967 #E4437 -  2129  2135
 GETFP    Ext                -   116   178   272   449   500  1117  1123  1574
                              1586  2150  2178
=GETPTR   Abs  935138 #E44E2 -  2189
 GT       Ext                -  1364
 GTDONE   Abs  934988 #E444C -  2136  2131
 GTPTRX   Ext                -  2192
 GTS13    Ext                -  1570
 HERE     Ext                -   159   161  1069  1175  1192  1217  1261  1264
                              1605  1686  1920
 I/OCON   Ext                -   275
 I/OEXP   Ext                -   268
 I/Obuf   Abs      10 #0000A -  2186  2190
 I>=L     Abs  933812 #E3FB4 -  1755  1750
=IALLOT   Abs  932733 #E3B7D -  1348
 IF       Ext                -  1236
 IN       Ext                -  1311  2048  2058  2094
 INTRP    Ext                -  2079
=IOCON    Abs  930365 #E323D -   229
 IOEC1    Abs  930455 #E3297 -   275   267
 IOEC2    Abs  930444 #E328C -   272   279
 IOECO    Abs  930401 #E3261 -   254   233
=IOEXP    Abs  930394 #E325A -   250
 IOFAIL   Abs  930465 #E32A1 -   278   269
 Iram     Abs      11 #0000B -  2187  2191
=LASTX    Abs  930620 #E333C -   337
 LATE     Ext                -  1656  1891
=LEFT$    Abs  935320 #E4598 -  2257
=LEV      Abs  932000 #E38A0 -  1057
=LIMIT    Abs  931934 #E385E -  1022
=LINE#    Abs  931967 #E387F -  1039  2017  2054  2064  2088
 LIT      Ext                -   147   338  1073  1153  1156  1357  1659  1836
                              1893  1915  1930  1975  2008  2022  2042  2208
=LOADF    Abs  934624 #E42E0 -  2040
 LOCFIL   Ext                -  2158
 LOD0     Abs  934786 #E4382 -  2075  2070
 LOD1     Abs  934811 #E439B -  2080  2078
 LSTCHR   Abs  931241 #E35A9 -   675   660
 LT       Abs  933840 #E3FD0 -  1766  1749  2233
 M*       Ext                -  1857
 M/       Ext                -  1859
=M/MOD    Abs  934080 #E40C0 -  1873
 MAT00    Abs  931196 #E357C -   654   662
 MATCH    Abs  931180 #E356C -   647   608   631   638
```

```
 MATCH1  Abs  931069 #E34FD -   603   589
 MFERsp  Abs   37901 #0940D -     9  1585
 MIN     Ext                -  2044
 MINUS   Ext                -  1193  1218  1262  1363  1835  1895  1957  1977
                               1982  1993
=MOVSET  Abs  931430 #E3666 -   774   742
 MVCN1   Abs  931442 #E3672 -   779   775
 NFIL0   Abs  929924 #E3084 -    47    50
 NFIL1   Abs  929939 #E3093 -    52    44
=NFILL   Abs  929889 #E3061 -    34
 NIB7    Ext                -   400
=NMOVE   Abs  931348 #E3614 -   738
 NMOVE0  Abs  931359 #E361F -   742  1284
=NMOVE1  Abs  931363 #E3623 -   747   754
 NMOVE2  Abs  931388 #E363C -   755   748
 NMOVE3  Abs  931391 #E363F -   756   763
=NULL$   Abs  935171 #E4503 -  2207
=OKFLG   Abs  931802 #E37DA -   949
 OKFOK   Abs  935093 #E44B5 -  2171  2166
 ONE     Ext                -    68   164  1176  1188  1213  1607  1672  1973
                               2014  2060  2258
 ONE-    Ext                -  1839
=ONERR   Abs  931835 #E37FB -   971  1433
 OPENF   Ext                -  2141
=OPNF    Abs  934928 #E4410 -  2118  2067
 OR      Ext                -   513
 OVER    Ext                -    69   297  1070
=OVER2   Abs  931307 #E35EB -   708
 PAD     Ext                -  2210  2213
 PBUF    Ext                -   299  1960
 PFA     Ext                -  1892
 PILERR  Ext                -   387
=PLOOP   Abs  932530 #E3AB2 -  1255
 POLL    Ext                -   443  1562
 PREV    Ext                -   294  1951  1987  2084
 PSTOR   Ext                -  1367
 QCSP    Ext                -  1149
=QUERY   Abs  932641 #E3B21 -  1307
 QUIT    Ext                -  1439  1444  1650
 R/W     Ext                -  1974  2015
 R<RSTK  Ext                -  2139
 R>      Ext                -  1059  1061  1354  1476  1858  1889  2016  2087
                               2090  2093  2096
 R@      Ext                -  1458  1466  1601  1965  1970  1992  2004  2011
 RCL     Ext                -   340
=REND3   Abs  935361 #E45C1 -  2276
=ROM;C   Abs  934103 #E40D7 -  1888
 ROT     Ext                -  2231  2237  2242
 RSTK<R  Ext                -  2149  2177
 Random  Abs        9 #00009 -  2185  2189
 S-R0-3  Ext                -   429
 S0      Ext                -  1356  1833
 SAMSGN  Abs  933866 #E3FEA -  1777  1772
 SAVEFP  Ext                -   108   169   255  1083  1530  1578  2120
 SCFIB   Ext                -  1955  1966  1971  1980  2012  2051  2080  2091
```

```
 SCRTCH  Ext                  -  2126  2140
 SEMI    Ext                  -    71   144   165   304   341   388   515  1079
                               1159  1177  1195  1220  1240  1266  1317  1342
                               1368  1390  1414  1430  1440  1479  1492  1651
                               1675  1701  1716  1840  1860  1897  1932  2025
                               2099  2216  2239  2244  2261
=SETERN  Abs  933134 #E3D0E -  1496  1460  1603
 SETLEV  Ext                  -  1265
 SETNAM  Ext                  -   134
 SETROM  Abs  931096 #E3518 -   614   594
 SMOV1   Abs  935283 #E4573 -  2241  2235
=SMOVE   Abs  935233 #E4541 -  2230   163
 SP!     Ext                  -  1424  1487
 SP@     Ext                  -  1834
=SPACE   Abs  933741 #E3F6D -  1713  1700
 SPAN    Ext                  -  1313
=STATE   Abs  931868 #E381C -   987  1383
 STKDRP  Ext                  -   112
 STOP    Abs  933930 #E402A -  1810  1753  1757
 STORE   Ext                  -   295  1071  1076  1312  1316  1667  1671  1896
                               1988  2006  2018  2059  2062  2065  2086  2089
                               2092  2095  2098  2211
 SUB$    Ext                  -    70  2260
 SUC01   Abs  931252 #E35B4 -   681
 SUCC    Abs  930440 #E3288 -   270   276
 SUCESS  Abs  931246 #E35AE -   678
 SWAP    Ext                  -   511  1075  1689  1924  2005  2236  2241  2259
=SWAP2   Abs  931624 #E3728 -   861
 TABLE   Ext                  -   625
 THEN    Ext                  -  1928
 THREE   Ext                  -  1257
 TIB     Ext                  -  1308
 TWO     Ext                  -  1926
 TWO*    Ext                  -  1340
 TWO+    Ext                  -   162  1239  1477  1688  1696  1990  2003
=UNTIL   Abs  932426 #E3A4A -  1211
=VARID   Abs  930005 #E30D5 -    88
=VOC-L   Abs  931769 #E37B9 -   934
 WH01    Abs  933679 #E3F2F -  1693  1698
=WHERE   Abs  933634 #E3F02 -  1684
=WHILE   Abs  932493 #E3A8D -  1235
=WIDTH   Abs  931720 #E3788 -   906
 WORD    Ext                  -  1409
=X<=Y?   Abs  930293 #E31F5 -   199
=X=>Y?   Abs  930329 #E3219 -   209
 XDO     Ext                  -  1692
=XLOOP   Abs  933873 #E3FF1 -  1787  1697
 XLP0    Abs  933933 #E402D -  1812  1800
 XLP00   Abs  933890 #E4002 -  1795
 XSTR$   Ext                  -    67
 XXYY    Ext                  -   202   212
 ZBRNH   Ext                  -   140   301  1216  1436  1456  1485  1599  1662
                               1958  1962  1984  1994  2069  2077  2234
 ZEQ     Ext                  -   300   510   512   514  1385  1961  1983  2068
                               2076
```

ZERO	Ext		-	296	1077	1310	1464	1691	1922	2057	2063
				2083	2215						
eMEM	Ext		-	393							
pENTER	Abs	18 #00012	-	8	444						
pERROR	Ext		-	1563							

Input Parameters

  Source file name is MR&FT3

  Listing file name is MR/FT3

  Object file name is MR%FT3::65

                                  111111
                        0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News

```
 1                      TITLE  FT4:_SIX_CHAR_WORDS
 2                      RDSYMB MR%GTO
 3                      RDSYMB NZ%SYM
 4 E4600                ABS    #E4600
 5                 ************************************************
 6                 *
 7                 * MR&FT4      <840608.1403>
 8                 *
 9                 * START OF 6 CHAR WORDS
10                 * ADD ADDITIONAL WORDS AT THIS END
11                 *
12                 ************************************************
```

```
13                      EJECT
14                    ********************************************************
15                    *
16                    * NALLOT  (n --- )  Add n NIBS to the parameter field
17                    *        of the most recently defined word.
18                    *
19                    *        Although its not standard FORTH we have
20                    * changed NALLOT to try and protect users from ruining
21                    * their dictionary and data stack.  Before alloting
22                    * any additional space in the dictionary we make sure
23                    * that the current DP setting allows for the entire
24                    * data stack (40 entries or 200 nibs) and the PAD area
25                    * (90 nibs) plus the # nibs to be alloted.
26                    *
27                    ********************************************************
28
29 E4600 0000          CON(5)  0               NO MORE 6 CHAR WORDS
          0
30 E4605 68    =!ALLOT CON(2)  #86             ALLOT
31 E4607 E414          NIBASC  \NALLO\
          C4C4
          F4
32 E4611 4D            CON(2)  \T\+#80
33
34 E4613 0000  =ALLOT  CON(5)  =DOCOL          :
          0
35 E4618 0000          CON(5)  =LIT
          0
36 E461D 93CF          CON(5)  =oALLOT         VECTOR FOR ALLOT
          2
37 E4622 0000          CON(5)  =AT             CFA TO USE
          0
38 E4627 0000          CON(5)  =EXEC           EXECUTE
          0
39 E462C 0000          CON(5)  =SEMI           ;
          0
```

```
40                      EJECT
41                  ************************************************
42                  *
43                  * FACTS ABOUT BASICI/BASICF/BASIC$
44                  *
45                  *       Do not confuse them with BASICX; BASICX executes
46                  * a statement via LINEPARSE: it finishes by returning
47                  * to the main loop, and it returns nothing to the
48                  * math stack. These words call the expression-execution
49                  * subroutine, essentially doing the VAL function to
50                  * return a number to the math stack.
51                  *       Control normally returns directly from expression-
52                  * execution and requires no poll handling as does BASICX.
53                  * However control will not return in the case of an
54                  * error or various oddities which can occur with user-defined
55                  * functions. The main loop- and error-poll handlers recognize
56                  * that one of these words is in progress by seeing ACTIVE=2.
57                  *
58                  *
59                  ************************************************
60                  *
61                  * BASICI ( str --- )  This word returns the value
62                  *       of the specified variable(s) to the
63                  *       FORTH data stack.  The user may also
64                  *       return the value of a variable expression
65                  *       (i.e.  " A4*B6/Z4").
66                  *
67                  ******************************************************
68 E4631 5064              CON(5) =!ALLOT
       E
69
70 E4636 68       =!BASI   CON(2) #86
71 E4638 2414             NIBASC \BASIC\
         3594
         34
72 E4642 9C               CON(2) \I\+#80
73 E4644 9464     =BASI   CON(5) $BASI
       E
74
75 E4649 7F70     $BASI   GOSUB  FLOT           see comments below
76 E464D 7A31             GOSUB  GETF#
77 E4651 AFA              A=C    W              VALUE TO A
78 E4654 7510             GOSUB  FLTOH
79 E4658 8F00             GOSBVL =COLLAP        COLLAPSE MTH STK
         000
80                  *                           FOR FUTURE BASIC CALLS
81 E465F 8E00             GOSUBL =GETFP
         00
82 E4665 1C4              D1=D1- 5              PUT 1 ITEM ON STACK
83 E4668 141              DAT1=A A              WRITE NEW VALUE
84 E466B 03               RTNCC
85
86 E466D 8F00     =FLTOH  GOSBVL =FLTDH         TURN TO AN INTEGER
         000
87 E4674 831              ?XM=0                 OKAY?
```

```
 88 E4677 00            RTNYES
 89 E4679 20            P=     0
 90 E467B 3400          LC(5)  =eOVFLW        GIVE OVERFLOW MESSAGE
          000
 91 E4682 8D00          GOVLNG =MFERR
          000
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
 92                     EJECT
 93                 ************************************************
 94                 *
 95                 * BASICF ( str --- )  This word returns the value
 96                 *       of the specified variable(s) to the
 97                 *       floating point stack.  The user may also
 98                 *       return the value of a variable expression
 99                 *       (i.e.  " A4*B6/Z4").
100                 *
101                 ************************************************************
102 E4689 6364             CON(5)  !BASI
        E
103 E468E 68       =!BASF  CON(2) #86
104 E4690 2414           NIBASC \BASIC\
        3594
        34
105 E469A 6C             CON(2) \F\+#80
106 E469C 1A64 =BASF     CON(5) $BASF
        E
107
108 E46A1 7720 =$BASF    GOSUB  FLOT              see below for details!
109 E46A5 72E0           GOSUB  GETF#
110 E46A9 8E00           GOSUBL =STKLFT           GET READY FOR PUSH
        00
111 E46AF 1B0D           D0=(5) =oX
        BF2
112 E46B6 11B            C=R3
113 E46B9 1547           DAT0=C W                 WRITE # TO X REGISTER
114 E46BD 8F00           GOSBVL =COLLAP           COLLAPSE MTH STK
        000
115 E46C4 8E00           GOSUBL =GETFP
        00
116 E46CA 03             RTNCC
117
118
119 E46CC 179  FLOT      D1=D1+ 10                POP STRING
120 E46CF 8E00           GOSUBL =SAVEFP           SAVE FORTH POINTERS
        00
121 E46D5 1BC0           D0=(5)  =ACTIVE
        BF2
122 E46DC 3420           LC(5)   2              SET ACTIVE TO 2 IN CASE OF
        000
123                 *                           PAUSE IN USER-DEFINED FUNCTION
124 E46E3 144            DAT0=C  A
125 E46E6 1C9            D1=D1- 10                BUT POINT TO STR NOW
126 E46E9 147            C=DAT1 A                 C(A)=CHAR COUNT OF STRING
127 E46EC 8AE            ?C#0   A                 ANY CHARS IN STRING?
128 E46EF 21             GOYES  FLOT0             YES!
129 E46F1 20   eIVerr    P=     0
130 E46F3 3400           LC(5)  =eDATTY           GIVE DATATYPE MF ERROR
        000
131 E46FA 8D00           GOVLNG =MFERR
        000
132
133 E4701 109  FLOT0     R1=C                     SAVE IN R1
```

```
134 E4704 C6          C=C+C  A            C(A)=NIB COUNT OF STRING
135 E4706 174         D1=D1+ 5
136 E4709 143         A=DAT1 A            ADDRESS OF STRING
137 E470C 102         R2=A                SAVE IN R2
138 E470F 1B00        D1=(5) =MTHSTK
          000
139 E4716 143         A=DAT1 A            A(A)=TOP OF STACK
140 E4719 131         D1=A                D1-->TOS
141 E471C EA          A=A-C  A
142 E471E 20          P=     0
143 E4720 3421        LC(5)  18           16 NIBS FOR STRING HEADER
          000
144               *                       AND 2 NIBS FOR TRAILING
145               *                       CARRIAGE RETURN
146 E4727 EA          A=A-C  A            TOS-STRING SPACE
147 E4729 1B00        D0=(5) =AVMEMS
          000
148 E4730 146         C=DAT0 A            BOTTOM OF STACK
149 E4733 8B6         ?A>C   A            ENOUGH MEMORY?
150 E4736 90          GOYES  FL0
151 E4738 8D00        GOVLNG =MEMERR      REPORT MEMORY ERROR
          000
152
153 E473F 111  FL0    A=R1                RECOVER CHAR CNT
154 E4742 11A         C=R2                RECOVER STRING ADDR
155 E4745 134         D0=C                D0--->STRING
156 E4748 CC          A=A-1  A            PRIME COUNTER FOR JUMP TEST
157
158               *
159               * NOTE:  THE STRING IS BEING WRITTEN TO THE MATH STACK
160               *        REVERSED (JUST THE WAY THEY LIKE 'EM)
161               *
162
163 E474A 14E  FL1    C=DAT0 B            READ BYTE FROM SOURCE
164 E474D 161         D0=D0+ 2            POINT TO NEXT BYTE
165 E4750 1C1         D1=D1- 2
166 E4753 14D         DAT1=C B            WRITE BYTE TO STACK
167 E4756 CC          A=A-1  A            DECREMENT COUNTER
168 E4758 51F         GONC   FL1          GET ANOTHER
169
170 E475B 1C1         D1=D1- 2            GET READY FOR CR
171 E475E 31D0        LC(2)  #0D          CARRIAGE RETURN
172 E4762 14D         DAT1=C B            WRITE CARRIAGE RETURN TO STACK
173 E4765 AF2         C=0    W
174 E4768 1C8         D1=D1- 9
175 E476B 15D8        DAT1=C 9            WRITE 9 0'S (PART OF HEADER)
176 E476F 1C4         D1=D1- 5
177 E4772 111         A=R1
178 E4775 E4          A=A+1  A            COUNT CARRIAGE RETURN
179 E4777 C4          A=A+A  A            NIB COUNT
180 E4779 141         DAT1=A A            WRITE OUT REST OF HEADER
181 E477C 31F0        LC(2)  #F
182 E4780 1C1         D1=D1- 2
183 E4783 14D         DAT1=C B
184 E4786 85A         ST=1   10            SET FOR VAL00
```

```
185 E4789 01          RTN
186           *
187           * EXAMPLE:  STRING = "HELLO"
188           *
189           * WHEN WE'RE DONE THE MATH STACK LOOKS LIKE THIS:
190           *
191           *  (LOW MEM) F0 A0000 000000000 D0 "OLLEH" (HIGH MEM)
192           *
193 E478B 8F00 GETF#   GOSBVL =VAL00        TURN STRING TO #
          000
194 E4792 84D         ST=0    13          CLEAR PRGM-RUNNING
195 E4795 1537        A=DAT1 W              READ #
196           * CHECK FOR COMPLEX
197 E4799 2F          P=      15
198 E479B 30E         LC(1)   14            CODE FOR COMPLEX
199 E479E 20          P=      0
200 E47A0 814         ASRC
201 E47A3 942         ?C=A    S           DON'T ALLOW IT
202 E47A6 D1          GOYES   eIVgo
203 E47A8 810         ASLC                RESTORE NUMBER IN REGISTER
204 E47AB 20          P=      0
205           * USE THIS OPPORTUNITY TO RESET ACTIVE TO 1
206 E47AD 1BC0        D0=(5)  =ACTIVE
          BF2
207 E47B4 D2          C=0     A
208 E47B6 E6          C=C+1   A
209 E47B8 144         DAT0=C  A
210 E47BB AF6         C=A     W           GET VALUE
211 E47BE 10B         R3=C                  SAVE IT
212 E47C1 01          RTN
213
214 E47C3 6D2F eIVgo  GOTO    eIVerr
215 E47C7 AC0  =SVSTAT A=0      S
216 E47CA 20          P=      0
217 E47CC 86D         ?ST=0   13          RUNNING
218 E47CF 80          GOYES   SS1
219 E47D1 B44         A=A+1   S
220 E47D4 84D         ST=0    13          CLEAR
221 E47D7 A44  SS1    A=A+A   S
222 E47DA 860         ?ST=0   =NoCont
223 E47DD 80          GOYES   SS2
224 E47DF B44         A=A+1   S
225 E47E2 840         ST=0    =NoCont
226 E47E5 A44  SS2    A=A+A   S
227 E47E8 100         R0=A
228 E47EB 3100        LC(2)   =flPRGM
229 E47EF 8F00        GOSBVL  =SFLAG?
          000
230 E47F6 110         A=R0
231 E47F9 561         GONC    SS3
232 E47FC B44         A=A+1   S
233 E47FF 100         R0=A
234 E4802 3100        LC(2)   =flPRGM
235 E4806 8F00        GOSBVL  =SFLAGC
          000
```

```
236 E480D 110          A=R0
237 E4810 A44  SS3     A=A+A   S
238 E4813 3100         LC(2)   =flSUSP
239 E4817 100          R0=A
240 E481A 8F00         GOSBVL  =SFLAG?
          000
241 E4821 110          A=R0
242 E4824 561          GONC    SS4
243 E4827 B44          A=A+1   S
244 E482A 100          R0=A
245 E482D 3100         LC(2)   =flSUSP
246 E4831 8F00         GOSBVL  =SFLAGC
          000
247 E4838 110          A=R0
248 E483B 3438 SS4     LC(5)   =oPSTAT
          CF2
249 E4842 136          CD0EX
250 E4845 810          ASLC                    PUT NIBBLE IN A[0]
251 E4848 140          DAT0=A  A
252 E484B 136          CD0EX
253 E484E 01           RTN
```

```
                        EJECT

                *************************************************
                *
                * BASIC$
                *
                * SAME IDEA AS BASICF AND BASIC BUT GETS A STRING
                *
                *************************************************
E4850 E864E             CON(5)  =!BASF
E4855 68        =!BAS$  CON(2)  #86
E4857 2414              NIBASC  \BASIC\
      3594
      34
E4861 4A                CON(2)  \$\+#80
E4863 00000     =BASIC$ CON(5)  =DOCOL
E4868 BD84E             CON(5)  =B$SUB          LEAVE LEN &ADDR ON STACK
                * NOW MOVE IT TO PAD FROM BASIC MATH STACK
E486D 00000             CON(5)  =DUP            STR LEN LEN
E4872 00000             CON(5)  =>R             STR LEN::LEN
E4877 00000             CON(5)  =PAD
E487C 00000             CON(5)  =TWO+
E4881 00000             CON(5)  =TWO+
E4886 00000             CON(5)  =SWAP           STR PAD+4 LEN
E488B 00000             CON(5)  =CMOVE          PUT STR ON PAD
E4890 00000             CON(5)  =R>             LEN
E4895 00000             CON(5)  =DUP            LEN LEN
E489A 00000             CON(5)  =LIT
E489F 05000             CON(5)  80
E48A4 00000             CON(5)  =MAX          TAKE MAX(LEN,80)
                *
E48A9 00000             CON(5)  =PAD            LEN MAX PAD
E48AE 00000             CON(5)  =C!             STORE MAXLEN
E48B3 00000             CON(5)  =PAD            LEN PAD
E48B8 00000             CON(5)  =TWO+           LEN PAD+2
E48BD 00000             CON(5)  =2DUP           LEN PAD+2 LEN PAD+2
```

```
          0
288 E48C2 0000          CON(5)  =C!             STORE LEN
          0
289 E48C7 0000          CON(5)  =TWO+           LEN PAD+4
          0
290 E48CC 0000          CON(5)  =SWAP
          0
291 E48D1 08A4          CON(5)  =CLAP           COLLAPSE MTH STK
          E
292 E48D6 0000          CON(5)  =SEMI
          0
293
294 E48DB 0E84 =B$SUB   CON(5)  =$BSUB
          E
295 E48E0 78ED =$BSUB   GOSUB   FLOT
296 E48E4 7350          GOSUB   VAL0$           D1-->STR,AFTER HEADER
297 E48E8 84D           ST=0    13            MAKE SURE PRGM RUN FLG CLEAR
298 E48EB 20            P=      0
299 E48ED 133           AD1EX
300 E48F0 131           D1=A
301 E48F3 1CD           D1=D1-  14              POINT TO LEN
302 E48F6 AE2           C=0     W
303 E48F9 147           C=DAT1  A               C=LEN
304             * ONLY RETURN 255 CHARS MAX
305             * SINCE FORTH STRINGS HAVE 1-BYTE LENGTH FIELD
306 E48FC D7            D=C     A
307 E48FE 34EF          LC(5)   510             255*2
          100
308 E4905 8B3           ?D>C    A
309 E4908 40            GOYES   BSU1
310 E490A DB            C=D     A
311 E490C 81E  BSU1     CSRB                    NIBS-->CHARS
312 E490F 109           R1=C
313             * RESET ACTIVE TO 1
314 E4912 1BC0          D0=(5)  =ACTIVE
          BF2
315 E4919 D2            C=0     A
316 E491B E6            C=C+1   A
317 E491D 144           DAT0=C  A
318 E4920 8E00          GOSUBL  =GETFP
          00
319 E4926 119           C=R1
320 E4929 1C4           D1=D1-  5
321 E492C 141           DAT1=A  A               PUT ON STRADDR
322 E492F 1C4           D1=D1-  5
323 E4932 145           DAT1=C  A               PUT ON LEN
324 E4935 03            RTNCC
325
326             =ValSub EQU     10              Indicates VAL is used as a sub
327             *
328             *
329 E4937 6B8E  VALERR GOTO   eIVgo
330             ********************************************************************
331              Return EQU     0
332 E493B 850   =VAL0$  ST=1   Return
```

```
333 E493E 8F00          GOSBVL =XXHEAD          Remove string header, set up for ST
          000
334 E4945 31D0          LCHEX  0D               Carriage return
335 E4949 8F00          GOSBVL =STKCHR          Append CR to end of string
          000
336 E4950 8F00          GOSBVL =ADHEAD           Put on new string header
          000
337 E4957 8F00          GOSBVL =REVPOP          Reverse string, pop it, C=D0
          000
338 E495E 1B00          D0=(5) =FUNCD1
          000
339 E4965 144           DAT0=C A                Save old D0 in FUNCD1
340 E4968 102           R2=A                    Save string length in R2
341 E496B 8F00          GOSBVL =R<RSTK          Save an RSTK level
          000
342 E4972 8F00          GOSBVL =EXCPAR          Call Execution EXPPAR
          000
343             *       ?ST=0  ValSub           VAL used as a sub?
344             *       GOYES  VAL01            No, then skip
345 E4979 3100          LC(2)  =tEOL
346 E497D 966           ?A#C   B                Is expression followed by CR?
347 E4980 7B            GOYES  VALERR           No, then error
348 E4982 870           ?ST=1  0                Valid expression?
349 E4985 2B            GOYES  VALERR           No, then error
350 E4987 873  VAL01    ?ST=1  3                STRING expression?
351 E498A DA            GOYES  VALERR           No, then error
352 E498C 3100          LC(2)  =tEOL
353 E4990 8F00          GOSBVL =OUTBYT          Append EOL token to expression
          000
354 E4997 DB            C=D    A                C(A)=(MTHSTK)
355 E4999 112           A=R2                    Recall string length
356 E499C C2            C=C+A  A                Add string length
357 E499E 135           D1=C                    D1=(Stack pointer)
358             * Prepare to move code buffer onto stack
359 E49A1 132           ADOEX                   A(A)=End of Source
360 E49A4 11B           C=R3                    C(A)=Start of Source
361 E49A7 8F00          GOSBVL =MOVED2          Move output buffer to stack
          000
362 E49AE 137           CD1EX                   C(A)=Start of dest
363 E49B1 1B00          D0=(5) =MTHSTK
          000
364 E49B8 144           DAT0=C A                Write out pointer to code buffer
365 E49BB 8F00          GOSBVL =RSTK<R
          000
366             * Save two RSTK levels and old D0(program PC) on GOSUB stack
367 E49C2 D2            C=0    A
368 E49C4 3121          LC(2)  18               18 nibbles
369 E49C8 D5            B=C    A                B(A)=Amount memory needs to open up
370 E49CA 22            P=     2
371             *                                Adjust 3 pointers (AVMEME,TFORN,GS
372 E49CC 1A00          D0=(4) =GSBSTK
          00
373             *                               D0 points at last ptr (GSBSTK)
374 E49D2 8F00          GOSBVL =PSHSTK
          000
```

```
375 E49D9 AF2          C=0    W
376 E49DC A7E          C=C-1  W
377 E49DF 1557         DAT1=C W          Write out 3 "F" GOSUB stack entry t
378 E49E3 170          D1=D1+ 1          Skip first entry type
379 E49E6 07           C=RSTK
380 E49E8 145          DAT1=C A          Save an RSTK level
381 E49EB 175          D1=D1+ 6          Point to next entry
382 E49EE 07           C=RSTK
383             *      ?C#0   A          Is this an unused stack level?
384             *      GOYES  VAL10      No, then okay
385             *      C=C+1  A          Yes, then don't leave it zero
386             *VAL10
387 E49F0 145          DAT1=C A          Save another RSTK level
388 E49F3 175          D1=D1+ 6          Point to next entry
389 E49F6 1B00         D0=(5) =FUNCD1
          000
390 E49FD 146          C=DAT0 A          Recall old D0(program PC)
391 E4A00 145          DAT1=C A          Save old D0(program PC)
392 E4A03 1A00         D0=(4) =MTHSTK
          00
393 E4A09 146          C=DAT0 A
394 E4A0C 134          D0=C              Set PC at start of code buffer
395 E4A0F 135          D1=C              Set Stack pointer to end AVMEM
396 E4A12 8F00         GOSBVL =EXPR      Evaluate expression
          000
397 E4A19 163          D0=D0+ 4          EOL+18 nibbles on GOSUB stack take
398             *                        20 of nibbles, now move ahead
399             *                        4 more to point where stack item wi
400 E4A1C 136          CD0EX
401 E4A1F 10A          R2=C              Save address where stack item will
402 E4A22 1B00         D0=(5) =GSBSTK
          000
403 E4A29 142          A=DAT0 A
404 E4A2C 130          D0=A
405 E4A2F 166          D0=D0+ 7          Skip to second entry
406 E4A32 7B30         GOSUB  GETADR
407 E4A36 06           RSTK=C            Restore an RSTK level
408 E4A38 185          D0=D0- 6          Move back to first entry
409 E4A3B 7230         GOSUB  GETADR
410 E4A3F 06           RSTK=C            Restore another RSTK level
411 E4A41 16B          D0=D0+ 12         Now move to third entry
412 E4A44 7920         GOSUB  GETADR
413 E4A48 DA           A=C    A
414             *      R3=A              Save old D0(program PC) in R3
415 E4A4A 164          D0=D0+ 5
416 E4A4D 132          AD0EX             A(A)=End of save space
417 E4A50 D2           C=0    A
418 E4A52 3121         LC(2)  18         18 nibbles
419 E4A56 EE           C=A-C  A          C(A)=Start of save space
420 E4A58 22           P=     2
421             *                        Adjust 3 pointers(MTHSTK,TFORN,GSBS
422 E4A5A 8F00         GOSBVL =POPSTK    Discard save space on GOSUB stack
          000
423 E4A61 18E          D0=D0- 15                 Point at MTHSTK
424 E4A64 142          A=DAT0 A          Read (MTHSTK)
```

```
425 E4A67 131          D1=A
426 E4A6A 8D00         GOVLNG  =REVPOP
          000
427              * REVPOP RTNS ENDING VAL0$
428
429
430 E4A71 146   GETADR C=DAT0 A
431 E4A74 8AE          ?C#0   A
432 E4A77 00           RTNYES
433 E4A79 8D00         GOVLNG =CORUPT
          000
434              *---  LC(2)  =eMMCOR
435              *---  GOTO   =MPerr)
436
437              * COLLAPSE MATH STACK SO FUTURE CALLS DON'T HAVE EXTRA STUFF
438 E4A80 58A4 =CLAP   CON(5) =$CLAP
          E
439 E4A85 8E00 =$CLAP  GOSUBL =SAVEFP
          00
440 E4A8B 8F00         GOSBVL =COLLAP
          000
441 E4A92 8E00         GOSUBL =GETFP
          00
442 E4A98 03           RTNCC
```

```
443                     EJECT
444                 ************************************************
445                 *
446                 * MAKEBF    ( n --- addr  I/O buff#  true)
447                 *           ( n --- false                 )
448                 *
449                 *       This word finds the next available scratch
450                 * I/O buffer number and creates an I/O buffer n nibs
451                 * long.  n cannot be > 4095.  If successful, it returns
452                 * a true flag, the I/O buffer# and the address of the
453                 * beginning of data area in the buffer. If it fails
454                 * (n is too large, there are no more free buffer ids,
455                 * or not enough memory) it simply returns a false flag.
456                 *
457                 *
458                 * definition changed to make n=nibbles instead of bytes
459                 * 12/12/83 B.M.
460                 ************************************************************
461 E4A9A 5584          CON(5)  !BAS$
      E
462 E4A9F 68    =!IOMAK CON(2)  #86
463 E4AA1 D414          NIBASC  \MAKEB\
      B454
      24
464 E4AAB 6C          CON(2)  \F\+#80
465 E4AAD 2BA4 =IOMAKE CON(5)  $IOMAK
      E
466
467 E4AB2 8E00 $IOMAK  GOSUBL  =SAVEFP
      00
468 E4AB8 143         A=DAT1  A               READ # nibbles
469 E4ABB 34FF        LC(5)   #FFF            MAX SIZE ALLOWED!
      F00
470 E4AC2 8B6         ?A>C    A
471 E4AC5 14          GOYES   FAIL            TOO BIG!
472 E4AC7 DC          ABEX    A               SIZE TO B(A)
473 E4AC9 8F00        GOSBVL  =IOFSCR         GET NEXT FREE I/O #
      000
474 E4AD0 453         GOC     FAIL            DIDN'T WORK
475 E4AD3 D0          A=0     A
476 E4AD5 ABA         A=C     X
477 E4AD8 101         R1=A                    SAVE IN R1
478 E4ADB 8F00        GOSBVL  =I/OALL         ALLOCATE #NIBS FOR THIS ID
      000
479 E4AE2 532         GONC    FAIL            DIDN'T WORK
480 E4AE5 133         AD1EX                   DATA ADDR IN A(A)
481 E4AE8 8E00        GOSUBL  =GETFP          RESTORE FORTH ENVIRONMENT
      00
482 E4AEE 141         DAT1=A  A               WRITE DATA ADDR TO STACK
483 E4AF1 1C4         D1=D1-  5
484 E4AF4 119         C=R1
485 E4AF7 145         DAT1=C  A               WRITE I/O # TO STACK
486 E4AFA D2    SUCC  C=0     A
487 E4AFC CE          C=C-1   A               TRUE FLAG
488 E4AFE 1C4         D1=D1-  5
```

```
489 E4B01 145  MB0     DAT1=C  A           WRITE FLAG TO STACK
490 E4B04 03           RTNCC
491 E4B06 8E00 FAIL    GOSUBL  =GETFP
          00
492 E4B0C D2           C=0     A           FALSE FLAG
493 E4B0E 62FF         GOTO    MB0
```

```
494                     EJECT
495                 ***********************************************
496                 *
497                 * FINDBF  (n --- addr or 0)  n is the I/O buffer
498                 *       ID number.  This routine returns the
499                 *       address of the start of data in the
500                 *       specified I/O buffer or it returns a
501                 *       0 (false flag) if the buffer cannot be
502                 *       found.
503                 *
504                 ***********************************************
505 E4B12 F9A4      E       CON(5)  !IOMAK
506 E4B17 68        =!IOFIN CON(2)  #86
507 E4B19 6494      E444    NIBASC  \FINDB\
              24
508 E4B23 6C              CON(2)  \F\+#80
509 E4B25 A2B4      E       CON(5)  $IOFIN
510
511 E4B2A 8E00      00      $IOFIN  GOSUBL  =SAVEFP       SAVE FORTH ENVIRONMENT
512 E4B30 15F2              C=DAT1  3               READ I/O BUFF NUMBER
513 E4B34 8F00      000     GOSBVL  =IOFND0         FIND BUFFER
514 E4B3B 5AC               GONC    FAIL            NOT THERE!
515 E4B3E 133               AD1EX                   DATA ADDR TO A(A)
516 E4B41 8E00      00      GOSUBL  =GETFP          RESTORE FORTH ENVIRONMENT
517 E4B47 141       IOFIN0  DAT1=A  A               PUSH ADDR TO STACK
518 E4B4A 03                RTNCC                   AND RETURN!
```

```
519                     EJECT
520                 ************************************************
521                 *
522                 * KILLBF  (n --- t/f)  n is the ID# of an I/O buffer
523                 *       to be removed.  If the buffer is there, it
524                 *       is killed and true flag is returned to the
525                 *       user, else a false flag is returned.
526                 *
527                 ************************************************
528 E4B4C 71B4          CON(5)  !IOFIN
          E
529 E4B51 68    =!IOKIL CON(2)  #86
530 E4B53 B494        NIBASC  \KILLB\
          C4C4
          24
531 E4B5D 6C          CON(2)  \F\+#80
532 E4B5F 46B4 =IOKILL CON(5)  $IOKIL
          E
533 E4B64 8E00 $IOKIL  GOSUBL  =SAVEFP       SAVE FORTH ENVIRONMENT
          00
534 E4B6A 15F2         C=DAT1  3             READ ID NUMBER
535 E4B6E 8F00         GOSBVL  =I/ODAL       KILL BUFFER
          000
536 E4B75 509          GONC    FAIL          COULDN'T DO IT!
537 E4B78 8E00 IOK0    GOSUBL  =GETFP        RESTORE FORTH ENVIRONMENT
          00
538 E4B7E D0           A=0     A
539 E4B80 CC           A=A-1   A             true flag!
540 E4B82 44C          GOC     !OFINO        CARRY ALWAYS CLEAR,FINISH AT SUCC
```

```
541                     EJECT
542
543                 ****************************************************************
544                 *
545                 * UM/MOD    This is the new FORTH 83 name for the old U/
546                 *           routine.
547                 *
548                 * U/  (ud1  u2  --- u3  u4)  Divide double dividend (ud1) by
549                 *      single divisor put remainder (u3) and quotient (u4) onto
550                 *      data stack.
551                 *
552                 ****************************************************************
553 E4B85 15B4          CON(5)   !IOKIL
          E
554 E4B8A 68    =!UDIV  CON(2)  #86             UM/MOD
555 E4B8C 55D4          NIBASC  \UM/MO\
          F2D4
          F4
556 E4B96 4C            CON(2)  \D\+#80
557 E4B98 D9B4  =UDIV   CON(5)  =$UDIV
          E
558
559 E4B9D AF0   =$UDIV  A=0     W           A WILL BE DIVISOR
560 E4BA0 AF2           C=0     W           C         PARTIAL REMAINDERS
561 E4BA3 AF3           D=0     W           D         QUOTIENT
562 E4BA6 BF1           BSL     W
563 E4BA9 BF1           BSL     W           SAVE B[A], CLEAR B[B] FOR DIGIT COUNT
564 E4BAC 143           A=DAT1  A           GET DIVISOR
565 E4BAF 1519          C=DAT1  10          MSD OF DIVIDEND
566 E4BB3 179           D1=D1+  10
567 E4BB6 147           C=DAT1  A           LSD OF DIVIDEND
568 E4BB9 8AC           ?A#0    A           TEST FOR DIVISOR=0
569 E4BBC D0            GOYES   UDIV1
570 E4BBE D2            C=0     A           SET UP FOR ANSWER
571 E4BC0 072           GONC    UDIV4       B.E.T.
572 E4BC3 A74   UDIV0   A=A+A   W           2*I*DIVISOR
573 E4BC6 B6D           B=B+1   B           INC DIGIT COUNT
574 E4BC9 9FA   UDIV1   ?A<=C   W           MAXIMUM DIGIT YET?
575 E4BCC 7F            GOYES   UDIV0       LOOP IF NOT
576 E4BCE 531           GONC    UDIV3       B.E.T.
577 E4BD1 81C   UDIV2   ASRB                RIGHT SHIFT DIVISOR
578 E4BD4 A77           D=D+D   W           PREPARE QUOTIENT FOR NEXT TWO-CADE
579 E4BD7 9F6           ?A>C    W           THIS QUOTIENT DIGIT ZERO?
580 E4BDA 80            GOYES   UDIV3       JUMP IF SO
581 E4BDC B72           C=C-A   W           NEXT PARTIAL REMAINDER
582 E4BDF B77           D=D+1   W           QUOTIENT DIGIT IS ONE
583 E4BE2 A6D   UDIV3   B=B-1   B           DEC DIGIT COUNT
584 E4BE5 5BE           GONC    UDIV2       LOOP IF MORE
585 E4BE8 145   UDIV4   DAT1=C  A           WRITE REMAINDER
586 E4BEB AFB           C=D     W           GET QUOTIENT LSD
587 E4BEE 1C4           D1=D1-  5
588 E4BF1 145           DAT1=C  A           WRITE "       '
589 E4BF4 BF5           BSR     W
590 E4BF7 BF5           BSR     W           RESTORE B[A]
591 E4BFA 03            RTNCC
```

```
592                     EJECT
593                 ****************************************
594                 *
595                 * FENTER          41C STACK MANIPULATION
596                 *
597                 *  essentially does a stack lift.
598                 ****************************************
599 E4BFC A8B4          CON(5)   =!UDIV
          E
600 E4C01 68    =!FENTR CON(2)   #86
601 E4C03 6454          NIBASC   \FENTE\        FENTER
          E445
          54
602 E4C0D 2D            CON(2)   \R\+#80
603 E4C0F 41C4  =FENTR   CON(5)   =$FENTR
          E
604 E4C14 8E00  =$FENTR GOSUBL   =SAVEFP
          00
605 E4C1A 8E00          GOSUBL   =STKLFT
          00
606 E4C20 8E00          GOSUBL   =GETFP
          00
607 E4C26 03            RTNCC
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
608                EJECT
609             ************************************************************
610             *
611             * BASICX  ( str --- )  This routine passes the string
612             *       provided to the BASIC operating system for parsing
613             *       and execution.
614             *       Sets ACTIVE=3 so this state is recognized by
615             *       poll handlers. Control is given up to system -- we
616             *       get it back through the mainloop poll (see BASPOL in
617             *       MR/FT0).
618             *       Command string is put in an I/O-Buffer for LINEP to
619             *       execute from. This buffer is deallocated when we regain
620             *       control.
621             *
622             ************************************************************
623
624 E4C28 10C4          CON(5)  =!FENTR
          E
625 E4C2D 68    =!BASCX CON(2)  #86
626 E4C2F 2414         NIBASC  \BASIC\
          3594
          34
627 E4C39 8D         CON(2)  \X\+#80
628 E4C3B 0000 =BASICX CON(5)  =DOCOL
          0
629 E4C40 0000       CON(5)  =BASIC      oBASIC VARIABLE
          0
630 E4C45 0000       CON(5)  =AT
          0
631 E4C4A 0000       CON(5)  =ABORTW     IF FROM FORTHX
          0
632 E4C4F F3         CON(2)  =eBASCX
633 E4C51 A6C4       CON(5)  =BASCX
          E
634 E4C56 0000       CON(5)  =ONE
          0
635 E4C5B 0000       CON(5)  =ACTIV
          0
636 E4C60 0000       CON(5)  =STORE
          0
637 E4C65 0000       CON(5)  =SEMI
          0
638
639             ****************************************
640             * SAVE TWO LEVELS OF CPU RTN ON FORTH RTN
641             * WHICH MAY BE TRASHED BY THE BASIC O/S
642             * WHEN ITS EXECUTING THE GIVEN STRING
643
644 E4C6A F6C4 =BASCX  CON(5)  $BASCX
          E
645 E4C6F DC    $BASCX  ABEX    A
646 E4C71 132        ADOEX
647 E4C74 184        D0=D0-  5
648 E4C77 07         C=RSTK
649 E4C79 144        DAT0=C  A
```

```
650 E4C7C 184          D0=D0-  5
651 E4C7F 07           C=RSTK
652 E4C81 144          DAT0=C  A
653 E4C84 132          AD0EX
654 E4C87 DC           ABEX    A           NEW FORTH RTN STK
655 E4C89 8E00         GOSUBL  =SAVEFP
          00
656               *
657               * NOTE:  WHEN WE RETURN (IN MR%FT0) WE MUST GET
658               * RID OF 2 ITEMS ON THE DATA STACK WHICH WE ARE
659               * POPPING NOW BUT WHICH IS NOT REFLECTED LATER SINCE
660               * WE SAVED THE DATA STACK POINTER BEFORE THE POPS.
661               *
662 E4C8F 143          A=DAT1  A           GET STR LEN
663 E4C92 3406         LC(5)   96          MAXIMUM ALLOWED
          000
664 E4C99 8B2          ?A<C    A           IS THE NUMBER OK?
665 E4C9C 40           GOYES   BSX0        YES
666 E4C9E DE           ACEX    A           TAKE MAX OF 96
667 E4CA0 C4   BSX0     A=A+A   A           CHAR-->NIBS
668 E4CA2 3450         LC(5)   5
          000
669 E4CA9 CA           A=C+A   A               ADD 5 FOR LEN(3)&CR
670 E4CAB 101          R1=A                    SAVE LENGTH
671 E4CAE D8           B=A     A               LENGTH FOR I/OALL
672 E4CB0 8F00         GOSBVL  =IOFSCR         GET I/O BUFF # IN C[X]
          000
673 E4CB7 4C0          GOC     nom
674 E4CBA 8F00         GOSBVL  =I/OALL         ALLOCATE IT (LEAVE PTR IN D1)
          000
675 E4CC1 460          GOC     yesmem
676               *
677 E4CC4 60C0 nom     GOTO    nomem
678               *
679               * WE WANT TO SAVE BUFFER ID SO WE CAN KILL IT LATER
680               *
681 E4CC8 D0   yesmem  A=0     A               CLEAR FOR ID
682 E4CCA 816          CSRC                    ID IN C[1-3]-->C[X]
683 E4CCD ABA          A=C     X
684 E4CD0 102          R2=A                    R2=BUFFER ID
685 E4CD3 133          AD1EX                   A=PTR INTO BUFFER
686
687 E4CD6 20           P=      0               set ACTIVE to 3
688 E4CD8 1FC0         D1=(5)  =ACTIVE         which tells rest of FORTH
          BF2
689 E4CDF 3430         LC(5)   3               system that we are doing a
          000
690 E4CE6 145          DAT1=C  A               BASICX stmt.
691
692 E4CE9 8E00         GOSUBL  =GETFP          RESTORE PTRS FOR NMOVE
          00
693
694               * SAVE ID ON FORTH RTN STACK
695
696 E4CEF DC           ABEX    A
```

```
697 E4CF1 132          ADOEX
698 E4CF4 184          D0=D0-  5
699 E4CF7 11A          C=R2                GET ID
700 E4CFA 144          DAT0=C  A           PUT ON RTN STK
701 E4CFD 132          ADOEX
702 E4D00 DC           ABEX    A           PUT PTR BACK IN B
703             *
704             * NOTE: 3 THINGS IN ALL SAVED ON FORTH RTN STACK
705             *
706 E4D02 1BDF         D0=(5)  (=DSTKAD)       WHERE STK PTR SAVED
          AF_
707 E4D09 146          C=DAT0  A
708 E4D0C 137          CD1EX
709 E4D0F 179          D1=D1+  10              DROP STRING
710 E4D12 137          CD1EX
711 E4D15 144          DAT0=C  A
712 E4D18 164          D0=D0+  5               POINT TO RTN STK SAVE AREA
713 E4D1B D9           C=B     A
714 E4D1D 144          DAT0=C  A               STORE NEW RTN TOS
715 E4D20 8E00         GOSUBL  =GETFP
          00
716 E4D26 119          C=R1                    GET BACK LENGTH
717 E4D29 CE           C=C-1   A              SUBTRACT 3 FOR LENGTH FIELD
718 E4D2B CE           C=C-1   A
719 E4D2D CE           C=C-1   A
720 E4D2F 109          R1=C                    SAVE STR LENGTH
721 E4D32 133          AD1EX                   POINT INTO BUFFER
722 E4D35 1553         DAT1=C  X               3 NIB LENGTH FIELD ON STRING
723 E4D39 172          D1=D1+  3               POINT PAST IT
724 E4D3C 133          AD1EX                   PTR BACK IN A
725 E4D3F 1C9          D1=D1-  10              BACK UP TO LEAVE STR ADDR ON
726             *                              STACK AND READY FOR DEST ADDR
727 E4D42 141          DAT1=A  A               PUT DEST ADDR ON FORTH STACK
728 E4D45 100          R0=A                    SAVE ADDR FOR C IN CALL TO LINEP+
729 E4D48 1C4          D1=D1-  5
730 E4D4B C2           C=C+A   A               POINT TO END OF BUFFER
731 E4D4D CE           C=C-1   A
732 E4D4F CE           C=C-1   A               BACK UP A CHAR
733 E4D51 133          AD1EX                   SAVE D1
734 E4D54 135          D1=C
735 E4D57 31D0         LC(2)   #0D             CARRIAGE RTN
736 E4D5B 14D          DAT1=C  B               PUT CR AT END OF LINE
737 E4D5E 131          D1=A                    RESTORE D1
738 E4D61 111          A=R1                    GET LENGTH AGAIN
739 E4D64 CC           A=A-1   A               SUBTRACT 2 ADDED FOR CR BEFORE
740 E4D66 CC           A=A-1   A               ONLY MOVE THE STRING ITSELF
741 E4D68 141          DAT1=A  A               PUT LENGTH TO MOVE ON STK
742 E4D6B 8E00         GOSUBL  =$NMOVE     PUT STRING IN BUFFER
          00
743 E4D71 118          C=R0                    C=LINEPTR FOR LINEP+
744 E4D74 1B00         D0=(5)  =INBS
          000
745 E4D7B 144          DAT0=C  A
746 E4D7E 8D00         GOVLNG  =LINEP*         this entry doesn't do CRLF
          000
```

```
747
748 E4D85 3100 nomem   LC(2)    =eMEM
749 E4D89 8D00         GOVLNG   =MFERR
          000
```

```
750                     EJECT
751                 ************************************************
752                 *
753                 *  OUTPUT  ( addr n ---  )  This routine ships an
754                 *          arbitrary number of data bytes to a device
755                 *          on the HPIL loop specified by the user.
756                 *
757                 *       n = number of bytes to send
758                 *    addr = addr of data to send
759                 *
760                 *          The device is specified by the contents
761                 *          of 3 user variables:  LOOP specifies
762                 *          any of 3 loops 1,2,3   PRIME specifies
763                 *          the  primary addr of the intended device
764                 *          (0 through 31) and SECONDARY specifies
765                 *          the secondary device addr (0 thru 31),
766                 *          if any, of the intended device.
767                 *
768                 ************************************************
769
770 E4D90 D2C4              CON(5)  =!BASCX
          E
771 E4D95 68      =!OUTPT  CON(2)  #86          OUTPUT
772 E4D97 F455              NIBASC  \OUTPU\
          4505
          55
773 E4DA1 4D              CON(2)  \T\+#80
774
775 E4DA3 0000  =OUTPUT   CON(5)  =DOCOL       :
          0
776 E4DA8 DCD4              CON(5)  =OUTP       OUT (WORK HORSE OF RTNE)
          E
777 E4DAD 7BD4              CON(5)  =PILERR     ENTER WITH FLAG, IF TRUE
          E
778                 *                           DO NOTHING, ELSE GIVE
779                 *                           "HPIL ERROR" MESSAGE
780 E4DB2 0000              CON(5)  =SEMI
          0
781
782
783
784 E4DB7 0000  =PILERR   CON(5)  =DOCOL
          0
785 E4DBC 0000              CON(5)  =ZEQ        0=
          0
786 E4DC1 0000              CON(5)  =ABORTW     ABORT"
          0
787 E4DC6 A0              CON(2)  =ePILE
788                 *       NIBASC  \ :HPIL e\
789                 *       NIBASC  \rror\
790 E4DC8 0000              CON(5)  =SEMI
          0
```

```
791                     EJECT
792                 ************************************************
793                 *
794                 * OUT : SAME INPUTS AS OUTPUT BUT IT RTNS A
795                 *       T/F FLAG FOR USE BY ABORT" IN OUTPUT
796                 *
797                 ************************************************
798
799 E4DCD 2DD4 =OUTP    CON(5)  $OUT
        E
800
801 E4DD2 7390 $OUT    GOSUB   NIB7            (SEE BELOW)
802
803                 *
804                 * STORE 7 NIB FIELD IN STMTR1+2
805                 *
806
807 E4DD6 1B00         D0=(5)  (=STMTR1)+2
        000
808 E4DDD AF2          C=0     W
809 E4DE0 15CA         DAT0=C  11              CLEAR STOP CONDITIONS
810 E4DE4 1586         DAT0=A  7               WRITE 7 NIBS
811 E4DE8 1B00         D0=(5)  =EOLLEN
        000
812 E4DEF 15E6         C=DAT0  7               READ EOL LEN & STR
813 E4DF3 1A00         D0=(4)  (=STMTR0)+11  POSITION TO CKINFO LOCATION
        00
814 E4DF9 15C6         DAT0=C  7               WRITE OUT EOL INFO
815 E4DFD 18B          D0=D0-  12              POSITION TO MLFFLG
816                 *       LC(2)   (=OUTPTt)*16+#F   WE'D LIKE TO DO THIS
817                 *                                 BUT THE ASSEMBLER DOESN'T
818                 *                                 SUPPORT IT, THEREFORE,
819                 *
820 E4E00 31F          NIBHEX  31F             THIS CLUES HPIL ITS AN OUTPUT
821 E4E03 2            CON(1)  OUTPTt        STATEMENT
822 E4E04 14C          DAT0=C  B               WRITE IT OUT
823
824                 *
825                 * ISSUE SLOW POLL TO HPIL ROM
826                 *
827
828 E4E07 8F00         GOSBVL  =POLL           NEVER CAUSES AN
        000
829 E4E0E 00           CON(2)  =pPRTCL         ERROR CONDITION
830 E4E10 831          ?XM=0                   WAS POLL HANDLED?
831 E4E13 04           GOYES   OK
832
833                 *
834                 * POLL WAS NOT HANDLED, RETURN FALSE TO OUTPUT
835                 *
836
837 E4E15 07   BAD     C=RSTK                  THROW AWAY DATA STK PTR
838 E4E17 8E00         GOSUBL  =GETFP          RESTORE FORTH POINTERS
        00
839 E4E1D D2           C=0     A               FALSE FLAG
```

```
840
841 E4E1F 174  BAD1    D1=D1+  5           THROW AWAY BYTE COUNT
842 E4E22 145          DAT1=C  A           OVERWRITE ADDR WITH FLAG
843 E4E25 03           RTNCC
844
845 E4E27 1B00 OK1     D0=(5)  (=STMTR0)+1 READ ADDR OF RTNE WHICH
          000
846 E4E2E 142          A=DAT0  A           WILL SHIP DATA
847 E4E31 130          D0=A
848 E4E34 184          D0=D0-  5
849 E4E37 146          C=DAT0  A           REL OFFSET OF CLEAN UP RTNE
850 E4E3A 132          AD0EX
851 E4E3D C2           C=C+A   A           ADDR OF CLEAN UP RTNE
852 E4E3F 06           RSTK=C              SAVE ADDR ON CPU STK
853 E4E41 136          CD0EX
854 E4E44 06           RSTK=C              ADDR OF SEND RTNE ON CPU STK
855 E4E46 143          A=DAT1  A           READ BYTES TO SEND INTO A(A)
856 E4E49 174          D1=D1+  5
857 E4E4C 147          C=DAT1  A           READ ADDR OF BYTES
858 E4E4F D7           D=C     A           INTO D(A)
859 E4E51 01           RTN                 GOTO SEND RTNE!
860             *                          THIS CODE LEAVES 3 ADDRS
861             *                          ON CPU STACK: TOPMOST IS
862             *                          SEND RTNE, NEXT IS CLEAN UP
863             *                          RTNE, LAST IS RTN TO OK ADDR
864
865
866 E4E53 07   OK      C=RSTK              PTRS TO DATA INTO
867 E4E55 135          D1=C                D1
868 E4E58 7BCF         GOSUB   OK1         SEND DATA
869             *                          AND CLEAN UP LOOP
870             *
871             * RECOVER FORTH POINTERS AND RETURN TRUE FLAG
872             *
873 E4E5C 8E00         GOSUBL  =GETFP
          00
874 E4E62 D2           C=0     A
875 E4E64 CE           C=C-1   A           TRUE FLAG
876 E4E66 48B          GOC     BAD1        B.E.T. TO FINISH IN BAD
877
878
879
880 E4E69 8E00 =NIB7   GOSUBL  =SAVEFP     SAVE FORTH POINTERS
          00
881 E4E6F 07           C=RSTK              RTNE RETURN ADDR
882 E4E71 DE           ACEX  A
883 E4E73 137          CD1EX
884 E4E76 06           RSTK=C              SAVE DATA STK POINTER
885             *                          ON CPU RTN STK
886 E4E78 DE           ACEX  A
887 E4E7A 06           RSTK=C              REPLACE RTN ADDR
888             ************************************************************
889             *
890             * CREATE 7 NIB ADDR FIELD WHICH SPECIFIES DEVICE
891             *
```

```
892             * FORMAT:
893             *
894             *       LLSS SSSP PPPP 0000 LLSS SSSP PPPP
895             *
896             * WHERE L -- SPECIFIES THE LOOP
897             *       S -- SPECIFIES THE SECONDARY ADDR
898             *       P -- SPECIFIES THE PRIME ADDR
899             *
900             ************************************************************
901
902 E4E7C 20            P=      0
903 E4E7E 1B7A          D0=(5)  =oLOOP      PT TO LOOP#
        BF2
904 E4E85 AF0           A=0     W
905 E4E88 14A           A=DAT0  B           READ LOOP#
906 E4E8B A6C           A=A-1   B           DECREMENT 1 TO 0, ETC.
907 E4E8E BB0           ASL     X
908 E4E91 A34           A=A+A   X           LEFT SHIFT 5 BITS
909 E4E94 AF8           B=A     W           COPY PARTIAL TO B(W)
910 E4E97 AB0           A=0     X
911 E4E9A 164           D0=D0+  5           PT TO SECONDARY ADDR
912 E4E9D 14A           A=DAT0  B           READ SECONDARY ADDR
913 E4EA0 0E6C          B=B!A   B           MERGE SEC. WITH LOOP
914 E4EA4 164           D0=D0+  5           PT TO PRIME ADDR
915 E4EA7 14A           A=DAT0  B           READ PRIME ADDR
916 E4EAA F1            BSL     A
917 E4EAC C5            B=B+B   A           LEFT SHIFT 5 BITS
918 E4EAE 0E6C          B=B!A   B           MERGE PRIME WITH ADDR
919 E4EB2 AF4           A=B     W           COPY TO A
920 E4EB5 F0            ASL     A           SHIFT A LEFT 4 NIBS
921 E4EB7 F0            ASL     A           1ST 3 AND LAST 3 NIBS
922 E4EB9 BF0           ASL     W           ARE DUPLICATES FOR
923 E4EBC BF0           ASL     W           THIS APPLICATION
924 E4EBF AB4           A=B     X           DONE!
925 E4EC2 01            RTN
```

```
926                     EJECT
927                 ************************************************
928                 *
929                 * SHRINK  (n --- t/f)  Shrink the user's dictionary
930                 *        space by n nibs, if the user has that many
931                 *        nibs free.  Return true (-1) flag if okay
932                 *        or false flag (0) if it failed.
933                 *
934                 * changed n to mean nibs instead of bytes
935                 * 12/12/83 B.M.
936                 ************************************************
937
938 E4EC4 59D4              CON(5) =!OUTPT
       E
939 E4EC9 68       =!SHRNK CON(2) #86          SHRINK
940 E4ECB 3584              NIBASC \SHRIN\
       2594
       E4
941 E4ED5 BC              CON(2) \K\+#80
942 E4ED7 CDE4  =SHRINK  CON(5) $SHRNK
       E
943
944 E4EDC 8E00  =$SHRNK  GOSUBL =CHK         save FORTH pointers, make
       00
945                 *                       sure n is legal
946 E4EE2 06              RSTK=C              save #nibs on CPU rtn stk
947 E4EE4 1B11            D0=(5) =oS0
       BF2
948 E4EEB 142             A=DAT0 A            A(A)=top of DATA STK
949 E4EEE 348C            LC(5)  200          200 FOR DATA STK
       000
950 E4EF5 EA              A=A-C  A            A(A)=BOTTOM OF DATA STACK
951 E4EF7 1B39            D0=(5) =oDP
       BF2
952 E4EFE 348F            LC(5)  248          168 (84 CHARS) REQUIRED BY PAD
       000
953                 *                       80 NIBS FOR BUFFER BETWEEN PAD
954                 *                       AND DP
955 E4F05 D5              B=C    A            SAVE THIS IN B
956 E4F07 146             C=DAT0 A            C(A)=current dict. ptr.
957 E4F0A C9              C=C+B  A            EFFECTIVE BEGINNING OF SPACE TO
958                 *                       SHRINK IN DICTIONARY
959 E4F0C EE              C=A-C  A            avail space to shrink
960 E4F0E 540             GONC   SH09         DIFFERENCE IS POSITIVE
961 E4F11 D2              C=0    A            MAKE SURE WE FAIL COMPARISON
962 E4F13 D5    SH09      B=C    A            COPY TO B
963 E4F15 07              C=RSTK              C(A)=desired shrink
964 E4F17 8B1             ?B>C   A            enough room?
965 E4F1A 80              GOYES  SH0          yes
966 E4F1C 8C00            GOLONG =WR1         no, clean up report failure
       00
967
968 E4F22 FA    SH0       C=-C   A            2's compl of #nibs
969 E4F24 06              RSTK=C              save copy
970 E4F26 D5              B=C    A            B(A)=-1*(#nibs)
```

```
971 E4F28 1B00          D0=(5) =MAINST      A(A)=bottom of DATA STK
          000
972 E4F2F 146           C=DAT0 A            C(A)=addr of FORTHRAM
973
974 E4F32 8F00          GOSBVL =MVMEM+      shrink file, adjust file chain
          000
975 E4F39 8C00          GOLONG =adj         adjust User Variables
          00
```

```
976                     EJECT
977                 ************************************************
978                 *
979                 * NEGATE  (n  --- -n) leaves 2's comp of number
980                 *
981                 ************************************************
982
983 E4F3F 9CE4             CON(5)  !SHRNK
          E
984 E4F44 68       =!NEGAT CON(2)  #86             NEGATE
985 E4F46 E454             NIBASC  \NEGAT\
          7414
          45
986 E4F50 5C               CON(2)  \E\+#80
987 E4F52 75F4     =NEGAT  CON(5)  =$NEGAT
          E
988
989 E4F57 147      =$NEGAT C=DAT1  A               POP n1
990 E4F5A FA               C=-C    A               2'S COMP
991 E4F5C 145              DAT1=C  A               PUSH -n1
992 E4F5F 00               RTNCC
```

```
 993                    EJECT
 994                ****************************************************************
 995                *
 996                * CMOVE> (addr1 addr2 u --- )  C-move-reverse
 997                *        Move u BYTES starting at addr1+n-1 to addr2+n-1
 998                *        and progressing to addr1 to addr2.
 999                *
1000                *        If u=0 do nothing.
1001                *
1002                *        FORTH 83 Standard
1003                *
1004                ****************************************************************
1005
1006 E4F61 44F4             CON(5)  =!NEGAT
           E
1007 E4F66 68     =!CMOV>   CON(2)  #86             CMOVE>
1008 E4F68 34D4             NIBASC  \CMOVE\
           F465
           54
1009 E4F72 EB               CON(2)  \>\+#80
1010
1011 E4F74 97F4   =CMOV>    CON(5)  =$CMOV>
           E
1012 E4F79 AF0    =$CMOV>   A=0     W               CLEAR FOR SHIFT LATER
1013 E4F7C 143              A=DAT1  A               GET# OF BYTES
1014 E4F7F C4               A=A+A   A               MAKE NIBS
1015 E4F81 6120             GOTO    NMOV0
1016
```

```
1017                    EJECT
1018                ************************************************************
1019                *
1020                * NMOVE> (addr1  addr2  u  --- )
1021                *
1022                * If u=0 then do nothing, else treat u as an unsigned
1023                * number specifying the number of bytes to move.
1024                * NMOVE> moves n nibbles  from addr1 to addr 2, however,
1025                * it starts moving from (addr1+n-1) to (addr2+n-1).
1026                *
1027                * It uses 1 sublevel, A, C, D0, D1, P, R1, R2
1028                *
1029                ************************************************************
1030
1031 E4F85 66F4             CON(5)  !CMOV>
           E
1032 E4F8A 68     =!NMOV>  CON(2)  #86                NMOVE>
1033 E4F8C E4D4           NIBASC  \NMOVE\
           F465
           54
1034 E4F96 EB             CON(2)  \>\+#80
1035 E4F98 D9F4 =NMOV>     CON(5)  =$NMOV>
           E
1036
1037 E4F9D AF0  =$NMOV>  A=0     W              CLEAR FOR SHIFT IN MOVSET
1038 E4FA0 143           A=DAT1  A              GET # NIBS
1039 E4FA3 8E00 NMOV0    GOSUBL  =MOVSET
           00
1040                * If A=0, MOVSET cleans stack and never returns.
1041 E4FA9 810           ASLC                   UNDO SHIFT IN MOVSET
1042 E4FAC 136           CD0EX                  GET  ADDR2 IN C
1043 E4FAF C2            C=C+A   A                  END OF ADDR2 FIELD
1044 E4FB1 136           CD0EX                      D0=ADDR2+N
1045 E4FB4 137           CD1EX                  GET ADDR1
1046 E4FB7 C2            C=C+A   A              ADDR1+N
1047 E4FB9 137           CD1EX
1048 E4FBC 814           ASRC                   A=#OF WORDS
1049 E4FBF 8A8  NMOV1    ?A=0    A              NO MORE WORDS?
1050 E4FC2 61            GOYES   NMOV2
1051 E4FC4 1CF           D1=D1-  16
1052 E4FC7 18F           D0=D0-  16
1053 E4FCA 1577          C=DAT1  W              READ WORD
1054 E4FCE 1547          DAT0=C  W              WRITE IT
1055 E4FD2 CC            A=A-1   A
1056 E4FD4 6AEF          GOTO    NMOV1
1057 E4FD8 810  NMOV2    ASLC
1058 E4FDB 8A8  NMOV3    ?A=0    A              NO MORE NIBS?
1059 E4FDE 61            GOYES   NMOV4
1060 E4FE0 1C0           D1=D1-  1                  DECREMENT ADDR1
1061 E4FE3 180           D0=D0-  1                  DECREMENT ADDR2
1062 E4FE6 15F0          C=DAT1  1                  READ NIBBLE
1063 E4FEA 15C0          DAT0=C  1                  WRITE NIBBLE
1064 E4FEE CC            A=A-1   A                  DECREMENT COUNTER
1065 E4FF0 6AEF          GOTO    NMOV3              IF NO CARRY DO ANOTHER
1066 E4FF4 8C00 NMOV4    GOLONG  =CM3                FINISH NMOVE
```

00

```
1067                    EJECT
1068                ************************************
1069                *
1070                * SCFIB   ( --- addr)  returns the
1071                * addr of variable with fib# of
1072                * currently active file
1073                *
1074                ************************************
1075
1076 E4FFA A8F4          CON(5)  !NMOV>
           E
1077 E4FFF 68    =!SCFIB CON(2)  #86             SCRFIB
1078 E5001 3534          NIBASC  \SCRFI\
           2564
           94
1079 E500B 2C            CON(2)  \B\+#80
1080 E500D 2105 =SCFIB   CON(5)  =$SCFIB
           E
1081
1082
1083 E5012 8E00 =$SCFIB GOSUBL  =DOUSE
           00
1084 E5018 16BF          CON(5)   (=oSCFIB)
           2
1085
1086 E501D 2205 =BSIZE   CON(5)  =$BSIZE
           E
1087
1088 E5022 8E00 =$BSIZE GOSUBL =DOUSE
           00
1089 E5028 89BF          CON(5) (=oBSIZE)
           2
```

```
1090                    EJECT
1091                ****************************************************************
1092                *
1093                * CREATE (  --  )  A defining word used to create a dictionary
1094                * entry for <name>, without allocating any parameter field
1095                * memory.  When <name> is subsequently executed, the address
1096                * of the first byte of <name>'s parameter field is left on
1097                * the stack.
1098                *
1099                * Form:  CREATE <name>
1100                *
1101                ***********************************************
1102
1103 E502D FFF4             CON(5)  =!SCFIB
           E
1104 E5032 68     =!CREAT   CON(2)  #86              CREATE
1105 E5034 3425             NIBASC  \CREAT\
           5414
           45
1106 E503E 5C               CON(2)  \E\+#80
1107
1108 E5040 0000   =CREAT    CON(5) =DOCOL
           0
1109 E5045 0000             CON(5)  =LIT
           0
1110 E504A 52CF             CON(5)  =oCREAT         VECTOR FOR CREATE
           2
1111 E504F 0000             CON(5)  =AT             GET CFA TO USE
           0
1112 E5054 0000             CON(5)  =EXEC           EXECUTE CONTENTS
           0
1113 E5059 0000             CON(5)  =SEMI           ;
           0
1114
1115                *
1116                * DEFAULT CREATE ROUTINE
1117                *
1118 E505E 0000   =ICREAT  CON(5) =DOCOL        :
           0
1119 E5063 5145             CON(5) =LATE        LATEST  get NFA of last defined wor
           E
1120 E5068 0000             CON(5) =COMMA       ,       compile it as a Link Field
           0
1121 E506D 0000 CREO        CON(5)  =BL         BL      get the new word
           0
1122 E5072 0000             CON(5)  =WORD       WORD    return counted string
           0
1123 E5077 0000             CON(5)  =DUP        DUP     make 2 copies of addr of ne
           0
1124 E507C 0000             CON(5)  =DUP        DUP     word
           0
1125 E5081 0000             CON(5)  =TWO+       2+      point to 1st char of word
           0
1126 E5086 0000             CON(5)  =CAT        C@      get 1st char
           0
```

```
1127 E508B 0000          CON(5)  =ZEQ          0=      if null make it -1 for ABOR
           0
1128
1129 E5090 0000 CRE01    CON(5)  =ABRT"X       ABORT"  if null give message:
           0
1130 E5095 B0            CON(2)  =eRDNL        attempted to redefine null"
1131
1132 E5097 0000 CRE1     CON(5)  =DUP          DUP     dup counted string addr aga
           0
1133 E509C 0000          CON(5)  =CONTX        CONTEXT get addr at which to start
           0
1134 E50A1 0000          CON(5)  =AT           @       our search of current searc
           0
1135 E50A6 0000          CON(5)  =AT           @       vocabulary (CONTEXT)
           0
1136 E50AB 0000          CON(5)  =FIND>        FIND    see if word already exists
           0
1137 E50B0 0000          CON(5)  =ZBRNH        IF      if so,
           0
1138 E50B5 7300          CON(5) (CREA10)-*
           0
1139 E50BA 0000          CON(5)  =2DROP        2DROP   throw away data from FIND
           0
1140 E50BF 0000          CON(5)  =WARN         WARNING see if user want's warning
           0
1141 E50C4 0000          CON(5)  =AT           @
           0
1142 E50C9 0000          CON(5)  =ZBRNH        IF      if warning is set
           0
1143 E50CE E100          CON(5) (CREA10)-*
           0
1144 E50D3 0000          CON(5)  =DUP          DUP     dup addr of counted string
           0
1145 E50D8 0000          CON(5)  =LIT                  get address of rtne
           0
1146 E50DD E3CF          CON(5)  =oUNIQ                which will print
           2
1147 E50E2 0000          CON(5)  =AT                   appropriate "not
           0
1148 E50E7 0000          CON(5)  =EXEC                 unique" message
           0
1149 E50EC 0000 CREA10   CON(5)  =DUP          COPY ADDR FOR REPLACING LEN
           0
1150 E50F1 0000          CON(5)  =CAT          C@      get len of word
           0
1151 E50F6 0000          CON(5)  =WIDTH        WIDTH   get max length allowed
           0
1152 E50FB 0000          CON(5)  =AT           @
           0
1153 E5100 0000          CON(5)  =MIN          MIN     make entry min of two
           0
1154 E5105 0000          CON(5)  =DUP          COPY MIN(LEN,WIDTH)
           0
1155 E510A 0000          CON(5)  =ROT          MIN MIN ADR
           0
```

```
1156 E510F 0000          CON(5)  =C!          REPLACE LEN WITH MIN(LEN,WIDTH)
           0
1157 E5114 0000          CON(5)  =ONE+        1+       add 1 to string len
           0
1158 E5119 0000          CON(5)  =TWO*        2*       get string len in nibs
           0
1159 E511E 3164          CON(5)  =ALLOT       NALLOT   allot space for word
           E
1160 E5123 0000          CON(5)  =DUP         DUP      dup addr of counted string
           0
1161 E5128 0000          CON(5)  =LIT                  again
           0
1162 E512D 0800          CON(5) #80           80       now TOGGLE, set high bit
           0
1163 E5132 1445          CON(5)  =TOGG        TOGGLE   in length byte of counted s
           E
1164 E5137 0000          CON(5)  =HERE        HERE     get addr of next free nib
           0
1165 E513C 0000          CON(5)  =TWO-        2-       point to last char in count
           0
1166 E5141 0000          CON(5)  =LIT                  TOGGLE (set high bit ) in l
           0
1167 E5146 0800          CON(5) #80           80       char of counted string
           0
1168 E514B 1445          CON(5)  =TOGG        TOGGLE
           E
1169 E5150 0000          CON(5)  =LIT                  compile a temporary prologu
           0
1170 E5155 0000          CON(5) =DOVAR        DOVARIABLE     (DOVAR) as Code Fiel
           0
1171 E515A 0000          CON(5)  =COMMA       ,        for this new word
           0
1172 E515F 0000          CON(5)  =CURR        CURRENT  store addr of counted strin
           0
1173 E5164 0000          CON(5)  =AT          @        (now its a new word) in the
           0
1174 E5169 0000          CON(5)  =STORE       !        word link field of CURRENT
           0
1175 E516E 0000          CON(5)  =SEMI        ;        vocabulary
           0
1176
1177              * This is the default "not unique" message rtne
1178
1179 E5173 0000 =IUNIQ   CON(5)  =DOCOL
           0
1180 E5178 0000          CON(5)  =COUNT            expects addr of counted string
           0
1181              *                                gets string count and addr
1182              *                                suitable for TYPE
1183 E517D 0000          CON(5)  =TYPE             TYPE  string to display device
           0
1184 E5182 0000          CON(5)  =SPACE            SPACE put out 1 delimiting spac
           0
1185 E5187 0000          CON(5)  =PDOTQ            ."    give message
           0
```

```
1186 E518C D0          CON(2) 13                isn't unique "
1187 E518E 9637        NIBASC \isn't \
           E672
           4702
1188 E519A 57E6        NIBASC \unique \
           9617
           5755
           02
1189 E51A8 0000        CON(5)  =SEMI            ;
           0
```

```
1190                    EJECT
1191                ************************************************************
1192                *
1193                * REPEAT   compile time: ( addr1 2 addr2 4 - )   immediate
1194                * compiles BRANCH ( - )  and offset back to BEGIN
1195                *
1196                ************************************************************
1197 E51AD 2305           CON(5)  =!CREAT
           E
1198 E51B2 6C     =!REPET CON(2) #C6              REPEAT
1199 E51B4 2554           NIBASC \REPEA\
           0554
           14
1200 E51BE 4D             CON(2) \T\+#80
1201
1202 E51C0 0000 =REPET    CON(5) =DOCOL
           0
1203 E51C5 0000           CON(5) =?COMP           ensure compile mode
           0
1204 E51CA 0000           CON(5)  =>R             save addr of WHILE
           0
1205 E51CF 0000           CON(5)  =>R             and its code 4
           0
1206 E51D4 0000           CON(5)  =AGAIN          compile BRNCH back to addr1 (BEGIN)
           0
1207 E51D9 0000           CON(5)  =R>             get back addr of WHILE
           0
1208 E51DE 0000           CON(5)  =R>             and the 4
           0
1209 E51E3 0000           CON(5)  =TWO-           make the 4 a 2 for THEN
           0
1210 E51E8 0000           CON(5)  =THEN           fill in HERE at ZBRNH of WHILE
           0
1211 E51ED 0000           CON(5)  =SEMI           ;
           0
```

```
                    EJECT
            ***************************************************************
            *
            * FORGET  Delete from dictionary <name> which is in the CURRENT
            *         vocabulary and all words added to the dictionary after
            *         <name> regardless of their vocabulary.
            *
            * First thing is to check against FENCE (protected dictionary)
            * or that word is not in ROM.
            * Then forget whole vocabularies which might be after the
            * forgotten word. If forgotten word is prior to current vocabular
            * make FORTH the CURRENT and CONTEXT vocabulary.
            *
            * If word is found in current vocabulary, we have to reset the
            * last-word-link in the vocabulary; then use VOC-LINK to get the
            * most recent vocabulary and chain back through them all (they
            * are linked in simple linear fashion) -- resetting the last-word
            * in each. We reset the last-word-link by chaining back through
            * linked list of words which forms the contents of the vocabulary
            *
            ***************************************************************
E51F2 2B15          CON(5)  =!REPET
      E
E51F7 68    =!FORGT CON(2)  #86           FORGET
E51F9 64F4          NIBASC  \FORGE\
      2574
      54
E5203 4D            CON(2)  \T\+#80

E5205 0000  =FORGT  CON(5)  =DOCOL        :
      0
E520A 0000          CON(5)  =BL
      0
E520F 0000          CON(5)  =WORD           GET WORD FOR FIND
      0
E5214 0000          CON(5)  =CURR
      0
E5219 0000          CON(5)  =AT
      0
E521E 0000          CON(5)  =AT
      0
            * LOOK FOR WORD IN CURRENT (& PARENT) VOCABULARIES
E5223 0000          CON(5)  =FIND>          ADDR CH FLAG
      0
E5228 0000          CON(5)  =ZEQ            change sense of FIND> flag
      0
E522D 0000          CON(5)  =ABORTW         abort if not found with
      0
E5232 63            CON(2)  =eNCUR          "not in current vocabulary " mess
E5234 0000          CON(5)  =DROP           DROP char returned by FIND>
      0
            *
            * Now check that word is not below FENCE or in ROM.
            *
            * CFA
```

```
1254 E5239 0000         CON(5)  =TWO-           BACK UP BEFORE LAST CHAR
           0
1255 E523E 0000         CON(5)  =ZERO
           0
1256 E5243 0000         CON(5)  =ONE-           -1 (FLAG FOR TRAVERSE)
           0
1257            *         (TRAVERSE WILL FIND 1ST BYTE WITH HIGH BIT SET)
1258 E5248 0000         CON(5)  =TRAVS          FIND NFA
           0
1259 E524D 0000         CON(5)  =DUP            NFA NFA
           0
1260 E5252 0000         CON(5)  =FENCE          get addr of protected area
           0
1261 E5257 0000         CON(5)  =AT             in dictionary
           0
1262 E525C 0000         CON(5)  =U<             word to forget above fence?
           0
1263 E5261 0000         CON(5)  =ABORTW         if not give error
           0
1264 E5266 D0           CON(2)  =ePDIC          "protected dictionary"
1265 E5268 0000         CON(5)  =DUP            NFA NFA
           0
1266            *
1267            * NOTE: we assume here that words in ROM will appear to have
1268            * a negative addr--E0000 and above.
1269            *
1270 E526D 0000         CON(5)  =LTZ            0<  IN ROM?
           0
1271 E5272 0000         CON(5)  =ABORTW         if so abort with same err
           0
1272 E5277 D0           CON(2)  =ePDIC          message
1273 E5279 0000         CON(5)  =>R                 [NFA]
           0
1274 E527E 0000         CON(5)  =R@             NFA  [NFA]
           0
1275 E5283 0000         CON(5)  =CONTX
           0
1276 E5288 0000         CON(5)  =AT             NFA CONTEXT
           0
1277 E528D 0000         CON(5)  =U<
           0
1278            * IF NFA<CONTEXT, THEN MAKE FORTH THE CONTEXT
1279 E5292 0000         CON(5)  =ZBRNH
           0
1280 E5297 9100         CON(5)  (FRGET1)-*
           0
1281 E529C 0000         CON(5)  =LIT
           0
1282 E52A1 7ACF         CON(5)  =FRTHVC
           2
1283 E52A6 0000         CON(5)  =CONTX
           0
1284 E52AB 0000         CON(5)  =STORE
           0
1285            * EQUIVALENT TO TYPING "FORTH" IN FORTH
```

```
1286 E52B0 0000 FRGET1  CON(5)  =R@             NFA
           0
1287 E52B5 0000         CON(5)  =CURR
           0
1288 E52BA 0000         CON(5)  =AT
           0
1289 E52BF 0000         CON(5)  =U<
           0
1290            * IF NFA<CURRENT THEN MAKE FORTH THE DEFINING VOCABULARY
1291 E52C4 0000         CON(5)  =ZBRNH
           0
1292 E52C9 E100         CON(5)  (FRGET2)-*
           0
1293 E52CE 0000         CON(5)  =LIT
           0
1294 E52D3 7ACF         CON(5)  =FRTHVC
           2
1295 E52D8 0000         CON(5)  =CONTX
           0
1296 E52DD 0000         CON(5)  =STORE
           0
1297 E52E2 0000         CON(5)  =DEFIN
           0
1298            * EQUIVALENT TO TYPING "FORTH DEFINITIONS"
1299            *
1300            * Now do the work of actually forgetting things by
1301            * resetting all the pointers.
1302            *
1303 E52E7 0000 FRGET2  CON(5)  =VOC-L
           0
1304 E52EC 0000         CON(5)  =AT             GET LATEST VOC
           0
1305            *
1306            * NEXT LOOP FORGETS VOCABULARIES AFTER FORGOTTEN WORD
1307            * BEGIN **********************   VOC
1308 E52F1 0000 FRGET3  CON(5)  =R@             VOC NFA
           0
1309 E52F6 0000         CON(5)  =OVER           VOC NFA VOC
           0
1310 E52FB 0000         CON(5)  =U<            (VOC AFTER NFA OF FORGETEE?)
           0
1311 E5300 0000         CON(5)  =ZBRNH
           0
1312            * WHILE
1313 E5305 4100         CON(5)  (FRGET4)-*      VOC
           0
1314 E530A 0000         CON(5)  =AT             GET PARENT VOC
           0
1315 E530F 0000         CON(5)  =BRNCH
           0
1316 E5314 DDFF         CON(5)  (FRGET3)-*
           F
1317            * REPEAT
1318            ******************************
1319 E5319 0000 FRGET4  CON(5)  =DUP            VOC VOC
```

```
          0
1320 E531E 0000         CON(5)  =VOC-L
          0
1321 E5323 0000         CON(5)  =STORE          NEW MOST RECENT VOCABULARY
          0
1322            *                           (WHICH IS VOC OF FORGOTTEN WORD)
1323            *
1324            * NEXT LOOP IS FOR EACH VOCABULARY THAT WILL REMAIN
1325            * BEGIN **************************************************
1326 E5328 0000 FRGETL  CON(5)  =DUP            VOC VOC
          0
1327 E532D 0000         CON(5)  =FIVE-          POINT TO WORD-LINK
          0
1328            *                               (LAST WORD IN VOC)
1329            * INNER LOOP TO RESET VOC-LINK OF EACH VOCABULARY
1330            * * * BEGIN
1331 E5332 0000 FRGET5  CON(5)  =AT             POINT TO WORD
          0
1332 E5337 0000         CON(5)  =DUP
          0
1333 E533C 0000         CON(5)  =R@             GET NFA OF FORGOTTEN WORD
          0
1334 E5341 0000         CON(5)  =U<
          0
1335 E5346 0000         CON(5)  =ZEQ
          0
1336            * * * WHILE                     WORD NOT < FORGOTTEN WORD
1337 E534B 0000         CON(5)  =ZBRNH
          0
1338 E5350 4100         CON(5)  (FRGET6)-*
          0
1339 E5355 0000         CON(5)  =FIVE-          POINT TO LINK
          0
1340 E535A 0000         CON(5)  =BRNCH
          0
1341 E535F 3DFF         CON(5)  (FRGET5)-*
          F
1342            * * * REPEAT
1343            * NOW GET PARENT VOCABULARY
1344 E5364 0000 FRGET6  CON(5)  =OVER           VOC LAST-WORD VOC
          0
1345 E5369 0000         CON(5)  =FIVE-          VOC LAST-WORD WORD-LINK-FIELD
          0
1346 E536E 0000         CON(5)  =STORE          SET NEW LAST-WORD-IN-VOC
          0
1347 E5373 0000         CON(5)  =AT             GET PARENT VOCABULARY
          0
1348 E5378 0000         CON(5)  =?DUP           DONE IF 0 LINK
          0
1349 E537D 0000         CON(5)  =ZEQ
          0
1350 E5382 0000         CON(5)  =ZBRNH
          0
1351 E5387 1AFF         CON(5)  (FRGETL)-*
          F
```

```
1352           * UNTIL ************************************************
1353 E538C 0000         CON(5)  =R>             NFA
           0
1354 E5391 0000         CON(5)  =FIVE-          BACK UP PAST LINK
           0
1355 E5396 0000         CON(5)  =DP
           0
1356 E539B 0000         CON(5)  =STORE
           0
1357 E53A0 0000         CON(5)   =SEMI        ;
           0
```

```
1358                    EJECT
1359                ****************************************************************
1360                *
1361                * ?STACK  ( --- ) Issue an error if the stack is out of bounds.
1362                *
1363                ****************************************************************
1364
1365 E53A5 7F15            CON(5)  !FORGT
           E
1366 E53AA 68     =!?STK    CON(2)  #86             ?STACK
1367 E53AC F335            NIBASC  \?STAC\
           4514
           34
1368 E53B6 BC              CON(2)  \K\+#80
1369
1370 E53B8 0000   =?STK    CON(5)  =DOCOL          :
           0
1371 E53BD 0000            CON(5)   =SP@           SP@   current value of stk pointer
           0
1372 E53C2 0000            CON(5)   =S0            S0    bottom of stack
           0
1373 E53C7 0000            CON(5)   =SWAP          SWAP
           0
1374 E53CC 0000            CON(5)   =U<            U<    if current value is > bottom
           0
1375                *                                    (remember stk grows down in m
1376 E53D1 0000            CON(5)   =ABRT"X        ABORT"  then abort with "empty stac
           0
1377 E53D6 E0              CON(2)  =eEMPT                  message
1378                *       NIBASC  \ empty s\
1379                *       NIBASC  \tack\
1380 E53D8 0000            CON(5)   =SP@           SP@     get current stack pointer
           0
1381 E53DD 0000            CON(5)   =PAD                   get PAD addr
           0
1382 E53E2 0000            CON(5)   =LIT
           0
1383 E53E7 8A00            CON(5)  168             we guarantee 84
           0
1384                *                               bytes between PAD & STK
1385 E53EC 0000            CON(5)   =ADD           +
           0
1386 E53F1 0000            CON(5)   =U<            U<      if current stack pointer is
           0
1387 E53F6 0000            CON(5)   =ABRT"X        ABORT"  < PAD + 168 then abort
           0
1388 E53FB F0              CON(2)  =eFULL                  with "full stack" message
1389                *       NIBASC  \ full st\
1390                *       NIBASC  \ack\
1391 E53FD 0000            CON(5)   =SEMI          ;
           0
```

```
1392                    EJECT
1393                ******************************************************
1394                *
1395                * LATEST ( --- addr)  Leave the name field addr of the
1396                *        topmost word in the CURRENT vocabulary.
1397                *
1398                ******************************************************
1399 E5402 AA35          CON(5)  =!?STK
           E
1400 E5407 68    =!LATE  CON(2)  #86             LATEST
1401 E5409 C414          NIBASC  \LATES\
           4554
           35
1402 E5413 4D            CON(2)  \T\+#80
1403
1404 E5415 0000  =LATE   CON(5)  =DOCOL          :
           0
1405 E541A 0000          CON(5)   =CURR          CURRENT
           0
1406 E541F 0000          CON(5)   =AT            @
           0
1407 E5424 0000          CON(5)   =AT            @
           0
1408 E5429 0000          CON(5)   =SEMI          ;
           0
1409
1410
1411                ******************************************************
1412                *
1413                * TOGGLE  (addr  b --- ) Complement the contents of addr
1414                *         by the bit pattern b.
1415                *
1416                ******************************************************
1417 E542E 7045          CON(5)  !LATE
           E
1418 E5433 68    =!TOGG  CON(2)  #86             TOGGLE
1419 E5435 45F4          NIBASC  \TOGGL\
           7474
           C4
1420 E543F 5C            CON(2)  \E\+#80
1421
1422 E5441 0000  =TOGG   CON(5)  =DOCOL          :
           0
1423 E5446 0000          CON(5)  =OVER           OVER  addr b addr
           0
1424 E544B 0000          CON(5)  =AT             @     addr b (addr)
           0
1425 E5450 0000          CON(5)  =XOR            XOR   addr XOR[b, (addr)]
           0
1426 E5455 0000          CON(5)  =SWAP           SWAP
           0
1427 E545A 0000          CON(5)  =STORE          !     store XOR result at addr
           0
1428 E545F 0000          CON(5)  =SEMI           ;
           0
```

```
1429                    EJECT
1430                ****************************************************************
1431                *
1432                * NUMBER (addr --- d) Convert the count & char string at addr
1433                *       to a signed 32 bit integer using the current base.
1434                *       If numeric conversion is not possible, an error
1435                *       condition exists.
1436                *
1437                *       (addr ---  ) Floating point number returns nothing!
1438                *       However, it does set DPL to #C0000.
1439                *
1440                *       If the string to be converted has a decimal point
1441                *       in it, it will be interpreted as a floating point
1442                *       number which will be put into the X register after
1443                *       doing a stack lift.
1444                *
1445                *       If the string to be converted has a colon, slash,
1446                *       or comma in it, it will be interpreted as a double
1447                *       number.
1448                *
1449                ****************************************************************
1450 E5464 3345             CON(5)  !TOGG
               E
1451 E5469 68     =!NUMB    CON(2)  #86             NUMBER
1452 E546B E455           NIBASC  \NUMBE\
               D424
               54
1453 E5475 2D             CON(2)  \R\+#80
1454
1455 E5477 0000 =NUMB     CON(5)  =DOCOL          :   (addr1)
               0
1456 E547C 0000           CON(5)  =LIT
               0
1457 E5481 A2CF           CON(5)  =oNUMB          VECTOR FOR NUMBER
               2
1458 E5486 0000           CON(5)  =AT             GET CFA TO USE
               0
1459 E548B 0000           CON(5)  =EXEC           EXECUTE
               0
1460 E5490 0000           CON(5)  =SEMI           ;
               0
1461
1462 E5495 0000 =INUMB    CON(5)  =DOCOL        :
               0
1463 E549A 0000           CON(5)  =QUOTC        COMPILED VERSION OF "
               0
1464 E549F 10             CON(2)  1             MAXLEN&LEN OF STRING "."
1465 E54A1 10             CON(2)  1            (WE'RE LOOKING FOR A
1466 E54A3 E2             CON(2)  \.\                    DECIMAL POINT)
1467                    *                        ADDR1 ADDR2 N
1468 E54A5 0000           CON(5)  =ROT          (addr2 n addr1)
               0
1469 E54AA 0000           CON(5)  =DUP          (addr2 n addr1 addr1)
               0
1470 E54AF 0000           CON(5)  =>R           PUSH COPY OF ADDR 1 TO RTN STK
```

```
            0
1471 E54B4 0000         CON(5)  =COUNT        NOW WE HAVE 2 STRINGS
            0
1472 E54B9 0000         CON(5)  =POS          SEE IF THERE'S A DECIMAL POINT
            0
1473 E54BE 0000         CON(5)  =R>           RETRIEVE ADDR1
            0
1474 E54C3 0000         CON(5)  =SWAP         FLAG FROM POS ON TOP
            0
1475 E54C8 0000         CON(5)  =ZBRNH        IF NO MATCH CONTINUE ON
            0
1476 E54CD 8200         CON(5)  (NUMB00)-*
            0
1477
1478            * we have a possible floating point number *
1479
1480 E54D2 0000         CON(5)  =LIT
            0
1481 E54D7 0000         CON(5)  #C0000        F.P. FLAG FOR NUMBER
            C
1482 E54DC 0000         CON(5)  =DPL          STORE IT IN DPL
            0
1483 E54E1 0000         CON(5)  =STORE
            0
1484 E54E6 0000         CON(5)  =COUNT        GET STRING FORM
            0
1485 E54EB C964         CON(5)  =BASF         MAKE IT F.P.# & PUSH TO F.P. STK
            E
1486 E54F0 0000         CON(5)  =SEMI
            0
1487
1488 E54F5 0000 NUMB00  CON(5)   =ZERO          0       addr 0
            0
1489 E54FA 0000         CON(5)   =ZERO          0       addr 0 0
            0
1490 E54FF 0000         CON(5)   =ROT           ROT     0 0 addr
            0
1491 E5504 0000         CON(5)   =DUP           DUP     0 0 addr addr
            0
1492 E5509 0000         CON(5)   =CAT           C@      get count
            0
1493 E550E 0000         CON(5)   =SWAP                  0 0 char-count  addr
            0
1494
1495            *
1496            * THIS NEXT PORTION GETS RID OF ANY LEADING
1497            * BLANKS IN THE STRING
1498            *
1499
1500 E5513 0000 numz    CON(5)   =TWO+          BEGIN 2+  pt to next char
            0
1501 E5518 0000         CON(5)   =DUP                   dup this addr
            0
1502 E551D 0000         CON(5)   =CAT                   get char
            0
```

```
 1503 E5522 0000          CON(5)   =LIT                  test for leading
            0
 1504 E5527 0200          CON(5)   32                   spaces
            0
 1505 E552C 0000          CON(5)   =EQUAL               is it a space?
            0
 1506 E5531 0000          CON(5)   =ZBRNH          IF SO THEN
            0
 1507 E5536 3200          CON(5)   (numz1)-*
            0
 1508 E553B 0000          CON(5)   =SWAP           addr  char-count
            0
 1509 E5540 0000          CON(5)   =ONE-           decrement char-count
            0
 1510 E5545 0000          CON(5)   =SWAP           char-count  addr
            0
 1511 E554A 0000          CON(5)   =ZERO           put 0 on stack for UNTIL test
            0
 1512 E554F 0000          CON(5)   =BRNCH
            0
 1513 E5554 F000          CON(5)   (numz2)-*
            0
 1514 E5559 0000 numz1    CON(5)   =LIT           ELSE -1
            0
 1515 E555E FFFF          CON(5)  (0-1)           -1 is for UNTIL test
            F
 1516 E5563 0000 numz2    CON(5)  =ZBRNH          THEN UNTIL
            0
 1517 E5568 BAFF          CON(5)  (numz)-*
            F
 1518 E556D 0000          CON(5)  =TWO-           reset addr to pt to prev char
            0
 1519
 1520              *
 1521              * NOW CHECK TO SEE IF THE FIRST NON-BLANK CHAR IS A MINUS
 1522              * SIGN, IF IT IS UPDATE ADDRESS POINTER AND DECREMENT CHAR
 1523              * COUNT.  IN ANY EVENT PUT A FLAG ON RETURN STACK WHICH SAYS
 1524              * WHETHER NUMBER WAS NEGATIVE (-1) OR POSITIVE (0)
 1525              *
 1526
 1527 E5572 0000          CON(5)  =DUP            char-count  addr  addr
            0
 1528 E5577 0000          CON(5)  =TWO+           char-count  addr  addr+2
            0
 1529 E557C 0000          CON(5)  =CAT            get char
            0
 1530 E5581 0000          CON(5)   =LIT            LIT     compare to
            0
 1531 E5586 D200          CON(5)  45              "-"     minus sign
            0
 1532 E558B 0000          CON(5)   =EQUAL          =       =?
            0
 1533 E5590 0000          CON(5)   =DUP
            0
 1534 E5595 0000          CON(5)   =>R
```

```
            0
1535 E559A 0000         CON(5)   =ZBRNH         IF       if neg. increment
            0
1536 E559F 9100         CON(5)  (NUM00)-*                 addr to first char
            0
1537 E55A4 0000         CON(5)   =TWO+           2+       beyond minus sign
            0
1538 E55A9 0000         CON(5)  =SWAP
            0
1539 E55AE 0000         CON(5)  =ONE-           decrement char count
            0
1540 E55B3 0000         CON(5)  =SWAP
            0
1541
1542
1543 E55B8 0000 NUM00   CON(5)   =LIT            THEN LIT
            0
1544 E55BD FFFF         CON(5)  (0-1)            -1
            F
1545 E55C2 0000         CON(5)   =DPL            DPL      set decimal pt var. to
            0
1546 E55C7 0000         CON(5)   =STORE          !        true
            0
1547            *
1548            * NOW WE'LL SET UP FOR A DO LOOP WHICH WILL TRY TO CONVERT
1549            * EACH CHAR OF THE STRING INTO A DIGIT ACCORDING TO BASE
1550            *
1551
1552 E55CC 0000         CON(5)  =SWAP
            0
1553 E55D1 0000         CON(5)  =ZERO           loop limit and index
            0
1554 E55D6 0000         CON(5)  =XDO            prepare return stack
            0
1555
1556 E55DB 0000 numy    CON(5)  =TWO+           point to next char
            0
1557 E55E0 0000         CON(5)  =DUP
            0
1558 E55E5 0000         CON(5)  =>R             save copy of addr on rtn stk
            0
1559 E55EA 0000         CON(5)  =CAT            get char
            0
1560 E55EF 0000         CON(5)  =BASE
            0
1561 E55F4 0000         CON(5)  =AT
            0
1562 E55F9 0000         CON(5)  =DIGIT
            0
1563
1564 E55FE 0000         CON(5)  =ZBRNH          IF successful
            0
1565 E5603 9600         CON(5)  (numy0)-*
            0
1566 E5608 0000         CON(5)  =SWAP
```

```
            0
1567 E560D 0000         CON(5)  =BASE
            0
1568 E5612 0000         CON(5)  =AT
            0
1569 E5617 0000         CON(5)  =U*
            0
1570 E561C 0000         CON(5)  =DROP
            0
1571 E5621 0000         CON(5)  =ROT
            0
1572 E5626 0000         CON(5)  =BASE
            0
1573 E562B 0000         CON(5)  =AT
            0
1574 E5630 0000         CON(5)  =U*
            0
1575 E5635 0000         CON(5)  =D+
            0
1576 E563A 0000         CON(5)  =DPL
            0
1577 E563F 0000         CON(5)  =AT
            0
1578 E5644 0000         CON(5)  =ONE+
            0
1579
1580 E5649 0000         CON(5)  =ZBRNH          IF------+
            0
1581 E564E 4100         CON(5)  (numy1)-*               |
            0
1582 E5653 0000         CON(5)  =ONE                    |
            0
1583 E5658 0000         CON(5)  =DPL                    |
            0
1584 E565D 0000         CON(5)  =PSTOR          +!      |
            0
1585            *                                       |
1586 E5662 0000 numy1   CON(5)  =BRNCH          THEN----+
            0
1587 E5667 6B00         CON(5)  (numy2)-*
            0
1588
1589            *
1590            * DIGIT failed.  If the char was a blank we
1591            * stop converting.  If the char was a ","  "/"
1592            * or a ":" we try to convert some more.  If its
1593            * anything else we bomb out with an error.
1594            *
1595
1596 E566C 0000 numy0   CON(5)  =R@              ELSE R@
            0
1597 E5671 0000         CON(5)  =CAT
            0
1598 E5676 0000         CON(5)  =DUP
            0
```

```
1599 E567B 0000          CON(5)  =LIT
           0
1600 E5680 0200          CON(5)  32              SPACE
           0
1601 E5685 0000          CON(5)  =EQUAL          test for space
           0
1602
1603 E568A 0000          CON(5)  =ZBRNH          IF a space
           0
1604 E568F 8200          CON(5)  (numy3)-*
           0
1605 E5694 0000          CON(5)  =R>
           0
1606 E5699 0000          CON(5)  =2DROP
           0
1607 E569E 0000          CON(5)  =R>
           0
1608 E56A3 0000          CON(5)  =R>
           0
1609 E56A8 0000          CON(5)  =2DROP
           0
1610 E56AD 0000          CON(5)  =BRNCH
           0
1611 E56B2 F700          CON(5)  (numy22)-*
           0
1612 E56B7 0000 numy3    CON(5)  =DUP            ELSE DUP
           0
1613 E56BC 0000          CON(5)   =LIT           LIT     dup this char
           0
1614 E56C1 C200          CON(5)  44              ","     is it a comma?  (c c , )
           0
1615 E56C6 0000          CON(5)   =EQUAL         =       (c f)
           0
1616 E56CB 0000          CON(5)   =SWAP                  (f c)
           0
1617 E56D0 0000          CON(5)   =DUP                   (f c c)
           0
1618 E56D5 0000          CON(5)   =LIT
           0
1619 E56DA F200          CON(5)   47             is it a slash?   (f c c / )
           0
1620 E56DF 0000          CON(5)   =EQUAL                 (f c f)
           0
1621 E56E4 0000          CON(5)   =SWAP                  (f f c)
           0
1622 E56E9 0000          CON(5)   =LIT
           0
1623 E56EE A300          CON(5)   58             is it a colon?  (f f c : )
           0
1624 E56F3 0000          CON(5)   =EQUAL                 (f f f)
           0
1625 E56F8 0000          CON(5)   =OR                    (f  (f OR f) )
           0
1626 E56FD 0000          CON(5)   =OR                    (f OR f OR f)
           0
```

```
1627 E5702 0000          CON(5)   =ZEQ            0=       IF NOT ONE OF THESE
           0
1628
1629 E5707 0000          CON(5)   =ABORTW         ABORT"   not recognized
           0
1630 E570C 01            CON(2)  =eNREC
1631
1632 E570E 0000          CON(5)   =ZERO           0
           0
1633 E5713 0000          CON(5)   =DPL            DPL
           0
1634 E5718 0000          CON(5)   =STORE          !
           0
1635 E571D 0000 numy2    CON(5)  =R>              THEN THEN R>
           0
1636
1637 E5722 0000          CON(5)   =XLOOP          LOOP
           0
1638 E5727 4BEF          CON(5)  (numy)-*
           F
1639 E572C 0000          CON(5)  =DROP
           0
1640 E5731 0000 numy22   CON(5)   =R>             R>
           0
1641
1642             *
1643             * RECOVER SIGN FLAG FROM RETURN STACK
1644             * IF FLAG IS TRUE NUMBER WAS NEGATIVE
1645             *
1646
1647 E5736 0000          CON(5)   =ZBRNH          IF
           0
1648 E573B A000          CON(5)  (NUM1)-*
           0
1649 E5740 0000          CON(5)   =DNGAT          DNEGATE
           0
1650 E5745 0000 NUM1     CON(5)   =SEMI           THEN ;
           0
```

```
1651                    EJECT
1652                ****************************************
1653                *
1654                * ABORT"  (flag --- )  If flag is true
1655                *         give error message that follows
1656                *         ABORT" and run ABORT sequence
1657                *         otherwise skip message.
1658                *
1659                ****************************************
1660 E574A 9645            CON(5)  !NUMB
           E
1661 E574F 6C     =!ABRT"  CON(2)  #C6              ABORT"
1662 E5751 1424            NIBASC  \ABORT\
           F425
           45
1663 E575B 2A              CON(2)  \"\+#80
1664
1665 E575D 0000   =ABRT"   CON(5)  =DOCOL           :
           0
1666
1667 E5762 0000            CON(5)  =DUP             DUP FLAG
           0
1668 E5767 0000            CON(5)  =ZBRNH           SKIP ON ERROR TEST IF 0
           0
1669 E576C A000            CON(5)  (ABO)-*
           0
1670 E5771 0000            CON(5)  =ERRTST          TEST FOR (& DO )ON ERROR RTNE
           0
1671
1672 E5776 0000 ABO        CON(5)  =STATE
           0
1673 E577B 0000            CON(5)  =AT              COMPILING?
           0
1674 E5780 0000            CON(5)  =ZBRNH           IF compiling then
           0
1675 E5785 F000            CON(5)  (AB5)-*          compile in runtime
           0
1676 E578A 0000            CON(5)  =COMPL           code for ABORT"
           0
1677 E578F E085            CON(5)  =ABRTC
           E
1678 E5794 0000 AB5        CON(5)  =LIT             THEN
           0
1679 E5799 2200            CON(5)  34               "  if string does not
           0
1680 E579E 3095            CON(5)  =GCHAR              end with " then give
           E
1681 E57A3 0000            CON(5)  =ABRT"X          'no ending " 'message
           0
1682 E57A8 50              CON(2)  =eNO"            GCHAR also moves string to
1683 E57AA 0000            CON(5)  =STATE           HERE
           0
1684 E57AF 0000            CON(5)  =AT              COMPILING?
           0
1685 E57B4 0000            CON(5)  =ZBRNH           IF compiling then
```

```
            0
1686 E57B9 F000          CON(5)  (AB6)-*
            0
1687 E57BE 4495          CON(5)  =MOVDP          MOVE DICTIONARY PTR
            E
1688 E57C3 0000          CON(5)  =SEMI           ELSE   (cheat and end here)
            0
1689
1690 E57C8 0000 AB6      CON(5)   =SWAP          GET ORIGINAL FLAG, LEAVE STR ADDR
            0
1691 E57CD 0000          CON(5)   =ZBRNH           IF   true give  error
            0
1692 E57D2 2300          CON(5)  (AB0)-*
            0
1693 E57D7 0000 AB3      CON(5)   =COUNT
            0
1694 E57DC 0000          CON(5)   =TYPE            TYPE     with desired string.
            0
1695 E57E1 0000          CON(5)   =CLALL           close all files
            0
1696 E57E6 0000          CON(5)   =SP!             reset data stk pointer
            0
1697 E57EB E9CF          CON(5)   (=FRTHHD)+12
            2
1698 E57F0 0000          CON(5)   =DEFIN           FORTH DEFINITIONS
            0
1699 E57F5 0000          CON(5)   =CLEAN                    get rid of garbage in d
            0
1700 E57FA 0000          CON(5)   =BASIC?
            0
1701 E57FF 0000          CON(5)   =QUIT            QUIT  we never return from QUIT
            0
1702
1703 E5804 0000 AB0      CON(5)   =DROP           DROP ADDR
            0
1704 E5809 0000          CON(5)   =SEMI
            0
1705
1706
1707
1708
1709            ******************************
1710            *
1711            * Run time rtne for ABORT"
1712            *
1713            ******************************
1714
1715 E580E 0000 =ABRTC   CON(5)  =DOCOL
            0
1716 E5813 0000          CON(5)  =DUP            DUP FLAG
            0
1717 E5818 0000          CON(5)  =ZBRNH          IF NON-ZERO
            0
1718 E581D A000          CON(5)  (ABER)-*        TEST FOR (& DO )
            0
```

```
1719 E5822 0000          CON(5)  =ERRTST        ON ERROR RTNE
           0
1720 E5827 0000 ABER     CON(5)  =R@             LEAVE FOR CODE AT AB3
           0
1721 E582C 0000          CON(5)  =SWAP           SWAP FLAG & ADDR
           0
1722              * NOW FIX RETURN TO POINT AFTER MESSAGE
1723 E5831 0000          CON(5)  =R>
           0
1724 E5836 0000          CON(5)  =DUP
           0
1725 E583B 0000          CON(5)  =CAT
           0
1726 E5840 0000          CON(5)  =ONE+
           0
1727 E5845 0000          CON(5)  =TWO*
           0
1728 E584A 0000          CON(5)  =ADD
           0
1729 E584F 0000          CON(5)  =>R
           0
1730 E5854 0000          CON(5)  =ZEQ          IF FLAG NONZERO, GO ON
           0
1731 E5859 0000          CON(5)  =ZBRNH
           0
1732 E585E 97FF          CON(5)  (AB3)-*
           F
1733 E5863 0000          CON(5)  =DROP
           0
1734 E5868 0000          CON(5)  =SEMI
           0
1735
```

```
1736                    EJECT
1737                ****************************************************************
1738                *
1739                * SPACES (n --- ) Transmit N spaces to current output device
1740                *       takes no action for n <=0
1741                *
1742                ****************************************************************
1743 E586D F475          CON(5)  !ABRT"
          E
1744 E5872 68    =!SPACS CON(2)  #86             SPACES
1745 E5874 3505          NIBASC  \SPACE\
          1434
          54
1746 E587E 3D            CON(2)  \S\+#80
1747
1748 E5880 0000 =SPACS   CON(5)  =DOCOL          :
          0
1749 E5885 0000          CON(5)   =ZERO          0
          0
1750 E588A 0000          CON(5)   =MAX           MAX
          0
1751 E588F 0000          CON(5)   =?DUP          ?DUP
          0
1752 E5894 0000          CON(5)   =ZBRNH         IF
          0
1753 E5899 E100          CON(5)  (SPC0)-*
          0
1754 E589E 0000          CON(5)   =ZERO          0
          0
1755 E58A3 0000          CON(5)   =XDO           DO
          0
1756 E58A8 0000 SPC1     CON(5)   =SPACE         SPACE
          0
1757 E58AD 0000          CON(5)   =XLOOP         LOOP
          0
1758 E58B2 6FFF          CON(5)  (SPC1)-*
          F
1759 E58B7 0000 SPC0     CON(5)   =SEMI          ;
          0
```

```
1760                    EJECT
1761                ****************************************************************
1762                *
1763                * SMUDGE  ( --- )  Toggle's the "smudge bit" in a definition's
1764                *         name field.  This prevents an uncompleted definition
1765                *         from being found during dictionary searches.
1766                *
1767                ****************************************************************
1768 E58BC 2785             CON(5)  =!SPACS
            E
1769 E58C1 68     =!SMUDG  CON(2)  #86             SMUDGE
1770 E58C3 35D4           NIBASC  \SMUDG\
            5544
            74
1771 E58CD 5C             CON(2)  \E\+#80
1772
1773 E58CF 0000 =SMUDG    CON(5)  =DOCOL           :
            0
1774 E58D4 5145           CON(5)   =LATE           LATEST
            E
1775 E58D9 0000           CON(5)   =LIT
            0
1776 E58DE 0200           CON(5)  #20              20 HEX
            0
1777 E58E3 1445           CON(5)   =TOGG           TOGGLE
            E
1778 E58E8 0000           CON(5)   =SEMI           ;
            0
1779
1780                ********************************************************
1781                *
1782                * ?PAIRS   (n1 n2 --- )  issues error message if n1#n2
1783                *
1784                ********************************************************
1785
1786 E58ED 0000 =?PAIR    CON(5)  =DOCOL           :
            0
1787 E58F2 0000           CON(5)   =MINUS          -
            0
1788 E58F7 0000           CON(5)   =ABORTW         ABORT"
            0
1789 E58FC 11             CON(2)  =eCOND
1790                *       NIBASC  \ conditi\
1791                *       NIBASC  \onals no\
1792                *       NIBASC  \t paired\
1793 E58FE 0000           CON(5)   =SEMI           ;
            0
1794                ****************************************
1795                *
1796                * GCHAR  ( c -- addr t/f)  moves string to HERE
1797                * looking for c; returns true if no ending c
1798                * otherwise false; also returns addr of string
1799                *
1800                ****************************************
1801
```

```
1802 E5903 0000 =GCHAR CON(5)  =DOCOL      :
           0
1803 E5908 0000        CON(5)   =DUP       DUP  (c c )
           0
1804 E590D 0000        CON(5)   =WORD           (c addr)
           0
1805 E5912 0000        CON(5)   =DUP            (c addr addr)
           0
1806 E5917 0000        CON(5)   =CAT       C@
           0
1807 E591C 0000        CON(5)   =ONE+      1+
           0
1808 E5921 0000        CON(5)   =TWO*      2*
           0
1809 E5926 0000        CON(5)   =OVER
           0
1810 E592B 0000        CON(5)   =ADD       +
           0
1811 E5930 0000        CON(5)   =CAT       C@   get last-char
           0
1812 E5935 0000        CON(5)   =ROT            ( addr  last-char  c)
           0
1813 E593A 0000        CON(5)   =<>        true if chars <>
           0
1814 E593F 0000        CON(5)   =SEMI      ;
           0
```

```
1815                    EJECT
1816                ********************************************
1817                *
1818                * MOVEDP:
1819                *
1820                * MOVE DICTIONARY POINTER PAST STRING AT END
1821                * OF DICTIONARY (PUT THERE BY WORD)
1822                *
1823                ********************************************
1824
1825 E5944 0000 =MOVDP CON(5)  =DOCOL       :
          0
1826 E5949 0000       CON(5)   =CAT         C@
          0
1827 E594E 0000       CON(5)   =ONE+        1+
          0
1828 E5953 0000       CON(5)   =TWO*        2*
          0
1829 E5958 3164       CON(5)   =ALLOT       NALLOT
          E
1830 E595D 0000       CON(5)   =SEMI        ;
          0
1831                ************************************************************
1832                *
1833                * CLOSEF  ( fib# --- )  This routine will close the file
1834                *         identified by the fib# on the data stack.
1835                *
1836                *
1837                ************************************************************
1838
1839 E5962 1C85          CON(5)  =!SMUDG
          E
1840 E5967 68    =!CLOSF CON(2) #86             CLOSEF
1841 E5969 34C4          NIBASC \CLOSE\
          F435
          54
1842 E5973 6C            CON(2) \F\+#80
1843 E5975 A795 =CLOSF   CON(5)  =$CLOSF
          E
1844
1845 E597A 143  =$CLOSF A=DAT1  A
1846 E597D 174         D1=D1+   5                 POP fib# FROM DATA STK
1847 E5980 8E00        GOSUBL   =SAVEFP           SAVE FORTH POINTERS
          00
1848 E5986 8F00        GOSBVL   =CLOSEF           CLOSE THIS FILE
          000
1849 E598D 8C00        GOLONG   =GETFP            RESTORE FORTH POINTERS
          00
```

```
1850                EJECT
1851            ****************************************************************
1852            *
1853            * BUFFER  (n1 n2 --- addr)  This routine will obtain the
1854            *         next block buffer, assigning it to block n.  The
1855            *         block is not read from mass storage.
1856            *
1857            * n1  --- desired line #
1858            * n2  --- fib# identifying the desired file
1859            * addr -- addr of 1st data byte in the buffer
1860            *
1861            ****************************************************************
1862
1863
1864 E5993 0000 =BUFFR CON(5)  =DOCOL        :
          0
1865 E5998 0000        CON(5)    =USE          USE     get addr of next
          0
1866 E599D 0000        CON(5)    =AT           @       buffer to use and
          0
1867 E59A2 0000        CON(5)    =DUP          DUP     duplicate it, put
          0
1868 E59A7 0000        CON(5)    =>R           >R      a copy on the return stk,
          0
1869 E59AC 0000 BUF0   CON(5)    =PBUF         BEGIN +BUF   get addr of next
          0
1870 E59B1 0000        CON(5)    =ZBRNH        UNTIL        buffer to use &
          0
1871 E59B6 6FFF        CON(5)   (BUF0)-*
          F
1872 E59BB 0000        CON(5)    =USE          USE       store it in
          0
1873 E59C0 0000        CON(5)    =STORE        !         USE
          0
1874 E59C5 0000        CON(5)    =R@           R@        get buffer addr
          0
1875 E59CA 0000        CON(5)    =C!           C!        store new fib# into it
          0
1876 E59CF 0000        CON(5)    =R@           R@        get buffer addr
          0
1877 E59D4 0000        CON(5)    =TWO+         2+        make it line# addr
          0
1878 E59D9 0000        CON(5)    =STORE        !         store new line# into it
          0
1879 E59DE 0000        CON(5)    =R@           R@        get buffer addr
          0
1880 E59E3 0000        CON(5)    =PREV         PREV      mark it as previously us
          0
1881 E59E8 0000        CON(5)    =STORE        !         buffer
          0
1882 E59ED 0000        CON(5)    =R>           R>        get buffer addr off rtn
          0
1883 E59F2 0000        CON(5)    =LIT
          0
1884 E59F7 B000        CON(5)   11             11
```

```
                0
1885 E59FC 0000         CON(5)    =ADD          +         make it addr of buffer d
                0
1886 E5A01 0000         CON(5)    =LIT                    we've just assigned, or
                0
1887 E5A06 FFFF         CON(5)    #FFFF         -1        more importantly, reassi
                0
1888 E5A0B 0000         CON(5)    =LINE#        LINE#     a buff to a file, we mus
                0
1889 E5A10 0000         CON(5)    =STORE        !         set LINE# to FFFF so tha
                0
1890              *                                       R/W will REWIND the file
1891              *                                       and reread the line.
1892 E5A15 0000         CON(5)    =SEMI         ;         and return!
                0
```

```
1893                    EJECT
1894                ************************************************
1895                *
1896                * STRING  Create a string variable of a maximum
1897                *         length
1898                *
1899                * 10 STRING  HOWDY   (HOWDY has a max len of 10)
1900                *
1901                ************************************************
1902
1903 E5A1A 7695          CON(5)  =!CLOSF
           E
1904 E5A1F 68    =!STRNG CON(2)  #86
1905 E5A21 3545          NIBASC  \STRIN\
           2594
           E4
1906 E5A2B 7C            CON(2)  \G\+#80
1907
1908 E5A2D 0000 =STRNG CON(5)  =DOCOL       :
           0
1909 E5A32 0405        CON(5)   =CREAT      CREATE
           E
1910 E5A37 49A5        CON(5)   =ROMC+      ROM;CODE
           E
1911               *                        with DOSTRING
1912 E5A3C 87A5        CON(5)   =M255       REPLACE MAXLEN WITH
           E
1913               *                        255 IF IT'S >255
1914 E5A41 0000        CON(5)   =DUP        maxlen maxlen
           0
1915 E5A46 0000        CON(5)   =HERE       maxlen maxlen here
           0
1916 E5A4B 0000        CON(5)   =C!        (store maxlen)
           0
1917 E5A50 0000        CON(5)   =ZERO       maxlen 0
           0
1918 E5A55 0000        CON(5)   =HERE       maxlen 0 here
           0
1919 E5A5A 0000        CON(5)   =TWO+       maxlen 0 here+2
           0
1920 E5A5F 0000        CON(5)   =C!        (store 0 as current length)
           0
1921 E5A64 0000        CON(5)   =TWO+       maxlen+2
           0
1922 E5A69 0000        CON(5)   =TWO*       2*(maxlen+2)=space to be
           0
1923               *                        allotted for chars and 2 len bytes
1924 E5A6E 3164        CON(5)   =ALLOT      NALLOT
           E
1925 E5A73 0000        CON(5)   =SEMI       ;
           0
1926
1927
1928            * REPLACE VALUE ON STACK WITH 255 IF IT'S >255
1929 E5A78 D7A5 =M255   CON(5)  =$M255
```

```
            E
1930 E5A7D 20    =$M255  P=      0
1931 E5A7F 143           A=DAT1  A
1932 E5A82 D2            C=0     A
1933 E5A84 31FF          LC(2)   255
1934 E5A88 8BA           ?A<=C   A           VALUE <256?
1935 E5A8B 40            GOYES   M255X       DON'T CHANGE
1936 E5A8D DA            A=C     A           REPLACE WITH 255
1937 E5A8F 141   M255X    DAT1=A  A
1938 E5A92 03            RTNCC
1939
1940 E5A94 0000  =ROMC+  CON(5)  =DOCOL      :
             0
1941 E5A99 0000          CON(5)   =ROM;C     ROM;CODE
             0
1942 E5A9E 0000          CON(5)  =DOSTR
             0
1943
1944 E5AA3 0000  =ROMC*  CON(5)  =DOCOL      :
             0
1945 E5AA8 0000          CON(5)   =ROM;C     ROM;CODE
             0
1946 E5AAD 0000          CON(5)  =DOSTRA
             0
```

```
1947                    EJECT
1948                ************************************************
1949                *
1950                * MAXLEN                        ( str  -- maxlen )
1951                * Maximum length of string. It is the first byte
1952                * at the pfa.
1953                *
1954                ************************************************
1955
1956 E5AB2 F1A5         CON(5)  !STRNG
            E
1957 E5AB7 68     =!MXLEN CON(2)  #86
1958 E5AB9 D414         NIBASC  \MAXLE\
            85C4
            54
1959 E5AC3 EC           CON(2)  \N\+#80
1960
1961 E5AC5 0000 =MXLEN CON(5)  =DOCOL       :
            0
1962 E5ACA 0000         CON(5)   =DROP      DROP
            0
1963 E5ACF 0000         CON(5)   =LIT
            0
1964 E5AD4 4000         CON(5)  4           4
            0
1965 E5AD9 0000         CON(5)   =MINUS     -
            0
1966 E5ADE 0000         CON(5)   =CAT       C@
            0
1967 E5AE3 0000         CON(5)   =SEMI      ;
            0
1968
1969
1970                ************************************************
1971                *
1972                * RIGHT$                        ( str size -- str )
1973                * Return a sub string of rightmost <size> chars.
1974                *
1975                * This is equivalent to doing <str> <len-size+1> SUB$
1976                * so that's how we implement it.
1977                ************************************************
1978
1979 E5AE8 7BA5          CON(5)  =!MXLEN
            E
1980 E5AED 68     =!RITE$ CON(2)  #86
1981 E5AEF 2594         NIBASC  \RIGHT\
            7484
            45
1982 E5AF9 4A           CON(2)  \$\+#80
1983
1984 E5AFB 0000 =RITE$ CON(5)  =DOCOL       :
            0
1985 E5B00 0000         CON(5)   =OVER      addr len size len
            0
1986 E5B05 0000         CON(5)   =SWAP      addr len len size
```

```
            0
1987 E5B0A  0000        CON(5)   =MINUS      addr len (len-size)
            0
1988 E5B0F  0000        CON(5)   =ONE+       (len-size+1 = pos of 1st char)
            0
1989            * addr len 1st
1990 E5B14  0000        CON(5)   =OVER       addr len 1st len
            0
1991            * str 1st len
1992 E5B19  0000        CON(5)   =SUB$       SUB$
            0
1993 E5B1E  0000        CON(5)   =SEMI       ;
            0
1994
1995 E5B23      =REND4  END
```

```
=!?STK   Abs  938922 #E53AA -  1366  1399
=!ABRT"  Abs  939855 #E574F -  1661  1743
=!ALLOT  Abs  935429 #E4605 -    30    68
=!BAS$   Abs  936021 #E4855 -   264   461
=!BASCX  Abs  937005 #E4C2D -   625   770
=!BASF   Abs  935566 #E468E -   103   263
=!BASI   Abs  935478 #E4636 -    70   102
=!CLOSF  Abs  940391 #E5967 -  1840  1903
=!CMOV>  Abs  937830 #E4F66 -  1007  1031
=!CREAT  Abs  938034 #E5032 -  1104  1197
=!FENTR  Abs  936961 #E4C01 -   600   624
=!FORGT  Abs  938487 #E51F7 -  1234  1365
=!IOFIN  Abs  936727 #E4B17 -   506   528
=!IOKIL  Abs  936785 #E4B51 -   529   553
=!IOMAK  Abs  936607 #E4A9F -   462   505
=!LATE   Abs  939015 #E5407 -  1400  1417
=!MXLEN  Abs  940727 #E5AB7 -  1957  1979
=!NEGAT  Abs  937796 #E4F44 -   984  1006
=!NMOV>  Abs  937866 #E4F8A -  1032  1076
=!NUMB   Abs  939113 #E5469 -  1451  1660
=!OUTPT  Abs  937365 #E4D95 -   771   938
=!REPET  Abs  938418 #E51B2 -  1198  1233
=!RITE$  Abs  940781 #E5AED -  1980
=!SCFIB  Abs  937983 #E4FFF -  1077  1103
=!SHRNK  Abs  937673 #E4EC9 -   939   983
=!SMUDG  Abs  940225 #E58C1 -  1769  1839
=!SPACS  Abs  940146 #E5872 -  1744  1768
=!STRNG  Abs  940575 #E5A1F -  1904  1956
=!TOGG   Abs  939059 #E5433 -  1418  1450
=!UDIV   Abs  936842 #E4B8A -   554   599
 $BASCX  Abs  937071 #E4C6F -   645   644
=$BASF   Abs  935585 #E46A1 -   108   106
 $BASI   Abs  935497 #E4649 -    75    73
=$BSIZE  Abs  938018 #E5022 -  1088  1086
=$BSUB   Abs  936160 #E48E0 -   295   294
=$CLAP   Abs  936581 #E4A85 -   439   438
=$CLOSF  Abs  940410 #E597A -  1845  1843
=$CMOV>  Abs  937849 #E4F79 -  1012  1011
=$FENTR  Abs  936980 #E4C14 -   604   603
 $IOFIN  Abs  936746 #E4B2A -   511   509
 $IOKIL  Abs  936804 #E4B64 -   533   532
 $IOMAK  Abs  936626 #E4AB2 -   467   465
=$M255   Abs  940669 #E5A7D -  1930  1929
=$NEGAT  Abs  937815 #E4F57 -   989   987
=$NMOV>  Abs  937885 #E4F9D -  1037  1035
 $NMOVE  Ext                -   742
 $OUT    Abs  937426 #E4DD2 -   801   799
=$SCFIB  Abs  938002 #E5012 -  1083  1080
=$SHRNK  Abs  937692 #E4EDC -   944   942
=$UDIV   Abs  936861 #E4B9D -   559   557
 2DROP   Ext                -  1139  1606  1609
 2DUP    Ext                -   287
 <>      Ext                -  1813
 >R      Ext                -   271  1204  1205  1273  1470  1534  1558  1729
                             1868
```

```
 ?COMP    Ext                  -  1203
 ?DUP     Ext                  -  1348  1751
=?PAIR    Abs  940269 #E58ED   -  1786
=?STK     Abs  938936 #E53B8   -  1370
 AB0      Abs  940036 #E5804   -  1703  1692
 AB3      Abs  939991 #E57D7   -  1693  1732
 AB5      Abs  939924 #E5794   -  1678  1675
 AB6      Abs  939976 #E57C8   -  1690  1686
 ABER     Abs  940071 #E5827   -  1720  1718
 ABO      Abs  939894 #E5776   -  1672  1669
 ABORTW   Ext                  -   631   786  1247  1263  1271  1629  1788
=ABRT"    Abs  939869 #E575D   -  1665
 ABRT"X   Ext                  -  1129  1376  1387  1681
=ABRTC    Abs  940046 #E580E   -  1715  1677
 ACTIV    Ext                  -   635
 ADD      Ext                  -  1385  1728  1810  1885
 ADHEAD   Ext                  -   336
 AGAIN    Ext                  -  1206
=ALLOT    Abs  935443 #E4613   -    34  1159  1829  1924
 AT       Ext                  -    37   630  1111  1134  1135  1141  1147  1152
                                1173  1242  1243  1261  1276  1288  1304  1314
                                1331  1347  1406  1407  1424  1458  1561  1568
                                1573  1577  1673  1684  1866
 AVMEMS   Ext                  -   147
=B$SUB    Abs  936155 #E48DB   -   294   268
 BAD      Abs  937493 #E4E15   -   837
 BAD1     Abs  937503 #E4E1F   -   841   876
=BASCX    Abs  937066 #E4C6A   -   644   633
 BASE     Ext                  -  1560  1567  1572
=BASF     Abs  935580 #E469C   -   106  1485
=BASI     Abs  935492 #E4644   -    73
 BASIC    Ext                  -   629
=BASIC$   Abs  936035 #E4863   -   267
 BASIC?   Ext                  -  1700
=BASICX   Abs  937019 #E4C3B   -   628
 BL       Ext                  -  1121  1239
 BRNCH    Ext                  -  1315  1340  1512  1586  1610
=BSIZE    Abs  938013 #E501D   -  1086
 BSU1     Abs  936204 #E490C   -   311   309
 BSX0     Abs  937120 #E4CA0   -   667   665
 BUF0     Abs  940460 #E59AC   -  1869  1871
=BUFFR    Abs  940435 #E5993   -  1864
 C!       Ext                  -   284   288  1156  1875  1916  1920
 CAT      Ext                  -  1126  1150  1492  1502  1529  1559  1597  1725
                                1806  1811  1826  1966
 CHK      Ext                  -   944
 CLALL    Ext                  -  1695
=CLAP     Abs  936576 #E4A80   -   438   291
 CLEAN    Ext                  -  1699
 CLOSEF   Ext                  -  1848
=CLOSF    Abs  940405 #E5975   -  1843
 CM3      Ext                  -  1066
=CMOV>    Abs  937844 #E4F74   -  1011
 CMOVE    Ext                  -   276
 COLLAP   Ext                  -    79   114   440
```

```
 COMMA   Ext                  -  1120  1171
 COMPL   Ext                  -  1676
 CONTX   Ext                  -  1133  1275  1283  1295
 CORUPT  Ext                  -   433
 COUNT   Ext                  -  1180  1471  1484  1693
 CRE0    Abs  938093 #E506D   -  1121
 CRE01   Abs  938128 #E5090   -  1129
 CRE1    Abs  938135 #E5097   -  1132
 CREA10  Abs  938220 #E50EC   -  1149  1138  1143
=CREAT   Abs  938048 #E5040   -  1108  1909
 CURR    Ext                  -  1172  1241  1287  1405
 D+      Ext                  -  1575
 DEFIN   Ext                  -  1297  1698
 DIGIT   Ext                  -  1562
 DNGAT   Ext                  -  1649
 DOCOL   Ext                  -    34   267   628   775   784  1108  1118  1179
                                1202  1238  1370  1404  1422  1455  1462  1665
                                1715  1748  1773  1786  1802  1825  1864  1908
                                1940  1944  1961  1984
 DOSTR   Ext                  -  1942
 DOSTRA  Ext                  -  1946
 DOUSE   Ext                  -  1083  1088
 DOVAR   Ext                  -  1170
 DP      Ext                  -  1355
 DPL     Ext                  -  1482  1545  1576  1583  1633
 DROP    Ext                  -  1249  1570  1639  1703  1733  1962
 DUP     Ext                  -   270   278  1123  1124  1132  1144  1149  1154
                                1160  1259  1265  1319  1326  1332  1469  1491
                                1501  1527  1533  1557  1598  1612  1617  1667
                                1716  1724  1803  1805  1867  1914
 EOLLEN  Ext                  -   811
 EQUAL   Ext                  -  1505  1532  1601  1615  1620  1624
 ERRTST  Ext                  -  1670  1719
 EXCPAR  Ext                  -   342
 EXEC    Ext                  -    38  1112  1148  1459
 EXPR    Ext                  -   396
 FAIL    Abs  936710 #E4B06   -   491   471   474   479   514   536
 FENCE   Ext                  -  1260
=FENTR   Abs  936975 #E4C0F   -   603
 FIND>   Ext                  -  1136  1245
 FIVE-   Ext                  -  1327  1339  1345  1354
 FL0     Abs  935743 #E473F   -   153   150
 FL1     Abs  935754 #E474A   -   163   168
 FLOT    Abs  935628 #E46CC   -   119    75   108   295
 FLOT0   Abs  935681 #E4701   -   133   128
 FLTDH   Ext                  -    86
=FLTOH   Abs  935533 #E466D   -    86    78
=FORGT   Abs  938501 #E5205   -  1238
 FRGET1  Abs  938672 #E52B0   -  1286  1280
 FRGET2  Abs  938727 #E52E7   -  1303  1292
 FRGET3  Abs  938737 #E52F1   -  1308  1316
 FRGET4  Abs  938777 #E5319   -  1319  1313
 FRGET5  Abs  938802 #E5332   -  1331  1341
 FRGET6  Abs  938852 #E5364   -  1344  1338
 FRGETL  Abs  938792 #E5328   -  1326  1351
```

```
 FUNCD1  Ext                    -   338   389
=GCHAR   Abs  940291 #E5903    -  1802  1680
 GETADR  Abs  936561 #E4A71    -   430   406   409   412
 GETF#   Abs  935819 #E478B    -   193    76   109
 GETFP   Ext                    -    81   115   318   441   481   491   516   537
                                   606   692   715   838   873  1849
 GSBSTK  Ext                    -   372   402
 HERE    Ext                    -  1164  1915  1918
 I/OALL  Ext                    -   478   674
 I/ODAL  Ext                    -   535
=ICREAT  Abs  938078 #E505E    -  1118
 INBS    Ext                    -   744
=INUMB   Abs  939157 #E5495    -  1462
 IOFIN0  Abs  936775 #E4B47    -   517   540
=IOFIND  Abs  936741 #E4B25    -   509
 IOFND0  Ext                    -   513
 IOFSCR  Ext                    -   473   672
 IOK0    Abs  936824 #E4B78    -   537
=IOKILL  Abs  936799 #E4B5F    -   532
=IOMAKE  Abs  936621 #E4AAD    -   465
=IUNIQ   Abs  938355 #E5173    -  1179
=LATE    Abs  939029 #E5415    -  1404  1119  1774
 LINE#   Ext                    -  1888
 LINEP*  Ext                    -   746
 LIT     Ext                    -    35   279  1109  1145  1161  1166  1169  1281
                                  1293  1382  1456  1480  1503  1514  1530  1543
                                  1599  1613  1618  1622  1678  1775  1883  1886
                                  1963
 LTZ     Ext                    -  1270
=M255    Abs  940664 #E5A78    -  1929  1912
 M255X   Abs  940687 #E5A8F    -  1937  1935
 MAINST  Ext                    -   971
 MAX     Ext                    -   281  1750
 MB0     Abs  936705 #E4B01    -   489   493
 MEMERR  Ext                    -   151
 MFERR   Ext                    -    91   131   749
 MIN     Ext                    -  1153
 MINUS   Ext                    -  1787  1965  1987
=MOVDP   Abs  940356 #E5944    -  1825  1687
 MOVED2  Ext                    -   361
 MOVSET  Ext                    -  1039
 MTHSTK  Ext                    -   138   363   392
 MVMEM+  Ext                    -   974
=MXLEN   Abs  940741 #E5AC5    -  1961
=NEGAT   Abs  937810 #E4F52    -   987
=NIB7    Abs  937577 #E4E69    -   880   801
 NMOV0   Abs  937891 #E4FA3    -  1039  1015
 NMOV1   Abs  937919 #E4FBF    -  1049  1056
 NMOV2   Abs  937944 #E4FD8    -  1057  1050
 NMOV3   Abs  937947 #E4FDB    -  1058  1065
 NMOV4   Abs  937972 #E4FF4    -  1066  1059
=NMOV>   Abs  937880 #E4F98    -  1035
 NUM00   Abs  939448 #E55B8    -  1543  1536
 NUM1    Abs  939845 #E5745    -  1650  1648
=NUMB    Abs  939127 #E5477    -  1455
```

```
 NUMB00  Abs  939253 #E54F5 -  1488  1476
 NoCont  Ext                -   222   225
 OK      Abs  937555 #E4E53 -   866   831
 OK1     Abs  937511 #E4E27 -   845   868
 ONE     Ext                -   634  1582
 ONE+    Ext                -  1157  1578  1726  1807  1827  1988
 ONE-    Ext                -  1256  1509  1539
 OR      Ext                -  1625  1626
 OUTBYT  Ext                -   353
=OUTP    Abs  937421 #E4DCD -   799   776
=OUTPUT  Abs  937379 #E4DA3 -   775
 OVER    Ext                -  1309  1344  1423  1809  1985  1990
 PAD     Ext                -   272   283   285  1381
 PBUF    Ext                -  1869
 PDOTQ   Ext                -  1185
=PILERR  Abs  937399 #E4DB7 -   784   777
 POLL    Ext                -   628
 POPSTK  Ext                -   422
 POS     Ext                -  1472
 PREV    Ext                -  1880
 PSHSTK  Ext                -   374
 PSTOR   Ext                -  1584
 QUIT    Ext                -  1701
 QUOTC   Ext                -  1463
 R<RSTK  Ext                -   341
 R>      Ext                -   277  1207  1208  1353  1473  1605  1607  1608
                              1635  1640  1723  1882
 R@      Ext                -  1274  1286  1308  1333  1596  1720  1874  1876
                              1879
=REND4   Abs  940835 #E5B23 -  1995
=REPET   Abs  938432 #E51C0 -  1202
 REVPOP  Ext                -   337   426
=RITE$   Abs  940795 #E5AFB -  1984
 ROM;C   Ext                -  1941  1945
=ROMC*   Abs  940707 #E5AA3 -  1944
=ROMC+   Abs  940692 #E5A94 -  1940  1910
 ROT     Ext                -  1155  1468  1490  1571  1812
 RSTK<R  Ext                -   365
 Return  Abs       0 #00000 -   331   332
 S0      Ext                -  1372
 SAVEFP  Ext                -   120   439   467   511   533   604   655   880
                              1847
=SCFIB   Abs  937997 #E500D -  1080
 SEMI    Ext                -    39   292   637   780   790  1113  1175  1189
                             1211  1357  1391  1408  1428  1460  1486  1650
                             1688  1704  1734  1759  1778  1793  1814  1830
                             1892  1925  1967  1993
 SFLAG?  Ext                -   229   240
 SFLAGC  Ext                -   235   246
 SH0     Abs  937762 #E4F22 -   968   965
 SH09    Abs  937747 #E4F13 -   962   960
=SHRINK  Abs  937687 #E4ED7 -   942
=SMUDG   Abs  940239 #E58CF -  1773
 SP!     Ext                -  1696
 SP@     Ext                -  1371  1380
```

```
 SPACE   Ext                    -  1184  1756
=SPACS   Abs  940160 #E5880     -  1748
 SPC0    Abs  940215 #E58B7     -  1759  1753
 SPC1    Abs  940200 #E58A8     -  1756  1758
 SS1     Abs  935895 #E47D7     -   221   218
 SS2     Abs  935909 #E47E5     -   226   223
 SS3     Abs  935952 #E4810     -   237   231
 SS4     Abs  935995 #E483B     -   248   242
 STATE   Ext                    -  1672  1683
 STKCHR  Ext                    -   335
 STKLFT  Ext                    -   110   605
 STMTR0  Ext                    -   813   845
 STMTR1  Ext                    -   807
 STORE   Ext                    -   636  1174  1284  1296  1321  1346  1356  1427
                                   1483  1546  1634  1873  1878  1881  1889
=STRNG   Abs  940589 #E5A2D     -  1908
 SUB↓    Ext                    -  1992
 SUCC    Abs  936698 #E4AFA     -   486
=SVSTAT  Abs  935879 #E47C7     -   215
 SWAP    Ext                    -   275   290  1373  1426  1474  1493  1508  1510
                                   1538  1540  1552  1566  1616  1621  1690  1721
                                   1986
 THEN    Ext                    -  1210
=TOGG    Abs  939073 #E5441     -  1422  1163  1168  1777
 TRAVS   Ext                    -  1258
 TWO*    Ext                    -  1158  1727  1808  1828  1922
 TWO+    Ext                    -   273   274   286   289  1125  1500  1528  1537
                                   1556  1877  1919  1921
 TWO-    Ext                    -  1165  1209  1254  1518
 TYPE    Ext                    -  1183  1694
 U*      Ext                    -  1569  1574
 U<      Ext                    -  1262  1277  1289  1310  1334  1374  1386
=UDIV    Abs  936856 #E4B98     -   557
 UDIV0   Abs  936899 #E4BC3     -   572   575
 UDIV1   Abs  936905 #E4BC9     -   574   569
 UDIV2   Abs  936913 #E4BD1     -   577   584
 UDIV3   Abs  936930 #E4BE2     -   583   576   580
 UDIV4   Abs  936936 #E4BE8     -   585   571
 USE     Ext                    -  1865  1872
=VAL0$   Abs  936251 #E493B     -   332   296
 VAL00   Ext                    -   193
 VAL01   Abs  936327 #E4987     -   350
 VALERR  Abs  936247 #E4937     -   329   347   349   351
 VOC-L   Ext                    -  1303  1320
=ValSub  Abs      10 #0000A     -   326
 WARN    Ext                    -  1140
 WIDTH   Ext                    -  1151
 WORD    Ext                    -  1122  1240  1804
 WR1     Ext                    -   966
 XDO     Ext                    -  1554  1755
 XLOOP   Ext                    -  1637  1757
 XOR     Ext                    -  1425
 XXHEAD  Ext                    -   333
 ZBRNH   Ext                    -  1137  1142  1279  1291  1311  1337  1350  1475
                                   1506  1516  1535  1564  1580  1603  1647  1668
```

					1674	1685	1691	1717	1731	1752	1870
ZEQ	Ext			-	785	1127	1246	1335	1349	1627	1730
ZERO	Ext			-	1255	1488	1489	1511	1553	1632	1749	1754
					1917						
adj	Ext			-	975						
eDATTY	Ext			-	130						
eIVerr	Abs	935665	#E46F1	-	129	214					
eIVgo	Abs	935875	#E47C3	-	214	202	329				
eMEM	Ext			-	748						
eOVFLW	Ext			-	90						
flPRGM	Ext			-	228	234					
flSUSP	Ext			-	238	245					
nom	Abs	937156	#E4CC4	-	677	673					
nomem	Abs	937349	#E4D85	-	748	677					
numy	Abs	939483	#E55DB	-	1556	1638					
numy0	Abs	939628	#E566C	-	1596	1565					
numy1	Abs	939618	#E5662	-	1586	1581					
numy2	Abs	939805	#E571D	-	1635	1587					
numy22	Abs	939825	#E5731	-	1640	1611					
numy3	Abs	939703	#E56B7	-	1612	1604					
numz	Abs	939283	#E5513	-	1500	1517					
numz1	Abs	939353	#E5559	-	1514	1507					
numz2	Abs	939363	#E5563	-	1516	1513					
pPRTCL	Ext			-	829						
tEOL	Ext			-	345	352					
yesmem	Abs	937160	#E4CC8	-	681	675					

Input Parameters

Source file name is MR&FT4

Listing file name is MR/FT4

Object file name is MR%FT4::65

```
                                  111111
                        0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                      TITLE  FT5:_7_&_8_CHAR_WORDS
 2                      RDSYMB MR%GTO
 3                *     RDSYMB MR%FT4
 4                *     ABS    REND4
 5
 6 E5C00                ABS    #E5C00
 7
 8                ********************************************
 9                *
10                * MR&FT5     <840608.1403>
11                *
12                *
13                *   START OF 7 CHAR WORDS
14                * ADD ADDITIONAL WORDS AT THIS END
15                *
16                ********************************************
17
18                ********************************************
19                *
20                * LISTING                    ( -- str)
21                *
22                * This is a string variable, the only one
23                * built into the system.
24                *
25                ********************************************
26 E5C00 0000          CON(5)  0             NO MORE 7'S
         0
27 E5C05 78    =!LSTNG CON(2)  #87
28 E5C07 C494          NIBASC  \LISTIN\
         3545
         94E4
29 E5C13 7C            CON(2)  \G\+#80
30 E5C15 A1C5 =LISTNG  CON(5)  =$LSTNG
         E
31 E5C1A 20    =$LSTNG P=      0
32 E5C1C 34D4          LC(5)   =oLSTNG       GET ADDR OF VARIABLE
         CF2
33 E5C23 E6            C=C+1   A
34 E5C25 E6            C=C+1   A             POINT TO CURLEN
35 E5C27 137           CD1EX
36 E5C2A D0            A=0     A
37 E5C2C 14B           A=DAT1  B             GET CUR LEN
38 E5C2F 137           CD1EX
39 E5C32 E6            C=C+1   A
40 E5C34 E6            C=C+1   A             POINT TO BEGINNING OF STR
41 E5C36 1C4           D1=D1-  5
42 E5C39 145           DAT1=C  A             PUT ADDR ON STK
43 E5C3C 1C4           D1=D1-  5
44 E5C3F 141           DAT1=A  A             PUT LEN ON STK
45 E5C42 03            RTNCC
```

```
46                      EJECT
47                  ******************************************************
48                  *
49                  * PRIMARY ( addr --- ) Returns the addr of a variable
50                  *       which contains the HPIL PRIMARY address (0, 31)
51                  *       of the device from which data will be ENTERed
52                  *       and OUTPUT.
53                  *
54                  *       It defaults to 1.  No checking is done to
55                  *       make sure that the user does not screw things
56                  *       up.
57                  *
58                  ******************************************************
59
60 E5C44 50C5              CON(5)  =!LSTNG
           E
61 E5C49 78       =!PRIME CON(2)  #87
62 E5C4B 0525             NIBASC  \PRIMAR\
           94D4
           1425
63 E5C57 9D               CON(2)  \Y\+#80
64 E5C59 E5C5     =PRIME  CON(5)  =$PRIME
           E
65
66 E5C5E 8E00     =$PRIME GOSUBL  =DOUSE
           00
67 E5C64 1BBF             CON(5)  (=oPRIME)
           2
```

```
     68                    EJECT
```

```
69                      EJECT
70                  ****************************************
71                  *
72                  * EXECUTE  (addr --- )  Execute the dictionary
73                  *        entry whose cfa addr is on the stack.
74                  *
75                  ****************************************
76
77 E5C69 94C5         CON(5)  !PRIME
        E
78 E5C6E 78    =!EXEC  CON(2) #87
79 E5C70 5485         NIBASC \EXECUT\
         5434
         5545
80 E5C7C 5C           CON(2) \E\+#80
81 E5C7E 38C5 =EXEC   CON(5)  $EXEC
         E
82
83 E5C83 143  $EXEC   A=DAT1 A                @DATA STK--> WA
84 E5C86 174          D1=D1+ 5                JUMP INTO NEXT AT RUN
85 E5C89 8C00         GOLONG =RUN
         00
```

```
 86                     EJECT
 87                 ****************************************
 88                 *
 89                 * RADIANS       SET MACHINE RADIAN MODE
 90                 *
 91                 ****************************************
 92 E5C8F E6C5       =!EXEC  CON(5)  !EXEC
          E
 93 E5C94 78         =!RAD   CON(2)  #87
 94 E5C96 2514       =RADIAN NIBASC  \RADIAN\
          4494
          14E4
 95 E5CA2 3D         =S+#80  CON(2)  \S\+#80
 96 E5CA4 9AC5       =$RAD   CON(5)  =$RAD
          E
 97 E5CA9 8E00       =SAVEFP GOSUBL  =SAVEFP
          00
 98 E5CAF 3100       =FLRAD  LC(2)   =FLRAD
 99 E5CB3 8F00       =SFLAGS GOSBVL  =SFLAGS
          000
100 E5CBA 8C00       =GETFP  GOLONG  =GETFP
          00
101
102                 ****************************************
103                 *
104                 * DEGREES       SET MACHINE DEGREE MODE
105                 *
106                 ****************************************
107 E5CC0 49C5       =!RAD   CON(5)  =!RAD
          E
108 E5CC5 78         =!DEGR  CON(2)  #87
109 E5CC7 4454       =DEGREE NIBASC  \DEGREE\
          7425
          5454
110 E5CD3 3D         =S+#80  CON(2)  \S\+#80
111 E5CD5 ADC5       =$DEGR  CON(5)  =$DEGR
          E
112 E5CDA 8E00       =SAVEFP GOSUBL  =SAVEFP
          00
113 E5CE0 3100       =FLRAD  LC(2)   =FLRAD
114 E5CE4 8F00       =SFLAGC GOSBVL  =SFLAGC     CLEAR RADIANS FLAG
          000
115 E5CEB 8C00       =GETFP  GOLONG  =GETFP
          00
```

```
116                     EJECT
117                 ************************************************************
118                 *
119                 * DNEGATE (d1 ---  -d1)  leave 2's comp of double number
120                 *
121                 ************************************************************
122
123 E5CF1 5CC5             CON(5)  =!DEGR
        E
124 E5CF6 78       =!DNGAT CON(2)  #87             DNEGATE
125 E5CF8 44E4             NIBASC  \DNEGAT\
          5474
          1445
126 E5D04 5C               CON(2)  \E\+#80
127 E5D06 B0D5 =DNGAT      CON(5)  =$DNGAT
          E
128
129 E5D0B 1C4  =$DNGAT     D1=D1-  5
130 E5D0E 15F9             C=DAT1  10           MSDs to C9:5
131 E5D12 179              D1=D1+  10
132 E5D15 147              C=DAT1  A            LSDs to C4:0
133 E5D18 29               P=      9
134 E5D1A B9A              C=-C    WP           2'S COMP
135 E5D1D 145              DAT1=C  A            LSDs back to the stack
136 E5D20 1C9              D1=D1-  10
137 E5D23 15D9             DAT1=C  10           MSDs back to the stack
138 E5D27 174              D1=D1+  5
139 E5D2A 03               RTNCC
```

```
140                     EJECT
141                 ****************************************
142                 *
143                 * RECSIZE  ( --- addr)  addr of variable
144                 *       which contains the max size of
145                 *       disc buffer record
146                 *
147                 ****************************************
148
149 E5D2C 13D5 =RSIZE  CON(5)  =$RSIZE
          E
150 E5D31 8E00 =$RSIZE GOSUBL  =DOUSE
          00
151 E5D37 93BF         CON(5)   (=oRSIZE)
          2
152
153
154                 ****************************************
155                 *
156                 * CONTEXT  ( --- addr)  addr of variable
157                 *       which contains the addr of the
158                 *       current vocabulary for searches
159                 *
160                 ****************************************
161
162 E5D3C 6FC5         CON(5)  !DNGAT
          E
163 E5D41 78   =!CONTX CON(2)  #87              CONTEXT
164 E5D43 34F4         NIBASC  \CONTEX\
          E445
          5485
165 E5D4F 4D           CON(2)  \T\+#80
166 E5D51 65D5 =CONTX  CON(5)  =$CONTX
          E
167
168 E5D56 8E00 =$CONTX GOSUBL  =DOUSE
          00
169 E5D5C 66BF         CON(5)   (=oCONTX)
          2
```

```
170                     EJECT
171                 ****************************************
172                 *
173                 * CURRENT  ( --- addr)  addr of variable
174                 *       which contains the addr of the
175                 *       vocabulary to which new entries
176                 *       are added
177                 *
178                 ****************************************
179
180 E5D61 14D5             CON(5)  !CONTX
            E
181 E5D66 78       =!CURR   CON(2)  #87              CURRENT
182 E5D68 3455             NIBASC  \CURREN\
            2525
            54E4
183 E5D74 4D               CON(2)  \T\+#80
184 E5D76 B7D5 =CURR       CON(5)  =$CURR
            E
185
186 E5D7B 8E00 =$CURR      GOSUBL  =DOUSE
            00
187 E5D81 B6BF             CON(5)   (=oCURR)
            2
```

```
188                EJECT
189             ************************************************
190             *
191             * 0BRANCH   ( flag --- )  If the flag is false, pick up
192             *           offset following 0BRANCH and add it to I
193             *           otherwise increment I to skip past the increment.
194             *
195             *
196             *                        0BRANCH
197             *           I------>     <offset>
198             *                        DUP
199             *
200             ************************************************
201
202 E5D86 B8D5 =ZBRNH  CON(5) =$ZBRNH
        E
203
204 E5D8B 143  =$ZBRNH A=DAT1  A              A=FLAG
205 E5D8E 174         D1=D1+  5              RETURN NOTHING ON DATA STK
206 E5D91 8AC         ?A#0    A              TRUE?
207 E5D94 D1          GOYES   0B0            YES
208 E5D96 570         GONC    $BRNCH
209
210 E5D99 E9D5 =BRNCH  CON(5) =$BRNCH
        E
211
212 E5D9E 146  =$BRNCH C=DAT0  A              READ OFFSET TO I
213 E5DA1 132         ADOEX                  A=CURRENT I
214 E5DA4 C2          C=C+A   A              NEW I
215 E5DA6 134         D0=C                   STORE NEW I
216 E5DA9 8E00        GOSUBL  =DOATN         CHECK FOR ATTN KEY
        00
217 E5DAF 03          RTNCC
218
219 E5DB1 164  0B0    D0=D0+  5              POINT BEYOND OFFSET
220 E5DB4 8E00        GOSUBL  =DOATN         CHECK FOR ATTN HIT, DO ABORT
        00
221 E5DBA 03          RTNCC
222
223             ************************************************
224             *
225             * DECIMAL    ( --- )  Set BASE to decimal mode
226             *
227             ************************************************
228
229 E5DBC 66D5        CON(5)  =!CURR
        E
230 E5DC1 78   =!DEC  CON(2)  #87          DECIMAL
231 E5DC3 4454       NIBASC  \DECIMA\
        3494
        D414
232 E5DCF CC         CON(2)  \L\+#80
233
234 E5DD1 0000 =DEC   CON(5)  =DOCOL       :
        0
```

```
235 E5DD6 0000          CON(5)   =LIT
          0
236 E5DDB A000          CON(5)  10              10
          0
237 E5DE0 0000          CON(5)   =BASE          BASE
          0
238 E5DE5 0000          CON(5)   =STORE         !
          0
239 E5DEA 0000          CON(5)   =SEMI          ;
          0
```

```
240                     EJECT
241                 ************************************************
242                 *
243                 * CONVERT  (d1 addr1 --- d2 addr2) Converts the text beginning
244                 *          at addr1+2 (NIBS) to a binary value with regard to
245                 *          BASE.  New value is accumulated into d2; addr2 is 1st
246                 *          non-convertible char.
247                 *
248                 ************************************************************
249
250 E5DEF 1CD5          CON(5)  =!DEC
          E
251 E5DF4 78    =!CONVT CON(2)  #87             CONVERT
252 E5DF6 34F4          NIBASC  \CONVER\
          E465
          5425
253 E5E02 4D            CON(2)  \T\+#80
254
255 E5E04 0000  =CONVT   CON(5)  =DOCOL          :
          0
256 E5E09 0000  CONV1    CON(5)   =TWO+          2+  INCR BY 2 TO GET TO NEXT BYT
          0
257 E5E0E 0000           CON(5)   =DUP       d1 addr+2 addr+2
          0
258 E5E13 0000           CON(5)   =>R        d1 addr+2
          0
259 E5E18 0000           CON(5)   =CAT       d1 char
          0
260 E5E1D 0000           CON(5)   =BASE           BASE
          0
261 E5E22 0000           CON(5)   =AT        d1 ch base
          0
262 E5E27 0000           CON(5)   =DIGIT     return true if digit , plus binary va
          0
263 E5E2C 68D5           CON(5)   =ZBRNH          WHILE
          E
264 E5E31 6400           CON(5)  (CONV3)-*
          0
265 E5E36 0000           CON(5)   =SWAP      d1a n d1b
          0
266 E5E3B 0000           CON(5)   =BASE           BASE
          0
267 E5E40 0000           CON(5)   =AT        d1a n d1b base
          0
268 E5E45 0000           CON(5)   =U*        d1a n base*d1b
          0
269 E5E4A 0000           CON(5)   =DROP           drop top of double-num result
          0
270 E5E4F 0000           CON(5)   =ROT       n d1b d1a
          0
271 E5E54 0000           CON(5)   =BASE      n d1b d1a base
          0
272 E5E59 0000           CON(5)   =AT        n d1a d1b [base]
          0
273 E5E5E 0000           CON(5)   =U*        n d1a <base*d1b>
```

```
            0
274 E5E63 0000          CON(5)   =D+         d2
            0
275 E5E68 0000          CON(5)   =R>         d2 addr+2(char-ptr)
            0
276             *                               REPEAT
277 E5E6D 99D5          CON(5)   =BRNCH
            E
278 E5E72 79FF          CON(5)   (CONV1)-*
            F
279 E5E77 0000 CONV3    CON(5)   =R>              R>
            0
280 E5E7C 0000          CON(5)  =SEMI
            0
281
```

```
282                     EJECT
283                 ****************************************************************
284                 *
285                 * ENCLOSE (addr1 c --- addr1 n1 n2 n3) From addr1 and an
286                 *         ASCII delimiting char, c, is determined the NIBBLE
287                 *         offset to the first non-delimiter char, n1, the offset
288                 *         to the 1st delimiter after the text, n2, and the offset
289                 *         to the 1st char not included, n3. An ASCII null is an
290                 *         unconditional delimiter.
291                 *
292                 ****************************************************************
293
294 E5E81 4FD5              CON(5)  =!CONVT
          E
295 E5E86 78      =!ENCL    CON(2)  #87             ENCLOSE
296 E5E88 54E4              NIBASC  \ENCLOS\
          34C4
          F435
297 E5E94 5C                CON(2)  \E\+#80
298 E5E96 B9E5  =ENCL       CON(5)  =$ENCL
          E
299
300 E5E9B 143   =$ENCL      A=DAT1  A               A=CHAR
301 E5E9E D9                C=B     A
302 E5EA0 109               R1=C                    SAVE RTN STK IN R1
303 E5EA3 D1                B=0     A
304 E5EA5 174               D1=D1+  5               PT TO ADDR
305 E5EA8 147               C=DAT1  A               C=ADDR
306 E5EAB 1C4               D1=D1-  5               PT TO CHAR AGAIN
307 E5EAE 136               CD0EX                   D0=ADDR
308 E5EB1 10A               R2=C                    SAVE I IN R2
309 E5EB4 181               D0=D0-  2               SET MEMORY PTR FOR LOOP
310 E5EB7 CD                B=B-1   A
311 E5EB9 CD                B=B-1   A               SET COUNTER FOR LOOP
312 E5EBB 161   ENCL1       D0=D0+  2               PT TO NEXT CHAR
313 E5EBE 14E               C=DAT0  B               C(B)=CHAR
314 E5EC1 E5                B=B+1   A
315 E5EC3 E5                B=B+1   A               INCREMENT COUNTER
316 E5EC5 962               ?C=A    B               =DELIMITER?
317 E5EC8 3F                GOYES   ENCL1           YES, GET ANOTHER
318 E5ECA DD                BCEX    A               COUNTER TO C
319 E5ECC 145               DAT1=C  A               PUSH N1
320 E5ECF 1C4               D1=D1-  5               READY FOR N2
321 E5ED2 96D               ?B#0    B               NON-NULL CHAR?
322 E5ED5 01                GOYES   ENCL2           YES
323                 *                               WAS NULL
324 E5ED7 E6                C=C+1   A               INCREMENT COUNTER
325 E5ED9 E6                C=C+1   A               BY 1 BYTE
326 E5EDB 145               DAT1=C  A               PUSH N2
327 E5EDE CE                C=C-1   A
328 E5EE0 CE                C=C-1   A               DECREMENT COUNTER
329 E5EE2 592               GONC    ENCL4           FINISH HERE
330 E5EE5 DD    ENCL2       BCEX    A               COUNTER TO B
331 E5EE7 161   ENCL20      D0=D0+  2               PT TO NEXT CHAR
332 E5EEA E5                B=B+1   A               INCR COUNTER
```

```
333 E5EEC E5           B=B+1   A       INCR COUNTER
334 E5EEE 14E          C=DAT0  B       C(B)=CHAR
335 E5EF1 962          ?C=A    B       =DELIMITER?
336 E5EF4 F0           GOYES   ENCL3   YES
337 E5EF6 96E          ?C#0    B       NON-NULL CHAR?
338 E5EF9 EE           GOYES   ENCL20  YES, GET ANOTHER
339 E5EFB DD           BCEX    A       COUNTER TO C
340 E5EFD 145          DAT1=C  A       PUSH N2
341 E5F00 5B0          GONC    ENCL4   FINISH HERE
342 E5F03 D9   ENCL3   C=B     A
343 E5F05 145          DAT1=C  A       PUSH N2
344 E5F08 E6           C=C+1   A
345 E5F0A E6           C=C+1   A       INCR CNTR 1 BYTE
346 E5F0C 1C4  ENCL4   D1=D1-  5
347 E5F0F 145          DAT1=C  A       PUSH N3
348 E5F12 11A          C=R2
349 E5F15 136          CD0EX           RESTORE I TO D0
350 E5F18 119          C=R1
351 E5F1B D5           B=C     A       RESTORE RTN STK
352 E5F1D 03           RTNCC
```

```
353                     EJECT
354                 ******************************************************
355                 *
356                 * 'STREAM ( --- addr) Returns addr of the next char
357                 *         in the input stream.
358                 *
359                 *  We assume that >IN is being incremented by 2 for
360                 *  nibbles as opposed to 1 for bytes!
361                 *
362                 ******************************************************
363 E5F1F 68E5          CON(5)  =!ENCL
          E
364 E5F24 78    =!STRM  CON(2)  #87             'STREAM
365 E5F26 7235          NIBASC  \'STREA\
          4525
          5414
366 E5F32 DC            CON(2)  \M\+#80
367
368 E5F34 0000  =STRM    CON(5)  =DOCOL          :
          0
369 E5F39 0000          CON(5)   =BLK           BLK   if contents of BLK are non-
          0
370 E5F3E 0000          CON(5)   =AT            @     then they represent the lin
          0
371 E5F43 0000          CON(5)   =?DUP          ?DUP  in a file which we are inte
          0
372 E5F48 68D5          CON(5)   =ZBRNH         IF    if this is the case BLK#0 t
          E
373 E5F4D 4100          CON(5)  (ST0)-*               use BLOCK to return addr of
          0
374 E5F52 0000          CON(5)   =BLOCK         BLOCK to be intrepreted
          0
375 E5F57 99D5          CON(5)   =BRNCH         ELSE  otherwise we are interpreti
          E
376 E5F5C A000          CON(5)  (ST01)-*              from the TIB
          0
377 E5F61 0000  ST0     CON(5)   =TIB            TIB  so get its addr
          0
378 E5F66 0000  ST01    CON(5)   =IN             THEN get contents of >IN (which
          0
379 E5F6B 0000          CON(5)   =AT             @    is the offset into the curr
          0
380 E5F70 0000          CON(5)   =ADD            +    line) and add to base addr
          0
381 E5F75 0000          CON(5)   =SEMI           ;
          0
```

```
382                     EJECT
383                   ************************************************************
384                   *
385                   * LITERAL (n --- ) If compiling, then compile the stack
386                   *       value as a 20 bit literal which when later executed
387                   *       will leave "n" on the stack
388                   *
389                   *        IMMEDIATE
390                   *
391                   ************************************************************
392 E5F7A 42F5                CON(5)  =!STRM
          E
393 E5F7F 7C          =!LITR  CON(2)  #C7             LITERAL
394 E5F81 C494                NIBASC  \LITERA\
          4554
          2514
395 E5F8D CC                  CON(2)  \L\+#80
396
397 E5F8F 0000        =LITR   CON(5)  =DOCOL          :
          0
398 E5F94 0000                CON(5)  =STATE        STATE   if state is 0
          0
399 E5F99 0000                CON(5)  =AT           @       do nothing
          0
400 E5F9E 68D5                CON(5)  =ZBRNH        IF      otherwise
          E
401 E5FA3 4100                CON(5)  (LITR0)-*
          0
402 E5FA8 1DF5                CON(5)   =COMPL       COMPILE literal handler
          E
403 E5FAD 0000                CON(5)   =LIT         LIT     runtime code
          0
404 E5FB2 0000                CON(5)   =COMMA       ,       into dictionary
          0
405 E5FB7 0000 LITR0          CON(5)   =SEMI        ;       as well as value
          0
```

```
406                     EJECT
407                 ****************************************
408                 *
409                 * COMPILE
410                 *
411                 * used in form:   : <name> . . . COMPILE <namex> ;
412                 *
413                 * When <name> is executed the compilation addr compiled
414                 * for <namex> is compiled and NOT executed. <name> is
415                 * typically immediate and <namex> is typically not
416                 * immediate.
417                 *
418                 ****************************************
419
420 E5FBC F7F5          CON(5)  !LITR
           E
421 E5FC1 78    =!COMPL CON(2)  #87             COMPILE
422 E5FC3 34F4          NIBASC  \COMPIL\
           D405
           94C4
423 E5FCF 5C            CON(2)  \E\+#80
424
425 E5FD1 0000  =COMPL  CON(5) =DOCOL
           0
426 E5FD6 0000          CON(5) =?COMP   error if not compiling
           0
427 E5FDB 0000          CON(5) =R>      get return addr; copy it
           0
428 E5FE0 0000          CON(5) =DUP     add 5 to skip beyond value to
           0
429 E5FE5 0000          CON(5) =FIVE+   compile and push it back to
           0
430 E5FEA 0000          CON(5) =>R      return stack; use unchanged
           0
431 E5FEF 0000          CON(5) =AT      addr, get contents and store in
           0
432 E5FF4 0000          CON(5) =COMMA   dictionary.
           0
433 E5FF9 0000          CON(5) =SEMI
           0
```

```
434                     EJECT
435                 ************************************************
436                 *
437                 * ?NEGATE   (n1 n2 -- n3) if n2 < 0 then NEGATE n1
438                 *
439                 * MADE HEADERLESS 10/10/83
440                 *
441                 ************************************************
442
443 E5FFE 0000 =?NEG   CON(5)  =DOCOL          :
          0
444 E6003 0000         CON(5)   =LTZ           0<
          0
445 E6008 68D5         CON(5)   =ZBRNH         IF
          E
446 E600D A000         CON(5)  (NG0)-*
          0
447 E6012 0000         CON(5)   =NEGAT         NEGATE
          0
448 E6017 0000 NG0     CON(5)   =SEMI          THEN ;
          0
449
450
451
452                 ************************************
453                 *
454                 * <;CODE> FOR RAM DEFINING WORDS
455                 *  (SEE P. 54 IN ALL ABOUT FORTH)
456                 *
457                 ************************************
458
459 E601C 0000 =<;COD  CON(5)  =DOCOL          :
          0
460 E6021 0000         CON(5)   =R>            R>
          0
461 E6026 0000         CON(5)   =LATE          LATEST
          0
462 E602B 0000         CON(5)   =PFA           PFA
          0
463 E6030 0000         CON(5)   =LIT
          0
464 E6035 5000         CON(5)   5              5
          0
465 E603A 0000         CON(5)   =MINUS         -    (RAM CFA ADDR)
          0
466 E603F 0000         CON(5)   =STORE         !
          0
467 E6044 0000         CON(5)   =SEMI          ;
          0
```

```
468                     EJECT
469                 ****************************************
470                 *
471                 * ENDCASE  (FROM CASE OF ENDOF ENDCASE)
472                 *
473                 ****************************************
474
475 E6049 1CF5             CON(5)  =!COMPL
            E
476 E604E 7C       =!ENDCS CON(2)  #C7
477 E6050 54E4             NIBASC  \ENDCAS\
            4434
            1435
478 E605C 5C               CON(2)  \E\+#80
479
480 E605E 0000     =ENDCS CON(5) =DOCOL       :
            0
481 E6063 0000             CON(5)  =?COMP      ensure compile mode
            0
482 E6068 0000             CON(5)  =DUP
            0
483 E606D 0000            CON(5)   =LIT
            0
484 E6072 7000            CON(5)  7             7 LEFT BY ENDOF
            0
485                 * THERE MUST HAVE BEEN AT LEAST ONE OF..ENDOF
486 E6077 0000             CON(5)  =<>           not equal
            0
487 E607C 0000             CON(5)  =ABRT"X      abort if not 7
            0
488 E6081 C3               CON(2)  =eCASE
489 E6083 1DF5            CON(5)   =COMPL       COMPILE a DROP
            E
490 E6088 0000            CON(5)   =DROP        to drop the unmatched index value if
            0
491                 *                           gets that far at runtime
492                 *                           BEGIN
493 E608D 0000 ENDC1  CON(5)   =SP@             SP@
            0
494 E6092 0000            CON(5)   =CSP         CSP
            0
495 E6097 0000            CON(5)   =AT          @
            0
496 E609C 0000            CON(5)   =EQUAL       =
            0
497 E60A1 68D5            CON(5)   =ZBRNH       IF THERE WAS A 7 BEFORE THE CASE
            E
498 E60A6 A000            CON(5)  (ENDC2)-*
            0
499 E60AB 0000             CON(5)  =SEMI             THEN JUST QUIT
            0
500 E60B0 0000 ENDC2   CON(5)   =DUP
            0
501 E60B5 0000             CON(5)  =LIT
            0
```

```
502 E60BA 7000          CON(5)  7
          0
503 E60BF 0000          CON(5)  =EQUAL          MATCH ANOTHER 7 FROM ENDOF?
          0
504 E60C4 68D5          CON(5)  =ZBRNH        WHILE
          E
505 E60C9 E100          CON(5)  (ENDC3)-*
          0
506 E60CE 0000          CON(5)  =DROP           DROP THE 7
          0
507 E60D3 0000        CON(5)    =TWO        2
          0
508             *     CON(5)    =[CMP]      [COMPILE]
509 E60D8 0000        CON(5)    =THEN       FILL IN HERE AT THE ENDOF ADDR
          0
510 E60DD 99D5        CON(5)    =BRNCH      REPEAT
          E
511 E60E2 BAFF        CON(5)  (ENDC1)-*
          F
512 E60E7 0000 ENDC3  CON(5)    =SEMI       ;
          0
```

```
513                EJECT
514             ****************************************
515             *
516             * Renamed CREATEF (from FCREATE) on
517             * 12/18/83
518             *
519             * CREATEF       ( str size -- addr )
520             *               ( str size -- f    )
521             * Create a file of type text, with
522             * given name and size.
523             *
524             ****************************************
525 E60EC E406          CON(5)  =!ENDCS
          E
526 E60F1 78    =!FCRT  CON(2)  #87
527 E60F3 3425          NIBASC  \CREATE\
          5414
          4554
528 E60FF 6C            CON(2)  \F\+#80
529 E6101 0000 =FCREAT CON(5)  =DOCOL
          0
530 E6106 0000          CON(5)  =ROT
          0
531 E610B 0000          CON(5)  =ROT            SIZE STR
          0
532 E6110 0000          CON(5)  =2DUP           SIZE STR STR
          0
533 E6115 0000          CON(5)  =FFIND           SIZE STR FLAG
          0
534 E611A 68D5          CON(5)  =ZBRNH          OK IF NOT FOUND
          E
535 E611F 9100          CON(5)  (FCR02)-*
          0
536 E6124 0000 FCFAIL  CON(5)  =2DROP
          0
537 E6129 0000 FCR01   CON(5)  =DROP
          0
538 E612E 0000          CON(5)  =ZERO       RETURN FALSE FLAG
          0
539 E6133 0000          CON(5)  =SEMI
          0
540
541 E6138 B126 FCR02   CON(5)  =FSTX           SIZE FLAG
          E
542 E613D 68D5          CON(5)  =ZBRNH          IF OK
          E
543 E6142 7EFF          CON(5)  (FCR01)-*
          F
544 E6147 6516          CON(5)  =FNAME          SIZE FNAME
          E
545 E614C B826          CON(5)  =CRFIL          ADDR  OR FALSE FLAG
          E
546 E6151 0000          CON(5)  =SEMI
          0
547
```

548

```
549                     EJECT
550                 ********************************************
551                 * UTILITIES FOR FCREATE
552                 ********************************************
553 E6156 B516 =FNAME  CON(5)  =$FNAM
          E
554 E615B 8E00 =$FNAM  GOSUBL  =DOUSE
          00
555 E6161 01CF        CON(5)  =oFNAME
          2
556
557                 ******************************************
558                 *
559                 * SETNAM        ( str -- )
560                 * Set up a string in the format required
561                 * by FSPECx, that is, with quotes around
562                 * it and a terminator byte, at STMTR0.
563                 *
564                 * ONLY USES 1st 8 CHARS OF NAME!
565                 *
566                 ******************************************
567 E6166 0000 =SETNAM CON(5)  =DOCOL
          0
568 E616B 0000        CON(5)  =ABS            ABS VALUE OF LENGTH OF STRING
          0
569 E6170 0000        CON(5)  =LIT            MAKE SURE THAT
          0
570 E6175 8000        CON(5)  8               FILE NAME IS NOT
          0
571 E617A 0000        CON(5)  =MIN            LONGER THAN 8 CHARS!
          0
572 E617F 0000        CON(5)  =DUP            STR LEN
          0
573 E6184 0000        CON(5)  =TWO*           STR LEN*2
          0
574 E6189 0000        CON(5)  =LIT
          0
575 E618E 0000        CON(5)  =STMTR0         STR LEN*2 SR0
          0
576 E6193 0000        CON(5)  =DUP            STR LEN*2 SR0 SR0
          0
577 E6198 0000        CON(5)  =ROT            STR SR0 SR0 LEN*2
          0
578 E619D 0000        CON(5)  =ADD            STR SR0 END-OF-STRING
          0
579 E61A2 0000        CON(5)  =>R             STR SR0  :: EOS
          0
580 E61A7 0000        CON(5)  =LIT            STR SR0  :: EOS
          0
581 E61AC 2200        CON(5)  34              STR SR0 "
          0
582 E61B1 0000        CON(5)  =OVER           STR SR0 " SR0
          0
583                 * STORE BEGINNING QUOTE
584 E61B6 0000        CON(5)  =C!             STR SR0
```

```
          0
585 E61BB 0000          CON(5)  =TWO+           STR SR0+2
          0
586 E61C0 0000          CON(5)  =SMOVE
          0
587 E61C5 0000          CON(5)  =R@             EOS         :: EOS
          0
588 E61CA 0000          CON(5)  =TWO+           (ACCOUNT FOR ")
          0
589 E61CF 0000          CON(5)  =LIT
          0
590 E61D4 2200          CON(5)  34              EOS "
          0
591 E61D9 0000          CON(5)  =SWAP           " EOS
          0
592 E61DE 0000          CON(5)  =C!             STORED END QUOTE
          0
593 E61E3 0000          CON(5)  =R>             EOS
          0
594 E61E8 0000          CON(5)  =FOUR+          (ACCOUNT FOR TWO "'S)
          0
595 E61ED 0000          CON(5)  =LIT
          0
596 E61F2 FF00          CON(5)  255             EOS FF
          0
597 E61F7 0000          CON(5)  =SWAP           FF EOS
          0
598 E61FC 0000          CON(5)  =C!             empty stack
          0
599 E6201 0000          CON(5)  =SEMI
          0
600               ************************************************
601               *
602               * Renamed SYNTAXF (from FSYNTAX)
603               * 12/18/83
604               *
605               * SYNTAXF       ( -- t/f )
606               * Checks for legal file specifier.
607               * String has already been put in STMTR0 by
608               * SETNAM.
609               * Stores blankfilled filename in variable oFLNAM.
610               *
611               ************************************************
612 E6206 1F06          CON(5)  =!FCRT
          E
613 E620B 78    =!FSYNT CON(2)  #87
614 E620D 3595          NIBASC  \SYNTAX\
          E445
          1485
615 E6219 6C            CON(2)  \F\+#80
616 E621B 0000  =FSTX    CON(5)  =DOCOL
          0
617 E6220 6616          CON(5)  =SETNAM         SET UP THE NAME IN STMTR0
          E
618 E6225 F226          CON(5)  =FSYNTX         RETURN FLAG
```

```
          E
619 E622A 0000          CON(5)  =SEMI
          0
620
621 E622F 4326 =FSYNTX  CON(5)  =$FSYNT
          E
622 E6234 8E00 =$FSYNT  GOSUBL  =SAVEFP
          00
623 E623A 24            P=      4
624 E623C 8F00          GOSBVL  =R<RSTK
          000
625 E6243 1B00          D0=(5)  =STMTR0
          000
626 E624A 8F00          GOSBVL  =FSPECx         CHECK IT OUT
          000
627               *                             IF LEGAL, CARRY CLEAR
628               *                             AND NAME BLANKFILLED IN A
629 E6251 841           ST=0    1
630 E6254 4B0           GOC     FSYNT1
631 E6257 B47           D=D+1   S               D[S]=F IS NO DEVICE
632 E625A 550           GONC    FSYNT1
633 E625D 851           ST=1    1               FLAG GOOD
634 E6260 1B01 FSYNT1   D0=(5)  =oFNAME
          CF2
635 E6267 1507          DAT0=A  W               STORE IN VARIABLE
636 E626B 24            P=      4
637 E626D 8F00          GOSBVL  =RSTK<R
          000
638 E6274 8E00          GOSUBL  =GETFP
          00
639 E627A D2            C=0     A
640 E627C 861           ?ST=0   1               BAD RESULT?
641 E627F 40            GOYES   FSYNT2
642 E6281 CE            C=C-1   A               ELSE -1 FOR GOOD
643 E6283 1C4  FSYNT2   D1=D1-  5
644 E6286 145           DAT1=C  A               PUT FLAG ON STACK
645 E6289 03            RTNCC
646               ************************************************
647               *
648               * CRFILE        ( size  fnameptr -- faddr/F )
649               * Make new file with given name and size.
650               * If desired size is negative, then we will create
651               * a 0 length file.
652               *
653               ************************************************
654
655 E628B 0926 =CRFIL CON(5)  =$CRFL
          E
656 E6290 8E00 =$CRFL  GOSUBL  =SAVEFP
          00
657 E6296 143           A=DAT1  A               GET ADDR OF FILENAME
658 E6299 133           AD1EX
659 E629C 1577          C=DAT1  W               GET PROPER FILENAME
660 E62A0 1B00          D0=(5)  =STMTR0      where CRFSUB wants filename
          000
```

```
661 E62A7 1547          DAT0=C  W
662 E62AB 131           D1=A                    restore FORTH stack
663 E62AE 174           D1=D1+  5                 POINT TO SIZE OF FILE DESIRED
664 E62B1 143           A=DAT1  A                 A=RECORD SIZE FOR CRFSUB
665 E62B4 D6            C=A     A                 make copy of size in C(A)
666 E62B6 C6            C=C+C   A                 shift left to test for neg #
667 E62B8 540           GONC    crf1              no carry means positive #
668 E62BB D0            A=0     A                 set desired size to 0
669 E62BD 16F   crf1    D0=D0+  16              point to STMTR1,where type goes
670 E62C0 AF2           C=0     W
671 E62C3 304           LCHEX   4               copy code for text file
672 E62C6 816           CSRC                    goes in [15]
673 E62C9 2A            P=      10
674 E62CB 301           LCHEX   1               type TEXT image in C
675 E62CE 20            P=      0
676 E62D0 1547          DAT0=C  W
677             *  get ready for CRETF+/CRFSB-
678 E62D4 23            P=      3
679 E62D6 8F00          GOSBVL  =R<RSTK
          000
680 E62DD D2            C=0     A
681 E62DF E6            C=C+1   A
682 E62E1 10A           R2=C                    # of records, "   " (=1)
683 E62E4 20            P=      0
684 E62E6 3100          LC(2)   =oIMPLh         header size
685 E62EA C2            C=C+A   A               C=total size of file
686 E62EC AF3           D=0     W               D(S) must be 0 for CRETF+
687 E62EF 8F00          GOSBVL  =CRETF+
          000
688 E62F6 475           GOC     CRFL0           file not created,
689             *                               RETURN A FALSE FLAG
690
691 E62F9 8F00          GOSBVL  =CRFSB-         leave D1 pointing to file
          000
692             * PUT IN THE EOF MARKER (FFFF) IF FILE IS AT LEAST 2 BYTES LONG
693 E6300 133           AD1EX                   save file ptr
694 E6303 20            P=      0
695 E6305 101           R1=A                  save ptr in R1
696 E6308 131           D1=A
697 E630B 1C4           D1=D1-  5             point to length field
698 E630E 143           A=DAT1  A             A=offset to EOF from here
699 E6311 D2            C=0     A
700 E6313 3190          LC(2)   9             file of size 4 has 5+4=9
701 E6317 8B2           ?A<C    A             file<2 bytes?
702 E631A 21            GOYES   crf11
703 E631C 111           A=R1                  restore ptr to first nib of file
704 E631F 131           D1=A
705 E6322 33FF          LCHEX   FFFF          EOF marker
          FF
706 E6328 15D3          DAT1=C  4             put it in
707 E632C 111   crf11   A=R1                  restore file ptr
708 E632F D2            C=0     A
709 E6331 3100          LC(2)   =oIMPLh         FILE HEADER SIZE
710 E6335 EA            A=A-C   A               POINT TO START OF WHOLE FILE
711 E6337 23    CRFRES  P=      3
```

```
712 E6339 8F00          GOSBVL  =RSTK<R
          000
713 E6340 8E00          GOSUBL  =GETFP
          00
714 E6346 174           D1=D1+  5
715 E6349 141           DAT1=A  A
716 E634C 03            RTNCC
717
718 E634E D0    CRFL0   A=0     A
719 E6350 66EF          GOTO    CRFRES
```

```
720                     EJECT
721                 ****************************************
722                 *
723                 * COMPARE NEXT CHARACTER TO QUOTE (34)
724                 *
725                 ****************************************
726
727 E6354 0000 =NQOT? CON(5)  =DOCOL       :
          0
728 E6359 43F5        CON(5)   =STRM       'STREAM
          E
729 E635E 0000        CON(5)   =CAT        C@
          0
730 E6363 0000        CON(5)   =LIT
          0
731 E6368 2200        CON(5)  34           \"\
          0
732 E636D 0000        CON(5)   =EQUAL       =
          0
733 E6372 0000        CON(5)   =SEMI        ;
          0
734
735                 ************************************************
736                 *
737                 * Renamed ADJUSTF (from FADJUST)
738                 * 12/18/83
739                 *
740                 * ADJUSTF                      ( addr n -- F )
741                 *
742                 * Given amount to add (or subtract if n is
743                 * negative) and place to add (subtract), do it.
744                 * ((MVMEM+ subtracts below ptr, so in case of n=-4,
745                 * I first add 4 to addr.))
746                 * Code checks for addresses above or below whole file
747                 * chain, or pointing into the file header.
748                 * If addr is bad, errors out through ABORT; flag
749                 * is left to indicate other error condition, memory.
750                 *
751                 ************************************************
752
753 E6377 B026            CON(5)  =!FSYNT
          E
754 E637C 78    =!FADJ   CON(2)  #87
755 E637E 1444           NIBASC  \ADJUST\
          A455
          3545
756 E638A 6C             CON(2)  \F\+#80
757 E638C 0000 =FADJ     CON(5)  =DOCOL
          0
758 E6391 2A36           CON(5)  =FADJU
          E
759 E6396 0000           CON(5)  =ABRT"X
          0
760 E639B B2             CON(2)  =eRANGE
761 E639D 0000           CON(5)  =SEMI
```

```
          0
    762
    763             *
    764             * DO ALL THE WORK, LEAVE FLAG FOR ABORTING
    765             *
    766 E63A2 7A36 =FADJU CON(5)  =$FADJ
          E
    767 E63A7 143  =$FADJ A=DAT1  A               get n
    768 E63AA 100         R0=A                    SAVE N
    769 E63AD 174         D1=D1+  5
    770 E63B0 147         C=DAT1  A               GET ADDR
    771 E63B3 D7          D=C     A               D=ADDR
    772 E63B5 174         D1=D1+  5               D1 SET IN FINAL POSITION
    773 E63B8 8E00        GOSUBL  =SAVEFP
          00
    774             * NOW FIND THE FILE WE'RE IN
    775 E63BE 1B00         D0=(5)  =MAINST
          000
    776 E63C5 142          A=DAT0  A              GET START OF 1ST FILE
    777 E63C8 D6           C=A     A              TO COMPARE
    778 E63CA 8B7          ?C>D    A              ADDR BELOW FILE CHAIN?
    779 E63CD D7           GOYES   rngerr
    780 E63CF 101  SKIP    R1=A                   SAVE WHERE WE ARE
    781 E63D2 8F00         GOSBVL  =FILSK+        FIND NEXT FILE IN CHAIN
          000
    782             *                             C[A]=NEXT FILE
    783 E63D9 8BF          ?C>=D   A              NEXT FILE PAST OR AT ADDR?
    784 E63DC 31           GOYES   FADJ01
    785             * NOTE THAT THIS MEANS AN ADDR OF START OF FILE N IS
    786             * TAKEN TO MEAN INSERT AT END OF FILE N-1
    787 E63DE DA           A=C     A              SKIP ANOTHER
    788 E63E0 134          D0=C
    789 E63E3 14E          C=DAT0  B              GET 1ST BYTE OF NEXT FILE
    790 E63E6 96A          ?C=0    B              ZERO MEANS END OF CHAIN
    791 E63E9 16           GOYES   rngerr
    792 E63EB 63EF         GOTO    SKIP
    793 E63EF DB   FADJ01  C=D     A              GET ADDR
    794 E63F1 DA           A=C     A              IT GOES IN A FOR MVMEM
    795 E63F3 118         C=R0                    GET BACK N
    796 E63F6 D5          B=C     A               N in B
    797 E63F8 3400        LCHEX   80000
          008
    798 E63FF 8B5         ?B<C    A               IS N POSITIVE?
    799 E6402 80          GOYES   plus
    800             * for shrinking file:
    801 E6404 D9          C=B     A               get amount to shrink
    802 E6406 FA          C=-C    A               absolute value
    803 E6408 CA          A=A+C   A               point ahead
    804             *
    805 E640A 119  plus    C=R1                   filehead in C
    806             *                             addr in A
    807             * CHECK FOR ADDR WITHIN FILEHEADER
    808 E640D 102         R2=A                  SAVE
    809 E6410 EA          A=A-C   A             HOW FAR PAST START OF FILE?
    810 E6412 3400        LC(5)   =oIMPLh       LENGTH OF HEADER
```

```
           000
811 E6419 8B2          ?A<C    A           IN HEADER?
812 E641C E2           GOYES   rngerr
813 E641E 112          A=R2
814 E6421 119          C=R1                RESTORE
815              *
816 E6424 8F00         GOSBVL  =MVMEM+     expand or shrink,
           000
817              *                         and update pointers
818 E642B D3           D=0     A           FLAG INDICATING MEMERR
819 E642D 440          GOC     nomove
820 E6430 CF           D=D-1   A           FLAG OK
821 E6432 D0    nomove A=0     A           FLAG FOR ABORT
822 E6434 8E00 FADJX   GOSUBL  =GETFP
           00
823 E643A 1C4          D1=D1-  5
824 E643D DB           C=D     A          GET MEMERR FLAG
825 E643F 145          DAT1=C  A
826 E6442 1C4          D1=D1-  5
827 E6445 141          DAT1=A  A           LEAVE FLAG
828 E6448 03           RTNCC
829 E644A D0    rngerr A=0     A
830 E644C CC           A=A-1   A
831 E644E 65EF         GOTO    FADJX
```

```
832                     EJECT
833                 ********************************************
834                 *
835                 * START OF 8 CHAR WORDS
836                 * ADD ADDITIONAL WORDS AT THIS END
837                 *
838                 ********************************************
839
840                 ********************************************
841                 *
842                 * PAGESIZE                    ( -- N )
843                 *
844                 * System user variable used by assembler.
845                 *
846                 ********************************************
847
848 E6452 0000             CON(5)  =!ASSEM
           0
849 E6457 88    =!PAGES CON(2)  #88
850 E6459 0514           NIBASC  \PAGESIZ\
           7454
           3594
           A5
851 E6467 5C            CON(2)  \E\+#80
852 E6469 E646  =PAGESZ CON(5)  =$PAGES
           E
853 E646E 8E00  =$PAGES GOSUBL  =DOUSE
           00
854 E6474 84CF           CON(5)  (=oPAGES)
           2
```

```
855                     EJECT
856                 ******************************************
857                 *
858                 * FLITERAL  ( ----  )  If compiling, then
859                 *         compile the value of the X register
860                 *         into the dictionary; else nothing.
861                 *
862                 *         Does not affect the integer stack.
863                 *
864                 *
865                 *         IMMEDIATE
866                 ******************************************
867 E6479 7546      E         CON(5) =!PAGES
868 E647E 8C       =!FLITR   CON(2) #C8
869 E6480 64C4      9445      NIBASC \FLITERA\
              5425
              14
870 E648E CC                 CON(2) \L\+#80
871
872 E6490 0000      0 =FLITR  CON(5) =DOCOL          :
873 E6495 0000      0         CON(5) =STATE         STATE
874 E649A 0000      0         CON(5) =AT            @
875 E649F 68D5      E         CON(5) =ZBRNH         IF
876 E64A4 8200      0         CON(5) (FLIT0)-*
877 E64A9 1DF5      E         CON(5) =COMPL          compile the f.p.
878 E64AE 0000      0         CON(5) =FLIT           literal handler into
879 E64B3 0000      0         CON(5) =HERE           the dictionary followed
880 E64B8 0000      0         CON(5) =STO            by the contents of the
881 E64BD 0000      0         CON(5) =LIT            X register; then
882 E64C2 0100      0         CON(5) 16              allot 16 nibs for that
883 E64C7 0000      0         CON(5) =ALLOT          value
884 E64CC 0000      0 FLIT0   CON(5) =SEMI           ;
```

```
885                     EJECT
886                 ************************************************
887                 *
888                 * CONSTANT   ( n - )   used as    31416 CONSTANT PI
889                 *
890                 ************************************************
891
892 E64D1 E746          CON(5)  =!FLITR         NO MORE WORDS
          E
893 E64D6 88    =!CONST CON(2)  #88              CONSTANT
894 E64D8 34F4          NIBASC  \CONSTAN\
          E435
          4514
          E4
895 E64E6 4D            CON(2)  \T\+#80
896
897 E64E8 0000  =CONST  CON(5) =DOCOL
          0
898 E64ED 0000          CON(5)  =CREAT          CREATE
          0
899 E64F2 0000          CON(5)  =COMMA          ,
          0
900 E64F7 0000          CON(5)  =ROM;C          ROM;CODE
          0
901 E64FC 0000          CON(5) =DOCON           RAM.doconstant
          0
902
903
904                 ************************************************
905                 *
906                 * VARIABLE   ( - )     used as    VARIABLE WINDSPEED
907                 * Allocates a 5 nibble variable.
908                 *
909                 ************************************************
910
911 E6501 6D46          CON(5)  !CONST
          E
912 E6506 88    =!VAR   CON(2) #88              VARIABLE
913 E6508 6514          NIBASC \VARIABL\
          2594
          1424
          C4
914 E6516 5C            CON(2) \E\+#80
915
916 E6518 0000  =VAR    CON(5) =DOCOL
          0
917 E651D 0000          CON(5)  =CREAT          CREATE
          0
918 E6522 0000          CON(5)  =LIT
          0
919 E6527 5000          CON(5) 5                5
          0
920 E652C 0000          CON(5)  =ALLOT          NALLOT
          0
921 E6531 0000          CON(5)  =SEMI           ;
```

```
0
```

```
922                     EJECT
923                 ************************************************************
924                 *
925                 * EXPECT96  (addr --- ) NOTE: we use TITAN mainframe rtne
926                 *         CHEDIT to allow user entry of a string, thus we
927                 *         dispense with the expected char cnt.  We put 2
928                 *         nulls at the end of the string.
929                 *
930                 *        This rtne also implements the command stack,
931                 *        as well as user re-defined keys.
932                 *
933                 *       We use MAKEBF to process the
934                 *       raw input; it stores this input at RFNBFR it
935                 *       ends the input with a CR.  We can't use this
936                 *       space as our TERMINAL INPUT BUFFER because if
937                 *       we replace the CR with 1 or 2 NULLs we will
938                 *       screw up the system (according to B.Stephens)
939                 *       So we move the data from RFNBFR to our TIB
940                 *       and put 2 nulls at the end of the string (the
941                 *       CR is overwritten by one of the NULLs.
942                 *
943                 ************************************************************
944
945 E6536 6056          CON(5)   =!VAR
          E
946 E653B 88    =!EXPCT CON(2)   #88              EXPECT96
947 E653D 5485          NIBASC   \EXPECT9\
          0554
          3445
          93
948 E654B 6B            CON(2)   \6\+#80
949 E654D 2556 =EXPCT   CON(5)   =$EXPCT
          E
950
951                 * note: that we pretend to drop the addr on the data stack
952                 *       this saves code in the case where the user turns the
953                 *       machine off in this routine.  And if they do enter
954                 *       data its simply a D1=D1-5  statement later on in this
955                 *       rtne.
956
957 E6552 174   =$EXPCT D1=D1+  5
958 E6555 8E00          GOSUBL   =SAVEFP          SAVE FORTH POINTERS
          00
959 E655B 20            P=       0
960 E655D 1B00          D0=(5)   =NEEDSC
          000
961 E6564 31F0          LCHEX    0F
962 E6568 14C           DAT0=C   B                SAY YES, WE NEED TO SCROLL
963                 *                       OTHERWISE SCRLLR WON'T DO A THING
964 E656B 8F00 EXP99    GOSBVL   =SCRLLR          WAIT FOR KEY, DON'T
          000
965                 *                             LOSE CURRENT DISPLAY
966 E6572 968           ?A=0     B
967 E6575 6F            GOYES    EXP99            IGNORE TIMEOUT
968 E6577 8F00          GOSBVL   =CMD1ST          INIT CMD STACK POINTER
```

```
          000
  969
  970 E657E 8F00 EXP88   GOSBVL  =CHEDIT          GET USER ENTRY
          000
  971 E6585 4C1          GOC     EXP86            NOT A REDEFINED KEY!
  972
  973            *
  974            * WE'VE GOTTEN AN IMMEDIATE EXECUTE REDEFINED KEY
  975            * FROM THE USER.  A(A)=DEFINITION LEN+1 NIB
  976            * D1-->1ST CHAR OF DEFINITION
  977            *
  978 E6588 137          CD1EX
  979 E658B 108          R0=C                     SAVE ADDR IN R0
  980 E658E E4           A=A+1   A                EXP2 EXPECTS THE LENTH TO BE
  981 E6590 E4           A=A+1   A                4 GREATER THAN ACTUAL COUNT
  982 E6592 E4           A=A+1   A
  983 E6594 101          R1=A                     SAVE LENGTH COUNT+4
  984 E6597 8F00         GOSBVL  =FINLIN          FINISH LINE
          000
  985 E659E 6260         GOTO    EXP2             PROCESS DEFINITION
  986            *                                 KEYS YET
  987 E65A2 8F00 EXP86   GOSBVL  =FINDA            FIND CHEDIT EXIT CONDITION
          000
  988 E65A9 D0           CON(2)  13               ENDLINE
  989 E65AB C20          REL(3)  EXP1
  990 E65AE 00           CON(2)  =kcUP            CURSOR UP KEY
  991 E65B0 7E0          REL(3)  INPUP
  992 E65B3 00           CON(2)  =kcDOWN          CURSOR DOWN KEY
  993 E65B5 BF0          REL(3)  INPDWN
  994 E65B8 00           CON(2)  =kcTOP           CURSOR TOP KEY
  995 E65BA 301          REL(3)  INPTOP
  996 E65BD 00           CON(2)  =kcBOT           CURSOR BOTTOM KEY
  997 E65BF EA0          REL(3)  INPBOT
  998 E65C2 00           CON(2)  =kcLAST          COMMAND STACK KEY
  999 E65C4 9A0          REL(3)  INPBOT
 1000 E65C7 00           CON(2)  =kcOFF           OFF KEY
 1001 E65C9 001          REL(3)  INPOFF
 1002 E65CC 00           CON(2)  =kcATTN
 1003 E65CE 680          REL(3)  INPATN
 1004 E65D1 00           CON(2)  0
 1005 E65D3 6AAF EXP0    GOTO    EXP88            GOT A STRANGE END CONDITION
 1006           *                                 FOR NOW TRASH IT & RESTART CHEDIT
 1007
 1008 E65D7 8F00 EXP1    GOSBVL   =FINLIN          FINISH CURRENT LINE
          000
 1009 E65DE 8F00         GOSBVL  =MAKEBF          PROCESS RAW INPUT
          000
 1010           *                                 RETURNS: C(A)=ADDR OF 1ST CHAR
 1011           *                                 A(A)=LINE LENGTH+3(IN NIBS)
 1012           *                                 (THIS INCLUDES THE CR)
 1013
 1014 E65E5 108          R0=C                     SAVE STRING START ADDR
 1015 E65E8 CC           A=A-1   A                NOW WE HAVE LENGTH WITH CR
 1016           *                                 SINCE WE WANT TO ADD NULLS, IT'S
 1017 E65EA 101          R1=A                     OK TO BE 2 GREATER
```

```
1018                *
1019                * now we set the user variable SPAN to equal the number
1020                * of characters read by EXPECT96 as required by FORTH 83
1021                * Standard
1022                *
1023 E65ED 1BC5             D0=(5)   =oSPAN          GET ADDR TO D0
           BF2
1024 E65F4 AD0              A=0      M               PROTECT AGAINST STRAY BITS
1025 E65F7 81C              ASRB                     IN SHIFT, MAKE NIBS=BYTES
1026 E65FA CC               A=A-1    A               GET RID OF EXTRA CHAR CNT
1027 E65FC CC               A=A-1    A               AND COUNT OF CR
1028 E65FE 140              DAT0=A   A               WRITE OUT COUNT
1029
1030                *       LC(2)    \E\              RESET DISPLAY
1031                *       GOSBVL   =ESCSEQ
1032
1033 E6601 8E00 EXP2        GOSUBL   =GETFP          RECOVER FORTH POINTERS, DOESN'T
           00
1034                *                                TRASH A(A) OR D(A)
1035 E6607 1C4              D1=D1-   5               RECOVER ADDR
1036                *
1037                * SEE ABOVE FOR WHY WE PRETEND TO DROP ADDR
1038                *
1039 E660A 147              C=DAT1   A               DESTINATION ADDR
1040 E660D 1C4              D1=D1-   5
1041 E6610 111              A=R1                     RECOVER LENGTH
1042 E6613 141              DAT1=A   A               PUSH CHAR CNT + 2 (NIBS)
1043 E6616 D7               D=C      A               SAVE DEST ADDR
1044 E6618 118              C=R0                     C=SOURCE ADDR
1045 E661B 1C4              D1=D1-   5
1046 E661E 145              DAT1=C   A               PUSH SOURCE ADDR
1047 E6621 DB               C=D      A
1048 E6623 1C4              D1=D1-   5
1049 E6626 145              DAT1=C   A               PUSH DEST ADDR
1050 E6629 1C4              D1=D1-   5
1051 E662C 141              DAT1=A   A               PUSH STRING LENGTH(IN NIBS)
1052
1053 E662F 8E00             GOSUBL   =$NMOVE         MOVE STRING TO TIB
           00
1054 E6635 143              A=DAT1   A               POP COUNT
1055 E6638 174              D1=D1+   5
1056 E663B 147              C=DAT1   A               POP STRING ADDR
1057 E663E 174              D1=D1+   5               RETURN NOTHING ON STACK
1058 E6641 C2               C=C+A    A               ADDR OF STR END + 2
1059 E6643 137              CD1EX
1060 E6646 1C3              D1=D1-   4               OVER WRITE CR
1061 E6649 D0               A=0      A
1062 E664B 1593             DAT1=A   4               WRITE 2 NULLS
1063 E664F 135              D1=C                     RESTORE DATA STK PTR
1064 E6652 03               RTNCC
1065
1066 E6654 8F00 INPATN      GOSBVL =ATNCLR           CLEAR ATTN FLAG
           000
1067 E665B 8F00             GOSBVL   =CURSFL         SEND CURSOR TO FAR LEFT
           000
```

```
1068 E6662 8F00          GOSBVL =-LINE          CLEAR LINE
           000
1069 E6669 641F          GOTO   EXP88           GET MORE INPUT
1070
1071 E666D 8F00 INPBOT   GOSBVL =CMD1ST         INIT COMMAND STACK
           000
1072
1073 E6674 8F00 INPB10   GOSBVL  =FINLIN        FINISH CURRENT LINE
           000
1074 E667B 8F00          GOSBVL =CMDFND         FIND BUFFER
           000
1075 E6682 172           D1=D1+ 3
1076 E6685 137           CD1EX                  C PTS TO BUFF START
1077 E6688 7E50          GOSUB  GPRMPT          SET UP WITH CMD STK "\"
1078 E668C 8F00          GOSBVL =REPROM         REPROMPT USER
           000
1079 E6693 6AEE          GOTO   EXP88
1080
1081 E6697 8F00 INPUP    GOSBVL =CMDINI         READ CURRENT & MAX CMD
           000
1082 E669E B04           A=A+1  P               INCREMENT CMD NUMBER
1083 E66A1 42D           GOC    INPB10          WATCH FOR OVERFLOW
1084 E66A4 986  INPU10   ?A>C   P               GT MAX CMD?
1085 E66A7 DC            GOYES  INPB10          YES, DON'T CHANGE IT
1086 E66A9 1590 INPU20   DAT1=A 1               CHANGE CMD NUMBER
1087 E66AD 56C           GONC   INPB10          B.E.T.
1088
1089 E66B0 8F00 INPDWN   GOSBVL =CMDINI
           000
1090 E66B7 CC            A=A-1  A
1091 E66B9 6AEF          GOTO   INPU10
1092
1093 E66BD 8F00 INPTOP   GOSBVL =CMDINI
           000
1094 E66C4 DA            A=C    A               SET CMD NUMBER TO MAX
1095 E66C6 52E           GONC   INPU20          B.E.T.
1096
1097 E66C9 1BC0 INPOFF   D0=(5)  =ACTIVE
           BF2
1098 E66D0 20            P=     0               write a 99 to ACTIVE,
1099 E66D2 3436          LC(5)  99              this is the mainloop
           000
1100 E66D9 144           DAT0=C A               poll handler`s clue to
1101           *                                restart in FORTH
1102 E66DC 8F00          GOSBVL =FINLIN         finish line
           000
1103 E66E3 8D00          GOVLNG =PWROFF         put machine to deep sleep
           000
1104
1105
1106 E66EA 10B  GPRMPT   R3=C
1107 E66ED 7900          GOSUB  GPR0
1108 E66F1 22            CON(2) \"\
1109 E66F3 C5            CON(2) 92            USE "\" AS PROMPT!
1110 E66F5 22            CON(2) \"\
```

```
1111 E66F7 000          CON(3)  0
1112
1113 E66FA 07   GPR0    C=RSTK                  C--> PROMPT
1114 E66FC 12B          CR3EX                   R3-->PROMPT, C(A)-->BUFFER
1115 E66FF 01           RTN
```

```
1116                    EJECT
1117                ********************************
1118                *
1119                * D?NEGATE  (d1 n --- d2)
1120                *
1121                * MADE HEADERLESS 10/10/83
1122                *
1123                ********************************
1124
1125 E6701 0000 =D?NEG  CON(5)   =DOCOL          :
           0
1126 E6706 0000         CON(5)    =LTZ            0<
           0
1127 E670B 68D5         CON(5)    =ZBRNH          IF
           E
1128 E6710 A000         CON(5)   (D?NO)-*
           0
1129 E6715 60D5         CON(5)    =DNGAT          DNEGATE
           E
1130               *                              THEN
1131 E671A 0000 D?NO    CON(5)    =SEMI            ;
           0
```

```
1132                    EJECT
1133                ****************************************************************
1134                *
1135                * TRAVERSE  (addr1 n --- addr2) Move across name field of a
1136                *       variable length dictionary header.  Addr1 is the addr
1137                *       of either the length byte or the last letter.  If n=1
1138                *       move toward high memory, if n=-1 move toward low memory.
1139                *
1140                *       If n is not 1 or -1 then return addr2=addr1!
1141                *
1142                ****************************************************************
1143
1144 E671F B356             CON(5)  !EXPCT
           E
1145 E6724 88    =!TRAVS    CON(2)  #88             TRAVERSE
1146 E6726 4525            NIBASC  \TRAVERS\
           1465
           5425
           35
1147 E6734 5C              CON(2)  \E\+#80
1148
1149 E6736 0000  =TRAVS    CON(5)  =DOCOL          :
           0
1150 E673B 0000            CON(5)  =DUP            (addr1 n n)
           0
1151 E6740 0000            CON(5)  =ABS            (addr1 n |n|)
           0
1152 E6745 0000            CON(5)  =ONE            (addr1 n |n| 1)
           0
1153 E674A 0000            CON(5)  =EQUAL          (addr1 n t/f)
           0
1154 E674F 68D5            CON(5)  =ZBRNH          if n is not 1 or -1 quit
           E
1155 E6754 1400            CON(5)  (TRAV0)-*
           0
1156 E6759 0000            CON(5)   =TWO*          2*   BYTES TO NIBBLES
           0
1157 E675E 0000            CON(5)   =SWAP          SWAP
           0
1158 E6763 0000 TRA        CON(5)   =OVER          BEGIN OVER
           0
1159 E6768 0000            CON(5)   =ADD           +
           0
1160 E676D 0000            CON(5)   =LIT
           0
1161 E6772 F700            CON(5)  #7F             TEST FOR HIGH BIT SET
           0
1162 E6777 0000            CON(5)   =OVER          OVER
           0
1163 E677C 0000            CON(5)   =CAT           C@     GET LETTER
           0
1164 E6781 0000            CON(5)   =LT            <
           0
1165 E6786 68D5            CON(5)   =ZBRNH         UNTIL
           E
```

```
1166 E678B 8DFF          CON(5)  (TRA)-*
           F
1167 E6790 0000          CON(5)   =SWAP          SWAP
           0
1168 E6795 0000 TRAV0    CON(5)   =DROP          DROP
           0
1169 E679A 0000          CON(5)   =SEMI          ;
           0
```

```
1170                    EJECT
1171                ************************************************************
1172                *
1173                * DLITERAL (d --- d ) executing  (d --- ) compiling
1174                *       If compiling, compile double # into a literal, if
1175                *       executing, nothing.
1176                *
1177                *        IMMEDIATE
1178                *
1179                ************************************************************
1180
1181 E679F 4276             CON(5)  =!TRAVS
           E
1182 E67A4 8C     =!DLITR   CON(2)  #C8              DLITERAL
1183 E67A6 44C4             NIBASC  \DLITERA\
           9445
           5425
           14
1184 E67B4 CC               CON(2)  \L\+#80
1185 E67B6 0000   =DLITR    CON(5)  =DOCOL          :
           0
1186 E67BB 0000             CON(5)  =STATE        STATE
           0
1187 E67C0 0000             CON(5)  =AT           @
           0
1188 E67C5 68D5             CON(5)  =ZBRNH        IF
           E
1189 E67CA 4100             CON(5)  (DLIT0)-*
           0
1190 E67CF 0000             CON(5)   =SWAP          SWAP
           0
1191 E67D4 F8F5             CON(5)   =LITR          LITERAL
           E
1192 E67D9 F8F5             CON(5)   =LITR          LITERAL
           E
1193 E67DE 0000 DLIT0       CON(5)   =SEMI          ;
           0
1194
1195                ************************************************************
1196                *
1197                * CLOSEALL ( --- )  This routine is used to close all open
1198                * files in the fib area.  It is used by ABORT and ABORT"
1199                *
1200                ************************************************************
1201
1202 E67E3 4A76             CON(5)  =!DLITR
           E
1203 E67E8 88     =!CLALL   CON(2)  #88              CLOSEALL (FILES)
1204 E67EA 34C4           NIBASC  \CLOSEAL\
           F435
           5414
           C4
1205 E67F8 CC               CON(2)  \L\+#80
1206
1207 E67FA FF76 =CLALL    CON(5) =$CLALL
```

```
            E
   1208
   1209 E67FF 8E00 =$CLALL GOSUBL  =SAVEFP         save forth pointers
            00
   1210 E6805 20           P=      0
   1211 E6807 8F00         GOSBVL  =CLOSEA         system rtne to close all files
            000
   1212 E680E 8C00         GOLONG  =GETFP          restore forth pointers
            00
   1213
   1214 E6814      =REND5  END
```

```
 !ASSEM  Ext                    -   848
=!CLALL  Abs  944104 #E67E8  -  1203
=!COMPL  Abs  942017 #E5FC1  -   421   475
=!CONST  Abs  943318 #E64D6  -   893   911
=!CONTX  Abs  941377 #E5D41  -   163   180
=!CONVT  Abs  941556 #E5DF4  -   251   294
=!CURR   Abs  941414 #E5D66  -   181   229
=!DEC    Abs  941505 #E5DC1  -   230   250
=!DEGR   Abs  941253 #E5CC5  -   108   123
=!DLITR  Abs  944036 #E67A4  -  1182  1202
=!DNGAT  Abs  941302 #E5CF6  -   124   162
=!ENCL   Abs  941702 #E5E86  -   295   363
=!ENDCS  Abs  942158 #E604E  -   476   525
=!EXEC   Abs  941166 #E5C6E  -    78    92
=!EXPCT  Abs  943419 #E653B  -   946  1144
=!FADJ   Abs  942972 #E637C  -   754
=!FCRT   Abs  942321 #E60F1  -   526   612
=!FLITR  Abs  943230 #E647E  -   868   892
=!FSYNT  Abs  942603 #E620B  -   613   753
=!LITR   Abs  941951 #E5F7F  -   393   420
=!LSTNG  Abs  941061 #E5C05  -    27    60
=!PAGES  Abs  943191 #E6457  -   849   867
=!PRIME  Abs  941129 #E5C49  -    61    77
=!RAD    Abs  941204 #E5C94  -    93   107
=!STRM   Abs  941860 #E5F24  -   364   392
=!TRAVS  Abs  943908 #E6724  -  1145  1181
=!VAR    Abs  943366 #E6506  -   912   945
=$BRNCH  Abs  941470 #E5D9E  -   212   208   210
=$CLALL  Abs  944127 #E67FF  -  1209  1207
=$CONTX  Abs  941398 #E5D56  -   168   166
=$CRFL   Abs  942736 #E6290  -   656   655
=$CURR   Abs  941435 #E5D7B  -   186   184
=$DEGR   Abs  941274 #E5CDA  -   112   111
=$DNGAT  Abs  941323 #E5D0B  -   129   127
=$ENCL   Abs  941723 #E5E9B  -   300   298
 $EXEC   Abs  941187 #E5C83  -    83    81
=$EXPCT  Abs  943442 #E6552  -   957   949
=$FADJ   Abs  943015 #E63A7  -   767   766
=$FNAM   Abs  942427 #E615B  -   554   553
=$FSYNT  Abs  942644 #E6234  -   622   621
=$LSTNG  Abs  941082 #E5C1A  -    31    30
 $NMOVE  Ext                   -  1053
=$PAGES  Abs  943214 #E646E  -   853   852
=$PRIME  Abs  941150 #E5C5E  -    66    64
=$RAD    Abs  941225 #E5CA9  -    97    96
=$RSIZE  Abs  941361 #E5D31  -   150   149
=$ZBRNH  Abs  941451 #E5D8B  -   204   202
 -LINE   Ext                   -  1068
 0B0     Abs  941489 #E5DB1  -   219   207
 2DROP   Ext                   -   536
 2DUP    Ext                   -   532
=<;COD   Abs  942108 #E601C  -   459
 <>      Ext                   -   486
 >R      Ext                   -   258   430   579
 ?COMP   Ext                   -   426   481
```

```
 ?DUP     Ext                    -   371
=?NEG     Abs  942078 #E5FFE     -   443
 ABRT"X   Ext                    -   487   759
 ABS      Ext                    -   568  1151
 ADD      Ext                    -   380   578  1159
 ALLOT    Ext                    -   883   920
 AT       Ext                    -   261   267   272   370   379   399   431   495
                                      874  1187
 ATNCLR   Ext                    -  1066
 BASE     Ext                    -   237   260   266   271
 BLK      Ext                    -   369
 BLOCK    Ext                    -   374
=BRNCH    Abs  941465 #E5D99     -   210   277   375   510
 C!       Ext                    -   584   592   598
 CAT      Ext                    -   259   729  1163
 CHEDIT   Ext                    -   970
=CLALL    Abs  944122 #E67FA     -  1207
 CLOSEA   Ext                    -  1211
 CMD1ST   Ext                    -   968  1071
 CMDFND   Ext                    -  1074
 CMDINI   Ext                    -  1081  1089  1093
 COMMA    Ext                    -   404   432   899
=COMPL    Abs  942033 #E5FD1     -   425   402   489   877
=CONST    Abs  943336 #E64E8     -   897
=CONTX    Abs  941393 #E5D51     -   166
 CONV1    Abs  941577 #E5E09     -   256   278
 CONV3    Abs  941687 #E5E77     -   279   264
=CONVT    Abs  941572 #E5E04     -   255
 CREAT    Ext                    -   898   917
 CRETF+   Ext                    -   687
=CRFIL    Abs  942731 #E628B     -   655   545
 CRFLO    Abs  942926 #E634E     -   718   688
 CRFRES   Abs  942903 #E6337     -   711   719
 CRFSB-   Ext                    -   691
 CSP      Ext                    -   494
=CURR     Abs  941430 #E5D76     -   184
 CURSFL   Ext                    -  1067
 D+       Ext                    -   274
 D?NO     Abs  943898 #E671A     -  1131  1128
=D?NEG    Abs  943873 #E6701     -  1125
=DEC      Abs  941521 #E5DD1     -   234
=DEGR     Abs  941269 #E5CD5     -   111
 DIGIT    Ext                    -   262
 DLIT0    Abs  944094 #E67DE     -  1193  1189
=DLITR    Abs  944054 #E67B6     -  1185
=DNGAT    Abs  941318 #E5D06     -   127  1129
 DOATN    Ext                    -   216   220
 DOCOL    Ext                    -   234   255   368   397   425   443   459   480
                                      529   567   616   727   757   872   897   916
                                     1125  1149  1185
 DOCON    Ext                    -   901
 DOUSE    Ext                    -    66   150   168   186   554   853
 DROP     Ext                    -   269   490   506   537  1168
 DUP      Ext                    -   257   428   482   500   572   576  1150
=ENCL     Abs  941718 #E5E96     -   298
```

ENCL1	Abs	941755	#E5EBB	-	312	317				
ENCL2	Abs	941797	#E5EE5	-	330	322				
ENCL20	Abs	941799	#E5EE7	-	331	338				
ENCL3	Abs	941827	#E5F03	-	342	336				
ENCL4	Abs	941836	#E5F0C	-	346	329	341			
ENDC1	Abs	942221	#E608D	-	493	511				
ENDC2	Abs	942256	#E60B0	-	500	498				
ENDC3	Abs	942311	#E60E7	-	512	505				
=ENDCS	Abs	942174	#E605E	-	480					
EQUAL	Ext			-	496	503	732	1153		
=EXEC	Abs	941182	#E5C7E	-	81					
EXP0	Abs	943571	#E65D3	-	1005					
EXP1	Abs	943575	#E65D7	-	1008	989				
EXP2	Abs	943617	#E6601	-	1033	985				
EXP86	Abs	943522	#E65A2	-	987	971				
EXP88	Abs	943486	#E657E	-	970	1005	1069	1079		
EXP99	Abs	943467	#E656B	-	964	967				
=EXPCT	Abs	943437	#E654D	-	949					
=FADJ	Abs	942988	#E638C	-	757					
FADJ01	Abs	943087	#E63EF	-	793	784				
=FADJU	Abs	943010	#E63A2	-	766	758				
FADJX	Abs	943156	#E6434	-	822	831				
FCFAIL	Abs	942372	#E6124	-	536					
FCR01	Abs	942377	#E6129	-	537	543				
FCR02	Abs	942392	#E6138	-	541	535				
=FCREAT	Abs	942337	#E6101	-	529					
FFIND	Ext			-	533					
FILSK+	Ext			-	781					
FINDA	Ext			-	987					
FINLIN	Ext			-	984	1008	1073	1102		
FIVE+	Ext			-	429					
FLIT	Ext			-	878					
FLIT0	Abs	943308	#E64CC	-	884	876				
=FLITR	Abs	943248	#E6490	-	872					
=FNAME	Abs	942422	#E6156	-	553	544				
FOUR+	Ext			-	594					
FSPECx	Ext			-	626					
=FSTX	Abs	942619	#E621B	-	616	541				
FSYNT1	Abs	942688	#E6260	-	634	630	632			
FSYNT2	Abs	942723	#E6283	-	643	641				
=FSYNTX	Abs	942639	#E622F	-	621	618				
GETFP	Ext			-	100	115	638	713	822	1033	1212
GPR0	Abs	943866	#E66FA	-	1113	1107				
GPRMPT	Abs	943850	#E66EA	-	1106	1077				
HERE	Ext			-	879					
IN	Ext			-	378					
INPATN	Abs	943700	#E6654	-	1066	1003				
INPB10	Abs	943732	#E6674	-	1073	1083	1085	1087		
INPBOT	Abs	943725	#E666D	-	1071	997	999			
INPDWN	Abs	943792	#E66B0	-	1089	993				
INPOFF	Abs	943817	#E66C9	-	1097	1001				
INPTOP	Abs	943805	#E66BD	-	1093	995				
INPU10	Abs	943780	#E66A4	-	1084	1091				
INPU20	Abs	943785	#E66A9	-	1086	1095				
INPUP	Abs	943767	#E6697	-	1081	991				

```
 LATE    Ext                    -   461
=LISTNG  Abs  941077 #E5C15     -    30
 LIT     Ext                    -   235   403   463   483   501   569   574   580
                                    589   595   730   881   918  1160
=LITR    Abs  941967 #E5F8F     -   397  1191  1192
 LITR0   Abs  942007 #E5FB7     -   405   401
 LT      Ext                    -  1164
 LTZ     Ext                    -   444  1126
 MAINST  Ext                    -   775
 MAKEBF  Ext                    -  1009
 MIN     Ext                    -   571
 MINUS   Ext                    -   465
 MVMEM+  Ext                    -   816
 NEEDSC  Ext                    -   960
 NEGAT   Ext                    -   447
 NG0     Abs  942103 #E6017     -   448   446
=NGOT?   Abs  942932 #E6354     -   727
 ONE     Ext                    -  1152
 OVER    Ext                    -   582  1158  1162
=PAGESZ  Abs  943209 #E6469     -   852
 PFA     Ext                    -   462
=PRIME   Abs  941145 #E5C59     -    64
 PWROFF  Ext                    -  1103
 R<RSTK  Ext                    -   624   679
 R>      Ext                    -   275   279   427   460   593
 R@      Ext                    -   587
=RAD     Abs  941220 #E5CA4     -    96
=REND5   Abs  944148 #E6814     -  1214
 REPROM  Ext                    -  1078
 ROM;C   Ext                    -   900
 ROT     Ext                    -   270   530   531   577
=RSIZE   Abs  941356 #E5D2C     -   149
 RSTK<R  Ext                    -   637   712
 RUN     Ext                    -    85
 SAVEFP  Ext                    -    97   112   622   656   773   958  1209
 SCRLLR  Ext                    -   964
 SEMI    Ext                    -   239   280   381   405   433   448   467   499
                                    512   539   546   599   619   733   761   884
                                    921  1131  1169  1193
=SETNAM  Abs  942438 #E6166     -   567   617
 SFLAGC  Ext                    -   114
 SFLAGS  Ext                    -    99
 SKIP    Abs  943055 #E63CF     -   780   792
 SMOVE   Ext                    -   586
 SP@     Ext                    -   493
 ST0     Abs  941921 #E5F61     -   377   373
 ST01    Abs  941926 #E5F66     -   378   376
 STATE   Ext                    -   398   873  1186
 STMTR0  Ext                    -   575   625   660
 STO     Ext                    -   880
 STORE   Ext                    -   238   466
=STRM    Abs  941876 #E5F34     -   368   728
 SWAP    Ext                    -   265   591   597  1157  1167  1190
 THEN    Ext                    -   509
 TIB     Ext                    -   377
```

TRA	Abs	943971	#E6763	-	1158	1166					
TRAV0	Abs	944021	#E6795	-	1168	1155					
=TRAVS	Abs	943926	#E6736	-	1149						
TWO	Ext			-	507						
TWO*	Ext			-	573	1156					
TWO+	Ext			-	256	585	588				
U*	Ext			-	268	273					
=VAR	Abs	943384	#E6518	-	916						
=ZBRNH	Abs	941446	#E5D86	-	202	263	372	400	445	497	504	534
					542	875	1127	1154	1165	1188		
ZERO	Ext			-	538						
crfl	Abs	942781	#E62BD	-	669	667					
crfl1	Abs	942892	#E632C	-	707	702					
flRAD	Ext			-	98	113					
kcATTN	Ext			-	1002						
kcBOT	Ext			-	996						
kcDOWN	Ext			-	992						
kcLAST	Ext			-	998						
kcOFF	Ext			-	1000						
kcTOP	Ext			-	994						
kcUP	Ext			-	990						
nomove	Abs	943154	#E6432	-	821	819					
oIMPLh	Ext			-	684	709	810				
plus	Abs	943114	#E640A	-	805	799					
rngerr	Abs	943178	#E644A	-	829	779	791	812			

Input Parameters

  Source file name is MR&FT5

  Listing file name is MR/FT5::65

  Object file name is MR%FT5::65

```
                                  111111
                        0123456789012345
```

  Initial flag settings are

Errors

  None

Saturn Assembler News

```
 1                      TITLE  FT6:_9_10_etc._CHAR WORDS
 2                      RDSYMB MR%GTO
 3                *     RDSYMB MR%FT5
 4                *     ABS    REND5
 5
 6 E6B00                ABS    #E6B00
 7
 8                ************************************************
 9                *
10                * ?TERMINAL   ( --- t/f)  This word checks to see
11                *              if a key has been hit; if it has then
12                *              it returns a true, else a false.
13                *
14                * NOTE:  once a key has been hit ?TERMINAL will
15                *        continue to return true until the key is
16                *        read with KEY
17                *
18                ************************************************************
19 E6B00 0000          CON(5)  0
         0
20 E6B05 98    =!?TERM CON(2)  #89
21 E6B07 F345          NIBASC  \?TERMINA\
         5425
         D494
         E414
22 E6B17 CC            CON(2)  \L\+#80
23 E6B19 E1B6 =?TERM   CON(5)  =$?TERM
         E
24 E6B1E 136  =$?TERM  CD0EX                    save I ptr in C
25 E6B21 1B00          D0=(5)  =KEYPTR          ptr to count of keys in buffer
         000
26 E6B28 1522          A=DAT0  XS               read key count
27 E6B2C 136           CD0EX                    restore I to D0
28 E6B2F D2            C=0     A                set C(A) up as FALSE flag
29 E6B31 A2C           A=A-1   XS               ANYTHING IN KEY BUFFER?
30 E6B34 440           GOC     TERMX            CARRY SET IF NO
31 E6B37 CE            C=C-1   A                make it TRUE
32 E6B39 1C4  TERMX    D1=D1-  5
33 E6B3C 145           DAT1=C  A                push flag to stack
34 E6B3F 03            RTNCC
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
                        EJECT
                *************************************************
                *
                * FCONSTANT    FORM:  (X) FCONSTANT  <name>
                *
                *       Create a floating point constant called
                *       <name> which contains the current value
                *       of the X register.  when <name> is
                *       executed later the value is pushed onto
                *       the floating point stack into the X
                *       register.
                *
                *************************************************
E6B41 50B6      =!?TERM CON(5)  =!?TERM
      E
E6B46 98        =!FCON  CON(2)  #89
E6B48 6434      =!FCON  NIBASC  \FCONSTAN\
      F4E4
      3545
      14E4
E6B58 4D                CON(2)  \T\+#80

E6B5A 0000      =FCON   CON(5)  =DOCOL
      0
E6B5F 0000              CON(5)  =CREAT          CREATE ENTRY
      0
E6B64 0000              CON(5)  =HERE           PLACE TO PUT IT
      0
E6B69 0000              CON(5)  =STO            STORE VALUE
      0
E6B6E 0000              CON(5)  =LIT
      0
E6B73 0100              CON(5)  16              ALLOT 16 NIBS FOR FLOATING
      0
E6B78 0000              CON(5)  =ALLOT          POINT CONSTANT
      0
E6B7D 0000              CON(5)  =ROM;C          COMPILE FLOATING POINT
      0
E6B82 0000              CON(5)  =DOFCON         CONSTANT PROLOGUE
      0
```

```
62                      EJECT
63                  ****************************************************
64                  *
65                  * FVARIABLE     FORM:  FVARIABLE <name>
66                  *
67                  *       create a floating point variable in the
68                  *       user's dictionary called <name>.
69                  *
70                  ****************************************************
71 E6B87 64B6          CON(5)  !FCON
         E
72 E6B8C 98    =!FVAR  CON(2)  #89
73 E6B8E 6465          NIBASC  \FVARIABL\
         1425
         9414
         24C4
74 E6B9E 5C            CON(2)  \E\+#80
75
76 E6BA0 0000  =FVAR   CON(5)  =DOCOL
         0
77 E6BA5 0000          CON(5)  =CREAT          CREATE ENTRY CALLED
         0
78 E6BAA 0000          CON(5)  =LIT            <name> AND ALLOT
         0
79 E6BAF 0100          CON(5)  16              16 NIBS FOR VALUE
         0
80 E6BB4 0000          CON(5)  =ALLOT
         0
81 E6BB9 0000          CON(5)  =SEMI
         0
```

```
 82                     EJECT
 83                 ************************************************
 84                 *
 85                 * HPIL-LOOP  ( --- addr ) Word which returns the addr
 86                 *       of a variable which contains the HPIL LOOP
 87                 *       number (1,2 or 3) over which data is to
 88                 *       be ENTERed and OUTPUT.
 89                 *
 90                 *       THIS WORD IS NOT AVAILABLE TO USER IN
 91                 *       CURRENT IMPLEMENTATION.
 92                 ************************************************
 93
 94                 *       CON(5)  !FVAR
 95                 *=!HPLP  CON(2)  #89
 96                 *       NIBASC  \HPIL-LOO\
 97                 *       CON(2)  \P\+#80
 98 E6BBE 3CB6 =HPLP   CON(5)  =$HPLP
        E
 99
100 E6BC3 8E00 =$HPLP  GOSUBL  =DOUSE
        00
101 E6BC9 7ABF         CON(5)  (=oLOOP)
        2
102
```

```
103                     EJECT
104                 ************************************************************
105                 *
106                 * SECONDARY     ( --- addr ) Word which returns the addr
107                 *               of a variable which contains the HPIL
108                 *               SECONDARY addr (if any).
109                 *
110                 ************************************************************
111
112 E6BCE C8B6          CON(5)  =!FVAR
          E
113 E6BD3 98    =!SECD  CON(2)  #89
114 E6BD5 3554          NIBASC  \SECONDAR\
          34F4
          E444
          1425
115 E6BE5 9D            CON(2)  \Y\+#80
116 E6BE7 CEB6 =SECD    CON(5)  =$SECD
          E
117
118 E6BEC 8E00 =$SECD   GOSUBL  =DOUSE
          00
119 E6BF2 CABF          CON(5)  (=oSECD)
          2
```

```
120                     EJECT
121                 ********************************************************
122                 *
123                 * [COMPILE] Used in colon-defs to force compilation of
124                 *           the following word.  Allows compilation of
125                 * an IMMEDIATE word when it would otherwise be executed.
126                 *
127                 * THIS IS AN IMMEDIATE WORD
128                 *
129                 ********************************************************
130
131 E6BF7 3DB6              CON(5)  =!SECD          NO MORE 9 CHAR WORDS
          E
132 E6BFC 9C    =![CMP]   CON(2)  #C9             [COMPILE]
133 E6BFE B534            NIBASC  \[COMPILE\
          F4D4
          0594
          C454
134 E6C0E DD              CON(2)  \]\+#80
135
136 E6C10 0000  =[CMP]    CON(5)  =DOCOL          :
          0
137 E6C15 0000            CON(5)   =?COMP          ?COMP  error if not compiling
          0
138 E6C1A 0000            CON(5)   =-FIND          -FIND  find tic addr of word
          0
139                 *                                      -FIND rtns a flag to
140                 *                                      signal if word was found
141 E6C1F 0000            CON(5)   =ZEQ            0=     change sense of flag
          0
142 E6C24 0000            CON(5)   =ABORTW         ABORT" abort if word not found
          0
143 E6C29 20              CON(2)  =eNOTF           with "not found" message
144 E6C2B 0000            CON(5)   =DROP           DROP   drop char count of word
          0
145 E6C30 0000            CON(5)   =COMMA          ,      compile tic addr
          0
146 E6C35 0000            CON(5)   =SEMI           ;
          0
```

```
147                     EJECT
148                 ********************************************************************
149                 *
150                 * INTERPRET (---)  Begin interpretation at the char indexed
151                 *           by the contents of >IN relative to the block number
152                 *           contained in BLK, continuing until the input stream
153                 *           is exhausted.  If BLK=0 interpret chars from the
154                 *           terminal input buffer.
155                 *
156                 * VECTORED WORD
157                 ********************************************************************
158
159 E6C3A CFB6          CON(5)  ![CMP]
          E
160 E6C3F 98    =!INTRP CON(2)  #89             INTERPRET
161 E6C41 94E4          NIBASC  \INTERPRE\
          4554
          2505
          2554
162 E6C51 4D            CON(2)  \T\+#80
163
164 E6C53 0000  =INTRP   CON(5)  =DOCOL          :
          0
165 E6C58 0000          CON(5)  =LIT
          0
166 E6C5D 02CF          CON(5)  =oINTRP         LOCATION OF INTERPRET VECTOR
          2
167 E6C62 0000          CON(5)  =AT             GET IT
          0
168 E6C67 0000          CON(5)  =EXEC           EXECUTE IT
          0
169 E6C6C 0000          CON(5)  =SEMI
          0
170                 *
171                 * DEFAULT INTERPRET
172                 *
173
174 E6C71 0000  =IINTRP CON(5)   =DOCOL         :
          0
175 E6C76 0000  INT00   CON(5)   =-FIND          -FIND   attempt to find word in
          0
176 E6C7B 0000          CON(5)   =ZBRNH          IF      dictionary, if found
          0
177 E6C80 C300          CON(5)  (INT0)-*                 check STATE.  If content
          0
178 E6C85 0000          CON(5)   =STATE          STATE   of STATE are > then the
          0
179 E6C8A 0000          CON(5)   =AT             @       raw length of word then
          0
180 E6C8F 0000          CON(5)   =LT             <       the word is not immediat
          0
181 E6C94 0000          CON(5)   =ZBRNH          IF      so compile it (remember
          0
182 E6C99 4100          CON(5)  (INT1)-*                 STATE=0 or  #C0)
          0
```

```
183 E6C9E 0000          CON(5)   =COMMA          ,       if raw length > STATE
          0
184 E6CA3 0000          CON(5)   =BRNCH          ELSE    then we have an immediat
          0
185 E6CA8 ECFF          CON(5)  (INT00)-*                word so lets execute it
          F
186 E6CAD 0000 INT1     CON(5)   =EXEC           EXECUTE
          0
187
188 E6CB2 0000 INT2     CON(5)   =BRNCH          THEN THEN ELSE
          0
189 E6CB7 FBFF          CON(5)  (INT00)-*        START OVER AGAIN!
          F
190
191 E6CBC 0000 INT0     CON(5)   =HERE           HERE   we couldn't find the word
          0
192 E6CC1 0000          CON(5)   =NUMB           NUMBER so let's see if its a leg
          0
193             *                                NUMBER will error out if not a l
194             *                                integer or floating point number
195 E6CC6 0000          CON(5)   =DPL            DPL    number
          0
196 E6CCB 0000          CON(5)   =AT             @
          0
197 E6CD0 0000          CON(5)   =DUP            DUP contents of DPL
          0
198 E6CD5 0000          CON(5)   =LIT
          0
199 E6CDA 0000          CON(5)   #C0000          see if we got a f.p.
          C
200 E6CDF 0000          CON(5)   =EQUAL          number
          0
201 E6CE4 0000          CON(5)   =ZEQ            0=  reverse sense of test
          0
202 E6CE9 0000          CON(5)   =ZBRNH          branch if f.p. number
          0
203 E6CEE 3200          CON(5)   (INT3)-*
          0
204 E6CF3 0000          CON(5)   =ONE+           1+  see if DPL was #FFFFF
          0
205 E6CF8 0000          CON(5)   =ZBRNH          IF if so it was a single number
          0
206 E6CFD 8200          CON(5)  (INT4)-*         else it was a double number
          0
207 E6D02 0000          CON(5)   =DLITR          DLITERAL
          0
208 E6D07 0000          CON(5)   =BRNCH          ELSE
          0
209 E6D0C A6FF          CON(5)  (INT00)-*
          F
210 E6D11 0000 INT3     CON(5)   =FLITR          FLITERAL  compile f.p. if compil
          0
211 E6D16 0000          CON(5)   =DROP           throw away excess copy of DPL
          0
212 E6D1B 0000          CON(5)   =BRNCH          GO AGAIN
```

```
           0
213 E6D20  65FF          CON(5)  (INT00)-*
           F
214 E6D25  0000  INT4    CON(5)   =DROP           DROP
           0
215 E6D2A  0000          CON(5)   =LITR           LITERAL
           0
216 E6D2F  0000  INT5    CON(5)   =BRNCH          THEN THEN AGAIN
           0
217 E6D34  24FF          CON(5)  (INT00)-*
           F
```

```
                        EJECT
                *****************************************************************
                *
                * -TRAILING  (addr n1 --- addr n2) Adjust char cnt, n1, of text s
                *       beginning at addr to exclude trailing blanks.
                *
                *****************************************************************

E6D39 F3C6          CON(5)  =!INTRP
      E
E6D3E 98    =!TRAIL CON(2)  #89             -TRAILING
E6D40 D245          NIBASC  \-TRAILIN\
      2514
      94C4
      94E4
E6D50 7C            CON(2)  \G\+#80

E6D52 0000  =TRAIL  CON(5)  =DOCOL          :
      0
E6D57 0000          CON(5)   =DUP           DUP     (addr cnt cnt)
      0
E6D5C 0000          CON(5)   =ZERO          0       (addr cnt cnt 0)
      0
E6D61 0000          CON(5)   =XDO           DO
      0
E6D66 0000  TRL00   CON(5)   =2DUP          2DUP    (addr cnt addr cnt)
      0
E6D6B 0000          CON(5)   =ONE-          1-      (addr cnt addr cnt-1)
      0
E6D70 0000          CON(5)   =TWO*          2*      (addr cnt addr 2*[cnt-1])
      0
E6D75 0000          CON(5)   =ADD           +       (addr cnt addr-of-last-ch
      0
E6D7A 0000          CON(5)   =CAT           C@      (addr cnt last-char)
      0
E6D7F 0000          CON(5)   =BL            BL      (addr cnt last-char  spac
      0
E6D84 0000          CON(5)   =MINUS         -       if last char=space do ELS
      0
E6D89 0000          CON(5)   =ZBRNH         IF      otherwise char#space so
      0
E6D8E 9100          CON(5)  (TRL0)-*                leave loop!
      0
E6D93 0000          CON(5)  =R>             RECOVER LOOP INDEX AND LIMIT
      0
E6D98 0000          CON(5)  =R>             AND DROP THEM
      0
E6D9D 0000          CON(5)  =2DROP
      0
E6DA2 0000          CON(5)  =SEMI           CHEAT AND END HERE
      0

E6DA7 0000  TRL0    CON(5)   =ONE-          1-      (addr cnt-1)  dropped tra
      0
E6DAC 0000  TRL1    CON(5)   =XLOOP         THEN  LOOP       space
```

```
            0
    251 E6DB1 5BFF          CON(5)    (TRL00)-*
            F
    252 E6DB6 0000          CON(5)    =SEMI           ;
            0
```

```
253                     EJECT
254                 ****************************************************************
255                 *
256                 * IMMEDIATE ( --- ) Mark most recently made dictionary entry
257                 *           as a word which will be executed when encountered
258                 *           during compilation rather than compiled.
259                 *
260                 ****************************************************************
261 E6DBB E3D6             CON(5)  !TRAIL
          E
262 E6DC0 98     =!IMMED   CON(2)  #89             IMMEDIATE
263 E6DC2 94D4             NIBASC  \IMMEDIAT\
          D454
          4494
          1445
264 E6DD2 5C               CON(2)  \E\+#80
265
266 E6DD4 0000   =IMMED    CON(5)  =DOCOL          :
          0
267 E6DD9 0000             CON(5)   =LATE          LATEST
          0
268 E6DDE 0000             CON(5)   =LIT
          0
269 E6DE3 0400             CON(5)  #40             40 HEX
          0
270 E6DE8 0000             CON(5)   =TOGG          TOGGLE
          0
271 E6DED 0000             CON(5)   =SEMI          ;
          0
```

```
272                     EJECT
273
274                ****************************************************************
275                *
276                * VOCABULARY   ( - )   used as   VOCABULARY FRENCH IMMEDIATE
277                *
278                * Creates a dictionary entry with normal header followed
279                * by another header for the word " " (space), a link to the
280                * last word in the new vocabulary, which is initialized to
281                * the nfa of the word (e.g.FRENCH) itself, and a link to the
282                * previously created vocabulary.
283                *
284                ****************************************************************
285
286 E6DF2 0000             CON(5) 0                 NO MORE 10 CHAR WORDS
          0
287 E6DF7 A8     =!VOCAB  CON(2) #8A
288 E6DF9 65F4             NIBASC \VOCABULA\
          3414
          2455
          C414
289 E6E09 25               NIBASC \R\
290 E6E0B 9D               CON(2) \Y\+#80
291
292 E6E0D 0000   =VOCAB    CON(5) =DOCOL
          0
293 E6E12 0000             CON(5)  =CREAT           CREATE
          0
294 E6E17 0000             CON(5)  =LIT
          0
295 E6E1C 1800             CON(5) #81               81
          0
296 E6E21 0000             CON(5)  =C,              C,
          0
297 E6E26 0000             CON(5)  =LIT
          0
298 E6E2B 0A00             CON(5) #A0               A0
          0
299 E6E30 0000             CON(5)  =C,              C,
          0
300 E6E35 0000             CON(5)  =CURR            CURRENT
          0
301 E6E3A 0000             CON(5)  =AT              @
          0
302 E6E3F 0000             CON(5)  =AT              get nfa of this word
          0
303 E6E44 0000             CON(5)  =COMMA           store as last-word link
          0
304 E6E49 0000             CON(5)  =HERE            HERE
          0
305 E6E4E 0000             CON(5)  =VOC-L           VOC-LINK
          0
306 E6E53 0000             CON(5)  =AT              ptr into most recent vocabulary
          0
307 E6E58 0000             CON(5)  =COMMA           store as parent link
```

```
            0
    308 E6E5D 0000          CON(5)  =VOC-L          VOC-LINK
            0
    309 E6E62 0000          CON(5)  =STORE          store HERE as new most recent vocab
            0
    310 E6E67 0000          CON(5)  =ROM;C          ROM;CODE
            0
    311 E6E6C 0000          CON(5) =DOVOC           dovocabulary
            0
```

```
312                     EJECT
313                 ********************************************************************
314                 *
315                 * DEFINITIONS   set CURRENT to the CONTEXT vocabulary, subsequent
316                 *               definitions will be created in the vocab selected
317                 *               as the CONTEXT
318                 ********************************************************************
319
320 E6E71 0000             CON(5)  0               NO MORE 11 CHAR WORDS
           0
321 E6E76 B8     =!DEFIN  CON(2)  #8B
322 E6E78 4454             NIBASC  \DEFINITI\
           6494
           E494
           4594
323 E6E88 F4E4             NIBASC  \ON\
324 E6E8C 3D               CON(2)  \S\+#80
325
326 E6E8E 0000   =DEFIN   CON(5)  =DOCOL         :
           0
327 E6E93 0000             CON(5)   =CONTX       CONTEXT
           0
328 E6E98 0000             CON(5)   =AT          @
           0
329 E6E9D 0000             CON(5)   =CURR        CURRENT
           0
330 E6EA2 0000             CON(5)   =STORE       !
           0
331 E6EA7 0000             CON(5)   =SEMI        ;
           0
```

```
                        EJECT

                ****************************************
                *
                * STRING-ARRAY
                * Use is: MAX DIM STRING-ARRAY <name>
                * String-array has form max dim (1 byte each),
                * followed by max*(dim+2) bytes.
                *
                ************************************************
E6EAC 0000      =!STRAR CON(5)  0               NO MORE 12 CHAR WORDS
      0
E6EB1 C8        =!STRAR CON(2)  #8C
E6EB3 3545              NIBASC  \STRING-\
      2594
      E474
      D2
E6EC1 1425              NIBASC  \ARRA\
      2514
E6EC9 9D                CON(2) \Y\+#80
E6ECB 0000      =STRAR  CON(5)  =DOCOL          :
      0
E6ED0 0000              CON(5)  =CREAT          CREATE
      0
E6ED5 0000              CON(5)  =ROMC*          ROM;CODE with DOSTRA
      0
                * max dim
E6EDA 0000              CON(5)  =M255           REPLACE DIM WITH 255 IF >255
      0
E6EDF 0000              CON(5)  =SWAP           SWAP
      0
E6EE4 0000              CON(5)  =M255           REPLACE MAX "   "   "  "
      0
E6EE9 0000              CON(5)  =2DUP           2DUP
      0
E6EEE 0000              CON(5)  =HERE           HERE
      0
                * dim max dim max here
E6EF3 0000              CON(5)  =C!             C!
      0
E6EF8 0000              CON(5)  =HERE           HERE
      0
E6EFD 0000              CON(5)  =TWO+           2+
      0
E6F02 0000              CON(5)  =C!             C!
      0
                * dim max
E6F07 0000              CON(5)  =2DUP           2DUP
      0
E6F0C 0000              CON(5)  =HERE           HERE
      0
E6F11 0000              CON(5)  =FOUR+          4+
      0
E6F16 0000              CON(5)  =ROT            ROT
      0
```

```
366 E6F1B 0000        CON(5)   =ROT         ROT
          0
367           * dim max here+ dim max
368 E6F20 0000        CON(5)   =TWO+        2+
          0
369 E6F25 0000        CON(5)   =MULT        *
          0
370 E6F2A 0000        CON(5)   =TWO*        2*
          0
371 E6F2F 0000        CON(5)   =FOUR+       4+
          0
372 E6F34 0000        CON(5)   =ALLOT       NALLOT
          0
373           * NOW GO THROUGH PUTTING IN MAX 0
374           * AT BEGINNING OF EACH ELEMENT
375           *
376           * dim max here+  (counter max ptr)
377           *                              BEGIN
378 E6F39 0000        CON(5)   =ROT       max ptr counter
          0
379 E6F3E 0000        CON(5)   =>R        max ptr    R:counter
          0
380 E6F43 0000 STRA1  CON(5)   =R>         max ptr counter
          0
381 E6F48 0000        CON(5)   =?DUP
          0
382 E6F4D 0000        CON(5)   =ZBRNH       WHILE
          0
383 E6F52 0500        CON(5)  (STRA2)-*
          0
384 E6F57 0000        CON(5)   =ONE-        decrement counter
          0
385 E6F5C 0000        CON(5)   =>R          max ptr  R:counter
          0
386 E6F61 0000        CON(5)   =2DUP        max ptr max ptr
          0
387 E6F66 0000        CON(5)   =C!          C!
          0
388 E6F6B 0000        CON(5)   =DUP         max ptr ptr
          0
389 E6F70 0000        CON(5)   =TWO+        max ptr ptr+
          0
390 E6F75 0000        CON(5)   =ZERO        0
          0
391 E6F7A 0000        CON(5)   =SWAP        max ptr 0 ptr+
          0
392 E6F7F 0000        CON(5)   =C!          C!
          0
393 E6F84 0000        CON(5)   =FOUR+       max ptr+4
          0
394           * max ptr(past str len bytes)
395 E6F89 0000        CON(5)   =OVER        max ptr max
          0
396 E6F8E 0000        CON(5)   =TWO*        max ptr 2*max
          0
```

```
397 E6F93 0000          CON(5)   =ADD         max newptr
          0
398 E6F98 0000          CON(5)   =BRNCH       REPEAT
          0
399 E6F9D 6AFF          CON(5)  (STRA1)-*
          F
400 E6FA2 0000 STRA2    CON(5)   =2DROP       2DROP
          0
401 E6FA7 0000          CON(5)   =SEMI        ;
          0
402
403 E6FAC 1BF6 =ERR?    CON(5)   =$ERR?
          E
404 E6FB1 8E00 =$ERR?   GOSUBL   =DOUSE
          00
405 E6FB7 BBBF          CON(5)   =oERR?
          2
406
407
408 E6FBC       =REND6  END
```

```
=!?TERM  Abs  944901 #E6B05 -    20    48
=!DEFIN  Abs  945782 #E6E76 -   321
=!FCON   Abs  944966 #E6B46 -    49    71
=!FVAR   Abs  945036 #E6B8C -    72   112
=!IMMED  Abs  945600 #E6DC0 -   262
=!INTRP  Abs  945215 #E6C3F -   160   226
=!SECD   Abs  945107 #E6BD3 -   113   131
=!STRAR  Abs  945841 #E6EB1 -   343
=!TRAIL  Abs  945470 #E6D3E -   227   261
=!VOCAB  Abs  945655 #E6DF7 -   287
=![CMP]  Abs  945148 #E6BFC -   132   159
=$?TERM  Abs  944926 #E6B1E -    24    23
=$ERR?   Abs  946097 #E6FB1 -   404   403
=$HPLP   Abs  945091 #E6BC3 -   100    98
=$SECD   Abs  945132 #E6BEC -   118   116
 -FIND   Ext          -      138   175
 2DROP   Ext          -      246   400
 2DUP    Ext          -      235   354   362   386
 >R      Ext          -      379   385
 ?COMP   Ext          -      137
 ?DUP    Ext          -      381
=?TERM   Abs  944921 #E6B19 -    23
 ABORTW  Ext          -      142
 ADD     Ext          -      238   397
 ALLOT   Ext          -       59    80   372
 AT      Ext          -      167   179   196   301   302   306   328
 BL      Ext          -      240
 BRNCH   Ext          -      184   188   208   212   216   398
 C!      Ext          -      357   360   387   392
 C,      Ext          -      296   299
 CAT     Ext          -      239
 COMMA   Ext          -      145   183   303   307
 CONTX   Ext          -      327
 CREAT   Ext          -       54    77   293   348
 CURR    Ext          -      300   329
=DEFIN   Abs  945806 #E6E8E -   326
 DLITR   Ext          -      207
 DOCOL   Ext          -       53    76   136   164   174   231   266   292
                             326   347
 DOFCON  Ext          -       61
 DOUSE   Ext          -      100   118   404
 DOVOC   Ext          -      311
 DPL     Ext          -      195
 DROP    Ext          -      144   211   214
 DUP     Ext          -      197   232   388
 EQUAL   Ext          -      200
=ERR?    Abs  946092 #E6FAC -   403
 EXEC    Ext          -      168   186
=FCON    Abs  944986 #E6B5A -    53
 FLITR   Ext          -      210
 FOUR+   Ext          -      364   371   393
=FVAR    Abs  945056 #E6BA0 -    76
 HERE    Ext          -       55   191   304   355   358   363
=HPLP    Abs  945086 #E6BBE -    98
=IINTRP  Abs  945265 #E6C71 -   174
```

```
=IMMED   Abs  945620 #E6DD4 -   266
 INT0    Abs  945340 #E6CBC -   191   177
 INT00   Abs  945270 #E6C76 -   175   185   189   209   213   217
 INT1    Abs  945325 #E6CAD -   186   182
 INT2    Abs  945330 #E6CB2 -   188
 INT3    Abs  945425 #E6D11 -   210   203
 INT4    Abs  945445 #E6D25 -   214   206
 INT5    Abs  945455 #E6D2F -   216
=INTRP   Abs  945235 #E6C53 -   164
 KEYPTR  Ext                -    25
 LATE    Ext                -   267
 LIT     Ext                -    57    78   165   198   268   294   297
 LITR    Ext                -   215
 LT      Ext                -   180
 M255    Ext                -   351   353
 MINUS   Ext                -   241
 MULT    Ext                -   369
 NUMB    Ext                -   192
 ONE+    Ext                -   204
 ONE-    Ext                -   236   249   384
 OVER    Ext                -   395
 R>      Ext                -   244   245   380
=REND6   Abs  946108 #E6FBC -   408
 ROM;C   Ext                -    60   310
 ROMC*   Ext                -   349
 ROT     Ext                -   365   366   378
=SECD    Abs  945127 #E6BE7 -   116
 SEMI    Ext                -    81   146   169   247   252   271   331   401
 STATE   Ext                -   178
 STO     Ext                -    56
 STORE   Ext                -   309   330
 STRA1   Abs  945987 #E6F43 -   380   399
 STRA2   Abs  946082 #E6FA2 -   400   383
=STRAR   Abs  945867 #E6ECB -   347
 SWAP    Ext                -   352   391
 TERMX   Abs  944953 #E6B39 -    32    30
 TOGG    Ext                -   270
=TRAIL   Abs  945490 #E6D52 -   231
 TRL0    Abs  945575 #E6DA7 -   249   243
 TRL00   Abs  945510 #E6D66 -   235   251
 TRL1    Abs  945580 #E6DAC -   250
 TWO*    Ext                -   237   370   396
 TWO+    Ext                -   359   368   389
 VOC-L   Ext                -   305   308
=VOCAB   Abs  945677 #E6E0D -   292
 XDO     Ext                -   234
 XLOOP   Ext                -   250
 ZBRNH   Ext                -   176   181   202   205   242   382
 ZEQ     Ext                -   141   201
 ZERO    Ext                -   233   390
=[CMP]   Abs  945168 #E6C10 -   136
```

Input Parameters

  Source file name is MR&FT6

  Listing file name is MR/FT6::65

  Object file name is MR%FT6::65

                                  111111
                        0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News

```
 1                      TITLE  FT7:_PROLOGUES
 2                *     RDSYMB MR%FT6
 3                *     ABS    REND6
 4                      RDSYMB MR%GTO
 5                      RDSYMB MR%TIQ
 6 E7000                ABS    F7STRT
 7                ***********************************************
 8                *                                             *
 9                *  MR&FT7      <840608.1403>                  *
10                *                                             *
11                * Prologues, etc.                             *
12                *                                             *
13                ***********************************************
14                *TYTABF = F7STRT IN MR%GTO
15                *
16                * FILE TYPE TABLE
17                *
18                * Used to supply file type since type FORTH is
19                * not known to mainframe. See CATPOL in MR/FT0.
20                *
21 E7000 0              CON(1)  0            mainframe format
22 E7001 0              CON(1)  0            mainframe copy
23 E7002 0              CON(1)  0            non-execute
24 E7003 50             CON(2)  5            no sub-header
25 E7005 64F4           NIBASC  \FORTH\
         2545
         84
26 E700F 2              CON(1)  2            2 types
27 E7010 812E           CON(4)  =FthFil       ordinary FORTH
28 E7014 912E           CON(4)  (=FthFil)+1   with SECURE
29 E7018 FF             NIBHEX  FF           end of table
30                ***************************************
31                *
32                * DOCOLON
33                * on entry, A[A]=WA, unincremented
34                *           D0=I, incremented
35                *
36                * A-register points to the DOCOL in secondary,
37                * since we come here right from NEXT. We
38                * will increment it and make it the new instruction
39                * pointer, after saving the old instruction pointer (in
40                * D0, of course) on the return stack (pointed to by the
41                * B-register).
42                *
43                ***************************************
44
45 E701A D9     =DOCOL  C=B     A              get rtn stk ptr
46 E701C 136           CD0EX                  D0=rtn stk;c= instr ptr
47 E701F 184           D0=D0-  5              push item on RS
48 E7022 144           DAT0=C  A              old I-->RS
49 E7025 132           AD0EX
50 E7028 D8            B=A     A              put RS back to B[A]
51 E702A 164           D0=D0+  5              old WA+5-->I
52 E702D 03            RTNCC
53
```

```
                *****************************************
                *
                * DOCONSTANT
                *
                * The runtime code for a constant.
                * A-register points to the cfa, where (=DOCON) is,
                * so we just increment it (pointing to pfa) and get
                * the value there; then push it on stack.
                *
                *****************************************

E702F 132   =DOCON  AD0EX                   WA-->D0
E7032 164           D0=D0+  5               inc WA
E7035 146           C=DAT0  A               get the value of the constant
E7038 130           D0=A                    restore I
E703B 1C4           D1=D1-  5
E703E 145           DAT1=C  A               push value onto SP
E7041 03            RTNCC

                ***************************
                *
                * DOFCONSTANT  (FLOATING POINT CONSTANT
                *
                * Same idea as with DOCON, but instead of pushing
                * the value (here 16 nibs instead of 5) stored at pfa,
                * we have to do a stack-lift on X,Y,Z,T locations and
                * write the value to the X-register location.
                *
                ***************************

E7043 132   =DOFCON AD0EX
E7046 164           D0=D0+ 5
E7049 1567          C=DAT0 W                READ F.P. VALUE
E704D 130           D0=A                    RECOVER I
E7050 10B           R3=C                    SAVE CONSTANT
E7053 7321          GOSUB  SAVEFP           SAVE FORTH POINTERS
E7057 75C2          GOSUB  =STKLFT          LIFT STACK
E705B 1B0D          D0=(5)  =oX
      BF2
E7062 113           A=R3
E7065 1507          DAT0=A W                WRITE CONSTANT TO X
E7069 6B31          GOTO   GETFP            RECOVER FORTH POINTERS

                ************************
                *
                * DOVARIABLE
                *
                * Runtime code for a variable.
                * As in above routines, A-register points to
                * cfa on entry; what is supposed to be returned is
                * the pfa, which is [A]+5.
                *
                ************************

E706D 20    =DOVAR  P=      0               SET FOR C LOAD
```

```
108 E706F 3450         LC(5)   5
          000
109 E7076 CA    dv     A=A+C   A              inc WA to get variable address
110 E7078 1C4          D1=D1-  5
111 E707B 141          DAT1=A  A              push addr onto SP
112 E707E 03           RTNCC
113
114
115             ********************************
116             *
117             * DOSTRING
118             *
119             * Instead of returning pfa(=cfa+5), a string
120             * variable wants to return: pfa+4, which is the
121             * address of the first character in the string
122             * (after the maxlen&curlen bytes); and then the
123             * current length on top of that.
124             *
125             ********************************
126
127 E7080 20    =DOSTR P=      0
128 E7082 3490         LC(5)   9              point to pfa+4
          000
129 E7089 79EF         GOSUB   dv             push pfa+4 on stack
130 E708D 132          AD0EX                  D0-->pfa+4
131 E7090 181          D0=D0-  2              point to current length
132 E7093 14E          C=DAT0  B              get it
133 E7096 161          D0=D0+  2
134 E7099 132          AD0EX                  restore A & D0
135 E709C 1C4          D1=D1-  5
136 E709F 145          DAT1=C  A              push curlen
137 E70A2 03           RTNCC
138
139             ***************************
140             *
141             * DOSTRINGARRAY
142             *
143             * Get index off stack; check that there is
144             * one and it is valid; point to the indexed
145             * array element and return its length
146             * and address.
147             *
148             ***********************************************
149 E70A4 31E2 DOSTer  LC(2)   =eBADPM
150 E70A8 22           P=      2
151 E70AA 31F2         LC(2)   =ID
152 E70AE 20           P=      0
153 E70B0 8D00         GOVLNG  =BSERR
          000
154             * * * * * * * * * * * * * * * * * * * * * * *
155             *
156 E70B7 20    =DOSTRA P=     0
157 E70B9 136          CD0EX
158 E70BC 108          R0=C                   SAVE D0
159 E70BF D9           C=B     A
```

```
160 E70C1 109          R1=C                SAVE B
161 E70C4 AF2          C=0     W
162 E70C7 147          C=DAT1  A           GET INDEX OF ARRAY
163 E70CA 8AA          ?C=0    A           ZERO ALWAYS BAD
164 E70CD 7D           GOYES   DOSTer
165 E70CF D7           D=C     A           D=index of array
166             * A-register points to cfa after NEXT
167 E70D1 130          D0=A                D0-->CFA
168 E70D4 166          D0=D0+  7           POINT TO PFA+2=DIMENSION
169 E70D7 D2          C=0     A
170 E70D9 14E         C=DAT0  B            get DIMENSION of array
171             * is dimension less than the index given to us?
172 E70DC 8B3          ?C<D    A           index out of range?
173 E70DF 5C           GOYES   DOSTer
174 E70E1 181          D0=D0-  2           POINT BACK TO MAXLEN
175 E70E4 174          D1=D1+  5           UPDATE STACK PTR
176 E70E7 14E          C=DAT0  B           GET MAXLEN
177 E70EA E6           C=C+1   A
178 E70EC E6           C=C+1   A           add 2 for max/cur bytes
179 E70EE C6           C=C+C   A           bytes to nibs
180 E70F0 D5           B=C     A           B=len of each string
181 E70F2 163          D0=D0+  4           point to 1st string
182 E70F5 136          CD0EX               get ptr into array
183 E70F8 CF   NSTR    D=D-1   A           count down index
184 E70FA 8AB          ?D=0    A
185 E70FD 80           GOYES   DSTR
186 E70FF C9           C=C+B   A           add string to ptr
187 E7101 66FF         GOTO    NSTR
188 E7105 137  DSTR    CD1EX               D1-->STR
189 E7108 10A          R2=C                save data stack pointer
190 E710B 171          D1=D1+  2
191 E710E 14F          C=DAT1  B           get len
192 E7111 AE7          D=C     B           D=lenght of string
193 E7114 171          D1=D1+  2           beginning of str
194 E7117 11A          C=R2                retrieve stk ptr
195 E711A 137          CD1EX               D1=STK,C=str addr
196 E711D 1C4          D1=D1-  5           push item
197 E7120 145          DAT1=C  A                addr
198 E7123 1C4          D1=D1-  5           push another
199 E7126 D2           C=0     A
200 E7128 AEB          C=D     B           get len
201 E712B 145          DAT1=C  A                len on stack
202 E712E 119          C=R1                get back B
203 E7131 D5           B=C     A
204 E7133 118          C=R0                get back D0
205 E7136 136          CD0EX
206 E7139 03           RTNCC
207
208             ************************************************************
209             *
210             * DODOES
211             *
212             * Subroutine of secondary DOES (in MR/FT3) and DOVOC below.
213             * Like DOCOL plus it returns pfa onto stack.
214             * on entry, RSTK  points to the list of cfas following DOES>
```

```
                *                                   in the defining word
                *          A[A]+5 points to the parameter field of the word
                *                                   being executed
                * the action of dodoes is:
                *        1. push I onto RS
                *        2. set new I to the cfa list following DOES>
                *        3. push the pfa of the word being executed onto SP
                *
                * To see why we want to do this, look at DOVOC below.
                *
                ************************************************************

E713B D9    =DODOES C=B     A
E713D 136           CD0EX
E7140 184           D0=D0-  5
E7143 144           DAT0=C  A               push I onto RS
E7146 07            C=RSTK
E7148 136           CD0EX                   put up new I
E714B D5            B=C     A               put RS ptr back to B.A
E714D 20            P=      0
E714F 3450          LC(5)   5
      000
E7156 CA            A=A+C   A               increment WA to get pfa
E7158 1C4           D1=D1-  5
E715B 141           DAT1=A  A               pfa to SP
E715E 03            RTNCC

                ***********************************************************
                *
                * DOVOCABULARY
                *
                * Get pfa of vocabulary. At pfa is:
                *                         * 180A  (dummy header)
                *                         * last-word field
                *                         * parent vocab field
                *
                * Skip the dummy header, store addr of last-word link
                * in CONTEXT.
                *
                ***********************************************************

E7160 8E5D  =DOVOC  GOSUBL  DODOES
      FF
E7166 0000          CON(5)   =FOUR+     skip dummy header
      0
E716B 0000          CON(5)   =CONTX
      0
E7170 0000          CON(5)   =STORE
      0
E7175 8E17          CON(5)   =SEMI
      E
```

```
261                     EJECT
262                 ****************************************
263                 * SAVEFP  --  SAVE FORTH POINTERS
264                 *
265                 * IN: D1= DATA STK PT
266                 *     D0= I
267                 *     B(A)=RTN STK PTR
268                 *
269                 * OUT: SAVES D0, D1, B(A) IN RAM
270                 *      CARRY CLEAR
271                 *
272                 * USES: C(A), D0, P
273                 *
274                 ****************************************
275 E717A 20       =SAVEFP P=      0
276 E717C 34DF             LC(5)  =DSTKAD          C(A)=DATA STK SAVE AREA
            AF2
277 E7183 137              CD1EX                   ADDR TO D1, CURRENT DATA STK TO C
278 E7186 145              DAT1=C A                SAVE DATA STK PT
279 E7189 174              D1=D1+ 5
280 E718C D9               C=B    A
281 E718E 145              DAT1=C A                SAVE RTN STK PT
282 E7191 174              D1=D1+ 5
283 E7194 136              CD0EX
284 E7197 145              DAT1=C A                SAVE I
285 E719A 1C9              D1=D1- 10               POINT TO ORIGINAL D1
286 E719D 147              C=DAT1 A
287 E71A0 137              CD1EX
288 E71A3 03               RTNCC
289
290
291                 ****************************************************************
292                 * GETFP  --  GET FORTH POINTERS
293                 *
294                 * IN: DOESN'T MATTER
295                 *
296                 * ASSUME: P= 0, HEXMODE
297                 *
298                 * OUT: D1= DATA STK PT
299                 *      D0= I
300                 *      B(A)= RTN STK PT
301                 *      CARRY CLEAR
302                 *
303                 * USES: C(A), B, D0, D1, P
304                 *
305
306 E71A5 20       =GETFP  P=      0
307 E71A7 3470             LC(5)  =IREG            START LOADING I
            BF2
308 E71AE 137              CD1EX                   SAVE ADDRESSES TO D1
309 E71B1 147              C=DAT1 A
310 E71B4 134              D0=C                    D0= I
311 E71B7 1C4              D1=D1- 5
312 E71BA 147              C=DAT1 A
313 E71BD D5               B=C    A                B= RTN STK PT
```

```
314 E71BF 1C4          D1=D1- 5
315 E71C2 147          C=DAT1 A
316 E71C5 135          D1=C                    D1= DATA STK
317 E71C8 03           RTNCC
318
```

```
319                EJECT
320             ****************************************************************
321             *                                                              *
322             * GENERAL USE OF CPU REGISTERS IN FORTH SYSTEM                 *
323             *                                                              *
324             * B(A)=  RTN STACK POINTER  (points at top item --             *
325             *                            decreasing stack)
326             * D1=    FORTH DATA STACK POINTER   (points at top item -- *
327             *                                    decreasing stack)
328             * D0=    I  (instruction pointer)                              *
329             * A(A)=  WA (word address)                                     *
330             *                                                              *
331             ****************************************************************
332
333
334
335             ****************************************
336             * INNER LOOP
337             *
338             * NEXT  @I--->WA
339             *       I=I+5          TYPICAL # STATES: 98
340             *       @WA-->PC
341             *
342             ****************************************
343
344 E71CA 142  =NEXT   A=DAT0  A       A(A)=WA  [18]
345 E71CD 164         D0=D0+  5       incr I to next addr [7]
346 E71D0 132  =RUN    AD0EX           D0=WA, A=I  [8]
347 E71D3 146         C=DAT0  A       C=@WA       [18]
348 E71D6 132         AD0EX           D0=I, A(A)=WA   [8]
349 E71D9 06          RSTK=C          push @WA to PC  [8]
350 E71DB 01          RTN                             [9]
351
352 E71DD 79EF =NEXT00 GOSUB   NEXT    put NEXT01's addr on CPU RTN STK
353             *                           [12]
354 E71E1 5BF  NEXT01  GONC    NEXT00  NOTE: we're counting on NO CARRY!!!
355             *                           [10]
356 E71E4 68FF         GOTO    NEXT00   This is insurance
```

```
                        EJECT

                *
                * SEMI  POP RTN STK--->I
                *       GOTO NEXT
                *
                * This routine is also called EXIT
                *

E71E8           =EXIT
E71E8 DE17E     =SEMI   CON(5)  =$SEMI
E71ED 7310      =$SEMI  GOSUB   DOATN
E71F1 D9                C=B     A       RTN STK PTR to C
E71F3 136               CD0EX           D0=RTN STK, C=I
E71F6 142               A=DAT0  A       A= new I
E71F9 164               D0=D0+  5       decrement RTN STK PTR
E71FC 132               AD0EX           D0=new I, A=RTN STK PTR
E71FF D8                B=A     A       restore RTN STK PTR
E7201 58C               GONC    NEXT


                ********************************************************
                *
                * This rtne checks to see if the ATTN key was hit
                * and if it was it runs the ABORT routine.
                * It also handles other service requests.  It is
                * run after every BRANCH and 0BRANCH and SEMI
                ********************************************************

E7204 727F      =DOATN  GOSUB   =SAVEFP         SAVE FORTH POINTERS
E7208 8F000             GOSBVL  =CK"ON"         CKECK IF ATTN KEY HIT
E720F 5E2               GONC    ATTN            WAS HIT
E7212 87C               ?ST=1   Except
E7215 D0                GOYES   EXCP10
E7217 80E               SREQ?                   SERV. REQ?
E721A 834               ?SR=0
E721D D1                GOYES   EXCP99          EXIT
E721F 824               SR=0
E7222 8F000     EXCP10  GOSBVL  =CKSREQ         CHECK SERVICE REQUEST
E7229 86C               ?ST=0   Except          CLEARED?
E722C E0                GOYES   EXCP99          EXIT
E722E 84C               ST=0    Except          CLEAR IT
E7231 8F000             GOSBVL   =FPOLL
E7238 8F                CON(2)  =pExcpt
E723A 6A6F      EXCP99  GOTO    =GETFP          RESTORE FORTH POINTERS


E723E 84C       ATTN    ST=0    Except          clear exception flag
E7241 1F000             D1=(5)  =ATNFLG
```

```
407 E7248 D0            A=0    A
408 E724A 1590          DAT1=A 1          CLEAR ATTN FLAG
409 E724E 735F          GOSUB  GETFP
410 E7252 07            C=RSTK            THROW AWAY 1 RTN ADDR
411 E7254 7A00          GOSUB  SETI0
412 E7258 000C          CON(5) =CR        DO A CARRIAGE RETURN
          2
413 E725D 0000          CON(5) =ABORT     NOW DO ABORT
          0
414
415 E7262 07   SETI0    C=RSTK            POP ADDR
416 E7264 136           CD0EX             D0=NEW I
417 E7267 626F          GOTO   NEXT       GO TO INNER LOOP
```

```
418                     EJECT
419                 ******************************************************
420                 *
421                 * THIS ROUTINE ALLOWS FOR RETURN TO BASIC KEYWORDS
422                 * ASSUMES THE RTN ADDR IS ON STK
423                 *
424                 ******************************************************
425
426 E726B 0727 =BSCRTN CON(5) =$BSRTN
          E
427 E7270 147  =$BSRTN C=DAT1 A
428 E7273 174          D1=D1+ 5
429 E7276 1BDF         D0=(5)  =DSTKAD
          AF2
430 E727D 137          CD1EX
431 E7280 144          DAT0=C  A               SAVE TOS
432 E7283 137          CD1EX
433 E7286 06           RSTK=C
434 E7288 01           RTN
```

```
                    STITLE FLOATING_POINT_SUBROUTINES
            ***************************************
            *
            * GETXLN
            *
            * GET X & LASTX AS 15-FORM NUMBERS IN
            * REGISTERS (C,D) AND (A,B)
            *
            ****************************************

E728A 1B0D =GETX   D0=(5)  (=oX)
      BF2
E7291 1527 GX00    A=DAT0  W              READ CONTENTS OF X REGISTER
E7295 05   GX01    SETDEC
E7297 1F00         D1=(5) =MTHSTK         D1 MUST POINT TO MATHSTK
      000
E729E 147          C=DAT1 A               FOR WARNINGS, ERRORS
E72A1 135          D1=C
E72A4 8F00         GOSBVL =SIGTST         TEST FOR NaNs, INFs
      000
E72AB 5C0          GONC   GX02
E72AE 8F00         GOSBVL =uRES12
      000
E72B5 AFA          A=C    W
E72B8 8D00 GX02    GOVLNG  =SPLITA      GET # IN (A,B)
      000

E72BF 77CF =GETXLN GOSUB   GETX         this used to be Y
            *                           before stkdrp
E72C3 8F00         GOSBVL =STAB1        A,B stored in R0,R1
      000
E72CA 18F          D0=D0-  16           POINT TO LASTX
E72CD 70CF         GOSUB  GX00          get X from LASTX
E72D1 8F00         GOSBVL =RCCD1        Y from R0,R1
      000
E72D8 8D00         GOVLNG =XYEX         exchange X,Y
      000

            *
            * GETX+L
            *
            * Gets X in (A,B); also puts X in LASTX
            *
E72DF 1B0D =GETX+L D0=(5)  (=oX)
      BF2
E72E6 1527         A=DAT0  W
E72EA 18F          D0=D0-  16           LASTX
E72ED 1507         DAT0=A  W            LASTX:=X
E72F1 63AF         GOTO    GX01
            *
            * PUTABX
            *
            * PUT A RESULT OF COMPUTATION IN (A,B) INTO
            * VARIABLE (41-C REGISTER) X
            *
```

```
481 E72F5 1F00 =PUTABX D1=(5)  =MTHSTK
          000
482 E72FC AFF          CDEX    W
483 E72FF 147          C=DAT1  A
484 E7302 135          D1=C
485 E7305 AFF          CDEX    W
486 E7308 8F00         GOSBVL  =uRES12     PACK UP # INTO C
          000
487 E730F 1B0D         D0=(5)  (=oX)
          BF2
488 E7316 1547         DAT0=C  W
489 E731A 04           SETHEX
490 E731C 688E         GOTO    GETFP       RECOVER FORTH POINTERS
491
492             *
493             * STACK_LIFT
494             *                  ---> LOST
495             *    +---------+   |            +----------+
496             *    |   T     |-- ---------->|     T    |
497             *    +---------+    |         +----------+
498             *    |   Z     |-----  ------->|     Z    |
499             *    +---------+       |      +----------+
500             *    |   Y     |--------  ---->|     Y    |
501             *    +---------+          |    +----------+
502             *    |   X     |-----------    |     X    |
503             *    +---------+               +----------+
504             *    |   L     |               |     L    |
505             *    +---------+               +----------+
506             *
507
508 E7320 20   =STKLFT P=       0
509 E7322 1F0D          D1=(5)  =oX           POINT TO X
          BF2
510 E7329 1577         C=DAT1  W             READ X
511 E732D 17F          D1=D1+  16            POINT TO Y
512 E7330 1537         A=DAT1  W             READ Y
513 E7334 1557         DAT1=C  W             WRITE X TO Y
514 E7338 17F          D1=D1+  16            POINT TO Z
515 E733B 1577         C=DAT1  W             READ Z
516 E733F 1517         DAT1=A  W             WRITE Y TO Z
517 E7343 17F          D1=D1+  16            POINT TO T
518 E7346 1557         DAT1=C  W             WRITE Z TO T
519 E734A 01           RTN
520
521
522             *
523             * STACK_DROP
524             *
525             *    +---------+               +----------+
526             *    |   T     |----------     |     T    |
527             *    +---------+          |    +----------+
528             *    |   Z     |-------- ----->|     Z    |
529             *    +---------+        |      +----------+
530             *    |   Y     |------ ------->|     Y    |
531             *    +---------+      |        +----------+
```

```
532                *    |   X    |---  --------->|     X    |
533                *    +--------+  |            +----------+
534                *    |   L    |  ------------>|     L    |
535                *    +--------+               +----------+
536                *
537                *
538
539 E734C 20    =STKDRP P=       0
540 E734E 1F00         D1=(5)  =oT            POINT TO T
          CF2
541 E7355 1577         C=DAT1  W              READ T
542 E7359 1CF          D1=D1-  16             POINT TO Z
543 E735C 1537         A=DAT1  W              READ Z
544 E7360 1557         DAT1=C  W              WRITE T TO Z
545 E7364 1CF          D1=D1-  16             POINT TO Y
546 E7367 1577         C=DAT1  W              READ Y
547 E736B 1517         DAT1=A  W              WRITE Z TO Y
548 E736F 1CF          D1=D1-  16             POINT TO X
549 E7372 1537         A=DAT1  W              READ X
550 E7376 1557         DAT1=C  W              WRITE Y TO X
551 E737A 1CF          D1=D1-  16             POINT TO LASTX
552 E737D 1517         DAT1=A  W              WRITE X TO LASTX
553 E7381 01           RTN
554
555
556 E7383              END
```

```
=$BSRTN  Abs  946800 #E7270 -   427   426
=$SEMI   Abs  946669 #E71ED -   368   367
 ABORT   Ext               -   413
 ATNFLG  Ext               -   406
 ATTN    Abs  946750 #E723E -   405   389
=BSCRTN  Abs  946795 #E726B -   426
 BSERR   Ext               -   153
 CK"ON"  Ext               -   388
 CKSREQ  Ext               -   396
 CONTX   Ext               -   257
=DOATN   Abs  946692 #E7204 -   387   368
=DOCOL   Abs  946202 #E701A -    45
=DOCON   Abs  946223 #E702F -    65
=DODOES  Abs  946491 #E713B -   227   255
=DOFCON  Abs  946243 #E7043 -    84
=DOSTR   Abs  946304 #E7080 -   127
=DOSTRA  Abs  946359 #E70B7 -   156
 DOSTer  Abs  946340 #E70A4 -   149   164   173
=DOVAR   Abs  946285 #E706D -   107
=DOVOC   Abs  946528 #E7160 -   255
 DSTR    Abs  946437 #E7105 -   188   185
 EXCP10  Abs  946722 #E7222 -   396   391
 EXCP99  Abs  946746 #E723A -   402   394   398
=EXIT    Abs  946664 #E71E8 -   366
 FOUR+   Ext               -   256
 FPOLL   Ext               -   400
=GETFP   Abs  946597 #E71A5 -   306    94   402   409   490
=GETX    Abs  946826 #E728A -   445   457
=GETX+L  Abs  946911 #E72DF -   470
=GETXLN  Abs  946879 #E72BF -   457
 GX00    Abs  946833 #E7291 -   446   461
 GX01    Abs  946837 #E7295 -   447   474
 GX02    Abs  946872 #E72B8 -   455   452
 MTHSTK  Ext               -   448   481
=NEXT    Abs  946634 #E71CA -   344   352   375   417
=NEXT00  Abs  946653 #E71DD -   352   354   356
 NEXT01  Abs  946657 #E71E1 -   354
 NSTR    Abs  946424 #E70F8 -   183   187
=PUTABX  Abs  946933 #E72F5 -   481
 RCCD1   Ext               -   462
=RUN     Abs  946640 #E71D0 -   346
=SAVEFP  Abs  946554 #E717A -   275    89   387
=SEMI    Abs  946664 #E71E8 -   367   259
 SETI0   Abs  946786 #E7262 -   415   411
 SIGTST  Ext               -   451
 SPLITA  Ext               -   455
 STAB1   Ext               -   459
=STKDRP  Abs  947020 #E734C -   539
=STKLFT  Abs  946976 #E7320 -   508    90
 STORE   Ext               -   258
 XYEX    Ext               -   463
 dv      Abs  946294 #E7076 -   109   129
 uRES12  Ext               -   453   486
```

Input Parameters

  Source file name is MR&FT7

  Listing file name is MR/FT7::65

  Object file name is MR%FT7::65

```
                                  111111
                        0123456789012345
```
  Initial flag settings are

Errors

  None

Saturn Assembler News

HP-71 Assember

Internal Design Specification

FORTH/Assembler ROM

2:20 PM THU., 10 MAY , 1984

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Overview — CHAPTER 1

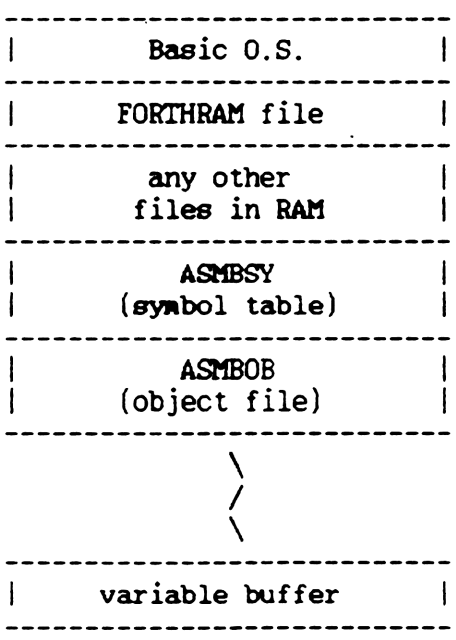
The Assembler is a typical two pass assembler. The first pass is spent processing labels & calculating the length of the object file. The second pass is spent calculating the object code, outputting the object file, and creating the listing file.

This document describes the Assembler by looking at each of the major parts: variables, symbol table, expressions, and opcode processing. It assumes a knowledge of HP-71 FORTH, how the Assembler is executed, and a rudimentary knowledge of assemblers.

Memory Layout During Assembly — CHAPTER 2

The assembler must handle four different data areas during execution. These are: the FORTHRAM file, the Symbol Table (ASMBSY), the Object File (ASMBOB), and the variable buffer. During a typical assembly, the memory will look like:

Memory Requirements



The assembler creates the ASMBOB file, whether it needs it or not. When a LEX or BIN pseudo-op is reached (1st line), it realizes that this file is where the output will go. If a FORTH pseudo-op is reached, it purges this file from the file chain and realizes that FORTHRAM is where the output will go.

2.1 Memory Requirements

The amount of memory required to run the assembler can be broken down into parts. The following diagram shows all possible sections of the assembler which require memory:

Memory Requirements

Symbol Table : 37 + 18 + 18 * <entries in symbol table>

Object File : FORTH: 38
LEX or BIN: <size of object file>

Variables : 1332

Calls to Basic : 160

Listing File : HP-IL: 0
RAM: <dependent on file size. Not predictable>
none: 0

Minimum : 1585 nibbles

Program Flow	CHAPTER 3

The assembler uses a two pass technique. The major tasks of pass one are to process all labels & equates and to accumulate the precise size of the object file in nibbles. The major tasks of pass two are to output the object code, create the listing file, and issue errors.

To illustrate the operation of the assembler, we will take a sample source line and detail which words get executed. We will further specify the words by adding, in parentheses following the word name, the number of the FORTH/Assembler ROM source file that contains the word. The source files are MR&AS0 through MR&AS8. Each source file has a title:

MR&AS0: OPCODE LOOKUP TABLES
MR&AS1: VARIABLES
MR&AS2: IO
MR&AS3: SYMBOL TABLE
MR&AS4: EXPRESSIONS
MR&AS5: OPCODES
MR&AS6: PSEUDO-OPS
MR&AS7: PARSING
MR&AS8: MAIN LOOP

The notation VAR.INIT(1) will indicate that VAR.INIT is in MR&AS1: Variables. The notation DROP(SYS) will indicate that the word DROP is part of the FORTH system, and not unique to the assembler. The sample source line is:

```
=BREAK  LC(5)  'AB'*16+2
```

In the sequence that follows, words called by other words are listed indented below the calling word.

Pass One Flow:

```
DO.LINE(8)  Start Processing this line.
  MONIT.ATTN(8)     Check for ATTN key.
  SHOW.PROGRESS(8)   Put another dot (.) to display.
  PARSE(7)     Parse source line into fields.
     (label field: =BREAK
     (opcode field: LC(5)
     (expression field: 'AB'*16+2)
  LABELS(8)     Process label BREAK.
    >SYT(3)       Put BREAK in symbol table.
  LC+(8)     Update location counter by 7 nibbles.
```

Pass Two Flow:

```
DO.LINE(8)  Finish Processing this line.
  MONIT.ATTN(8)     Check for ATTN key.
  SHOW.PROGRESS(8)   Put another dot (.) to display.
  PARSE(7)     Parse source line into fields.
     (label field: =BREAK
     (opcode field: LC(5)
     (expression field: 'AB'*16+2)
    LABELS(8)       Process label field.
      LABEL.OK?(3)        Verify label BREAK is valid.
      SYT>(3)         Verify value of BREAK same as pass 1.
  PROCESS(8)     Process opcode LC(5)
    BRANCHES(5)       Opcode class is 4 - branches.
      EXPR(5)         Send expression 'AB'*16+2 for evaluation.
        EXPRESSION(4)          Evaluate expression 'AB'*16+2.
          LEXSCAN(4)            Get first token (single quote).
          TERM(4)             Evaluate.  Return 267298.
      FILL.OP(5)        Fill expression  41422 into opcodes 3-7.
  SPIT(8)     Output results of processing this line.
    OUT.OBJ(2)       Output object code:  3422414.
    OUT.LIST(2)       Output listing line to listing
       (assume LISTING is an HP-IL device.)
      OUT.LINE(2)        Send built listing line to listing.
        MONAT.ATTN(8)          Check for ATTN key.
        OUTPUT(SYS)          Send output to HP-IL.
        CRLF(SYS)          Build a carriage return/line feed.
        OUTPUT(SYS)          Send newline to HP-IL.
        &CLEAR(2)          Clear listing line variable.
  LC+(8)     Update location counter by 7 nibbles.
```

Comment Conventions — CHAPTER 4

There are four kinds of comments used in the source listings. The first is a description of each word. The second is a description of what the code is doing. This is embedded inline. The third is the name of the Forth word that the label (in the CON(5)) references. Every headerless assembler word has a name associated with it. The fourth is the condition of the stack after the word on that line has been executed. The rightmost element is on the top of the stack.

4.1 Word Description

Each word in the assembler has a description at its declaration. This description includes a name, what the word does to the data stack, and a brief description of what it does. The name given is the name it would have if it had a header. This is also the name that the third kind of comment references.

4.2 Algorithm description

Throughout the inline code are short, descriptive comments which divide the code into actions. These comments say what the code is doing at this point, or make specific references to other parts of the code when a particularly complicated action occurs.

4.3 Forth Word

Since the assembler is actually coded in SASM assembly language, each reference to another word is made by a label. These labels often aren't descriptive enough, so I've put the Forth word associated with the label in the comment field of the source line. All assembler words are headerless to save space, but each of these has a name (see word description above).

4.4 Stack Description

Following the Forth word is a description of what is left on the stack after the word executes. It usually has the form:

(* STR NUM F *)

This means there is a string, a number, and a flag on the stack after the word executes. Although there are other items left on the stack besides strings, numbers and flags, a suitable mnemonic was chosen. In this example the flag is on the top of the stack.

Variables — CHAPTER 5

The variables used by the assembler fall into two categories: those kept in the user variable space, and those used strictly during assembly, refered to as temporary variables.

5.1 User Variables

The assembler uses three variables which reside in the FORTHRAM file, and are described in the owner's manual. The first, LISTING(SYS), is a string variable, twenty (20) characters long, that holds the name of the listing file or device. The user sets this variable before an assembly.

The second, PAGESIZE(SYS), is a numeric variable which holds the size of pages for the listing. When a listing device/file is specified, every PAGESIZE(SYS) lines will be a TOF (control L).

The third, VARID(SYS), is used to hold the ID of the general purpose buffer that holds the rest of the variables. The assembler deletes any existing version of a LEX file that it is creating, which causes a configure poll to be issued by the system upon execution of the PURGE command. Therefore, the FORTH system handles the configure poll and saves the buffer whose ID is held in VARID(SYS). Otherwise, all temporary variables would be lost.

5.2 Temporary Variables

When the assembler starts up, VAR.INIT(1) creates a general purpose buffer to hold all the temporary variables. The buffer is created with size 1332 nibbles. These variables act like normal FORTH variables in all respects; except that each reference to a variable finds the general purpose buffer and adds an offset to find the address of the variable.

Numeric Variable Layout Part One

Offset	Variable	Description
000	PASS	Either 1 or 2. Which pass are we in.
005	LC	The location counter.
010	LAST.REQ	A flag to indicate whether the last instruction requires a GOYES/RTNYES.
015	OCCUR	A series of flags: 1 - The listing file is full. 2 - The file type is declared. (LEX, BIN, FORT?? 4 - The symbol table is full. 8 - An error occurred on this source line. 16 - A TOKEN pseudo-op was encountered.
020	KNOWN	Used by SYT>. See Symbol Table chapter.
025	DONE	A flag to indicate END pseudo-op reached.
030	FILETYPE	A variable used to indicate filetype: 1=FORTH, 2=LEX, 3=BIN.
035	SLINE	Current source line number.
040	LNOFF	Offset to end of listing file in RAM.
045	LLINE	Current listing line number.
050	LISTADDR	HP-IL address of listing device.
055	LISTFILE	Address of listing file in RAM.
060	PAGENO	Current page number of listing.
065	TOLIST	Toggle of LIST ON/OFF.
070	OPTYPE	Opcode class of current opcode.
075	OPFLAGS	Opcode flags of current opcode.
080	OPLEN	Length (in nibs) of current opcode.
085	OP	Start of an eighteen variable block, each holdi?? a nibble of object code.
175	FILL.MARK	First nibble that expressions are filled to.
	REG.GROUP	Which register group the opcode is in.
	ARITH.GROUP	Which arithmetic group the opcode is in.
180	FILL.LENGTH	Number of nibbles that expressions are filled t??
185	OPCPOS	Which node in the opcode group we just looked a??
	RTNSTK	Return stack at start of expression evaluation.
190	OPCPTR	Pointer to current opcode entry.
	DATSTK	Data stack at start of expression evaluation.

Numberic Variable Layout Part Two

Offset	Variable	Description
195	OPCTOP	Pointer to beginning of opcode group.
200	VALUE	Value of constant token during expression parsi??
205	TOKEN	Current token during expression parsing.
210	REVERS	Length of expression in LCxxx instructions
215	EXPRCOL	Column of source line that expression field sta??
220	HITOK	Highest lex file TOKEN specified.
225	LOTOK	Lowest lex file TOKEN specified.
230	TENT	Number of ENTRY declarations.
235	KENT	Number of KEY declarations.
240	SYTAD	Start of symbol table (ASMBSY + 37 nibs).
245	SYTSIZE	Number of entries in symbol table.
250	SYTLAST	Last symbol table entry looked at.
255	BTOP	Used in binary search of symbol table.
260	BLOW	Used in binary search of symbol table.
265	BFOUND	Flag indicating symbol found in table.
270	OBJFILE	Start address of object file (for LEX & BIN fil??
275	FILESIZE	Calculated size of object file (after pass 1).
280	LINECNT	Number of dots currently on display.
285	ERRORS	Count of errors this assembly.

String Variable Layout

Offset	Variable	Max size	Description
290	TIT	40	Title line.
374	STIT	40	Subtitle line.
458	SFILE	20	Source file name.
502	SLINE	96	Current source line.
698	LLINE	96	Current listing line.
894	OFILE	20	Object file name.
938	ERR$	50	Error message & temporary storage.
1042	LABEL.FIELD	10	Label field from source line.
1066	OPCODE.FIELD	10	Opcode field from source line.
1090	EXPRESSION.FI	50	Expression field from source line.
1194	IDENTIFIER	10	Value of identifier token during expre?? evaluation.
1218	OLDEXPR	50	Used to save expression.field during m?? expanding pseudo-ops.
1322	-end of general purpose buffer-		

Each variable in the general purpose buffer has a corresponding word in the source file MR&AS1: VARS. Calls to these variables are simply calls to these words.

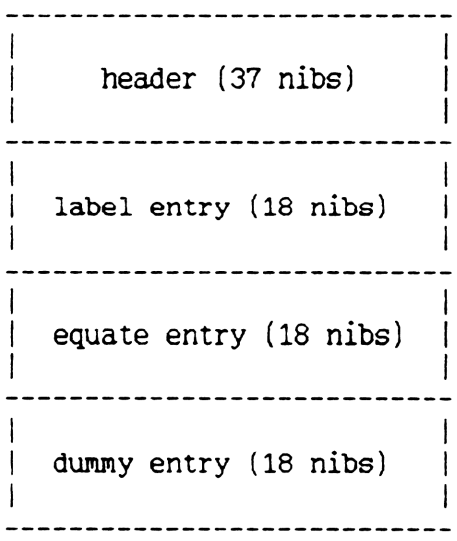
Symbol Table — CHAPTER 6

The symbol table is used to hold all labels and equates. The data is held in a file in the file chain called ASMBSY. All symbol table words are in the source file MR&AS3: Symbol Table.

6.1 Creation of Symbol Table

The Forth word to create the symbol table is SYT.INIT(3). The file SYT.INIT(3) creates is called ASMBSY, a standard TEXT file in the RAM file chain. Originally it has length 9 bytes; each new entry uses another 9 bytes. When first created it has a dummy entry. This entry is the highest possible symbol possible, thus this entry will always be the last entry. A typical symbol table during execution would look like this:

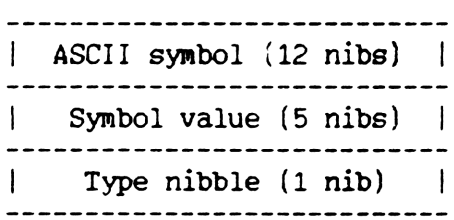
Typical Symbol Table



6.2 Format of Symbol Table Entries

Each entry must contain three items: The symbol itself (with a maximum of 6 characters), its value (a 5 nibble quantity), and a type nibble which indicates a label or an equate. Each entry in the symbol table will look like:

Symbol Table Entry



All symbols in the symbol table are kept in ASCII order. There is no case folding. The dummy entry has ASCII symbol FFFFFFFFFFFF forcing it to the end of the file. It's value & type nibble are FFFFF and F respecively.

The ASCII symbols are always six characters long, right padded with spaces. The symbol value is always an absolute address, even though the listing reports a relative address. This can be achieved because the object file never moves during an assembly. The type nibble can have one of 4 possible meanings: 0 - Equate during pass one, 1 - Label, 2 - Equate during pass two, F - Dummy entry (End of file).

6.3 Important Symbol Table Words

The four key words used for symbol table management are:

SYT.INIT (--) - initializes the symbol table,
>SYT (STR NUM --) - adds symbol STR to symbol table with value NUM,
SYT> (STR -- NUM) - returns the value of symbol STR,
OUT.SYT (--) - outputs the symbol table contents to the listing file??

Note: when SYT> is executed, the variable KNOWN gets set. It can have one of the following values: 0 - symbol not found in symbol table, 1 - symbol found is an equate, -1 - symbol found is a label.

Expression Evaluation — CHAPTER 7

The assembler uses a recursive descent algorithm for evaluating expressions. These words, and all other expression words, are in the source file MR&AS4: EXPRESSIONS.

7.1 Backus-Naur Form

Note: the following symbols are meta-symbols belonging to the BNF formalism, and not symbols of the expression analysis:

::= | { }

The ::= symbol is read 'is defined as'. The | symbol is read 'or'. The curly brackets denote possible repetition of the enclosed symbols zero or more times. Thus A ::= { B } is a short form for the purely recursive rule A ::= <empty> | AB.

<expression> ::= <term>

<term> ::= <factor> { +|- <factor> }

<factor> ::= <boolean> { *|/ <boolean> }

<boolean> ::= <unary-> { &|! <unary-> }

<unary-> ::= -<base> | <base>

<base> ::= DECIMALCONSTANT | HEXADECIMALCONSTANT | 'ASCII' |
SYMBOL | (<expression>) | *

7.2 Stack Overflow During Evaluation

One problem generated by this approach occurs when multiple levels of parenthesis are in an expression. The recursion from <base> to <expression> uses seven (7) levels of the return stack plus another seven (7) to do a lexscan. If more than three levels of parenthesis are used, the return stack will overwrite the Terminal Input Buffer.

A routine called DEPTH.CHECK(4) is called at the beginning of each module in the recursive descent chain. It looks to see if the return stack is too close to the TIB(SYS). If it is, it will reset the data and return stacks to their entry-level values and return an error (error 30 'illegal expression'), and a zero on the data stack.

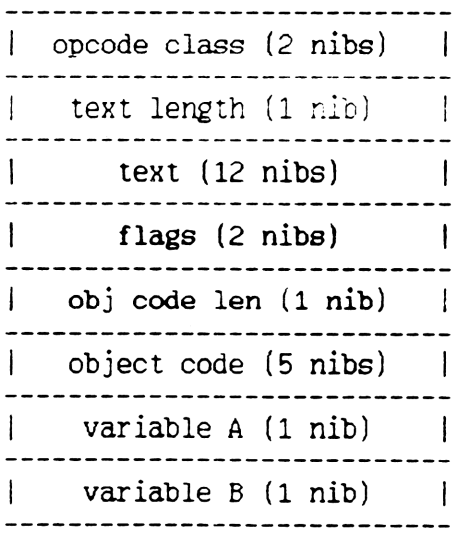
Opcode Lookup & New Opcodes — CHAPTER 8

This chapter describes the opcode tables found in the source file MR&AS0: Opcode Tables, the algorithm used to find opcodes, and how to add new opcodes through hooks in the FORTHRAM file.

8.1 Opcode Tables

The opcode tables are divided into 43 groups (0 to 42), each group having at most 15 opcode entries. Each entry contains information describing the opcode, it's base object code, and some extra information peculiar to that opcode. The layout of an opcode entry is:

Opcode Table Entry



8.2 Description of an Opcode Table Entry

Opcodes are divided into classes based on the processing of the expression field that they require. Internally there are 40 opcode

classes (0 to 39). A table of these classes can be found at the label =aTABLE(8). Each class has a routine which does the required processing.

The text length is a number from 3 through 6, which is simply the number of characters in the text. The text field is right padded with spaces to the 6 character length. This preserves fixed length records.

The flags field has 8 flags which distinguish between certain opcodes in the same class, provides information for the main loop, or tells the lookup routine that this entry is the last in a chain. Here is a description of each flag:

Opcode Flags In Opcode Table Entries

Flags	Meaning if Set
1	The object code length field contains the correct length regardless of any expression field processing. This means that no pass one processing is required.
2	This opcode requires a RTNYES or GOYES instruction following it, otherwise, the main loop will issue a 'requires GOYES/RTNYES' error.
4	This opcode entry is a leaf of the binary tree of opcode entries in this particular group. See the Structure of Opcode Groups.
8	This opcode is a RTNYES or GOYES instruction. The main loop recognizes these instructions and insures a previous test instruction is present.
16	This opcode has an expression imbedded in the object code which is an absolute reference (like GOVLNG, not like GOTO).
32	The expression field of this opcode CAN have quoted spaces. During parsing a space doesn't necessarily mark the end of the expression field.
64	This opcode is one of the gosub opcodes. The opcode has an expression imbedded in the object code which is a relative offset to the address. This offset is calculated from the beginning of the offset with goto opcodes and the end of the offset with gosub opcodes.
128	This opcode has an expression imbedded in the object code; however, if the expression requires more nibbles than the object code can handle, fill as much as will fit.

The object code length and object code are the actual nibbles that get sent to the object file. Of course these are the original nibbles: any processing can modify these nibbles.

Because of the structure of the SASM opcode CON(5), the nibbles get put into memory reversed. Extracting the individual nibbles from this field requires a knowledge of how long the object code is. The

first nibble in memory is the last nibble of the object code. This extraction is done by the word SET.OP.VARS(8) following the comment GET EACH OPCODE SEPARATELY.

The variables are used in three of the opcode classes: register tests, register arithmetic, and branches. In the first two cases, variable A contains the register group to which the opcode belongs. Processing differs for different register groups. In the third case, variable A contains a fill.mark. This is the nibble at which the first nibble of the expression embedded in the object code should start. Variable B contains the fill.length. This is the number of nibbles reserved in the object code for the expression.

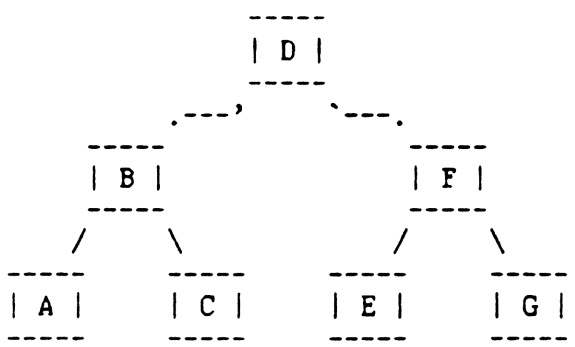
8.3 Hashing function

The hashing function used to get to the opcode's group is done by the word HASH(7). The process is to take the low order three bits from each letter, place them end to end (thus getting an eighteen nibble value) then take this value mod 43. This returns the group.

8.4 Structure of Opcode Groups

The opcodes within a group are arranged in a very specific order. If one were to arrange the opcodes in a binary tree, such that a pre-fix traversal would yield an alphabetic order list, the order becomes apparent. The root node is the first entry. Its two children nodes are the second and third entries. And so forth. Here is a pictoral representation:

Sample Opcode Group



The order within the group would be D-B-F-A-C-E-G. The nodes A, C, E, and G will have the flag 4 set (see above flag descriptions).

8.5 New Opcodes

There is a hook in the assembler for adding new opcodes, or replacing the processing for old opcodes. Whenever the assembler is about to look up an opcode in the tables, it looks at a user variable oPARRT. If this five nibble location is non-zero, it is presumed to contain the CFA of a user-supplied opcode routine. The opcode is placed on the data stack (as a string) and the code identified in oPARRT is EXECUTE(SYS)ed. During processing, when the opcode table entry is scanned, assembler handles all internal opcode classes (0-39); however, if the opcode class is greater than thirty nine (> 39) it puts the opcode clas on the data stack (as a number) and the code identified in oPRORT (in an identical manner to oPARRT) is EXECUTE(SYS)ed. If you're going to do this, be careful: the assembler makes no check that oPRORT is non-zero (if it is zero, a memory reset occurs!) Here are the stack parameters for each routine:

Stack Parameters For Opcode Hook Routines

	1st pass	2nd pass
oPARRT rout.	STR -- FF STR -- PTR TF	STR -- FF STR -- PTR TF
oPRORT rout.	NUM -- LEN	NUM --

8.6 oPARRT Routine (STR -- [PTR] F)

Put the tick (') address of the parsing routine in location 2FC79. Take the string, which is the opcode the assembler is parsing, and check if it is the opcode you're trying to handle. If it isn't, return a false flag on the stack (0). If it is, then you must return a pointer to an opcode table entry (described under Opcode Tables) and a true flag (-1). If you want to handle the processing of the statement (i.e. it isn't a carbon copy of an existing opcode) you will want to make the opcode group greater than thirty nine (>=40). This will cause the second routine, whose tick (') address is in oPRORT, to be evoked during the process stage.

8.7 oPRORT Routine (NUM -- [LEN])

Put the tick (') address of the processing routine in location 2FC7E. The number passed on the stack is the opcode group. It is your job to call the appropriate routines to modify the current opcodes, or to generate the right macro expansions. To call headerless routines from the assembler, an uptodate version of the assembler listings is needed.

The number you return on the stack should only be returned if your routine is called during the first pass. If you don't set flag 1 in the opcode entry, then this routine will get called during pass one. It is your responsibility to return the length (in nibs) of opcodes you will generate during the second pass. If these don't jive, the file chain, labels, and other parts of the system can develop problems. This is not recommended.

8.8 Common Routine Table

When putting in new opcodes, or replacing the processing for old opcodes, you will find many routines are used over and over again. If a temporary scheme is needed, as opposed to a new release, processing routines will need to call internal, headerless words. A table of entry points is included at the end of the ROM for just this purpose. Different releases of the Assembler will keep this table up to date:

Address	Routine whose address is stored there	
EFF00	?PASS=1(5)	(-- F)
EFF05	WRAP.UP.OLD(6)	(--)
EFF0A	SIM.LINE(6)	(STR --)
EFF0F	START.UP.NEW(6)	(STR --)
EFF14	>SYT(3)	(STR NUM --)
EFF19	SYT>(3)	(STR -- NUM)
EFF1E	ERROR(2)	(NUM --)
EFF23	>PAD(2)	(STR -- STR)
EFF28	EXPRESSION	(STR -- NUM)

Address	Variable whose address is stored there	
EFF80	LABEL.FIELD	(-- STR)
EFF85	OPCODE.FIELD	(-- STR)
EFF8A	EXPRESSION.FIELD	(-- STR)

```
  EFF8F     FILETYPE           ( -- NUM )
  EFF94     KNOWN              ( -- NUM )
  EFF99     OLD.EXPRESSION     ( -- STR )
```

I'm not going to go into detail about what these routines do. If you follow the flow of a macro expansion pseudo-op, you'll see most of these in use.

A typical way to compile a call to one of these routines would be as follows:

```
HEX : NULLMACROPSEUDOOP
      [ EFF05  , ]   ( WRAP.UP.OLD )
      [ EFF0F  , ]   ( START.UP.NEW )

    ;
```

Macro Expansion Psuedo-ops — CHAPTER 9

Macro expansion pseudo-ops are a subclass of the pseudo-ops the assembler recognizes. Specifically, they interface with the system in some way. Each macro expansion pseudo-op has just one parameter in the expression field. When interfacing with the system requires more than one parameter, more than one macro expansion pseudo-op will work together.

Each macro expansion pseudo-op generates no code, per se; instead it creates one or more source lines that themselves generate code. Usually the lines generated correspond to specific fields required for interfacing with the system. Sometimes specific lines refer to variables manipulated by other pseudo-ops, e.g. in LEX files, the ID pseudo-op accesses the highest and lowest token declared by the TOKEN pseudo-ops.

The method that macro expansion pseudo-ops use to achieve this effect is somewhat recursive in nature. The processing of a line, as described in the previous Program Flow chapter, is done by the DO.LINE(8) word. This word breakes down into four parts: PARSE(7), PROCESS(8), SPIT(8), and LC+(8). The generation of new source lines occurs during the PROCESS word. At this time the macro expansion pseudo-ops create a new source line, store it in the variable SLINE(1), and call DO.LINE(8). This process is consolidated in SIM.LINE(6).

There is a hitch in this process. If the macro expansion pseudo-op immediately calls SIM.LINE(6), then the processing on the current line is lost. As we said earlier, each macro expansion pseudo-op generates no code. This is because it first sets the variable OPLEN(1) to zero (0) and calls SPIT(8) and LC+(8). This process is consolidated in WRAPUPOLD(6). Similiarly, if the macro expansion pseudo-op called SIM.LINE(6) on the last line, the system would continue with the original DO.LINE(8) and do a SPIT(8) and a LC+(8) again, as the recursion finished. Instead it only does the first two steps: PARSE(7) and PROCESS(8). This process is consolidated in STARTUPNEW(6).

The only other aspect of macro expansion pseudo-ops that isn't covered in the above paragraphs is the handling of labels. The macro expansion pseudo-ops call the words >SYT(3), SYT>(3), and LABEL.OK?(3) directly. This processing doesn't fit in to the nice DO.LINE(8) breakdown, so it is the responsibility of the macro expansion pseudo-ops to handle labels independently.

Assembler Aborting & Ending — CHAPTER 10

Since the assembler has a number of data structures, the aborting and ending routines are alike; however, when the assembler aborts, it must also purge the object and listing files. There are four aborting and ending routines: CLOSEDOWN, CLEANUP, ASSEMBLER ABORT, SHUTDOWN. In this diagram, each routine is shown with the other aborting and ending routines it calls.

Assembler Exit Routines

```
SHUTDOWN(2)
  ASSEM.ABORT(2)
    CLEANUP(2)
      CLOSEDOWN(2)

ASSEM.ABORT(2)
  CLEANUP(2)
    CLOSEDOWN(2)

CLEANUP(2)
  CLOSEDOWN(2)

CLOSEDOWN(2)
```

10.1 SHUTDOWN (NUM --)

This routine requires an error number on the stack. This message is sent to the display and the assembler aborts. All data structures and files associated with the assembly (except source) are removed from the file chain.

This routine is called when the assembler is past the initialization stage and encounters a fatal error.

10.2 ASSEM.ABORT (NUM STR --)

This routine requires an error number and the name of the object file on the stack. Just like SHUTDOWN(2), the error message is sent

to the display and the assembler aborts. All data structures and files associated with the assembly (except source) are removed from the file chain.

This routine is called when the assembler encouters a fatal error, but cannot retrieve the object file name from the temporary variable buffer because the variable buffer is gone.

10.3 CLEANUP (--)

This routine removes the internal files ASMBSY and ASMBOB from the file chain. It is not an abort routine. It closes the source file, kills the variable buffer, resets the ATTN key, and resets the ONERR(SYS) variable.

10.4 CLOSEDOWN (--)

This routine does the latter part of what CLEANUP(2) does. It closes the source file, resets the SCRFIB(SYS) variable, kills the variable buffer, resets the ATTN key, and resets the on error trap.

Out of Memory Condition — CHAPTER 11

When an out of memory condition is recognized, the assembler has to abort (except if listing file fills) and clean up the object file, the symbol table, and the variable buffer. This condition can occur in many ways.

11.1 No Room During Initialization

As the assembler fires up, it must create the symbol table file ASMBSY, the object file ASMBOB, and the variable buffer with id found in the FORTH variable VARID(SYS). If there isn't enough memory the assembler simply quits. This is probably the simplest case of out of memory.

11.2 Symbol Table Fills

Every time a new label is found, an extra eighteen (18) nibbles is required in the symbol table. If ADJUSTF(SYS) cannot add these nibbles the assembler quits with the error 'symbol table full'.

11.3 At the Start of Pass Two

When the assembler begins pass two, it has figured out the number of nibbles required in the object file. If the assembly is FORTH, then it attempts to ALLOT(SYS) this space in the FORTHRAM file. If the assembly is LEX or BIN, it tries to ADJUSTF(SYS) the ASMBOB file by that many nibbles (minus thirty seven (-37) for the file header which already exists). If this fails the assembler quits with the error 'not enough memory for assembler'. This happens in the word OBJ.GROW(2).

11.4 Listing File Fills

This happens only when the FORTH variable LISTING(SYS) is a TEXT file in RAM. As the assembler adds lines to the file, once again a ADJUSTF(SYS) fails. This occurs in the word PRINT (2). The assembler

doesn't quit, it just issues the error 'listing file full'.

11.5 Call to Basic

Whenever a BASICX(SYS), BASIC$(SYS), BASICF(SYS), or BASICI(SYS) is issued, a small buffer is created that builds the basic line to execute. Sometimes this small buffer is enough to cause an out of memory condition. Whenever the assembler makes such a call it sets the FORTH variable ONERR(SYS) so the out of memory will trap to the word MEMAB(1).

The routine MEMAB(1) is required to free up space so the normal shutdown routines can work properly. Since the object and symbol table files need to be purged, a process which requires enough space to make a BASICX call, the normal shutdown routines would cause an infinite loop. To solve this, the shutdown routines are broken down into a part that shutsdown with a variable buffer around, and a part that shutsdown without a variable buffer but with the object file name on the stack. MEMAB(1) gets the object file name onto the stack, kills the variable buffer (thus freeing up space for a BASICX(SYS) call), then calls the second part of the shutdown routines.

Known Bugs — CHAPTER 12

12.1 Word Not Unique

Sometimes during the assembly of FORTH primitives, a warning: word not unique message can appear when it shouldn't. This happens because when a WORD is being assembled, a call to FIND is made. It starts at the current location and searches backwards in the dictionary. When a colon definition is being compiled, the smudge bit is set, thus ensuring the unique message isn't given in reference to the current word. This wasn't necessary in the assembler, since the name field hadn't been put into the dictionary yet. However, when assembling a FORTH primitive in exactly the same place as done previously, the name field from the previous entry remains unchanged. FIND sees this and reports the message.

To recreate this error, this simple file should be assembled:

```
FORTH
WORD   'TEST1'
RTNCC
WORD   'TEST2'
RTNCC
END
```

If you assemenble this, FORGET TEST1, and re-assemble, then this message will show up on the word TEST2.

To fix this error, there is a very simple fix. In the source file MR&AS6 at line 959 (just after the comment CHECK IF WORD UNIQUE), add the following lines:

```
CON(5) =LIT          #20          ( * STR NUM * )
CON(5) #20
CON(5) =HERE         HERE         ( * STR NUM ADDR * )
CON(5) =C!           C!           ( * STR * )
```

This will store a two nibble name field with the smudge bit set. This way, FIND will skip over this entry. When processing continues this two nibble field will be overwritten by the correct name field.

12.2 Symbol Table Listing Page

When the symbol table has more entries than will fit on one page, the second page reports invalid values for the entries. What happens is during a page advance BASE is changed to decimal to report the page number correctly. It never gets changed back, hence the values reported for the symbols are reported in decimal not hex. If these values are for a primitive, all addresses within the file require six significat decimal digits, but only five are reported.

To fix this error, In the source file MR&AS3 at line 653 (just after the comment APPEND VALUE TO LISTING LINE), add the following lines:

```
CON(5) =HEX          HEX          ( * STR PTR STR' * )
```

This will reset BASE to hex every time a symbol table value is reported.

```
 1                      TITLE   AS0: FORTH_ASSEMBLER_OPCODE_TABLES
 2 E7400                ABS     #E7400
 3              zTHIS   EQU     *
 4              zNEXT   EQU     #E9900
 5
 6              ************************************************************
 7              **
 8              ** MR&AS0       <840504.1036>
 9              **
10              ** OPCODE LOOKUP TABLES
11              **
12              ************************************************************
13              F.LSET  EQU      01
14              F.RETY  EQU      02
15              F.TREE  EQU      04
16              F.GOYS  EQU      08
17              F.ABSL  EQU      16
18              F.EXPR  EQU      32
19              F.GSUB  EQU      64
20              F.PART  EQU     128
21
```

```
     22                      STITLE  JUMP TABLE
     23 E7400 7D47 =OPTABL CON(5)  OPCG00
               E
     24 E7405 8B57         CON(5)  OPCG01
               E
     25 E740A F277         CON(5)  OPCG02
               E
     26 E740F 0187         CON(5)  OPCG03
               E
     27 E7414 FB87         CON(5)  OPCG04
               E
     28 E7419 40A7         CON(5)  OPCG05
               E
     29 E741E 71B7         CON(5)  OPCG06
               E
     30 E7423 8FB7         CON(5)  OPCG07
               E
     31 E7428 7AC7         CON(5)  OPCG08
               E
     32 E742D E1E7         CON(5)  OPCG09
               E
     33 E7432 DCE7         CON(5)  OPCG10
               E
     34 E7437 C7F7         CON(5)  OPCG11
               E
     35 E743C B208         CON(5)  OPCG12
               E
     36 E7441 E318         CON(5)  OPCG13
               E
     37 E7446 F128         CON(5)  OPCG14
               E
     38 E744B EC28         CON(5)  OPCG15
               E
     39 E7450 3148         CON(5)  OPCG16
               E
     40 E7455 6258         CON(5)  OPCG17
               E
     41 E745A 5D58         CON(5)  OPCG18
               E
     42 E745F 2568         CON(5)  OPCG19
               E
     43 E7464 1078         CON(5)  OPCG20
               E
     44 E7469 E778         CON(5)  OPCG21
               E
     45 E746E D288         CON(5)  OPCG22
               E
     46 E7473 CD88         CON(5)  OPCG23
               E
     47 E7478 B898         CON(5)  OPCG24
               E
     48 E747D 80A8         CON(5)  OPCG25
               E
     49 E7482 B1B8         CON(5)  OPCG26
               E
```

```
     50 E7487 ACB8          CON(5)  OPCG27
              E
     51 E748C BAC8          CON(5)  OPCG28
              E
     52 E7491 82D8          CON(5)  OPCG29
              E
     53 E7496 7DD8          CON(5)  OPCG30
              E
     54 E749B 68E8          CON(5)  OPCG31
              E
     55 E74A0 99F8          CON(5)  OPCG32
              E
     56 E74A5 A709          CON(5)  OPCG33
              E
     57 E74AA D819          CON(5)  OPCG34
              E
     58 E74AF E629          CON(5)  OPCG35
              E
     59 E74B4 1839          CON(5)  OPCG36
              E
     60 E74B9 0349          CON(5)  OPCG37
              E
     61 E74BE FD49          CON(5)  OPCG38
              E
     62 E74C3 2F59          CON(5)  OPCG39
              E
     63 E74C8 3D69          CON(5)  OPCG40
              E
     64 E74CD 0579          CON(5)  OPCG41
              E
     65 E74D2 1389          CON(5)  OPCG42
              E
```

```
                        STITLE  HASH TO GROUP 0
E74D7       OPCG00
E74D7 50                CON(2)  5       FIXED
E74D9 4                 CON(1)  4       OPCODE MNEMONIC
E74DA 3435              NIBASC  \CSLC  \
      C434
      0202
E74E6 10                CON(2)  (F.LSET)
E74E8 3                 CON(1)  3       OPCODE
E74E9 2180              CON(5)  #812
      0
E74EE 00                CON(2)  0       NO VARIABLES
            *
            *
E74F0 30                CON(2)  3       REGISTER LOGIC
E74F2 5                 CON(1)  5       OPCODE MNEMONIC
E74F3 34D3              NIBASC  \C=C!B \
      3412
      2402
E74FF 10                CON(2)  (F.LSET)
E7501 4                 CON(1)  4       OPCODE
E7502 D0E0              CON(5)  #0E0D
      0
E7507 00                CON(2)  0       NO VARIABLES
            *
            *
E7509 A0                CON(2)  10      SET POINTER
E750B 3                 CON(1)  3       OPCODE MNEMONIC
E750C 05D3              NIBASC  \P=C   \
      3402
      0202
E7518 12                CON(2)  (F.LSET)!(F.EXPR)
E751A 4                 CON(1)  4       Q CODE
E751B 0D08              CON(5)  #80D0
      0
E7520 00                CON(2)  0       NO VARIABLES
            *
            *
E7522 10                CON(2)  1       REGISTER TESTS
E7524 4                 CON(1)  4       OPCODE MNEMONIC
E7525 F314              NIBASC  \?A>B  \
      E324
      0202
E7531 30                CON(2)  (F.LSET)!(F.RETY)
E7533 3                 CON(1)  3       OPCODE
E7534 0080              CON(5)  #800
      0
E7539 2                 CON(1)  2       GROUP B
E753A 0                 CON(1)  0
            *
            *
E753B 50                CON(2)  5       FIXED
E753D 5                 CON(1)  5       OPCODE MNEMONIC
E753E 3425              NIBASC  \CR1EX \
      1354
```

```
          8502
108 E754A 50          CON(2)  (F.LSET)!(F.TREE)
109 E754C 3           CON(1)  3       OPCODE
110 E754D 9210        CON(5)  #129
          0
111 E7552 00          CON(2)  0       NO VARIABLES
112           *
113           *
114 E7554 50          CON(2)  5       FIXED
115 E7556 5           CON(1)  5       OPCODE MNEMONIC
116 E7557 4413        NIBASC  \D1=CS \
          D334
          3502
117 E7563 50          CON(2)  (F.LSET)!(F.TREE)
118 E7565 3           CON(1)  3       OPCODE
119 E7566 D310        CON(5)  #13D
          0
120 E756B 00          CON(2)  0       NO VARIABLES
121           *
122           *
123 E756D 50          CON(2)  5       FIXED
124 E756F 6           CON(1)  6       OPCODE MNEMONIC
125 E7570 3554        NIBASC  \SETDEC\
          4544
          5434
126 E757C 50          CON(2)  (F.LSET)!(F.TREE)
127 E757E 2           CON(1)  2       OPCODE
128 E757F 5000        CON(5)  #05
          0
129 E7584 00          CON(2)  0       NO VARIABLES
130           *
131           *
132 E7586 00  =NULENT CON(2)  0       NULL
133 E7588 0           CON(1)  0       OPCODE MNEMONIC
134 E7589 0202        NIBASC  \      \
          0202
          0202
135 E7595 50          CON(2)  (F.LSET)!(F.TREE)
136 E7597 0           CON(1)  0       OPCODE
137 E7598 0000        CON(5)  0
          0
138 E759D 00          CON(2)  0       NO VARIABLES
139           *
140           *
141 E759F 50          CON(2)  5       FIXED
142 E75A1 5           CON(1)  5       OPCODE MNEMONIC
143 E75A2 1425        NIBASC  \AR0EX \
          0354
          8502
144 E75AE 50          CON(2)  (F.LSET)!(F.TREE)
145 E75B0 3           CON(1)  3       OPCODE
146 E75B1 0210        CON(5)  #120
          0
147 E75B6 00          CON(2)  0       NO VARIABLES
```

```
148                     STITLE  HASH TO GROUP 1
149 E75B8       OPCG01
150 E75B8 D0            CON(2)  13      DATA TRANSFER
151 E75BA 6             CON(1)  6       OPCODE MNEMONIC
152 E75BB 4414          NIBASC  \DAT0=A\
          4503
          D314
153 E75C7 02            CON(2)  (F.EXPR)
154 E75C9 4             CON(1)  4       OPCODE
155 E75CA 0051          CON(5)  #1500
          0
156 E75CF 00            CON(2)  0       NO VARIABLES
157             *
158             *
159 E75D1 10            CON(2)  1       REGISTER TESTS
160 E75D3 4             CON(1)  4       OPCODE MNEMONIC
161 E75D4 F334          NIBASC  \?C>A  \
          E314
          0202
162 E75E0 30            CON(2)  (F.LSET)!(F.RETY)
163 E75E2 3             CON(1)  3       OPCODE
164 E75E3 2080          CON(5)  #802
          0
165 E75E8 2             CON(1)  2       GROUP B
166 E75E9 0             CON(1)  0
167             *
168             *
169 E75EA 40            CON(2)  4       BRANCHES
170 E75EC 5             CON(1)  5       OPCODE MNEMONIC
171 E75ED 74F4          NIBASC  \GOYES \
          9554
          3502
172 E75F9 92            CON(2)  (F.LSET)!(F.GOYS)!(F.EXPR)
173 E75FB 2             CON(1)  2       OPCODE
174 E75FC 0000          CON(5)  #00
          0
175 E7601 1             CON(1)  1       FILL.MARK
176 E7602 2             CON(1)  2       FILL.LENGTH
177             *
178             *
179 E7603 10            CON(2)  1       REGISTER TESTS
180 E7605 5             CON(1)  5       OPCODE MNEMONIC
181 E7606 F314          NIBASC  \?A>=C \
          E3D3
          3402
182 E7612 30            CON(2)  (F.LSET)!(F.RETY)
183 E7614 3             CON(1)  3       OPCODE
184 E7615 E080          CON(5)  #80E
          0
185 E761A 2             CON(1)  2       GROUP B
186 E761B 0             CON(1)  0
187             *
188             *
189 E761C 12            CON(2)  33      PSEUDO-OP
190 E761E 4             CON(1)  4       OPCODE MNEMONIC
```

```
191 E761F 3484          NIBASC  \CHAR  \
          1425
          0202
192 E762B 12            CON(2)  (F.LSET)!(F.EXPR)
193 E762D 1             CON(1)  1
194 E762E 0000          CON(5)  #0
          0
195 E7633 00            CON(2)  0       NO VARIABLES
196             *
197             *
198 E7635 40            CON(2)  4       BRANCHES
199 E7637 4             CON(1)  4       OPCODE MNEMONIC
200 E7638 74F4          NIBASC  \GONC  \
          E434
          0202
201 E7644 12            CON(2)  (F.LSET)!(F.EXPR)
202 E7646 3             CON(1)  3       OPCODE
203 E7647 0050          CON(5)  #500
          0
204 E764C 2             CON(1)  2       FILL.MARK
205 E764D 2             CON(1)  2       FILL.LENGTH
206             *
207             *
208 E764E 50            CON(2)  5       FIXED
209 E7650 3             CON(1)  3       OPCODE MNEMONIC
210 E7651 2545          NIBASC  \RTI   \
          9402
          0202
211 E765D 10            CON(2)  (F.LSET)
212 E765F 2             CON(1)  2       OPCODE
213 E7660 F000          CON(5)  #0F
          0
214 E7665 00            CON(2)  0       NO VARIABLES
215             *
216             *
217 E7667 10            CON(2)  1       REGISTER TESTS
218 E7669 5             CON(1)  5       OPCODE MNEMONIC
219 E766A F314          NIBASC  \?A<=B \
          C3D3
          2402
220 E7676 70            CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
221 E7678 3             CON(1)  3       OPCODE
222 E7679 C080          CON(5)  #80C
          0
223 E767E 2             CON(1)  2       GROUP B
224 E767F 0             CON(1)  0
225             *
226             *
227 E7680 10            CON(2)  1       REGISTER TESTS
228 E7682 4             CON(1)  4       OPCODE MNEMONIC
229 E7683 F324          NIBASC  \?B#C  \
          3234
          0202
230 E768F 70            CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
231 E7691 3             CON(1)  3       OPCODE
```

```
232 E7692 5080          CON(5)  #805
          0
233 E7697 1             CON(1)  1       GROUP A
234 E7698 0             CON(1)  0
235             *
236             *
237 E7699 20            CON(2)  2       REGISTER ARITHMATIC
238 E769B 5             CON(1)  5       OPCODE MNEMONIC
239 E769C 24D3          NIBASC  \B=B+B \
          24B2
          2402
240 E76A8 50            CON(2)  (F.LSET)!(F.TREE)
241 E76AA 3             CON(1)  3       OPCODE
242 E76AB 5000          CON(5)  #005
          0
243 E76B0 1             CON(1)  1       GROUP C
244 E76B1 0             CON(1)  0
245             *
246             *
247 E76B2 50            CON(2)  5       FIXED
248 E76B4 5             CON(1)  5       OPCODE MNEMONIC
249 E76B5 4413          NIBASC  \D1=AS \
          D314
          3502
250 E76C1 50            CON(2)  (F.LSET)!(F.TREE)
251 E76C3 3             CON(1)  3       OPCODE
252 E76C4 8310          CON(5)  #138
          0
253 E76C9 00            CON(2)  0       NO VARIABLES
254             *
255             *
256 E76CB 61            CON(2)  22      EQU PSUEDO-OP
257 E76CD 3             CON(1)  3       OPCODE MNEMONIC
258 E76CE 5415          NIBASC  \EQU   \
          5502
          0202
259 E76DA 42            CON(2)  (F.TREE)!(F.EXPR)
260 E76DC 0             CON(1)  0       OPCODE
261 E76DD 0000          CON(5)  #0
          0
262 E76E2 00            CON(2)  0       NO VARIABLES
263             *
264             *
265 E76E4 40            CON(2)  4       BRANCHES
266 E76E6 6             CON(1)  6       OPCODE MNEMONIC
267 E76E7 74F4          NIBASC  \GOSBVL\
          3524
          65C4
268 E76F3 53            CON(2)  (F.LSET)!(F.TREE)!(F.ABSL)!(F.EXPR)
269 E76F5 7             CON(1)  7       OPCODE
270 E76F6 000F          CON(5)  #8F000
          8
271 E76FB 3             CON(1)  3       FILL.MARK
272 E76FC 5             CON(1)  5       FILL.LENGTH
273             *
```

```
274             *
275 E76FD 50            CON(2)  5       FIXED
276 E76FF 4             CON(1)  4       OPCODE MNEMONIC
277 E7700 E4F4          NIBASC  \NOP4  \
          0543
          0202
278 E770C 50            CON(2)  (F.LSET)!(F.TREE)
279 E770E 4             CON(1)  4       OPCODE
280 E770F 0036          CON(5)  #6300
          0
281 E7714 00            CON(2)  0       NO VARIABLES
282             *
283             *
284 E7716 50            CON(2)  5       FIXED
285 E7718 4             CON(1)  4       OPCODE MNEMONIC
286 E7719 2545          NIBASC  \RTNC  \
          E434
          0202
287 E7725 50            CON(2)  (F.LSET)!(F.TREE)
288 E7727 3             CON(1)  3       OPCODE
289 E7728 0040          CON(5)  #400
          0
290 E772D 00            CON(2)  0       NO VARIABLES
```

```
291                     STITLE  HASH TO GROUP 2
292 E772F       OPCG02
293 E772F 20            CON(2)  2       REGISTER ARITHMETIC
294 E7731 3             CON(1)  3       OPCODE MNEMONIC
295 E7732 34D3          NIBASC  \C=D   \
          4402
          0202
296 E773E 00            CON(2)  0
297 E7740 3             CON(1)  3       OPCODE
298 E7741 B000          CON(5)  #00B
          0
299 E7746 2             CON(1)  2       GROUP D
300 E7747 0             CON(1)  0
301             *
302             *
303 E7748 20            CON(2)  2       REGISTER ARITHMETIC
304 E774A 5             CON(1)  5       OPCODE MNEMONIC
305 E774B 14D3          NIBASC  \A=A-B \
          14D2
          2402
306 E7757 00            CON(2)  0
307 E7759 3             CON(1)  3       OPCODE
308 E775A 0000          CON(5)  #000
          0
309 E775F 3             CON(1)  3       GROUP E
310 E7760 0             CON(1)  0
311             *
312             *
313 E7761 50            CON(2)  5       FIXED
314 E7763 5             CON(1)  5       OPCODE MNEMONIC
315 E7764 2545          NIBASC  \RTNNC \
          E4E4
          3402
316 E7770 10            CON(2)  (F.LSET)
317 E7772 3             CON(1)  3       OPCODE
318 E7773 0050          CON(5)  #500
          0
319 E7778 00            CON(2)  0       NO VARIABLES
320             *
321             *
322 E777A 60            CON(2)  6       HARDWARE TESTS
323 E777C 5             CON(1)  5       OPCODE MNEMONIC
324 E777D F3D4          NIBASC  \?MP=0 \
          05D3
          0302
325 E7789 30            CON(2)  (F.LSET)!(F.RETY)
326 E778B 3             CON(1)  3       OPCODE
327 E778C 8380          CON(5)  #838
          0
328 E7791 00            CON(2)  0       NO VARIABLES
329             *
330             *
331 E7793 20            CON(2)  2       REGISTER ARITHMETIC
332 E7795 3             CON(1)  3       OPCODE MNEMONIC
333 E7796 14D3          NIBASC  \A=C   \
```

```
            3402
            0202
    334 E77A2 40          CON(2)  (F.TREE)
    335 E77A4 3           CON(1)  3       OPCODE
    336 E77A5 A000        CON(5)  #00A
            0
    337 E77AA 2           CON(1)  2       GROUP D
    338 E77AB 0           CON(1)  0
    339             *
    340             *
    341 E77AC 50          CON(2)  5       FIXED
    342 E77AE 4           CON(1)  4       OPCODE MNEMONIC
    343 E77AF 4435        NIBASC  \DSLC  \
            C434
            0202
    344 E77BB 50          CON(2)  (F.LSET)!(F.TREE)
    345 E77BD 3           CON(1)  3       OPCODE
    346 E77BE 3180        CON(5)  #813
            0
    347 E77C3 00          CON(2)  0       NO VARIABLES
    348             *
    349             *
    350 E77C5 70          CON(2)  7       RETURN YES
    351 E77C7 6           CON(1)  6       OPCODE MNEMONIC
    352 E77C8 2545        NIBASC  \RTNYES\
            E495
            5435
    353 E77D4 D0          CON(2)  (F.LSET)!(F.GOYS)!(F.TREE)
    354 E77D6 2           CON(1)  2       OPCODE
    355 E77D7 0000        CON(5)  #00
            0
    356 E77DC 00          CON(2)  0       NO VARIABLES
    357             *
    358             *
    359 E77DE 10          CON(2)  1       REGISTER TESTS
    360 E77E0 4           CON(1)  4       OPCODE MNEMONIC
    361 E77E1 F324        NIBASC  \?B#A  \
            3214
            0202
    362 E77ED 70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
    363 E77EF 3           CON(1)  3       OPCODE
    364 E77F0 4080        CON(5)  #804
            0
    365 E77F5 1           CON(1)  1       GROUP A
    366 E77F6 0           CON(1)  0
    367             *
    368             *
    369 E77F7 80          CON(2)  8       POINTER TESTS
    370 E77F9 3           CON(1)  3       OPCODE MNEMONIC
    371 E77FA F305        NIBASC  \?P#   \
            3202
            0202
    372 E7806 72          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)!(F.EXPR)
    373 E7808 3           CON(1)  3       OPCODE
    374 E7809 0880        CON(5)  #880
```

```
                0
    375 E780E 00          CON(2)  0       NO VARIABLES
```

```
376                     STITLE  HASH TO GROUP 3
377 E7810       OPCG03
378 E7810 D0            CON(2)  13      DATA TRANSFER
379 E7812 6             CON(1)  6       OPCODE MNEMONIC
380 E7813 4414          NIBASC  \DAT0=C\
          4503
          D334
381 E781F 02            CON(2)  (F.EXPR)
382 E7821 4             CON(1)  4       OPCODE
383 E7822 0451          CON(5)  #1540
          0
384 E7827 00            CON(2)  0       NO VARIABLES
385             *
386             *
387 E7829 20            CON(2)  2       REGISTER ARITHMETIC
388 E782B 5             CON(1)  5       OPCODE MNEMONIC
389 E782C 14D3          NIBASC  \A=A+B \
          14B2
          2402
390 E7838 00            CON(2)  0
391 E783A 3             CON(1)  3       OPCODE
392 E783B 0000          CON(5)  #000
          0
393 E7840 1             CON(1)  1       GROUP C
394 E7841 0             CON(1)  0
395             *
396             *
397 E7842 B1            CON(2)  27      IMMEDIATE FORTH WORD
398 E7844 5             CON(1)  5       OPCODE MNEMONIC
399 E7845 75F4          NIBASC  \WORDI \
          2544
          9402
400 E7851 02            CON(2)  (F.EXPR)
401 E7853 0             CON(1)  0       OPCODE
402 E7854 0000          CON(5)  #0
          0
403 E7859 00            CON(2)  0       NO VARIABLES
404             *
405             *
406 E785B 10            CON(2)  1       REGISTER TESTS
407 E785D 4             CON(1)  4       OPCODE MNEMONIC
408 E785E F344          NIBASC  \?D#0  \
          3203
          0202
409 E786A 70            CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
410 E786C 3             CON(1)  3       OPCODE
411 E786D F080          CON(5)  #80F
          0
412 E7872 1             CON(1)  1       GROUP A
413 E7873 0             CON(1)  0
414             *
415             *
416 E7874 20            CON(2)  2       REGISTER ARITHMETIC
417 E7876 5             CON(1)  5       OPCODE MNEMONIC
418 E7877 34D3          NIBASC  \C=D+C \
```

```
           44B2
           3402
   419 E7883 40          CON(2)  (F.TREE)
   420 E7885 3           CON(1)  3       OPCODE
   421 E7886 B000        CON(5)  #00B
           0
   422 E788B 1           CON(1)  1       GROUP C
   423 E788C 0           CON(1)  0
   424            *
   425            *
   426 E788D D1          CON(2)  29      PSEUDO-OP
   427 E788F 2           CON(1)  2       OPCODE MNEMONIC
   428 E7890 9444        NIBASC  \ID    \
           0202
           0202
   429 E789C 42          CON(2)  (F.TREE)!(F.EXPR)
   430 E789E 0           CON(1)  0       OPCODE
   431 E789F 0000        CON(5)  #0
           0
   432 E78A4 00          CON(2)  0       NO VARIABLES
   433            *
   434            *
   435 E78A6 00          CON(2)  0       NULL
   436 E78A8 0           CON(1)  0       OPCODE MNEMONIC
   437 E78A9 0202        NIBASC  \      \
           0202
           0202
   438 E78B5 40          CON(2)  (F.TREE)
   439 E78B7 0           CON(1)  0       OPCODE
   440 E78B8 0000        CON(5)  #0
           0
   441 E78BD 00          CON(2)  0       NO VARIABLES
```

```
442                     STITLE  HASH TO GROUP 4
443 E78BF       OPCG04
444 E78BF 30            CON(2)  3       REGISTER LOGIC
445 E78C1 5             CON(1)  5       OPCODE MNEMONIC
446 E78C2 34D3          NIBASC  \C=D!C \
          4412
          3402
447 E78CE 10            CON(2)  (F.LSET)
448 E78D0 4             CON(1)  4       OPCODE
449 E78D1 F0E0          CON(5)  #0E0F
          0
450 E78D6 00            CON(2)  0       NO VARIABLES
451             *
452             *
453 E78D8 50            CON(2)  5       FIXED
454 E78DA 4             CON(1)  4       OPCODE MNEMONIC
455 E78DB 14D3          NIBASC  \A=R4  \
          2543
          0202
456 E78E7 10            CON(2)  (F.LSET)
457 E78E9 3             CON(1)  3       OPCODE
458 E78EA 4110          CON(5)  #114
          0
459 E78EF 00            CON(2)  0       NO VARIABLES
460             *
461             *
462 E78F1 40            CON(2)  4       BRANCHES
463 E78F3 5             CON(1)  5       OPCODE MNEMONIC
464 E78F4 C434          NIBASC  \LC(4) \
          8243
          9202
465 E7900 1B            CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
466 E7902 6             CON(1)  6       OPCODE
467 E7903 0003          CON(5)  #33000
          3
468 E7908 3             CON(1)  3       FILL.MARK
469 E7909 4             CON(1)  4       FILL.LENGTH
470             *
471             *
472 E790A 10            CON(2)  1       REGISTER TESTS
473 E790C 5             CON(1)  5       OPCODE MNEMONIC
474 E790D F324          NIBASC  \?B<=A \
          C3D3
          1402
475 E7919 30            CON(2)  (F.LSET)!(F.RETY)
476 E791B 3             CON(1)  3       OPCODE
477 E791C 8080          CON(5)  #808
          0
478 E7921 2             CON(1)  2       GROUP B
479 E7922 0             CON(1)  0
480             *
481             *
482 E7923 50            CON(2)  5       FIXED
483 E7925 4             CON(1)  4       OPCODE MNEMONIC
484 E7926 1435          NIBASC  \ASRC  \
```

```
                2534
                0202
    485 E7932   10          CON(2)  (F.LSET)
    486 E7934   3           CON(1)  3       OPCODE
    487 E7935   4180        CON(5)  #814
                0
    488 E793A   00          CON(2)  0       NO VARIABLES
    489             *
    490             *
    491 E793C   50          CON(2)  5       FIXED
    492 E793E   5           CON(1)  5       OPCODE MNEMONIC
    493 E793F   3425        NIBASC  \CR0EX \
                0354
                8502
    494 E794B   10          CON(2)  (F.LSET)
    495 E794D   3           CON(1)  3       OPCODE
    496 E794E   8210        CON(5)  #128
                0
    497 E7953   00          CON(2)  0       NO VARIABLES
    498             *
    499             *
    500 E7955   50          CON(2)  5       FIXED
    501 E7957   4           CON(1)  4       OPCODE MNEMONIC
    502 E7958   2503        NIBASC  \R0=C  \
                D334
                0202
    503 E7964   50          CON(2)  (F.LSET)!(F.TREE)
    504 E7966   3           CON(1)  3       OPCODE
    505 E7967   8010        CON(5)  #108
                0
    506 E796C   00          CON(2)  0       NO VARIABLES
    507             *
    508             *
    509 E796E   10          CON(2)  1       REGISTER TESTS
    510 E7970   4           CON(1)  4       OPCODE MNEMONIC
    511 E7971   F314        NIBASC  \?A=B  \
                D324
                0202
    512 E797D   70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
    513 E797F   3           CON(1)  3       OPCODE
    514 E7980   0080        CON(5)  #800
                0
    515 E7985   1           CON(1)  1       GROUP A
    516 E7986   0           CON(1)  0
    517             *
    518             *
    519 E7987   30          CON(2)  3       REGISTER LOGIC
    520 E7989   5           CON(1)  5       OPCODE MNEMONIC
    521 E798A   14D3        NIBASC  \A=A!B \
                1412
                2402
    522 E7996   50          CON(2)  (F.LSET)!(F.TREE)
    523 E7998   4           CON(1)  4       OPCODE
    524 E7999   80E0        CON(5)  #0E08
                0
```

```
525 E799E 00          CON(2)  0       NO VARIABLES
526               *
527               *
528 E79A0 20          CON(2)  2       FIXED
529 E79A2 4           CON(1)  4       OPCODE MNEMONIC
530 E79A3 1424        NIBASC  \ABEX  \
          5485
          0202
531 E79AF 40          CON(2)  (F.TREE)
532 E79B1 3           CON(1)  3       OPCODE
533 E79B2 C000        CON(5)  #00C
          0
534 E79B7 2           CON(1)  2       GROUP D
535 E79B8 0           CON(1)  0
536               *
537               *
538 E79B9 20          CON(2)  2       REGISTER ARITHMETIC
539 E79BB 3           CON(1)  3       OPCODE MNEMONIC
540 E79BC 24D3        NIBASC  \B=C   \
          3402
          0202
541 E79C8 40          CON(2)  (F.TREE)
542 E79CA 3           CON(1)  3       OPCODE
543 E79CB 5000        CON(5)  #005
          0
544 E79D0 2           CON(1)  2       GROUP D
545 E79D1 0           CON(1)  0
546               *
547               *
548 E79D2 50          CON(2)  5       FIXED
549 E79D4 4           CON(1)  4       OPCODE MNEMONIC
550 E79D5 34D3        NIBASC  \C=ST  \
          3545
          0202
551 E79E1 50          CON(2)  (F.LSET)!(F.TREE)
552 E79E3 2           CON(1)  2       OPCODE
553 E79E4 9000        CON(5)  #09
          0
554 E79E9 00          CON(2)  0       NO VARIABLES
555               *
556               *
557 E79EB 20          CON(2)  2       REGISTER ARITHMETIC
558 E79ED 5           CON(1)  5       OPCODE MNEMONIC
559 E79EE 44D3        NIBASC  \D=D-C \
          44D2
          3402
560 E79FA 40          CON(2)  (F.TREE)
561 E79FC 3           CON(1)  3       OPCODE
562 E79FD 3000        CON(5)  #003
          0
563 E7A02 3           CON(1)  3       GROUP E
564 E7A03 0           CON(1)  0
```

```
565                     STITLE  HASH TO GROUP 5
566 E7A04       OPCG05
567 E7A04 40            CON(2)  4       BRANCHES
568 E7A06 5             CON(1)  5       OPCODE MNEMONIC
569 E7A07 C434          NIBASC  \LC(2) \
          8223
          9202
570 E7A13 1B            CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
571 E7A15 4             CON(1)  4       OPCODE
572 E7A16 0013          CON(5)  #3100
          0
573 E7A1B 3             CON(1)  3       FILL.MARK
574 E7A1C 2             CON(1)  2       FILL.LENGTH
575               *
576               *
577 E7A1D 20            CON(2)  2       REGISTER ARITHMETIC
578 E7A1F 5             CON(1)  5       OPCODE MNEMONIC
579 E7A20 24D3          NIBASC  \B=A+B \
          14B2
          2402
580 E7A2C 00            CON(2)  0
581 E7A2E 3             CON(1)  3       OPCODE
582 E7A2F 8000          CON(5)  #008
          0
583 E7A34 1             CON(1)  1       GROUP C
584 E7A35 0             CON(1)  0
585               *
586               *
587 E7A36 50            CON(2)  5       FIXED
588 E7A38 4             CON(1)  4       OPCODE MNEMONIC
589 E7A39 2503          NIBASC  \R0=A  \
          D314
          0202
590 E7A45 10            CON(2)  (F.LSET)
591 E7A47 3             CON(1)  3       OPCODE
592 E7A48 0010          CON(5)  #100
          0
593 E7A4D 00            CON(2)  0       NO VARIABLES
594               *
595               *
596 E7A4F 10            CON(2)  1       REGISTER TESTS
597 E7A51 4             CON(1)  4       OPCODE MNEMONIC
598 E7A52 F334          NIBASC  \?C=A  \
          D314
          0202
599 E7A5E 30            CON(2)  (F.LSET)!(F.RETY)
600 E7A60 3             CON(1)  3       OPCODE
601 E7A61 2080          CON(5)  #802
          0
602 E7A66 1             CON(1)  1       GROUP A
603 E7A67 0             CON(1)  0
604               *
605               *
606 E7A68 40            CON(2)  4       BRANCHES
607 E7A6A 6             CON(1)  6       OPCODE MNEMONIC
```

```
608 E7A6B 4403          NIBASC  \D0=(2)\
          D382
          2392
609 E7A77 1B            CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
610 E7A79 4             CON(1)  4       OPCODE
611 E7A7A 0091          CON(5)  #1900
          0
612 E7A7F 3             CON(1)  3       FILL.MARK
613 E7A80 2             CON(1)  2       FILL.LENGTH
614             *
615             *
616 E7A81 71            CON(2)  23      LIST PSEUDO-OP
617 E7A83 4             CON(1)  4       OPCODE MNEMONIC
618 E7A84 C494          NIBASC  \LIST  \
          3545
          0202
619 E7A90 50            CON(2)  (F.LSET)!(F.TREE)
620 E7A92 0             CON(1)  0       OPCODE
621 E7A93 0000          CON(5)  #0
          0
622 E7A98 00            CON(2)  0       NO VARIABLES
623             *
624             *
625 E7A9A 50            CON(2)  5       FIXED
626 E7A9C 4             CON(1)  4       OPCODE MNEMONIC
627 E7A9D 2543          NIBASC  \R4=C  \
          D334
          0202
628 E7AA9 50            CON(2)  (F.LSET)!(F.TREE)
629 E7AAB 3             CON(1)  3       OPCODE
630 E7AAC C010          CON(5)  #10C
          0
631 E7AB1 00            CON(2)  0       NO VARIABLES
632             *
633             *
634 E7AB3 10            CON(2)  1       REGISTER TESTS
635 E7AB5 4             CON(1)  4       OPCODE MNEMONIC
636 E7AB6 F314          NIBASC  \?A=0  \
          D303
          0202
637 E7AC2 70            CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
638 E7AC4 3             CON(1)  3       OPCODE
639 E7AC5 8080          CON(5)  #808
          0
640 E7ACA 1             CON(1)  1       GROUP A
641 E7ACB 0             CON(1)  0
642             *
643             *
644 E7ACC 50            CON(2)  5       FIXED
645 E7ACE 4             CON(1)  4       OPCODE MNEMONIC
646 E7ACF 14D3          NIBASC  \A=R2  \
          2523
          0202
647 E7ADB 50            CON(2)  (F.LSET)!(F.TREE)
648 E7ADD 3             CON(1)  3       OPCODE
```

```
649 E7ADE 2110          CON(5)  #112
          0
650 E7AE3 00            CON(2)  0       NO VARIABLES
651             *
652             *
653 E7AE5 50            CON(2)  5       FIXED
654 E7AE7 5             CON(1)  5       OPCODE MNEMONIC
655 E7AE8 2455          NIBASC  \BUSCC \
          3534
          3402
656 E7AF4 50            CON(2)  (F.LSET)!(F.TREE)
657 E7AF6 3             CON(1)  3       OPCODE
658 E7AF7 B080          CON(5)  #80B
          0
659 E7AFC 00            CON(2)  0       NO VARIABLES
660             *
661             *
662 E7AFE 20            CON(2)  2       REGISTER ARITHMETIC
663 E7B00 5             CON(1)  5       OPCODE MNEMONIC
664 E7B01 44D3          NIBASC  \D=D+C \
          44B2
          3402
665 E7B0D 40            CON(2)  (F.TREE)
666 E7B0F 3             CON(1)  3       OPCODE
667 E7B10 3000          CON(5)  #003
          0
668 E7B15 1             CON(1)  1       GROUP C
669 E7B16 0             CON(1)  0
```

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670                     STITLE  HASH TO GROUP 6
671 E7B17       OPCG06
672 E7B17 40            CON(2)  4       BRANCHES
673 E7B19 6             CON(1)  6       OPCODE MNEMONIC
674 E7B1A 34F4          NIBASC  \CON(4)\
          E482
          4392
675 E7B26 13            CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)
676 E7B28 4             CON(1)  4       OPCODE
677 E7B29 0000          CON(5)  #0
          0
678 E7B2E 1             CON(1)  1       FILL.MARK
679 E7B2F 4             CON(1)  4       FILL.LENGTH
680               *
681               *
682 E7B30 30            CON(2)  3       REGISTER LOGIC
683 E7B32 5             CON(1)  5       OPCODE MNEMONIC
684 E7B33 24D3          NIBASC  \B=A!B \
          1412
          2402
685 E7B3F 10            CON(2)  (F.LSET)
686 E7B41 4             CON(1)  4       OPCODE
687 E7B42 C0E0          CON(5)  #0E0C
          0
688 E7B47 00            CON(2)  0       NO VARIABLES
689               *
690               *
691 E7B49 50            CON(2)  5       FIXED
692 E7B4B 4             CON(1)  4       OPCODE MNEMONIC
693 E7B4C 2543          NIBASC  \R4=A  \
          D314
          0202
694 E7B58 10            CON(2)  (F.LSET)
695 E7B5A 3             CON(1)  3       OPCODE
696 E7B5B 4010          CON(5)  #104
          0
697 E7B60 00            CON(2)  0       NO VARIABLES
698               *
699               *
700 E7B62 50            CON(2)  5       FIXED
701 E7B64 4             CON(1)  4       OPCODE MNEMONIC
702 E7B65 14D3          NIBASC  \A=R0  \
          2503
          0202
703 E7B71 10            CON(2)  (F.LSET)
704 E7B73 3             CON(1)  3       OPCODE
705 E7B74 0110          CON(5)  #110
          0
706 E7B79 00            CON(2)  0       NO VARIABLES
707               *
708               *
709 E7B7B 50            CON(2)  5       FIXED
710 E7B7D 4             CON(1)  4       OPCODE MNEMONIC
711 E7B7E 2435          NIBASC  \BSRC  \
          2534
```

```
          0202
712 E7B8A 50          CON(2)  (F.LSET)!(F.TREE)
713 E7B8C 3           CON(1)  3       OPCODE
714 E7B8D 5180        CON(5)  #815
          0
715 E7B92 00          CON(2)  0       NO VARIABLES
716             *
717             *
718 E7B94 30          CON(2)  3       REGISTER LOGIC
719 E7B96 5           CON(1)  5       OPCODE MNEMONIC
720 E7B97 44D3        NIBASC  \D=D!C \
          4412
          3402
721 E7BA3 50          CON(2)  (F.LSET)!(F.TREE)
722 E7BA5 4           CON(1)  4       OPCODE
723 E7BA6 B0E0        CON(5)  #0E0B
          0
724 E7BAB 00          CON(2)  0       NO VARIABLES
725             *
726             *
727 E7BAD 50          CON(2)  5       FIXED
728 E7BAF 6           CON(1)  6       OPCODE MNEMONIC
729 E7BB0 2545        NIBASC  \RTNSXM\
          E435
          85D4
730 E7BBC 50          CON(2)  (F.LSET)!(F.TREE)
731 E7BBE 2           CON(1)  2       OPCODE
732 E7BBF 0000        CON(5)  #00
          0
733 E7BC4 00          CON(2)  0       NO VARIABLES
734             *
735             *
736 E7BC6 20          CON(2)  2       REGISTER ARITHMETIC
737 E7BC8 3           CON(1)  3       OPCODE MNEMONIC
738 E7BC9 14D3        NIBASC  \A=B   \
          2402
          0202
739 E7BD5 40          CON(2)  (F.TREE)
740 E7BD7 3           CON(1)  3       OPCODE
741 E7BD8 4000        CON(5)  #004
          0
742 E7BDD 2           CON(1)  2       GROUP D
743 E7BDE 0           CON(1)  0
744             *
745             *
746 E7BDF 00          CON(2)  0       NULL
747 E7BE1 0           CON(1)  0       OPCODE MNEMONIC
748 E7BE2 0202        NIBASC  \      \
          0202
          0202
749 E7BEE 40          CON(2)  (F.TREE)
750 E7BF0 0           CON(1)  0       OPCODE
751 E7BF1 0000        CON(5)  #0
          0
752 E7BF6 00          CON(2)  0       NO VARIABLES
```

```
753                     STITLE  HASH TO GROUP 7
754 E7BF8       OPCG07
755 E7BF8 50            CON(2)  5       FIXED
756 E7BFA 4             CON(1)  4       OPCODE MNEMONIC
757 E7BFB 14D3          NIBASC  \A=IN  \
          94E4
          0202
758 E7C07 10            CON(2)  (F.LSET)
759 E7C09 3             CON(1)  3       OPCODE
760 E7C0A 2080          CON(5)  #802
          0
761 E7C0F 00            CON(2)  0       NO VARIABLES
762               *
763               *
764 E7C11 90            CON(2)  9       STATUS TESTS
765 E7C13 5             CON(1)  5       OPCODE MNEMONIC
766 E7C14 F335          NIBASC  \?ST=0 \
          45D3
          0302
767 E7C20 32            CON(2)  (F.LSET)!(F.RETY)!(F.EXPR)
768 E7C22 3             CON(1)  3       OPCODE
769 E7C23 0680          CON(5)  #860
          0
770 E7C28 00            CON(2)  0       NO VARIABLES
771               *
772               *
773 E7C2A 40            CON(2)  4       BRANCHES
774 E7C2C 4             CON(1)  4       OPCODE MNEMONIC
775 E7C2D 74F4          NIBASC  \GOTO  \
          45F4
          0202
776 E7C39 12            CON(2)  (F.LSET)!(F.EXPR)
777 E7C3B 4             CON(1)  4       OPCODE
778 E7C3C 0006          CON(5)  #6000
          0
779 E7C41 2             CON(1)  2       FILL.MARK
780 E7C42 3             CON(1)  3       FILL.LENGTH
781               *
782               *
783 E7C43 10            CON(2)  1       REGISTER TESTS
784 E7C45 5             CON(1)  5       OPCODE MNEMONIC
785 E7C46 F334          NIBASC  \?C>=A \
          E3D3
          1402
786 E7C52 70            CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
787 E7C54 3             CON(1)  3       OPCODE
788 E7C55 A080          CON(5)  #80A
          0
789 E7C5A 2             CON(1)  2       GROUP B
790 E7C5B 0             CON(1)  0
791               *
792               *
793 E7C5C 30            CON(2)  3       REGISTER LOGIC
794 E7C5E 5             CON(1)  5       OPCODE MNEMONIC
795 E7C5F 14D3          NIBASC  \A=C&A \
```

```
            3462
            1402
    796 E7C6B 50            CON(2)  (F.LSET)!(F.TREE)
    797 E7C6D 4             CON(1)  4       OPCODE
    798 E7C6E 60E0          CON(5)  #0E06
            0
    799 E7C73 00            CON(2)  0       NO VARIABLES
    800             *
    801             *
    802 E7C75 20            CON(2)  2       REGISTER ARITHMETIC
    803 E7C77 5             CON(1)  5       OPCODE MNEMONIC
    804 E7C78 34D3          NIBASC  \C=C+C \
            34B2
            3402
    805 E7C84 40            CON(2)  (F.TREE)
    806 E7C86 3             CON(1)  3       OPCODE
    807 E7C87 6000          CON(5)  #006
            0
    808 E7C8C 1             CON(1)  1       GROUP C
    809 E7C8D 0             CON(1)  0
    810             *
    811             *
    812 E7C8E 50            CON(2)  5       FIXED
    813 E7C90 4             CON(1)  4       OPCODE MNEMONIC
    814 E7C91 3545          NIBASC  \ST=C  \
            D334
            0202
    815 E7C9D 50            CON(2)  (F.LSET)!(F.TREE)
    816 E7C9F 2             CON(1)  2       OPCODE
    817 E7CA0 A000          CON(5)  #0A
            0
    818 E7CA5 00            CON(2)  0       NO VARIABLES
```

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```
819                     STITLE  HASH TO GROUP 8
820 E7CA7       OPCG08
821 E7CA7 50            CON(2)  5       FIXED
822 E7CA9 4             CON(1)  4       OPCODE MNEMONIC
823 E7CAA 3435          NIBASC  \CSRC  \
          2534
          0202
824 E7CB6 10            CON(2)  (F.LSET)
825 E7CB8 3             CON(1)  3       OPCODE
826 E7CB9 6180          CON(5)  #816
          0
827 E7CBE 00            CON(2)  0       NO VARIABLES
828               *
829               *
830 E7CC0 20            CON(2)  2       REGISTER ARITHMETIC
831 E7CC2 5             CON(1)  5       OPCODE MNEMONIC
832 E7CC3 24D3          NIBASC  \B=B-C \
          24D2
          3402
833 E7CCF 00            CON(2)  0
834 E7CD1 3             CON(1)  3       OPCODE
835 E7CD2 1000          CON(5)  #001
          0
836 E7CD7 3             CON(1)  3       GROUP E
837 E7CD8 0             CON(1)  0
838               *
839               *
840 E7CD9 50            CON(2)  5       FIXED
841 E7CDB 4             CON(1)  4       OPCODE MNEMONIC
842 E7CDC 3524          NIBASC  \SB=0  \
          D303
          0202
843 E7CE8 10            CON(2)  (F.LSET)
844 E7CEA 3             CON(1)  3       OPCODE
845 E7CEB 2280          CON(5)  #822
          0
846 E7CF0 00            CON(2)  0       NO VARIABLES
847               *
848               *
849 E7CF2 90            CON(2)  9       STATUS TESTS
850 E7CF4 5             CON(1)  5       OPCODE MNEMONIC
851 E7CF5 F335          NIBASC  \?ST#0 \
          4532
          0302
852 E7D01 32            CON(2)  (F.LSET)!(F.RETY)!(F.EXPR)
853 E7D03 3             CON(1)  3       OPCODE
854 E7D04 0780          CON(5)  #870
          0
855 E7D09 00            CON(2)  0       NO VARIABLES
856               *
857               *
858 E7D0B 20            CON(2)  2       REGISTER ARITHMETIC
859 E7D0D 4             CON(1)  4       OPCODE MNEMONIC
860 E7D0E 3424          NIBASC  \CBEX  \
          5485
```

```
           0202
    861 E7D1A 00           CON(2)  0
    862 E7D1C 3            CON(1)  3       OPCODE
    863 E7D1D D000         CON(5)  #00D
           0
    864 E7D22 2            CON(1)  2       GROUP D
    865 E7D23 0            CON(1)  0
    866             *
    867             *
    868 E7D24 C0           CON(2)  12      DATA POINTER ARITHMETIC
    869 E7D26 6            CON(1)  6       OPCODE MNEMONIC
    870 E7D27 4413         NIBASC  \D1=D1+\
           D344
           13B2
    871 E7D33 12           CON(2)  (F.LSET)!(F.EXPR)
    872 E7D35 3            CON(1)  3       OPCODE
    873 E7D36 0710         CON(5)  #170
           0
    874 E7D3B 00           CON(2)  0       NO VARIABLES
    875             *
    876             *
    877 E7D3D B0           CON(2)  11      SET STATUS
    878 E7D3F 4            CON(1)  4       OPCODE MNEMONIC
    879 E7D40 3545         NIBASC  \ST=1  \
           D313
           0202
    880 E7D4C 12           CON(2)  (F.LSET)!(F.EXPR)
    881 E7D4E 3            CON(1)  3       OPCODE
    882 E7D4F 0580         CON(5)  #850
           0
    883 E7D54 00           CON(2)  0       NO VARIABLES
    884             *
    885             *
    886 E7D56 10           CON(2)  1       REGISTER TESTS
    887 E7D58 4            CON(1)  4       OPCODE MNEMONIC
    888 E7D59 F314         NIBASC  \?A<B  \
           C324
           0202
    889 E7D65 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
    890 E7D67 3            CON(1)  3       OPCODE
    891 E7D68 4080         CON(5)  #804
           0
    892 E7D6D 2            CON(1)  2       GROUP B
    893 E7D6E 0            CON(1)  0
    894             *
    895             *
    896 E7D6F D0           CON(2)  13      DATA TRANSFER
    897 E7D71 6            CON(1)  6       OPCODE MNEMONIC
    898 E7D72 14D3         NIBASC  \A=DAT0\
           4414
           4503
    899 E7D7E 42           CON(2)  (F.TREE)!(F.EXPR)
    900 E7D80 4            CON(1)  4       OPCODE
    901 E7D81 0251         CON(5)  #1520
           0
```

```
902 E7D86 00          CON(2)  0       NO VARIABLES
903             *
904             *
905 E7D88 50          CON(2)  5       FIXED
906 E7D8A 4           CON(1)  4       OPCODE MNEMONIC
907 E7D8B 34D3        NIBASC  \C=R4  \
          2543
          0202
908 E7D97 50          CON(2)  (F.LSET)!(F.TREE)
909 E7D99 3           CON(1)  3       OPCODE
910 E7D9A C110        CON(5)  #11C
          0
911 E7D9F 00          CON(2)  0       NO VARIABLES
912             *
913             *
914 E7DA1 50          CON(2)  5       FIXED
915 E7DA3 5           CON(1)  5       OPCODE MNEMONIC
916 E7DA4 34C4        NIBASC  \CLRST \
          2535
          4502
917 E7DB0 50          CON(2)  (F.LSET)!(F.TREE)
918 E7DB2 2           CON(1)  2       OPCODE
919 E7DB3 8000        CON(5)  #08
          0
920 E7DB8 00          CON(2)  0       NO VARIABLES
921             *
922             *
923 E7DBA 50          CON(2)  5       FIXED
924 E7DBC 4           CON(1)  4       OPCODE MNEMONIC
925 E7DBD 4403        NIBASC  \D0=C  \
          D334
          0202
926 E7DC9 50          CON(2)  (F.LSET)!(F.TREE)
927 E7DCB 3           CON(1)  3       OPCODE
928 E7DCC 4310        CON(5)  #134
          0
929 E7DD1 00          CON(2)  0       NO VARIABLES
930             *
931             *
932 E7DD3 20          CON(2)  2       REGISTER ARITHMETIC
933 E7DD5 3           CON(1)  3       OPCODE MNEMONIC
934 E7DD6 44D3        NIBASC  \D=C   \
          3402
          0202
935 E7DE2 40          CON(2)  (F.TREE)
936 E7DE4 3           CON(1)  3       OPCODE
937 E7DE5 7000        CON(5)  #007
          0
938 E7DEA 2           CON(1)  2       GROUP D
939 E7DEB 0           CON(1)  0
940             *
941             *
942 E7DEC 50          CON(2)  5       FIXED
943 E7DEE 4           CON(1)  4       OPCODE MNEMONIC
944 E7DEF 3525        NIBASC  \SR=0  \
```

```
            D303
            0202
    945 E7DFB 50            CON(2)  (F.LSET)!(F.TREE)
    946 E7DFD 3             CON(1)  3       OPCODE
    947 E7DFE 4280          CON(5)  #824
            0
    948 E7E03 00            CON(2)  0       NO VARIABLES
    949             *
    950             *
    951 E7E05 00            CON(2)  0       NULL
    952 E7E07 0             CON(1)  0       OPCODE MNEMONIC
    953 E7E08 0202          NIBASC  \       \
            0202
            0202
    954 E7E14 40            CON(2)  (F.TREE)
    955 E7E16 0             CON(1)  0       OPCODE
    956 E7E17 0000          CON(5)  #0
            0
    957 E7E1C 00            CON(2)  0       NO VARIABLES
```

```
 958                    STITLE  HASH TO GROUP 9
 959 E7E1E      OPCG09
 960 E7E1E 20           CON(2)  2       REGISTER ARITHMETIC
 961 E7E20 5            CON(1)  5       OPCODE MNEMONIC
 962 E7E21 24D3         NIBASC  \B=B+C \
           24B2
           3402
 963 E7E2D 00           CON(2)  0
 964 E7E2F 3            CON(1)  3       OPCODE
 965 E7E30 1000         CON(5)  #001
           0
 966 E7E35 1            CON(1)  1       GROUP C
 967 E7E36 0            CON(1)  0
 968            *
 969            *
 970 E7E37 10           CON(2)  1       REGISTER TESTS
 971 E7E39 4            CON(1)  4       OPCODE MNEMONIC
 972 E7E3A F334         NIBASC  \?C<A  \
           C314
           0202
 973 E7E46 30           CON(2)  (F.LSET)!(F.RETY)
 974 E7E48 3            CON(1)  3       OPCODE
 975 E7E49 6080         CON(5)  #806
           0
 976 E7E4E 2            CON(1)  2       GROUP B
 977 E7E4F 0            CON(1)  0
 978            *
 979            *
 980 E7E50 50           CON(2)  5       FIXED
 981 E7E52 4            CON(1)  4       OPCODE MNEMONIC
 982 E7E53 4403         NIBASC  \D0=A  \
           D314
           0202
 983 E7E5F 10           CON(2)  (F.LSET)
 984 E7E61 3            CON(1)  3       OPCODE
 985 E7E62 0310         CON(5)  #130
           0
 986 E7E67 00           CON(2)  0       NO VARIABLES
 987            *
 988            *
 989 E7E69 10           CON(2)  1       REGISTER TESTS
 990 E7E6B 5            CON(1)  5       OPCODE MNEMONIC
 991 E7E6C F314         NIBASC  \?A<=C \
           C3D3
           3402
 992 E7E78 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
 993 E7E7A 3            CON(1)  3       OPCODE
 994 E7E7B A080         CON(5)  #80A
           0
 995 E7E80 2            CON(1)  2       GROUP B
 996 E7E81 0            CON(1)  0
 997            *
 998            *
 999 E7E82 D0           CON(2)  13      DATA TRANSFER
1000 E7E84 6            CON(1)  6       OPCODE MNEMONIC
```

```
1001 E7E85 14D3          NIBASC  \A=DAT1\
           4414
           4513
1002 E7E91 42            CON(2)  (F.TREE)!(F.EXPR)
1003 E7E93 4             CON(1)  4       OPCODE
1004 E7E94 0351          CON(5)  #1530
           0
1005 E7E99 00            CON(2)  0       NO VARIABLES
1006            *
1007            *
1008 E7E9B 50            CON(2)  5       FIXED
1009 E7E9D 4             CON(1)  4       OPCODE MNEMONIC
1010 E7E9E 34D3          NIBASC  \C=R2  \
           2523
           0202
1011 E7EAA 50            CON(2)  (F.LSET)!(F.TREE)
1012 E7EAC 3             CON(1)  3       OPCODE
1013 E7EAD A110          CON(5)  #11A
           0
1014 E7EB2 00            CON(2)  0       NO VARIABLES
1015            *
1016            *
1017 E7EB4 40            CON(2)  4       BRANCHES
1018 E7EB6 6             CON(1)  6       OPCODE MNEMONIC
1019 E7EB7 2554          NIBASC  \REL(1)\
           C482
           1392
1020 E7EC3 52            CON(2)  (F.LSET)!(F.TREE)!(F.EXPR)
1021 E7EC5 1             CON(1)  1       OPCODE
1022 E7EC6 0000          CON(5)  #0
           0
1023 E7ECB 1             CON(1)  1       FILL.MARK
1024 E7ECC 1             CON(1)  1       FILL.LENGTH
```

```
1025                    STITLE  HASH TO GROUP 10
1026 E7ECD      OPCG10
1027 E7ECD 50           CON(2)  5       FIXED
1028 E7ECF 4            CON(1)  4       OPCODE MNEMONIC
1029 E7ED0 34D3         NIBASC  \C=R0  \
           2503
           0202
1030 E7EDC 10           CON(2)  (F.LSET)
1031 E7EDE 3            CON(1)  3       OPCODE
1032 E7EDF 8110         CON(5)  #118
           0
1033 E7EE4 00           CON(2)  0       NO VARIABLES
1034            *
1035            *
1036 E7EE6 30           CON(2)  3       REGISTER LOGIC
1037 E7EE8 5            CON(1)  5       OPCODE MNEMONIC
1038 E7EE9 24D3         NIBASC  \B=B!C \
           2412
           3402
1039 E7EF5 10           CON(2)  (F.LSET)
1040 E7EF7 4            CON(1)  4       OPCODE
1041 E7EF8 90E0         CON(5)  #0E09
           0
1042 E7EFD 00           CON(2)  0       NO VARIABLES
1043            *
1044            *
1045 E7EFF 50           CON(2)  5       FIXED
1046 E7F01 4            CON(1)  4       OPCODE MNEMONIC
1047 E7F02 4435         NIBASC  \DSRC  \
           2534
           0202
1048 E7F0E 10           CON(2)  (F.LSET)
1049 E7F10 3            CON(1)  3       OPCODE
1050 E7F11 7180         CON(5)  #817
           0
1051 E7F16 00           CON(2)  0       NO VARIABLES
1052            *
1053            *
1054 E7F18 20           CON(2)  2       REGISTER ARITHMETIC
1055 E7F1A 5            CON(1)  5       OPCODE MNEMONIC
1056 E7F1B 14D3         NIBASC  \A=A-C \
           14D2
           3402
1057 E7F27 40           CON(2)  (F.TREE)
1058 E7F29 3            CON(1)  3       OPCODE
1059 E7F2A A000         CON(5)  #00A
           0
1060 E7F2F 3            CON(1)  3       GROUP E
1061 E7F30 0            CON(1)  0
1062            *
1063            *
1064 E7F31 20           CON(2)  2       REGISTER ARITHMETIC
1065 E7F33 3            CON(1)  3       OPCODE MNEMONIC
1066 E7F34 34D3         NIBASC  \C=B   \
           2402
```

```
            0202
1067 E7F40  40          CON(2)  (F.TREE)
1068 E7F42  3           CON(1)  3       OPCODE
1069 E7F43  9000        CON(5)  #009
            0
1070 E7F48  2           CON(1)  2       GROUP D
1071 E7F49  0           CON(1)  0
1072            *
1073            *
1074 E7F4A  C0          CON(2)  12      DATA POINTER ARITHMETIC
1075 E7F4C  6           CON(1)  6       OPCODE MNEMONIC
1076 E7F4D  4413        NIBASC  \D1=D1-\
            D344
            13D2
1077 E7F59  52          CON(2)  (F.LSET)!(F.EXPR)!(F.TREE)
1078 E7F5B  3           CON(1)  3       OPCODE
1079 E7F5C  0C10        CON(5)  #1C0
            0
1080 E7F61  00          CON(2)  0       NO VARIABLES
1081            *
1082            *
1083 E7F63  50          CON(2)  5       FIXED
1084 E7F65  5           CON(1)  5       OPCODE MNEMONIC
1085 E7F66  F455        NIBASC  \OUT=C \
            45D3
            3402
1086 E7F72  50          CON(2)  (F.LSET)!(F.TREE)
1087 E7F74  3           CON(1)  3       OPCODE
1088 E7F75  1080        CON(5)  #801
            0
1089 E7F7A  00          CON(2)  0       NO VARIABLES
```

```
1090                    STITLE  HASH TO GROUP 11
1091 E7F7C      OPCG11
1092 E7F7C 20           CON(2)  2       REGISTER ARITHMETIC
1093 E7F7E 5            CON(1)  5       OPCODE MNEMONIC
1094 E7F7F 34D3         NIBASC  \C=B+C \
           24B2
           3402
1095 E7F8B 00           CON(2)  0
1096 E7F8D 3            CON(1)  3       OPCODE
1097 E7F8E 9000         CON(5)  #009
           0
1098 E7F93 1            CON(1)  1       GROUP C
1099 E7F94 0            CON(1)  0
1100            *
1101            *
1102 E7F95 20           CON(2)  2       REGISTER ARITHMETIC
1103 E7F97 5            CON(1)  5       OPCODE MNEMONIC
1104 E7F98 14D3         NIBASC  \A=A+C \
           14B2
           3402
1105 E7FA4 00           CON(2)  0
1106 E7FA6 3            CON(1)  3       OPCODE
1107 E7FA7 A000         CON(5)  #00A
           0
1108 E7FAC 1            CON(1)  1       GROUP C
1109 E7FAD 0            CON(1)  0
1110            *
1111            *
1112 E7FAE 50           CON(2)  5       FIXED
1113 E7FB0 4            CON(1)  4       OPCODE MNEMONIC
1114 E7FB1 34D3         NIBASC  \C=IN  \
           94E4
           0202
1115 E7FBD 10           CON(2)  (F.LSET)
1116 E7FBF 3            CON(1)  3       OPCODE
1117 E7FC0 3080         CON(5)  #803
           0
1118 E7FC5 00           CON(2)  0       NO VARIABLES
1119            *
1120            *
1121 E7FC7 10           CON(2)  1       REGISTER TESTS
1122 E7FC9 4            CON(1)  4       OPCODE MNEMONIC
1123 E7FCA F344         NIBASC  \?D>C  \
           E334
           0202
1124 E7FD6 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1125 E7FD8 3            CON(1)  3       OPCODE
1126 E7FD9 3080         CON(5)  #803
           0
1127 E7FDE 2            CON(1)  2       GROUP B
1128 E7FDF 0            CON(1)  0
1129            *
1130            *
1131 E7FE0 30           CON(2)  3       REGISTER LOGIC
1132 E7FE2 5            CON(1)  5       OPCODE MNEMONIC
```

```
1133 E7FE3 14D3          NIBASC  \A=B&A \
           2462
           1402
1134 E7FEF 50            CON(2)  (F.LSET)!(F.TREE)
1135 E7FF1 4             CON(1)  4       OPCODE
1136 E7FF2 00E0          CON(5)  #0E00
           0
1137 E7FF7 00            CON(2)  0       NO VARIABLES
1138             *
1139             *
1140 E7FF9 30            CON(2)  3       REGISTER LOGIC
1141 E7FFB 5             CON(1)  5       OPCODE MNEMONIC
1142 E7FFC 34D3          NIBASC  \C=C&A \
           3462
           1402
1143 E8008 50            CON(2)  (F.LSET)!(F.TREE)
1144 E800A 4             CON(1)  4       OPCODE
1145 E800B 20E0          CON(5)  #0E02
           0
1146 E8010 00            CON(2)  0       NO VARIABLES
1147             *
1148             *
1149 E8012 32            CON(2)  35      PSEUDO-OP
1150 E8014 5             CON(1)  5       OPCODE MNEMONIC
1151 E8015 45F4          NIBASC  \TOKEN \
           B454
           E402
1152 E8021 42            CON(2)  (F.TREE)!(F.EXPR)
1153 E8023 2             CON(1)  2       OPCODE
1154 E8024 0000          CON(5)  #0
           0
1155 E8029 00            CON(2)  0       NO VARIABLES
```

```
1156                    STITLE  HASH TO GROUP 12
1157 E802B      OPCG12
1158 E802B 50           CON(2)  5       FIXED
1159 E802D 4            CON(1)  4       OPCODE MNEMONIC
1160 E802E 34D3         NIBASC  \C=ID  \
           9444
           0202
1161 E803A 10           CON(2)  (F.LSET)
1162 E803C 3            CON(1)  3       OPCODE
1163 E803D 6080         CON(5)  #806
           0
1164 E8042 00           CON(2)  0       NO VARIABLES
1165            *
1166            *
1167 E8044 20           CON(2)  2       REGISTER ARITHMETIC
1168 E8046 3            CON(1)  3       OPCODE MNEMONIC
1169 E8047 24D3         NIBASC  \B=A   \
           1402
           0202
1170 E8053 00           CON(2)  0
1171 E8055 3            CON(1)  3       OPCODE
1172 E8056 8000         CON(5)  #008
           0
1173 E805B 2            CON(1)  2       GROUP D
1174 E805C 0            CON(1)  0
1175            *
1176            *
1177 E805D A0           CON(2)  10      SET POINTER
1178 E805F 2            CON(1)  2       OPCODE MNEMONIC
1179 E8060 05D3         NIBASC  \P=    \
           0202
           0202
1180 E806C 12           CON(2)  (F.LSET)!(F.EXPR)
1181 E806E 2            CON(1)  2       OPCODE
1182 E806F 0200         CON(5)  #20
           0
1183 E8074 00           CON(2)  0       NO VARIABLES
1184            *
1185            *
1186 E8076 10           CON(2)  1       REGISTER TESTS
1187 E8078 5            CON(1)  5       OPCODE MNEMONIC
1188 E8079 F324         NIBASC  \?B>=C \
           E3D3
           3402
1189 E8085 30           CON(2)  (F.LSET)!(F.RETY)
1190 E8087 3            CON(1)  3       OPCODE
1191 E8088 9080         CON(5)  #809
           0
1192 E808D 2            CON(1)  2       GROUP B
1193 E808E 0            CON(1)  0
1194            *
1195            *
1196 E808F D0           CON(2)  13      DATA TRANSFER
1197 E8091 6            CON(1)  6       OPCODE MNEMONIC
1198 E8092 34D3         NIBASC  \C=DAT0\
```

```
            4414
            4503
1199 E809E  02          CON(2)  (F.EXPR)
1200 E80A0  4           CON(1)  4       OPCODE
1201 E80A1  0651        CON(5)  #1560
            0
1202 E80A6  00          CON(2)  0       NO VARIABLES
1203            *
1204            *
1205 E80A8  E0          CON(2)  14      HEX CONSTANTS
1206 E80AA  6           CON(1)  6       OPCODE MNEMONIC
1207 E80AB  E494        NIBASC  \NIBHEX\
            2484
            5485
1208 E80B7  40          CON(2)  (F.TREE)
1209 E80B9  0           CON(1)  0       OPCODE
1210 E80BA  0000        CON(5)  #0
            0
1211 E80BF  1           CON(1)  1       FILL.MARK
1212 E80C0  E           CON(1)  14      FILL.LENGTH
1213            *
1214            *
1215 E80C1  50          CON(2)  5       FIXED
1216 E80C3  5           CON(1)  5       OPCODE MNEMONIC
1217 E80C4  2554        NIBASC  \RESET \
            3554
            4502
1218 E80D0  50          CON(2)  (F.LSET)!(F.TREE)
1219 E80D2  3           CON(1)  3       OPCODE
1220 E80D3  A080        CON(5)  #80A
            0
1221 E80D8  00          CON(2)  0       NO VARIABLES
1222            *
1223            *
1224 E80DA  10          CON(2)  1       REGISTER TESTS
1225 E80DC  4           CON(1)  4       OPCODE MNEMONIC
1226 E80DD  F314        NIBASC  \?A#B  \
            3224
            0202
1227 E80E9  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1228 E80EB  3           CON(1)  3       OPCODE
1229 E80EC  4080        CON(5)  #804
            0
1230 E80F1  1           CON(1)  1       GROUP A
1231 E80F2  0           CON(1)  0
1232            *
1233            *
1234 E80F3  30          CON(2)  3       REGISTER LOGIC
1235 E80F5  5           CON(1)  5       OPCODE MNEMONIC
1236 E80F6  14D3        NIBASC  \A=A!C \
            1412
            3402
1237 E8102  50          CON(2)  (F.LSET)!(F.TREE)
1238 E8104  4           CON(1)  4       OPCODE
1239 E8105  E0E0        CON(5)  #0E0E
```

```
            0
 1240 E810A 00          CON(2)  0       NO VARIABLES
 1241           *
 1242           *
 1243 E810C 30          CON(2)  3       REGISTER LOGIC
 1244 E810E 5           CON(1)  5       OPCODE MNEMONIC
 1245 E810F 34D3        NIBASC  \C=B!C \
            2412
            3402
 1246 E811B 50          CON(2)  (F.LSET)!(F.TREE)
 1247 E811D 4           CON(1)  4       OPCODE
 1248 E811E D0E0        CON(5)  #0E0D
            0
 1249 E8123 00          CON(2)  0       NO VARIABLES
 1250           *
 1251           *
 1252 E8125 00          CON(2)  0       NULL
 1253 E8127 0           CON(1)  0       OPCODE MNEMONIC
 1254 E8128 0202        NIBASC  \      \
            0202
            0202
 1255 E8134 40          CON(2)  (F.TREE)
 1256 E8136 0           CON(1)  0       OPCODE
 1257 E8137 0000        CON(5)  #0
            0
 1258 E813C 00          CON(2)  0       NO VARIABLES
```

```
1259                        STITLE  HASH TO GROUP 13
1260 E813E       OPCG13
1261 E813E 30               CON(2)  3       REGISTER LOGIC
1262 E8140 5                CON(1)  5       OPCODE MNEMONIC
1263 E8141 24D3             NIBASC  \B=B&A \
           2462
           1402
1264 E814D 10               CON(2)  (F.LSET)
1265 E814F 4                CON(1)  4       OPCODE
1266 E8150 40E0             CON(5)  #0E04
           0
1267 E8155 00               CON(2)  0       NO VARIABLES
1268              *
1269              *
1270 E8157 60               CON(2)  6       HARDWARE TESTS
1271 E8159 5                CON(1)  5       OPCODE MNEMONIC
1272 E815A F385             NIBASC  \?XM=0 \
           D4D3
           0302
1273 E8166 30               CON(2)  (F.LSET)!(F.RETY)
1274 E8168 3                CON(1)  3       OPCODE
1275 E8169 1380             CON(5)  #831
           0
1276 E816E 00               CON(2)  0       NO VARIABLES
1277              *
1278              *
1279 E8170 20               CON(2)  2       REGISTER ARITHMETIC
1280 E8172 5                CON(1)  5       OPCODE MNEMONIC
1281 E8173 44D3             NIBASC  \D=D+D \
           44B2
           4402
1282 E817F 00               CON(2)  0
1283 E8181 3                CON(1)  3       OPCODE
1284 E8182 7000             CON(5)  #007
           0
1285 E8187 1                CON(1)  1       GROUP C
1286 E8188 0                CON(1)  0
1287              *
1288              *
1289 E8189 10               CON(2)  1       REGISTER TESTS
1290 E818B 4                CON(1)  4       OPCODE MNEMONIC
1291 E818C F334             NIBASC  \?C#A  \
           3214
           0202
1292 E8198 30               CON(2)  (F.LSET)!(F.RETY)
1293 E819A 3                CON(1)  3       OPCODE
1294 E819B 6080             CON(5)  #806
           0
1295 E81A0 1                CON(1)  1       GROUP A
1296 E81A1 0                CON(1)  0
1297              *
1298              *
1299 E81A2 20               CON(2)  2       REGISTER ARITHMETIC
1300 E81A4 6                CON(1)  6       OPCODE MNEMONIC
1301 E81A5 14D3             NIBASC  \A=-A-1\
```

```
            D214
            D213
1302 E81B1  40          CON(2)  (F.TREE)
1303 E81B3  3           CON(1)  3       OPCODE
1304 E81B4  C000        CON(5)  #00C
            0
1305 E81B9  4           CON(1)  4       GROUP F
1306 E81BA  0           CON(1)  0
1307            *
1308            *
1309 E81BB  D0          CON(2)  13      DATA TRANSFER
1310 E81BD  6           CON(1)  6       OPCODE MNEMONIC
1311 E81BE  34D3        NIBASC  \C=DAT1\
            4414
            4513
1312 E81CA  42          CON(2)  (F.EXPR)!(F.TREE)
1313 E81CC  4           CON(1)  4       OPCODE
1314 E81CD  0751        CON(5)  #1570
            0
1315 E81D2  00          CON(2)  0       NO VARIABLES
1316            *
1317            *
1318 E81D4  50          CON(2)  5       FIXED
1319 E81D6  6           CON(1)  6       OPCODE MNEMONIC
1320 E81D7  F455        NIBASC  \OUT=CS\
            45D3
            3435
1321 E81E3  50          CON(2)  (F.LSET)!(F.TREE)
1322 E81E5  3           CON(1)  3       OPCODE
1323 E81E6  0080        CON(5)  #800
            0
1324 E81EB  00          CON(2)  0       NO VARIABLES
1325            *
1326            *
1327 E81ED  10          CON(2)  1       REGISTER TESTS
1328 E81EF  4           CON(1)  4       OPCODE MNEMONIC
1329 E81F0  F314        NIBASC  \?A#0  \
            3203
            0202
1330 E81FC  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1331 E81FE  3           CON(1)  3       OPCODE
1332 E81FF  C080        CON(5)  #80C
            0
1333 E8204  1           CON(1)  1       GROUP 1
1334 E8205  0           CON(1)  0
1335            *
1336            *
1337 E8206  00          CON(2)  0       NULL
1338 E8208  0           CON(1)  0       OPCODE MNEUMONIC
1339 E8209  0202        NIBASC  \      \
            0202
            0202
1340 E8215  40          CON(2)  (F.TREE)
1341 E8217  0           CON(1)  0       OPCODE
1342 E8218  0000        CON(5)  #0
```

```
                0
  1343 E821D 00          CON(2)  0       NO VARIABLES
```

```
1344                    STITLE  HASH TO GROUP 14
1345 E821F      OPCG14
1346 E821F 20           CON(2)  2       REGISTER ARITHMETIC
1347 E8221 5            CON(1)  5       OPCODE MNEMONIC
1348 E8222 34D3         NIBASC  \C=C-D \
           34D2
           4402
1349 E822E 00           CON(2)  0
1350 E8230 3            CON(1)  3       OPCODE
1351 E8231 B000         CON(5)  #00B
           0
1352 E8236 3            CON(1)  3       GROUP E
1353 E8237 0            CON(1)  0
1354            *
1355            *
1356 E8238 20           CON(2)  2       REGISTER ARITHMETIC
1357 E823A 3            CON(1)  3       OPCODE MNEMONIC
1358 E823B 34D3         NIBASC  \C=A    \
           1402
           0202
1359 E8247 00           CON(2)  0
1360 E8249 3            CON(1)  3       OPCODE
1361 E824A 6000         CON(5)  #006
           0
1362 E824F 2            CON(1)  2       GROUP D
1363 E8250 0            CON(1)  0
1364            *
1365            *
1366 E8251 22           CON(2)  34      PSEUDO-OP
1367 E8253 3            CON(1)  3       OPCODE MNEMONIC
1368 E8254 B454         NIBASC  \KEY    \
           9502
           0202
1369 E8260 02           CON(2)  (F.EXPR)
1370 E8262 0            CON(1)  0       OPCODE
1371 E8263 0000         CON(5)  #0
           0
1372 E8268 00           CON(2)  0       NO VARIABLES
1373            *
1374            *
1375 E826A 20           CON(2)  2       REGISTER ARITHMETIC
1376 E826C 3            CON(1)  3       OPCODE MNEMONIC
1377 E826D 14D3         NIBASC  \A=0    \
           0302
           0202
1378 E8279 40           CON(2)  (F.TREE)
1379 E827B 3            CON(1)  3       OPCODE
1380 E827C 0000         CON(5)  #000
           0
1381 E8281 2            CON(1)  2       GROUP D
1382 E8282 0            CON(1)  0
1383            *
1384            *
1385 E8283 20           CON(2)  2       REGISTER ARITHMETIC
1386 E8285 5            CON(1)  5       OPCODE MNEMONIC
```

```
1387 E8286 34D3         NIBASC  \C=A-C \
           14D2
           3402
1388 E8292 40           CON(2)  (F.TREE)
1389 E8294 3            CON(1)  3       OPCODE
1390 E8295 E000         CON(5)  #00E
           0
1391 E829A 3            CON(1)  3       GROUP E
1392 E829B 0            CON(1)  0
1393            *
1394            *
1395 E829C 40           CON(2)  4       BRANCHES
1396 E829E 6            CON(1)  6       OPCODE MNEMONIC
1397 E829F 34F4         NIBASC  \CON(5)\
           E482
           5392
1398 E82AB 53           CON(2)  (F.LSET)!(F.TREE)!(F.ABSL)!(F.EXPR)
1399 E82AD 5            CON(1)  5       OPCODE
1400 E82AE 0000         CON(5)  #00000
           0
1401 E82B3 1            CON(1)  1       FILL.MARK
1402 E82B4 5            CON(1)  5       FILL.LENGTH
1403            *
1404            *
1405 E82B5 00           CON(2)  0       NULL
1406 E82B7 0            CON(1)  0       OPCODE MNEMONIC
1407 E82B8 0202         NIBASC  \      \
           0202
           0202
1408 E82C4 40           CON(2)  (F.TREE)
1409 E82C6 0            CON(1)  0       OPCODE
1410 E82C7 0000         CON(5)  #0
           0
1411 E82CC 00           CON(2)  0       NO VARIABLES
```

```
1412                    STITLE  HASH TO GROUP 15
1413 E82CE      OPCG15
1414 E82CE 20           CON(2)  2       REGISTER ARITHMETIC
1415 E82D0 4            CON(1)  4       OPCODE MNEMONIC
1416 E82D1 1434         NIBASC  \ACEX   \
           5485
           0202
1417 E82DD 00           CON(2)  0
1418 E82DF 3            CON(1)  3       OPCODE
1419 E82E0 E000         CON(5)  #00E
           0
1420 E82E5 2            CON(1)  2       GROUP D
1421 E82E6 0            CON(1)  0
1422            *
1423            *
1424 E82E7 60           CON(2)  6       HARDWARE TESTS
1425 E82E9 5            CON(1)  5       OPCODE MNEMONIC
1426 E82EA F335         NIBASC  \?SB=0 \
           24D3
           0302
1427 E82F6 30           CON(2)  (F.LSET)!(F.RETY)
1428 E82F8 3            CON(1)  3       OPCODE
1429 E82F9 2380         CON(5)  #832
           0
1430 E82FE 00           CON(2)  0       NO VARIABLES
1431            *
1432            *
1433 E8300 E1           CON(2)  30      PSEUDO-OP
1434 E8302 3            CON(1)  3       OPCODE MNEMONIC
1435 E8303 D435         NIBASC  \MSG    \
           7402
           0202
1436 E830F 12           CON(2)  (F.LSET)!(F.EXPR)
1437 E8311 4            CON(1)  4       OPCODE
1438 E8312 0000         CON(5)  #0
           0
1439 E8317 00           CON(2)  0       NO VARIABLES
1440            *
1441            *
1442 E8319 10           CON(2)  1       REGISTER TESTS
1443 E831B 5            CON(1)  5       OPCODE MNEMONIC
1444 E831C F334         NIBASC  \?C>=B \
           E3D3
           2402
1445 E8328 30           CON(2)  (F.LSET)!(F.RETY)
1446 E832A 3            CON(1)  3       OPCODE
1447 E832B D080         CON(5)  #80D
           0
1448 E8330 2            CON(1)  2       GROUP B
1449 E8331 0            CON(1)  0
1450            *
1451            *
1452 E8332 90           CON(2)  9       STATUS TESTS
1453 E8334 5            CON(1)  5       OPCODE MNEMONIC
1454 E8335 F335         NIBASC  \?ST=1 \
```

```
            45D3
            1302
1455 E8341  32          CON(2)  (F.LSET)!(F.RETY)!(F.EXPR)
1456 E8343  3           CON(1)  3       OPCODE
1457 E8344  0780        CON(5)  #870
            0
1458 E8349  00          CON(2)  0       NO VARIABLES
1459              *
1460              *
1461 E834B  20          CON(2)  2       REGISTER ARITHMETIC
1462 E834D  5           CON(1)  5       OPCODE MNEMONIC
1463 E834E  34D3        NIBASC  \C=C+D \
            34B2
            4402
1464 E835A  00          CON(2)  0
1465 E835C  3           CON(1)  3       OPCODE
1466 E835D  B000        CON(5)  #00B
            0
1467 E8362  1           CON(1)  1       GROUP C
1468 E8363  0           CON(1)  0
1469              *
1470              *
1471 E8364  50          CON(2)  5       FIXED
1472 E8366  4           CON(1)  4       OPCODE MNEMONIC
1473 E8367  2513        NIBASC  \R1=C  \
            D334
            0202
1474 E8373  50          CON(2)  (F.LSET)!(F.TREE)
1475 E8375  3           CON(1)  3       OPCODE
1476 E8376  9010        CON(5)  #109
            0
1477 E837B  00          CON(2)  0       NO VARIABLES
1478              *
1479              *
1480 E837D  10          CON(2)  1       REGISTER TESTS
1481 E837F  5           CON(1)  5       OPCODE MNEMONIC
1482 E8380  F334        NIBASC  \?C<=A \
            C3D3
            1402
1483 E838C  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1484 E838E  3           CON(1)  3       OPCODE
1485 E838F  E080        CON(5)  #80E
            0
1486 E8394  2           CON(1)  2       GROUP B
1487 E8395  0           CON(1)  0
1488              *
1489              *
1490 E8396  10          CON(2)  1       REGISTER TESTS
1491 E8398  4           CON(1)  4       OPCODE MNEMONIC
1492 E8399  F344        NIBASC  \?D=C  \
            D334
            0202
1493 E83A5  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1494 E83A7  3           CON(1)  3       OPCODE
1495 E83A8  3080        CON(5)  #803
```

```
                0
1496 E83AD 1            CON(1)  1       GROUP A
1497 E83AE 0            CON(1)  0
1498            *
1499            *
1500 E83AF 60           CON(2)  6       HARDWARE TESTS
1501 E83B1 5            CON(1)  5       OPCODE MNEMONIC
1502 E83B2 F335         NIBASC  \?SR=0 \
                25D3
                0302
1503 E83BE 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1504 E83C0 3            CON(1)  3       OPCODE
1505 E83C1 4380         CON(5)  #834
                0
1506 E83C6 00           CON(2)  0       NO VARIABLES
1507            *
1508            *
1509 E83C8 20           CON(2)  2       REGISTER ARITHMETIC
1510 E83CA 4            CON(1)  4       OPCODE MNEMONIC
1511 E83CB 14D3         NIBASC  \A=-A  \
                D214
                0202
1512 E83D7 40           CON(2)  (F.TREE)
1513 E83D9 3            CON(1)  3       OPCODE
1514 E83DA 8000         CON(5)  #008
                0
1515 E83DF 4            CON(1)  4       GROUP F
1516 E83E0 0            CON(1)  0
1517            *
1518            *
1519 E83E1 20           CON(2)  2       REGISTER ARITHMETIC
1520 E83E3 5            CON(1)  5       OPCODE MNEMONIC
1521 E83E4 34D3         NIBASC  \C=A+C \
                14B2
                3402
1522 E83F0 40           CON(2)  (F.TREE)
1523 E83F2 3            CON(1)  3       OPCODE
1524 E83F3 2000         CON(5)  #002
                0
1525 E83F8 1            CON(1)  1       GROUP C
1526 E83F9 0            CON(1)  0
1527            *
1528            *
1529 E83FA 00           CON(2)  0       NULL
1530 E83FC 0            CON(1)  0       OPCODE MNEMONIC
1531 E83FD 0202         NIBASC  \      \
                0202
                0202
1532 E8409 40           CON(2)  (F.TREE)
1533 E840B 0            CON(1)  0       OPCODE
1534 E840C 0000         CON(5)  #0
                0
1535 E8411 00           CON(2)  0       NO VARIABLES
```

```
1536                    STITLE  HASH TO GROUP 16
1537 E8413      OPCG16
1538 E8413 40           CON(2)  4       BRANCHES
1539 E8415 6            CON(1)  6       OPCODE MNEMONIC
1540 E8416 4413         NIBASC  \D1=(2)\
           D382
           2392
1541 E8422 1B           CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
1542 E8424 4            CON(1)  4       OPCODE
1543 E8425 00D1         CON(5)  #1D00
           0
1544 E842A 3            CON(1)  3       FILL.MARK
1545 E842B 2            CON(1)  2       FILL.LENGTH
1546            *
1547            *
1548 E842C 20           CON(2)  2       REGISTER ARITHMETIC
1549 E842E 6            CON(1)  6       OPCODE MNEMONIC
1550 E842F 34D3         NIBASC  \C=-C-1\
           D234
           D213
1551 E843B 00           CON(2)  0
1552 E843D 3            CON(1)  3       OPCODE
1553 E843E E000         CON(5)  #00E
           0
1554 E8443 4            CON(1)  4       GROUP F
1555 E8444 0            CON(1)  0
1556            *
1557            *
1558 E8445 F1           CON(2)  31      PSEUDO-OP
1559 E8447 4            CON(1)  4       OPCODE MNEMONIC
1560 E8448 05F4         NIBASC  \POLL  \
           C4C4
           0202
1561 E8454 12           CON(2)  (F.LSET)!(F.EXPR)
1562 E8456 5            CON(1)  5       OPCODE
1563 E8457 0000         CON(5)  #0
           0
1564 E845C 00           CON(2)  0       NO VARIABLES
1565            *
1566            *
1567 E845E 90           CON(2)  9       STATUS TESTS
1568 E8460 5            CON(1)  5       OPCODE MNEMONIC
1569 E8461 F335         NIBASC  \?ST#1 \
           4532
           1302
1570 E846D 32           CON(2)  (F.LSET)!(F.RETY)!(F.EXPR)
1571 E846F 3            CON(1)  3       OPCODE
1572 E8470 0680         CON(5)  #860
           0
1573 E8475 00           CON(2)  0       NO VARIABLES
1574            *
1575            *
1576 E8477 30           CON(2)  3       REGISTER LOGIC
1577 E8479 5            CON(1)  5       OPCODE MNEMONIC
1578 E847A 34D3         NIBASC  \C=C!D \
```

```
            3412
            4402
1579 E8486  10          CON(2)  (F.LSET)
1580 E8488  4           CON(1)  4       OPCODE
1581 E8489  F0E0        CON(5)  #0E0F
            0
1582 E848E  00          CON(2)  0       NO VARIABLES
1583            *
1584            *
1585 E8490  20          CON(2)  2       REGISTER ARITHMETIC
1586 E8492  5           CON(1)  5       OPCODE MNEMONIC
1587 E8493  44D3        NIBASC  \D=C-D \
            34D2
            4402
1588 E849F  40          CON(2)  (F.TREE)
1589 E84A1  3           CON(1)  3       OPCODE
1590 E84A2  F000        CON(5)  #00F
            0
1591 E84A7  3           CON(1)  3       GROUP E
1592 E84A8  0           CON(1)  0
1593            *
1594            *
1595 E84A9  50          CON(2)  5       FIXED
1596 E84AB  4           CON(1)  4       OPCODE MNEMONIC
1597 E84AC  2513        NIBASC  \R1=A  \
            D314
            0202
1598 E84B8  50          CON(2)  (F.LSET)!(F.TREE)
1599 E84BA  3           CON(1)  3       OPCODE
1600 E84BB  1010        CON(5)  #101
            0
1601 E84C0  00          CON(2)  0       NO VARIABLES
1602            *
1603            *
1604 E84C2  10          CON(2)  1       REGISTER TESTS
1605 E84C4  4           CON(1)  4       OPCODE MNEMONIC
1606 E84C5  F324        NIBASC  \?B=0  \
            D303
            0202
1607 E84D1  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1608 E84D3  3           CON(1)  3       OPCODE
1609 E84D4  9080        CON(5)  #809
            0
1610 E84D9  1           CON(1)  1       GROUP A
1611 E84DA  0           CON(1)  0
1612            *
1613            *
1614 E84DB  20          CON(2)  2       REGISTER ARITHMETIC
1615 E84DD  3           CON(1)  3       OPCODE MNEMONIC
1616 E84DE  24D3        NIBASC  \B=0   \
            0302
            0202
1617 E84EA  40          CON(2)  (F.TREE)
1618 E84EC  3           CON(1)  3       OPCODE
1619 E84ED  1000        CON(5)  #001
```

```
            0
1620 E84F2  2           CON(1)  2       GROUP D
1621 E84F3  0           CON(1)  0
1622              *
1623              *
1624 E84F4  30          CON(2)  3       REGISTER LOGIC
1625 E84F6  5           CON(1)  5       OPCODE MNEMONIC
1626 E84F7  34D3        NIBASC  \C=A!C \
            1412
            3402
1627 E8503  50          CON(2)  (F.LSET)!(F.TREE)
1628 E8505  4           CON(1)  4       OPCODE
1629 E8506  A0E0        CON(5)  #0E0A
            0
1630 E850B  00          CON(2)  0       NO VARIABLES
1631              *
1632              *
1633 E850D  00          CON(2)  0       NULL
1634 E850F  0           CON(1)  0       OPCODE MNEMONIC
1635 E8510  0202        NIBASC  \      \
            0202
            0202
1636 E851C  40          CON(2)  (F.TREE)
1637 E851E  0           CON(1)  0       OPCODE
1638 E851F  0000        CON(5)  #0
            0
1639 E8524  00          CON(2)  0       NO VARIABLES
```

```
1640                    STITLE  HASH TO GROUP 17
1641 E8526      OPCG17
1642 E8526 51           CON(2)  21      END PSEUDO-OP
1643 E8528 3            CON(1)  3       OPCODE MNEMONIC
1644 E8529 54E4         NIBASC  \END   \
           4402
           0202
1645 E8535 00           CON(2)  0
1646 E8537 0            CON(1)  0       OPCODE
1647 E8538 0000         CON(5)  #0
           0
1648 E853D 00           CON(2)  0       NO VARIABLES
1649            *
1650            *
1651 E853F 20           CON(2)  2       REGISTER ARITHMETIC
1652 E8541 4            CON(1)  4       OPCODE MNEMONIC
1653 E8542 2434         NIBASC  \BCEX  \
           5485
           0202
1654 E854E 00           CON(2)  0
1655 E8550 3            CON(1)  3       OPCODE
1656 E8551 D000         CON(5)  #00D
           0
1657 E8556 2            CON(1)  2       GROUP D
1658 E8557 0            CON(1)  0
1659            *
1660            *
1661 E8558 40           CON(2)  4       BRANCHES
1662 E855A 6            CON(1)  6       OPCODE MNEMONIC
1663 E855B 2554         NIBASC  \REL(2)\
           C482
           2392
1664 E8567 12           CON(2)  (F.LSET)!(F.EXPR)
1665 E8569 2            CON(1)  2       OPCODE
1666 E856A 0000         CON(5)  #0
           0
1667 E856F 1            CON(1)  1       FILL.MARK
1668 E8570 2            CON(1)  2       FILL.LENGTH
1669            *
1670            *
1671 E8571 30           CON(2)  3       REGISTER LOGIC
1672 E8573 5            CON(1)  5       OPCODE MNEMONIC
1673 E8574 24D3         NIBASC  \B=C&B \
           3462
           2402
1674 E8580 50           CON(2)  (F.LSET)!(F.TREE)
1675 E8582 4            CON(1)  4       OPCODE
1676 E8583 10E0         CON(5)  #0E01
           0
1677 E8588 00           CON(2)  0       NO VARIABLES
1678            *
1679            *
1680 E858A 20           CON(2)  2       REGISTER ARITHMETIC
1681 E858C 5            CON(1)  5       OPCODE MNEMONIC
1682 E858D 44D3         NIBASC  \D=C+D \
```

```
            34B2
            4402
1683 E8599  40          CON(2)  (F.TREE)
1684 E859B  3           CON(1)  3       OPCODE
1685 E859C  3000        CON(5)  #003
            0
1686 E85A1  1           CON(1)  1       GROUP C
1687 E85A2  0           CON(1)  0
1688            *
1689            *
1690 E85A3  F0          CON(2)  15      LCHEX
1691 E85A5  5           CON(1)  5       OPCODE MNEMONIC
1692 E85A6  C434        NIBASC  \LCHEX \
            8454
            8502
1693 E85B2  40          CON(2)  (F.TREE)
1694 E85B4  2           CON(1)  2       OPCODE
1695 E85B5  0300        CON(5)  #30
            0
1696 E85BA  3           CON(1)  3       FILL.MARK
1697 E85BB  2           CON(1)  2       FILL.LENGTH
1698            *
1699            *
1700 E85BC  00          CON(2)  0       NULL
1701 E85BE  0           CON(1)  0       OPCODE MNEMONIC
1702 E85BF  0202        NIBASC  \      \
            0202
            0202
1703 E85CB  40          CON(2)  (F.TREE)
1704 E85CD  0           CON(1)  0       OPCODE
1705 E85CE  0000        CON(5)  #0
            0
1706 E85D3  00          CON(2)  0       NO VARIABLES
```

```
1707                    STITLE  HASH TO GROUP 18
1708 E85D5      OPCG18
1709 E85D5 A0           CON(2)  10      SET POINTER
1710 E85D7 3            CON(1)  3       OPCODE MNEMONIC
1711 E85D8 34D3         NIBASC  \C=P    \
           0502
           0202
1712 E85E4 12           CON(2)  (F.LSET)!(F.EXPR)
1713 E85E6 4            CON(1)  4       OPCODE
1714 E85E7 0C08         CON(5)  #80C0
           0
1715 E85EC 00           CON(2)  0       NO VARIABLES
1716            *
1717            *
1718 E85EE 20           CON(2)  2       REGISTER ARITHMETIC
1719 E85F0 4            CON(1)  4       OPCODE MNEMONIC
1720 E85F1 34D3         NIBASC  \C=-C   \
           D234
           0202
1721 E85FD 00           CON(2)  0
1722 E85FF 3            CON(1)  3       OPCODE
1723 E8600 A000         CON(5)  #00A
           0
1724 E8605 4            CON(1)  4       GROUP F
1725 E8606 0            CON(1)  0
1726            *
1727            *
1728 E8607 30           CON(2)  3       REGISTER LOGIC
1729 E8609 5            CON(1)  5       OPCODE MNEMONIC
1730 E860A 44D3         NIBASC  \D=C!D  \
           3412
           4402
1731 E8616 50           CON(2)  (F.LSET)!(F.TREE)
1732 E8618 4            CON(1)  4       OPCODE
1733 E8619 B0E0         CON(5)  #0E0B
           0
1734 E861E 00           CON(2)  0       NO VARIABLES
1735            *
1736            *
1737 E8620 50           CON(2)  5       FIXED
1738 E8622 5            CON(1)  5       OPCODE MNEMONIC
1739 E8623 1444         NIBASC  \AD1EX  \
           1354
           8502
1740 E862F 50           CON(2)  (F.LSET)!(F.TREE)
1741 E8631 3            CON(1)  3       OPCODE
1742 E8632 3310         CON(5)  #133
           0
1743 E8637 00           CON(2)  0       NO VARIABLES
1744            *
1745            *
1746 E8639 20           CON(2)  2       REGISTER ARITHMETIC
1747 E863B 3            CON(1)  3       OPCODE MNEMONIC
1748 E863C 34D3         NIBASC  \C=0    \
           0302
```

```
            0202
   1749 E8648 40          CON(2)  (F.TREE)
   1750 E864A 3           CON(1)  3       OPCODE
   1751 E864B 2000        CON(5)  #002
            0
   1752 E8650 2           CON(1)  2       GROUP D
   1753 E8651 0           CON(1)  0
```

```
1754                    STITLE  HASH TO GROUP 19
1755 E8652      OPCG19
1756 E8652 50           CON(2)  5       FIXED
1757 E8654 4            CON(1)  4       OPCODE MNEMONIC
1758 E8655 4413         NIBASC  \D1=C  \
           D334
           0202
1759 E8661 10           CON(2)  (F.LSET)
1760 E8663 3            CON(1)  3       OPCODE
1761 E8664 5310         CON(5)  #135
           0
1762 E8669 00           CON(2)  0       NO VARIABLES
1763            *
1764            *
1765 E866B 20           CON(2)  2       REGISTER ARITHMETIC
1766 E866D 3            CON(1)  3       OPCODE MNEMONIC
1767 E866E 1435         NIBASC  \ASL   \
           C402
           0202
1768 E867A 00           CON(2)  0
1769 E867C 3            CON(1)  3       OPCODE
1770 E867D 0000         CON(5)  #000
           0
1771 E8682 4            CON(1)  4       GROUP F
1772 E8683 0            CON(1)  0
1773            *
1774            *
1775 E8684 40           CON(2)  4       BRANCHES
1776 E8686 6            CON(1)  6       OPCODE MNEMONIC
1777 E8687 74F4         NIBASC  \GOLONG\
           C4F4
           E474
1778 E8693 12           CON(2)  (F.LSET)!(F.EXPR)
1779 E8695 6            CON(1)  6       OPCODE
1780 E8696 000C         CON(5)  #8C000
           8
1781 E869B 3            CON(1)  3       FILL.MARK
1782 E869C 4            CON(1)  4       FILL.LENGTH
1783            *
1784            *
1785 E869D 10           CON(2)  1       REGISTER TESTS
1786 E869F 4            CON(1)  4       OPCODE MNEMONIC
1787 E86A0 F344         NIBASC  \?D<C  \
           C334
           0202
1788 E86AC 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1789 E86AE 3            CON(1)  3       OPCODE
1790 E86AF 7080         CON(5)  #807
           0
1791 E86B4 2            CON(1)  2       GROUP B
1792 E86B5 0            CON(1)  0
1793            *
1794            *
1795 E86B6 30           CON(2)  3       REGISTER LOGIC
1796 E86B8 5            CON(1)  5       OPCODE MNEMONIC
```

```
1797 E86B9 34D3         NIBASC  \C=C&B \
           3462
           2402
1798 E86C5 50           CON(2)  (F.LSET)!(F.TREE)
1799 E86C7 4            CON(1)  4       OPCODE
1800 E86C8 50E0         CON(5)  #0E05
           0
1801 E86CD 00           CON(2)  0       NO VARIABLES
1802            *
1803            *
1804 E86CF 72           CON(2) 39       PSEUDO-OP
1805 E86D1 6            CON(1) 6        OPCODE MNEMONIC
1806 E86D2 54E4         NIBASC \ENDTXT\
           4445
           8545
1807 E86DE 40           CON(2) (F.TREE)
1808 E86E0 0            CON(1) 0        OPCODE
1809 E86E1 0000         CON(5) #0
           0
1810 E86E6 00           CON(2) 0        NO VARIABLES
1811            *
1812            *
1813 E86E8 00           CON(2) 0        NULL
1814 E86EA 0            CON(1) 0        OPCODE MNEMONIC
1815 E86EB 0202         NIBASC \      \
           0202
           0202
1816 E86F7 40           CON(2) (F.TREE)
1817 E86F9 0            CON(1) 0        OPCODE
1818 E86FA 0000         CON(5) #0
           0
1819 E86FF 00           CON(2) 0        NO VARIABLES
```

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1820                    STITLE  HASH TO GROUP 20
1821 E8701      OPCG20
1822 E8701 C1           CON(2)  28      PSEUDO-OP
1823 E8703 3            CON(1)  3       OPCODE MNEMONIC
1824 E8704 C454         NIBASC  \LEX   \
           8502
           0202
1825 E8710 02           CON(2)  (F.EXPR)
1826 E8712 0            CON(1)  0       OPCODE
1827 E8713 0000         CON(5)  #0
           0
1828 E8718 00           CON(2)  0       NO VARIABLES
1829            *
1830            *
1831 E871A 50           CON(2)  5       FIXED
1832 E871C 4            CON(1)  4       OPCODE MNEMONIC
1833 E871D 4413         NIBASC  \D1=A  \
           D314
           0202
1834 E8729 10           CON(2)  (F.LSET)
1835 E872B 3            CON(1)  3       OPCODE
1836 E872C 1310         CON(5)  #131
           0
1837 E8731 00           CON(2)  0       NO VARIABLES
1838            *
1839            *
1840 E8733 11           CON(2)  17      NIBASC STATEMENT
1841 E8735 6            CON(1)  6       OPCODE MNEMONIC
1842 E8736 E494         NIBASC  \NIBASC\
           2414
           3534
1843 E8742 42           CON(2)  (F.TREE)!(F.EXPR)
1844 E8744 0            CON(1)  0       OPCODE
1845 E8745 0000         CON(5)  #0
           0
1846 E874A 1            CON(1)  1       FILL.MARK
1847 E874B E            CON(1)  14      FILL.LENGTH
1848            *
1849            *
1850 E874C 10           CON(2)  1       REGISTER TESTS
1851 E874E 5            CON(1)  5       OPCODE MNEMONIC
1852 E874F F324         NIBASC  \?B<=C \
           C3D3
           3402
1853 E875B 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1854 E875D 3            CON(1)  3       OPCODE
1855 E875E D080         CON(5)  #80D
           0
1856 E8763 2            CON(1)  2       GROUP B
1857 E8764 0            CON(1)  0
1858            *
1859            *
1860 E8765 20           CON(2)  2       REGISTER ARITHMETIC
1861 E8767 3            CON(1)  3       OPCODE MNEMONIC
1862 E8768 44D3         NIBASC  \D=0   \
```

```
            0302
            0202
 1863 E8774 40          CON(2)  (F.TREE)
 1864 E8776 3           CON(1)  3       OPCODE
 1865 E8777 3000        CON(5)  #003
            0
 1866 E877C 2           CON(1)  2       GROUP D
 1867 E877D 0           CON(1)  0
```

```
1868                    STITLE  HASH TO GROUP 21
1869 E877E      OPCG21
1870 E877E 40           CON(2)  4       BRANCHES
1871 E8780 6            CON(1)  6       OPCODE MNEMONIC
1872 E8781 4403         NIBASC  \D0=(4)\
           D382
           4392
1873 E878D 1B           CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
1874 E878F 6            CON(1)  6       OPCODE
1875 E8790 000A         CON(5)  #1A000
           1
1876 E8795 3            CON(1)  3       FILL.MARK
1877 E8796 4            CON(1)  4       FILL.LENGTH
1878            *
1879            *
1880 E8797 10           CON(2)  1       REGISTER TESTS
1881 E8799 4            CON(1)  4       OPCODE MNEMONIC
1882 E879A F334         NIBASC  \?C>D  \
           E344
           0202
1883 E87A6 30           CON(2)  (F.LSET)!(F.RETY)
1884 E87A8 3            CON(1)  3       OPCODE
1885 E87A9 7080         CON(5)  #807
           0
1886 E87AE 2            CON(1)  2       GROUP B
1887 E87AF 0            CON(1)  0
1888            *
1889            *
1890 E87B0 41           CON(2)  20      EJECT PSEUDO-OP
1891 E87B2 5            CON(1)  5       OPCODE MNEMONIC
1892 E87B3 54A4         NIBASC  \EJECT \
           5434
           4502
1893 E87BF 10           CON(2)  (F.LSET)
1894 E87C1 0            CON(1)  0       OPCODE
1895 E87C2 0000         CON(5)  #0
           0
1896 E87C7 00           CON(2)  0       NO VARIABLES
1897            *
1898            *
1899 E87C9 10           CON(2)  1       REGISTER TESTS
1900 E87CB 4            CON(1)  4       OPCODE MNEMONIC
1901 E87CC F314         NIBASC  \?A>C  \
           E334
           0202
1902 E87D8 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1903 E87DA 3            CON(1)  3       OPCODE
1904 E87DB 6080         CON(5)  #806
           0
1905 E87E0 2            CON(1)  2       GROUP B
1906 E87E1 0            CON(1)  0
1907            *
1908            *
1909 E87E2 20           CON(2)  2       REGISTER ARITHMETIC
1910 E87E4 3            CON(1)  3       OPCODE MNEMONIC
```

```
1911 E87E5 2435        NIBASC  \BSL   \
           C402
           0202
1912 E87F1 40          CON(2)  (F.TREE)
1913 E87F3 3           CON(1)  3       OPCODE
1914 E87F4 1000        CON(5)  #001
           0
1915 E87F9 4           CON(1)  4       GROUP F
1916 E87FA 0           CON(1)  0
1917           *
1918           *
1919 E87FB 20          CON(2)  2       REGISTER ARITHMETIC
1920 E87FD 4           CON(1)  4       OPCODE MNEMONIC
1921 E87FE 4434        NIBASC  \DCEX  \
           5485
           0202
1922 E880A 40          CON(2)  (F.TREE)
1923 E880C 3           CON(1)  3       OPCODE
1924 E880D F000        CON(5)  #00F
           0
1925 E8812 2           CON(1)  2       GROUP D
1926 E8813 0           CON(1)  0
1927           *
1928           *
1929 E8814 00          CON(2)  0       NULL
1930 E8816 0           CON(1)  0       OPCODE MNEMONIC
1931 E8817 0202        NIBASC  \      \
           0202
           0202
1932 E8823 40          CON(2)  (F.TREE)
1933 E8825 0           CON(1)  0       OPCODE
1934 E8826 0000        CON(5)  #0
           0
1935 E882B 00          CON(2)  0       NO VARIABLES
```

```
1936                    STITLE  HASH TO GROUP 22
1937 E882D      OPCG22
1938 E882D 50           CON(2)  5       FIXED
1939 E882F 5            CON(1)  5       OPCODE MNEMONIC
1940 E8830 3444         NIBASC  \CD1EX \
           1354
           8502
1941 E883C 10           CON(2)  (F.LSET)
1942 E883E 3            CON(1)  3       OPCODE
1943 E883F 7310         CON(5)  #137
           0
1944 E8844 00           CON(2)  0       NO VARIABLES
1945            *
1946            *
1947 E8846 50           CON(2)  5       FIXED
1948 E8848 5            CON(1)  5       OPCODE MNEMONIC
1949 E8849 1444         NIBASC  \AD0EX \
           0354
           8502
1950 E8855 10           CON(2)  (F.LSET)
1951 E8857 3            CON(1)  3       OPCODE
1952 E8858 2310         CON(5)  #132
           0
1953 E885D 00           CON(2)  0       NO VARIABLES
1954            *
1955            *
1956 E885F 50           CON(2)  5       FIXED
1957 E8861 4            CON(1)  4       OPCODE MNEMONIC
1958 E8862 E4F4         NIBASC  \NOP5  \
           0553
           0202
1959 E886E 10           CON(2)  (F.LSET)
1960 E8870 5            CON(1)  5       OPCODE
1961 E8871 0004         CON(5)  #64000
           6
1962 E8876 00           CON(2)  0       NO VARIABLES
1963            *
1964            *
1965 E8878 10           CON(2)  1       REGISTER TESTS
1966 E887A 4            CON(1)  4       OPCODE MNEMONIC
1967 E887B F334         NIBASC  \?C>B  \
           E324
           0202
1968 E8887 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
1969 E8889 3            CON(1)  3       OPCODE
1970 E888A 5080         CON(5)  #805
           0
1971 E888F 2            CON(1)  2       GROUP B
1972 E8890 0            CON(1)  0
1973            *
1974            *
1975 E8891 50           CON(2)  5        FIXED
1976 E8893 6            CON(1)  6       OPCODE MNEMONIC
1977 E8894 34D3         NIBASC  \C=RSTK\
           2535
```

```
            45B4
1978 E88A0  50          CON(2)  (F.LSET)!(F.TREE)
1979 E88A2  2           CON(1)  2       OPCODE
1980 E88A3  7000        CON(5)  #07
            0
1981 E88A8  00          CON(2)  0       NO VARIABLES
1982              *
1983              *
1984 E88AA  D0          CON(2)  13      DATA TRANSFER
1985 E88AC  6           CON(1)  6       OPCODE MNEMONIC
1986 E88AD  4414        NIBASC  \DAT1=A\
            4513
            D314
1987 E88B9  42          CON(2)  (F.TREE)!(F.EXPR)
1988 E88BB  4           CON(1)  4       OPCODE
1989 E88BC  0151        CON(5)  #1510
            0
1990 E88C1  00          CON(2)  0       NO VARIABLES
1991              *
1992              *
1993 E88C3  50          CON(2)  5       FIXED
1994 E88C5  6           CON(1)  6       OPCODE MNEMONIC
1995 E88C6  3584        NIBASC  \SHUTDN\
            5545
            44E4
1996 E88D2  50          CON(2)  (F.LSET)!(F.TREE)
1997 E88D4  3           CON(1)  3       OPCODE
1998 E88D5  7080        CON(5)  #807
            0
1999 E88DA  00          CON(2)  0       NO VARIABLES
```

```
2000                    STITLE  HASH TO GROUP 23
2001 E88DC      OPCG23
2002 E88DC 50           CON(2)  5       FIXED
2003 E88DE 5            CON(1)  5       OPCODE MNEMONIC
2004 E88DF 1444         NIBASC  \AD1XS \
           1385
           3502
2005 E88EB 10           CON(2)  (F.LSET)
2006 E88ED 3            CON(1)  3       OPCODE
2007 E88EE B310         CON(5)  #13B
           0
2008 E88F3 00           CON(2)  0       NO VARIABLES
2009               *
2010               *
2011 E88F5 10           CON(2)  1       REGISTER TESTS
2012 E88F7 4            CON(1)  4       OPCODE MNEMONIC
2013 E88F8 F344         NIBASC  \?D#C  \
           3234
           0202
2014 E8904 30           CON(2)  (F.LSET)!(F.RETY)
2015 E8906 3            CON(1)  3       OPCODE
2016 E8907 7080         CON(5)  #807
           0
2017 E890C 1            CON(1)  1       GROUP A
2018 E890D 0            CON(1)  0
2019               *
2020               *
2021 E890E 20           CON(2)  2       REGISTER ARITHMETIC
2022 E8910 3            CON(1)  3       OPCODE MNEMONIC
2023 E8911 3435         NIBASC  \CSL   \
           C402
           0202
2024 E891D 00           CON(2)  0
2025 E891F 3            CON(1)  3       OPCODE
2026 E8920 2000         CON(5)  #002
           0
2027 E8925 4            CON(1)  4       GROUP F
2028 E8926 0            CON(1)  0
2029               *
2030               *
2031 E8927 10           CON(2)  1       REGISTER TESTS
2032 E8929 5            CON(1)  5       OPCODE MNEMONIC
2033 E892A F334         NIBASC  \?C<=B \
           C3D3
           2402
2034 E8936 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2035 E8938 3            CON(1)  3       OPCODE
2036 E8939 9080         CON(5)  #809
           0
2037 E893E 2            CON(1)  2       GROUP B
2038 E893F 0            CON(1)  0
2039               *
2040               *
2041 E8940 30           CON(2)  3       REGISTER LOGIC
2042 E8942 5            CON(1)  5       OPCODE MNEMONIC
```

```
2043 E8943 14D3          NIBASC  \A=A&B \
           1462
           2402
2044 E894F 50            CON(2)  (F.LSET)!(F.TREE)
2045 E8951 4             CON(1)  4       OPCODE
2046 E8952 00E0          CON(5)  #0E00
           0
2047 E8957 00            CON(2)  0       NO VARIABLES
2048             *
2049             *
2050 E8959 30            CON(2)  3       REGISTER LOGIC
2051 E895B 5             CON(1)  5       OPCODE MNEMONIC
2052 E895C 34D3          NIBASC  \C=D&C \
           4462
           3402
2053 E8968 50            CON(2)  (F.LSET)!(F.TREE)
2054 E896A 4             CON(1)  4       OPCODE
2055 E896B 70E0          CON(5)  #0E07
           0
2056 E8970 00            CON(2)  0       NO VARIABLES
2057             *
2058             *
2059 E8972 50            CON(2)  5       FIXED
2060 E8974 4             CON(1)  4       OPCODE MNEMONIC
2061 E8975 E4F4          NIBASC  \NOP3  \
           0533
           0202
2062 E8981 50            CON(2)  (F.LSET)!(F.TREE)
2063 E8983 3             CON(1)  3       OPCODE
2064 E8984 0240          CON(5)  #420
           0
2065 E8989 00            CON(2)  0       NO VARIABLES
```

```
2066                    STITLE  HASH TO GROUP 24
2067 E898B      OPCG24
2068 E898B 02           CON(2)  32      PSEUDO-OP
2069 E898D 5            CON(1)  5       OPCODE MNEMONIC
2070 E898E 54E4         NIBASC  \ENTRY \
           4525
           9502
2071 E899A 12           CON(2)  (F.LSET)!(F.EXPR)
2072 E899C 8            CON(1)  8       OPCODE
2073 E899D 0000         CON(5)  #0
           0
2074 E89A2 00           CON(2)  0       NO VARIABLES
2075            *
2076            *
2077 E89A4 50           CON(2)  5       FIXED
2078 E89A6 5            CON(1)  5       OPCODE MNEMONIC
2079 E89A7 34B2         NIBASC  \C+P+1 \
           05B2
           1302
2080 E89B3 10           CON(2)  (F.LSET)
2081 E89B5 3            CON(1)  3       OPCODE
2082 E89B6 9080         CON(5)  #809
           0
2083 E89BB 00           CON(2)  0       NO VARIABLES
2084            *
2085            *
2086 E89BD 50           CON(2)  5       FIXED
2087 E89BF 3            CON(1)  3       OPCODE MNEMONIC
2088 E89C0 2545         NIBASC  \RTN   \
           E402
           0202
2089 E89CC 50           CON(2)  (F.LSET)!(F.TREE)
2090 E89CE 2            CON(1)  2       OPCODE
2091 E89CF 1000         CON(5)  #01
           0
2092 E89D4 00           CON(2)  0       NO VARIABLES
2093            *
2094            *
2095 E89D6 10           CON(2)  1       REGISTER TESTS
2096 E89D8 4            CON(1)  4       OPCODE MNEMONIC
2097 E89D9 F324         NIBASC  \?B#0  \
           3203
           0202
2098 E89E5 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2099 E89E7 3            CON(1)  3       OPCODE
2100 E89E8 D080         CON(5)  #80D
           0
2101 E89ED 1            CON(1)  1       GROUP A
2102 E89EE 0            CON(1)  0
2103            *
2104            *
2105 E89EF D0           CON(2)  13      DATA TRANSFER
2106 E89F1 6            CON(1)  6       OPCODE MNEMONIC
2107 E89F2 4414         NIBASC  \DAT1=C\
           4513
```

```
            D334
2108 E89FE  42          CON(2)  (F.TREE)!(F.EXPR)
2109 E8A00  4           CON(1)  4       OPCODE
2110 E8A01  0551        CON(5)  #1550
            0
2111 E8A06  00          CON(2)  0       NO VARIABLES
```

```
2112                    STITLE  HASH TO GROUP 25
2113 E8A08      OPCG25
2114 E8A08 40           CON(2)  4       BRANCHES
2115 E8A0A 5            CON(1)  5       OPCODE MNEMONIC
2116 E8A0B C434         NIBASC  \LC(5) \
           8253
           9202
2117 E8A17 1B           CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
2118 E8A19 7            CON(1)  7       OPCODE
2119 E8A1A 0004         CON(5)  #34000
           3
2120 E8A1F 3            CON(1)  3       FILL MARK
2121 E8A20 5            CON(1)  5       FILL LENGTH
2122            *
2123            *
2124 E8A21 31           CON(2)  19      BSS PSEUDO-OP
2125 E8A23 3            CON(1)  3       OPCODE MNEMONIC
2126 E8A24 2435         NIBASC  \BSS   \
           3502
           0202
2127 E8A30 02           CON(2)  (F.EXPR)
2128 E8A32 0            CON(1)  0       OPCODE
2129 E8A33 0000         CON(5)  #0
           0
2130 E8A38 00           CON(2)  0       NO VARIABLES
2131            *
2132            *
2133 E8A3A 50           CON(2)  5       FIXED
2134 E8A3C 5            CON(1)  5       OPCODE MNEMONIC
2135 E8A3D 2545         NIBASC  \RTNCC \
           E434
           3402
2136 E8A49 10           CON(2)  (F.LSET)
2137 E8A4B 2            CON(1)  2       OPCODE
2138 E8A4C 3000         CON(5)  #03
           0
2139 E8A51 00           CON(2)  0       NO VARIABLES
2140            *
2141            *
2142 E8A53 10           CON(2)  1       REGISTER TESTS
2143 E8A55 4            CON(1)  4       OPCODE MNEMONIC
2144 E8A56 F334         NIBASC  \?C=D  \
           D344
           0202
2145 E8A62 30           CON(2)  (F.LSET)!(F.RETY)
2146 E8A64 3            CON(1)  3       OPCODE
2147 E8A65 3080         CON(5)  #803
           0
2148 E8A6A 1            CON(1)  1       GROUP A
2149 E8A6B 0            CON(1)  0
2150            *
2151            *
2152 E8A6C 30           CON(2)  3       REGISTER LOGIC
2153 E8A6E 5            CON(1)  5       OPCODE MNEMONIC
2154 E8A6F 44D3         NIBASC  \D=D&C \
```

```
            4462
            3402
2155 E8A7B  10          CON(2)  (F.LSET)
2156 E8A7D  4           CON(1)  4       OPCODE
2157 E8A7E  30E0        CON(5)  #0E03
            0
2158 E8A83  00          CON(2)  0       NO VARIABLES
2159            *
2160            *
2161 E8A85  40          CON(2)  4       BRANCHES
2162 E8A87  6           CON(1)  6       OPCODE MNEMONIC
2163 E8A88  2554        NIBASC  \REL(3)\
            C482
            3392
2164 E8A94  52          CON(2)  (F.LSET)!(F.TREE)!(F.EXPR)
2165 E8A96  3           CON(1)  3       OPCODE
2166 E8A97  0000        CON(5)  #0
            0
2167 E8A9C  1           CON(1)  1       FILL.MARK
2168 E8A9D  3           CON(1)  3       FILL.LENGTH
2169            *
2170            *
2171 E8A9E  50          CON(2)  5       FIXED
2172 E8AA0  5           CON(1)  5       OPCODE MNEMONIC
2173 E8AA1  2545        NIBASC  \RTNSC \
            E435
            3402
2174 E8AAD  50          CON(2)  (F.LSET)!(F.TREE)
2175 E8AAF  2           CON(1)  2       OPCODE
2176 E8AB0  2000        CON(5)  #02
            0
2177 E8AB5  00          CON(2)  0       NO VARIABLES
2178            *
2179            *
2180 E8AB7  10          CON(2)  1       REGISTER TESTS
2181 E8AB9  4           CON(1)  4       OPCODE MNEMONIC
2182 E8ABA  F314        NIBASC  \?A=C  \
            D334
            0202
2183 E8AC6  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2184 E8AC8  3           CON(1)  3       OPCODE
2185 E8AC9  2080        CON(5)  #802
            0
2186 E8ACE  1           CON(1)  1       GROUP A
2187 E8ACF  0           CON(1)  0
2188            *
2189            *
2190 E8AD0  30          CON(2)  3       REGISTER LOGIC
2191 E8AD2  5           CON(1)  5       OPCODE MNEMONIC
2192 E8AD3  24D3        NIBASC  \B=A&B \
            1462
            2402
2193 E8ADF  50          CON(2)  (F.LSET)!(F.TREE)
2194 E8AE1  4           CON(1)  4       OPCODE
2195 E8AE2  40E0        CON(5)  #0E04
```

```
                0
2196 E8AE7 00           CON(2)  0       NO VARIABLES
2197            *
2198            *
2199 E8AE9 40           CON(2)  4       BRANCHES
2200 E8AEB 6            CON(1)  6       OPCODE MNEMONIC
2201 E8AEC 34F4         NIBASC  \CON(1)\
           E482
           1392
2202 E8AF8 53           CON(2)  (F.LSET)!(F.TREE)!(F.ABSL)!(F.EXPR)
2203 E8AFA 1            CON(1)  1       OPCODE
2204 E8AFB 0000         CON(5)  #0
           0
2205 E8B00 1            CON(1)  1       FILL.MARK
2206 E8B01 1            CON(1)  1       FILL.LENGTH
2207            *
2208            *
2209 E8B02 20           CON(2)  2       REGISTER ARITHMETIC
2210 E8B04 3            CON(1)  3       OPCODE MNEMONIC
2211 E8B05 4435         NIBASC  \DSL   \
           C402
           0202
2212 E8B11 40           CON(2)  (F.TREE)
2213 E8B13 3            CON(1)  3       OPCODE
2214 E8B14 3000         CON(5)  #003
           0
2215 E8B19 4            CON(1)  4       GROUP F
2216 E8B1A 0            CON(1)  0
```

```
2217                    STITLE  HASH TO GROUP 26
2218 E8B1B      OPCG26
2219 E8B1B 50           CON(2)  5       FIXED
2220 E8B1D 5            CON(1)  5       OPCODE MNEMONIC
2221 E8B1E 3444         NIBASC  \CD0EX \
           0354
           8502
2222 E8B2A 10           CON(2)  (F.LSET)
2223 E8B2C 3            CON(1)  3       OPCODE
2224 E8B2D 6310         CON(5)  #136
           0
2225 E8B32 00           CON(2)  0       NO VARIABLES
2226            *
2227            *
2228 E8B34 50           CON(2)  5       FIXED
2229 E8B36 4            CON(1)  4       OPCODE MNEMONIC
2230 E8B37 14D3         NIBASC  \A=R3  \
           2533
           0202
2231 E8B43 10           CON(2)  (F.LSET)
2232 E8B45 3            CON(1)  3       OPCODE
2233 E8B46 3110         CON(5)  #113
           0
2234 E8B4B 00           CON(2)  0       NO VARIABLES
2235            *
2236            *
2237 E8B4D 50           CON(2)  5       FIXED
2238 E8B4F 4            CON(1)  4       OPCODE MNEMONIC
2239 E8B50 2523         NIBASC  \R2=C  \
           D334
           0202
2240 E8B5C 10           CON(2)  (F.LSET)
2241 E8B5E 3            CON(1)  3       OPCODE
2242 E8B5F A010         CON(5)  #10A
           0
2243 E8B64 00           CON(2)  0       NO VARIABLES
2244            *
2245            *
2246 E8B66 10           CON(2)  1       REGISTER TESTS
2247 E8B68 4            CON(1)  4       OPCODE MNEMONIC
2248 E8B69 F334         NIBASC  \?C=B  \
           D324
           0202
2249 E8B75 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2250 E8B77 3            CON(1)  3       OPCODE
2251 E8B78 1080         CON(5)  #801
           0
2252 E8B7D 1            CON(1)  1       GROUP A
2253 E8B7E 0            CON(1)  0
2254            *
2255            *
2256 E8B7F 50           CON(2)  5       FIXED
2257 E8B81 4            CON(1)  4       OPCODE MNEMONIC
2258 E8B82 1435         NIBASC  \ASRB  \
           2524
```

```
           0202
2259 E8B8E 50          CON(2)  (F.LSET)!(F.TREE)
2260 E8B90 3           CON(1)  3       OPCODE
2261 E8B91 C180        CON(5)  #81C
           0
2262 E8B96 00          CON(2)  0       NO VARIABLES
2263            *
2264            *
2265 E8B98 40          CON(2)  4       BRANCHES
2266 E8B9A 5           CON(1)  5       OPCODE MNEMONIC
2267 E8B9B C434        NIBASC  \LC(3) \
           8233
           9202
2268 E8BA7 5B          CON(2)  (F.LSET)!(F.ABSL)!(F.TREE)!(F.EXPR)!(F.PART)
2269 E8BA9 5           CON(1)  5       OPCODE
2270 E8BAA 0002        CON(5)  #32000
           3
2271 E8BAF 3           CON(1)  3       FILL.MARK
2272 E8BB0 3           CON(1)  3       FILL.LENGTH
2273            *
2274            *
2275 E8BB1 00          CON(2)  0       NULL
2276 E8BB3 0           CON(1)  0       OPCODE MNEMONIC
2277 E8BB4 0202        NIBASC  \      \
           0202
           0202
2278 E8BC0 40          CON(2)  (F.TREE)
2279 E8BC2 0           CON(1)  0       OPCODE
2280 E8BC3 0000        CON(5)  #0
           0
2281 E8BC8 00          CON(2)  0       NO VARIABLES
```

```
2282                    STITLE  HASH TO GROUP 27
2283 E8BCA      OPCG27
2284 E8BCA 50           CON(2)  5       FIXED
2285 E8BCC 5            CON(1)  5       OPCODE MNEMONIC
2286 E8BCD 3444         NIBASC  \CD1XS \
           1385
           3502
2287 E8BD9 10           CON(2)  (F.LSET)
2288 E8BDB 3            CON(1)  3       OPCODE
2289 E8BDC F310         CON(5)  #13F
           0
2290 E8BE1 00           CON(2)  0       NO VARIABLES
2291            *
2292            *
2293 E8BE3 50           CON(2)  5       FIXED
2294 E8BE5 5            CON(1)  5       OPCODE MNEMONIC
2295 E8BE6 1425         NIBASC  \AR4EX \
           4354
           8502
2296 E8BF2 10           CON(2)  (F.LSET)
2297 E8BF4 3            CON(1)  3       OPCODE
2298 E8BF5 4210         CON(5)  #124
           0
2299 E8BFA 00           CON(2)  0       NO VARIABLES
2300            *
2301            *
2302 E8BFC 40           CON(2)  4       BRANCHES
2303 E8BFE 5            CON(1)  5       OPCODE MNEMONIC
2304 E8BFF C434         NIBASC  \LC(1) \
           8213
           9202
2305 E8C0B 1B           CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
2306 E8C0D 3            CON(1)  3       OPCODE
2307 E8C0E 0030         CON(5)  #300
           0
2308 E8C13 3            CON(1)  3       FILL.MARK
2309 E8C14 1            CON(1)  1       FILL.LENGTH
2310            *
2311            *
2312 E8C15 50           CON(2)  5       FIXED
2313 E8C17 4            CON(1)  4       OPCODE MNEMONIC
2314 E8C18 14D3         NIBASC  \A=R1  \
           2513
           0202
2315 E8C24 10           CON(2)  (F.LSET)
2316 E8C26 3            CON(1)  3       OPCODE
2317 E8C27 1110         CON(5)  #111
           0
2318 E8C2C 00           CON(2)  0       NO VARIABLES
2319            *
2320            *
2321 E8C2E 20           CON(2)  2       REGISTER ARITHMETIC
2322 E8C30 3            CON(1)  3       OPCODE MNEMONIC
2323 E8C31 1435         NIBASC  \ASR   \
           2502
```

```
            0202
2324 E8C3D 40          CON(2)  (F.TREE)
2325 E8C3F 3           CON(1)  3       OPCODE
2326 E8C40 4000        CON(5)  #004
            0
2327 E8C45 4           CON(1)  4       GROUP F
2328 E8C46 0           CON(1)  0
2329            *
2330            *
2331 E8C47 50          CON(2)  5       FIXED
2332 E8C49 6           CON(1)  6       OPCODE MNEMONIC
2333 E8C4A 34C4        NIBASC  \CLRHST\
            2584
            3545
2334 E8C56 50          CON(2)  (F.LSET)!(F.TREE)
2335 E8C58 3           CON(1)  3       OPCODE
2336 E8C59 F280        CON(5)  #82F
            0
2337 E8C5E 00          CON(2)  0       NO VARIABLES
2338            *
2339            *
2340 E8C60 50          CON(2)  5       FIXED
2341 E8C62 4           CON(1)  4       OPCODE MNEMONIC
2342 E8C63 2523        NIBASC  \R2=A  \
            D314
            0202
2343 E8C6F 50          CON(2)  (F.LSET)!(F.TREE)
2344 E8C71 3           CON(1)  3       OPCODE
2345 E8C72 2010        CON(5)  #102
            0
2346 E8C77 00          CON(2)  0       NO VARIABLES
2347            *
2348            *
2349 E8C79 10          CON(2)  1       REGISTER TESTS
2350 E8C7B 4           CON(1)  4       OPCODE MNEMONIC
2351 E8C7C F334        NIBASC  \?C=0  \
            D303
            0202
2352 E8C88 70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2353 E8C8A 3           CON(1)  3       OPCODE
2354 E8C8B A080        CON(5)  #80A
            0
2355 E8C90 1           CON(1)  1       GROUP A
2356 E8C91 0           CON(1)  0
2357            *
2358            *
2359 E8C92 50          CON(2)  5       FIXED
2360 E8C94 5           CON(1)  5       OPCODE MNEMONIC
2361 E8C95 1444        NIBASC  \AD0XS \
            0385
            3502
2362 E8CA1 50          CON(2)  (F.LSET)!(F.TREE)
2363 E8CA3 3           CON(1)  3       OPCODE
2364 E8CA4 A310        CON(5)  #13A
            0
```

```
2365 E8CA9 00          CON(2)  0       NO VARIABLES
```

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2366                    STITLE  HASH TO GROUP 28
2367 E8CAB      OPCG28
2368 E8CAB 01           CON(2)  16      Dx=HEX INSTRUCTIONS
2369 E8CAD 6            CON(1)  6       OPCODE MNEMONIC
2370 E8CAE 4403         NIBASC  \D0=HEX\
           D384
           5485
2371 E8CBA 10           CON(2)  (F.LSET)
2372 E8CBC 4            CON(1)  4       OPCODE
2373 E8CBD 0091         CON(5)  #1900
           0
2374 E8CC2 3            CON(1)  3       FILL.MARK
2375 E8CC3 2            CON(1)  2       FILL.LENGTH
2376              *
2377              *
2378 E8CC4 62           CON(2)  38      CHAIN
2379 E8CC6 5            CON(1)  5       OPCODE MNEMONIC
2380 E8CC7 3484         NIBASC  \CHAIN \
           1494
           E402
2381 E8CD3 12           CON(2)  (F.LSET)!(F.EXPR)
2382 E8CD5 C            CON(1)  12      OPCODE
2383 E8CD6 0000         CON(5)  #0
           0
2384 E8CDB 00           CON(2)  0       NO VARIABLES
2385              *
2386              *
2387 E8CDD 40           CON(2)  4       BRANCHES
2388 E8CDF 5            CON(1)  5       OPCODE MNEMONIC
2389 E8CE0 74F4         NIBASC  \GOSUB \
           3555
           2402
2390 E8CEC 56           CON(2)  (F.LSET)!(F.TREE)!(F.EXPR)!(F.GSUB)
2391 E8CEE 4            CON(1)  4       OPCODE
2392 E8CEF 0007         CON(5)  #7000
           0
2393 E8CF4 2            CON(1)  2       FILL.MARK
2394 E8CF5 3            CON(1)  3       FILL.LENGTH
2395              *
2396              *
2397 E8CF6 50           CON(2)  5       FIXED
2398 E8CF8 4            CON(1)  4       OPCODE MNEMONIC
2399 E8CF9 2435         NIBASC  \BSRB  \
           2524
           0202
2400 E8D05 50           CON(2)  (F.LSET)!(F.TREE)
2401 E8D07 3            CON(1)  3       OPCODE
2402 E8D08 D180         CON(5)  #81D
           0
2403 E8D0D 00           CON(2)  0       NO VARIABLES
2404              *
2405              *
2406 E8D0F 50           CON(2)  5       FIXED
2407 E8D11 6            CON(1)  6       OPCODE MNEMONIC
2408 E8D12 34F4         NIBASC  \CONFIG\
```

```
            E464
            9474
   2409 E8D1E 50          CON(2)  (F.LSET)!(F.TREE)
   2410 E8D20 3           CON(1)  3       OPCODE
   2411 E8D21 5080        CON(5)  #805
            0
   2412 E8D26 00          CON(2)  0       NO VARIABLES
```

```
2413                    STITLE  HASH TO GROUP 29
2414 E8D28      OPCG29
2415 E8D28 20           CON(2)  2       REGISTER ARITHMETIC
2416 E8D2A 3            CON(1)  3       OPCODE MNEMONIC
2417 E8D2B 2435         NIBASC  \BSR   \
           2502
           0202
2418 E8D37 00           CON(2)  0
2419 E8D39 3            CON(1)  3       OPCODE
2420 E8D3A 5000         CON(5)  #005
           0
2421 E8D3F 4            CON(1)  4       GROUP F
2422 E8D40 0            CON(1)  0
2423            *
2424            *
2425 E8D41 10           CON(2)  1       REGISTER TESTS
2426 E8D43 4            CON(1)  4       OPCODE MNEMONIC
2427 E8D44 F334         NIBASC  \?C<D  \
           C344
           0202
2428 E8D50 30           CON(2)  (F.LSET)!(F.RETY)
2429 E8D52 3            CON(1)  3       OPCODE
2430 E8D53 3080         CON(5)  #803
           0
2431 E8D58 2            CON(1)  2       GROUP B
2432 E8D59 0            CON(1)  0
2433            *
2434            *
2435 E8D5A 40           CON(2)  4       BRANCHES
2436 E8D5C 6            CON(1)  6       OPCODE MNEMONIC
2437 E8D5D 4403         NIBASC  \D0=(5)\
           D382
           5392
2438 E8D69 1B           CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
2439 E8D6B 7            CON(1)  7       OPCODE
2440 E8D6C 000B         CON(5)  #1B000
           1
2441 E8D71 3            CON(1)  3       FILL.MARK
2442 E8D72 5            CON(1)  5       FILL.LENGTH
2443            *
2444            *
2445 E8D73 10           CON(2)  1       REGISTER TESTS
2446 E8D75 4            CON(1)  4       OPCODE MNEMONIC
2447 E8D76 F314         NIBASC  \?A<C  \
           C334
           0202
2448 E8D82 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2449 E8D84 3            CON(1)  3       OPCODE
2450 E8D85 2080         CON(5)  #802
           0
2451 E8D8A 2            CON(1)  2       GROUP B
2452 E8D8B 0            CON(1)  0
2453            *
2454            *
2455 E8D8C 30           CON(2)  3       REGISTER LOGIC
```

```
2456 E8D8E 5          CON(1)  5       OPCODE MNEMONIC
2457 E8D8F 24D3       NIBASC  \B=B&C \
           2462
           3402
2458 E8D9B 50         CON(2)  (F.LSET)!(F.TREE)
2459 E8D9D 4          CON(1)  4       OPCODE
2460 E8D9E 10E0       CON(5)  #0E01
           0
2461 E8DA3 00         CON(2)  0       NO VARIABLES
2462           *
2463           *
2464 E8DA5 A0         CON(2)  10      SET POINTER
2465 E8DA7 4          CON(1)  4       OPCODE MNEMONIC
2466 E8DA8 3405       NIBASC  \CPEX  \
           5485
           0202
2467 E8DB4 52         CON(2)  (F.LSET)!(F.TREE)!(F.EXPR)
2468 E8DB6 4          CON(1)  4       OPCODE
2469 E8DB7 0F08       CON(5)  #80F0
           0
2470 E8DBC 00         CON(2)  0       NO VARIABLES
2471           *
2472           *
2473 E8DBE 00         CON(2)  0       NULL
2474 E8DC0 0          CON(1)  0       OPCODE MNEMONIC
2475 E8DC1 0202       NIBASC  \      \
           0202
           0202
2476 E8DCD 40         CON(2)  (F.TREE)
2477 E8DCF 0          CON(1)  0       OPCODE
2478 E8DD0 0000       CON(5)  #0
           0
2479 E8DD5 00         CON(2)  0       NO VARIABLES
```

```
2480                    STITLE  HASH TO GROUP 30
2481 E8DD7      OPCG30
2482 E8DD7 20           CON(2)  2       REGISTER ARITHMETIC
2483 E8DD9 4            CON(1)  4       OPCODE MNEMONIC
2484 E8DDA 3444         NIBASC  \CDEX  \
           5485
           0202
2485 E8DE6 00           CON(2)  0
2486 E8DE8 3            CON(1)  3       OPCODE
2487 E8DE9 F000         CON(5)  #00F
           0
2488 E8DEE 2            CON(1)  2       GROUP D
2489 E8DEF 0            CON(1)  0
2490               *
2491               *
2492 E8DF0 20           CON(2)  2       REGISTER ARITHMETIC
2493 E8DF2 5            CON(1)  5       OPCODE MNEMONIC
2494 E8DF3 14D3         NIBASC  \A=C+A \
           34B2
           1402
2495 E8DFF 00           CON(2)  0
2496 E8E01 3            CON(1)  3       OPCODE
2497 E8E02 A000         CON(5)  #00A
           0
2498 E8E07 1            CON(1)  1       GROUP C
2499 E8E08 0            CON(1)  0
2500               *
2501               *
2502 E8E09 B0           CON(2)  11      SET STATUS
2503 E8E0B 4            CON(1)  4       OPCODE MNEMONIC
2504 E8E0C 3545         NIBASC  \ST=0  \
           D303
           0202
2505 E8E18 12           CON(2)  (F.LSET)!(F.EXPR)
2506 E8E1A 3            CON(1)  3       OPCODE
2507 E8E1B 0480         CON(5)  #840
           0
2508 E8E20 00           CON(2)  0       NO VARIABLES
2509               *
2510               *
2511 E8E22 10           CON(2)  1       REGISTER TESTS
2512 E8E24 4            CON(1)  4       OPCODE MNEMONIC
2513 E8E25 F334         NIBASC  \?C<B  \
           C324
           0202
2514 E8E31 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2515 E8E33 3            CON(1)  3       OPCODE
2516 E8E34 1080         CON(5)  #801
           0
2517 E8E39 2            CON(1)  2       GROUP B
2518 E8E3A 0            CON(1)  0
2519               *
2520               *
2521 E8E3B 50           CON(2)  5       FIXED
2522 E8E3D 4            CON(1)  4       OPCODE MNEMONIC
```

```
2523 E8E3E 34D3          NIBASC  \C=R3  \
           2533
           0202
2524 E8E4A 50            CON(2)  (F.LSET)!(F.TREE)
2525 E8E4C 3             CON(1)  3       OPCODE
2526 E8E4D B110          CON(5)  #11B
           0
2527 E8E52 00            CON(2)  0       NO VARIABLES
2528             *
2529             *
2530 E8E54 50            CON(2)  5       FIXED
2531 E8E56 4             CON(1)  4       OPCODE MNEMONIC
2532 E8E57 3435          NIBASC  \CSRB  \
           2524
           0202
2533 E8E63 50            CON(2)  (F.LSET)!(F.TREE)
2534 E8E65 3             CON(1)  3       OPCODE
2535 E8E66 E180          CON(5)  #81E
           0
2536 E8E6B 00            CON(2)  0       NO VARIABLES
2537             *
2538             *
2539 E8E6D 50            CON(2)  5       FIXED
2540 E8E6F 6             CON(1)  6       OPCODE MNEMONIC
2541 E8E70 55E4          NIBASC  \UNCNFG\
           34E4
           6474
2542 E8E7C 50            CON(2)  (F.LSET)!(F.TREE)
2543 E8E7E 3             CON(1)  3       OPCODE
2544 E8E7F 4080          CON(5)  #804
           0
2545 E8E84 00            CON(2)  0       NO VARIABLES
```

```
2546                    STITLE  HASH TO GROUP 31
2547 E8E86      OPCG31
2548 E8E86 50           CON(2)  5       FIXED
2549 E8E88 5            CON(1)  5       OPCODE MNEMONIC
2550 E8E89 3444         NIBASC  \CD0XS \
           0385
           3502
2551 E8E95 10           CON(2)  (F.LSET)
2552 E8E97 3            CON(1)  3       OPCODE
2553 E8E98 E310         CON(5)  #13E
           0
2554 E8E9D 00           CON(2)  0       NO VARIABLES
2555            *
2556            *
2557 E8E9F 50           CON(2)  5       FIXED
2558 E8EA1 5            CON(1)  5       OPCODE MNEMONIC
2559 E8EA2 1425         NIBASC  \AR3EX \
           3354
           8502
2560 E8EAE 10           CON(2)  (F.LSET)
2561 E8EB0 3            CON(1)  3       OPCODE
2562 E8EB1 3210         CON(5)  #123
           0
2563 E8EB6 00           CON(2)  0       NO VARIABLES
2564            *
2565            *
2566 E8EB8 20           CON(2)  2       REGISTER ARITHMETIC
2567 E8EBA 3            CON(1)  3       OPCODE MNEMONIC
2568 E8EBB 3435         NIBASC  \CSR   \
           2502
           0202
2569 E8EC7 00           CON(2)  0
2570 E8EC9 3            CON(1)  3       OPCODE
2571 E8ECA 6000         CON(5)  #006
           0
2572 E8ECF 4            CON(1)  4       GROUP F
2573 E8ED0 0            CON(1)  0
2574            *
2575            *
2576 E8ED1 30           CON(2)  3       REGISTER LOGIC
2577 E8ED3 5            CON(1)  5       OPCODE MNEMONIC
2578 E8ED4 14D3         NIBASC  \A=A&C \
           1462
           3402
2579 E8EE0 10           CON(2)  (F.LSET)
2580 E8EE2 4            CON(1)  4       OPCODE
2581 E8EE3 60E0         CON(5)  #0E06
           0
2582 E8EE8 00           CON(2)  0       NO VARIABLES
2583            *
2584            *
2585 E8EEA 50           CON(2)  5       FIXED
2586 E8EEC 4            CON(1)  4       OPCODE MNEMONIC
2587 E8EED 34D3         NIBASC  \C=R1  \
           2513
```

```
            0202
2588 E8EF9  10          CON(2)  (F.LSET)
2589 E8EFB  3           CON(1)  3       OPCODE
2590 E8EFC  9110        CON(5)  #119
            0
2591 E8F01  00          CON(2)  0       NO VARIABLES
2592              *
2593              *
2594 E8F03  50          CON(2)  5       FIXED
2595 E8F05  5           CON(1)  5       OPCODE MNEMONIC
2596 E8F06  3425        NIBASC  \CR4EX \
            4354
            8502
2597 E8F12  50          CON(2)  (F.LSET)!(F.TREE)
2598 E8F14  3           CON(1)  3       OPCODE
2599 E8F15  C210        CON(5)  #12C
            0
2600 E8F1A  00          CON(2)  0       NO VARIABLES
2601              *
2602              *
2603 E8F1C  20          CON(2)  2       REGISTER ARITHMETIC
2604 E8F1E  5           CON(1)  5       OPCODE MNEMONIC
2605 E8F1F  44D3        NIBASC  \D=D-1 \
            44D2
            1302
2606 E8F2B  40          CON(2)  (F.TREE)
2607 E8F2D  3           CON(1)  3       OPCODE
2608 E8F2E  F000        CON(5)  #00F
            0
2609 E8F33  1           CON(1)  1       GROUP C
2610 E8F34  0           CON(1)  0
2611              *
2612              *
2613 E8F35  10          CON(2)  1       REGISTER TESTS
2614 E8F37  5           CON(1)  5       OPCODE MNEMONIC
2615 E8F38  F334        NIBASC  \?C>=D \
            E3D3
            4402
2616 E8F44  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2617 E8F46  3           CON(1)  3       OPCODE
2618 E8F47  F080        CON(5)  #80F
            0
2619 E8F4C  2           CON(1)  2       GROUP B
2620 E8F4D  0           CON(1)  0
2621              *
2622              *
2623 E8F4E  30          CON(2)  3       REGISTER LOGIC
2624 E8F50  5           CON(1)  5       OPCODE MNEMONIC
2625 E8F51  14D3        NIBASC  \A=C!A \
            3412
            1402
2626 E8F5D  50          CON(2)  (F.LSET)!(F.TREE)
2627 E8F5F  4           CON(1)  4       OPCODE
2628 E8F60  E0E0        CON(5)  #0E0E
            0
```

```
2629 E8F65 00          CON(2)  0       NO VARIABLES
2630           *
2631           *
2632 E8F67 30          CON(2)  3       REGISTER LOGIC
2633 E8F69 5           CON(1)  5       OPCODE MNEMONIC
2634 E8F6A 34D3        NIBASC  \C=B&C \
           2462
           3402
2635 E8F76 50          CON(2)  (F.LSET)!(F.TREE)
2636 E8F78 4           CON(1)  4       OPCODE
2637 E8F79 50E0        CON(5)  #0E05
           0
2638 E8F7E 00          CON(2)  0       NO VARIABLES
2639           *
2640           *
2641 E8F80 00          CON(2)  0       NULL
2642 E8F82 0           CON(1)  0       OPCODE MNEMONIC
2643 E8F83 0202        NIBASC  \      \
           0202
           0202
2644 E8F8F 40          CON(2)  (F.TREE)
2645 E8F91 0           CON(1)  0       OPCODE
2646 E8F92 0000        CON(5)  #0
           0
2647 E8F97 00          CON(2)  0       NO VARIABLES
```

```
2648                    STITLE  HASH TO GROUP 32
2649 E8F99      OPCG32
2650 E8F99 20           CON(2)  2       REGISTER ARITHMETIC
2651 E8F9B 5            CON(1)  5       OPCODE MNEMONIC
2652 E8F9C 44D3         NIBASC  \D=D+1 \
           44B2
           1302
2653 E8FA8 00           CON(2)  0
2654 E8FAA 3            CON(1)  3       OPCODE
2655 E8FAB 7000         CON(5)  #007
           0
2656 E8FB0 3            CON(1)  3       GROUP E
2657 E8FB1 0            CON(1)  0
2658            *
2659            *
2660 E8FB2 C0           CON(2)  12      DATA POINTER ARITHMETIC
2661 E8FB4 6            CON(1)  6       OPCODE MNEMONIC
2662 E8FB5 4403         NIBASC  \D0=D0+\
           D344
           03B2
2663 E8FC1 12           CON(2)  (F.LSET)!(F.EXPR)
2664 E8FC3 3            CON(1)  3       OPCODE
2665 E8FC4 0610         CON(5)  #160
           0
2666 E8FC9 00           CON(2)  0       NO VARIABLES
2667            *
2668            *
2669 E8FCB 40           CON(2)  4       BRANCHES
2670 E8FCD 6            CON(1)  6       OPCODE MNEMONIC
2671 E8FCE 74F4         NIBASC  \GOSUBL\
           3555
           24C4
2672 E8FDA 16           CON(2)  (F.LSET)!(F.EXPR)!(F.GSUB)
2673 E8FDC 6            CON(1)  6       OPCODE
2674 E8FDD 000E         CON(5)  #8E000
           8
2675 E8FE2 3            CON(1)  3       FILL.MARK
2676 E8FE3 4            CON(1)  4       FILL.LENGTH
2677            *
2678            *
2679 E8FE4 50           CON(2)  5       FIXED
2680 E8FE6 5            CON(1)  5       OPCODE MNEMONIC
2681 E8FE7 4403         NIBASC  \D0=CS \
           D334
           3502
2682 E8FF3 10           CON(2)  (F.LSET)
2683 E8FF5 3            CON(1)  3       OPCODE
2684 E8FF6 C310         CON(5)  #13C
           0
2685 E8FFB 00           CON(2)  0       NO VARIABLES
2686            *
2687            *
2688 E8FFD 40           CON(2)  4       BRANCHES
2689 E8FFF 6            CON(1)  6       OPCODE MNEMONIC
2690 E9000 4413         NIBASC  \D1=(4)\
```

```
            D382
            4392
2691 E900C  5B          CON(2)  (F.LSET)!(F.ABSL)!(F.TREE)!(F.EXPR)!(F.PART)
2692 E900E  6           CON(1)  6       OPCODE
2693 E900F  000E        CON(5)  #1E000
            1
2694 E9014  3           CON(1)  3       FILL.MARK
2695 E9015  4           CON(1)  4       FILL.LENGTH
2696            *
2697            *
2698 E9016  50          CON(2)  5       FIXED
2699 E9018  4           CON(1)  4       OPCODE MNEMONIC
2700 E9019  4435        NIBASC  \DSRB  \
            2524
            0202
2701 E9025  50          CON(2)  (F.LSET)!(F.TREE)
2702 E9027  3           CON(1)  3       OPCODE
2703 E9028  F180        CON(5)  #81F
            0
2704 E902D  00          CON(2)  0       NO VARIABLES
2705            *
2706            *
2707 E902F  50          CON(2)  5       FIXED
2708 E9031  5           CON(1)  5       OPCODE MNEMONIC
2709 E9032  94E4        NIBASC  \INTON \
            45F4
            E402
2710 E903E  50          CON(2)  (F.LSET)!(F.TREE)
2711 E9040  4           CON(1)  4       OPCODE
2712 E9041  0808        CON(5)  #8080
            0
2713 E9046  00          CON(2)  0       NO VARIABLES
2714            *
2715            *
2716 E9048  10          CON(2)  1       REGISTER TESTS
2717 E904A  4           CON(1)  4       OPCODE MNEMONIC
2718 E904B  F324        NIBASC  \?B>C  \
            E334
            0202
2719 E9057  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2720 E9059  3           CON(1)  3       OPCODE
2721 E905A  1080        CON(5)  #801
            0
2722 E905F  2           CON(1)  2       GROUP B
2723 E9060  0           CON(1)  0
2724            *
2725            *
2726 E9061  00          CON(2)  0       NULL
2727 E9063  0           CON(1)  0       OPCODE MNEMONIC
2728 E9064  0202        NIBASC  \      \
            0202
            0202
2729 E9070  40          CON(2)  (F.TREE)
2730 E9072  0           CON(1)  0       OPCODE
2731 E9073  0000        CON(5)  #0
```

```
                0
  2732 E9078 00          CON(2)  0       NO VARIABLES
```

```
2733                    STITLE  HASH TO GROUP 33
2734 E907A      OPCG33
2735 E907A 50           CON(2)  5       FIXED
2736 E907C 5            CON(1)  5       OPCODE MNEMONIC
2737 E907D 4403         NIBASC  \D0=AS \
           D314
           3502
2738 E9089 10           CON(2)  (F.LSET)
2739 E908B 3            CON(1)  3       OPCODE
2740 E908C 8310         CON(5)  #138
           0
2741 E9091 00           CON(2)  0       NO VARIABLES
2742               *
2743               *
2744 E9093 20           CON(2)  2       REGISTER ARITHMETIC
2745 E9095 5            CON(1)  5       OPCODE MNEMONIC
2746 E9096 14D3         NIBASC  \A=B-A \
           24D2
           1402
2747 E90A2 00           CON(2)  0
2748 E90A4 3            CON(1)  3       OPCODE
2749 E90A5 C000         CON(5)  #00C
           0
2750 E90AA 3            CON(1)  3       GROUP E
2751 E90AB 0            CON(1)  0
2752               *
2753               *
2754 E90AC 50           CON(2)  5       FIXED
2755 E90AE 4            CON(1)  4       OPCODE MNEMONIC
2756 E90AF D405         NIBASC  \MP=0  \
           D303
           0202
2757 E90BB 10           CON(2)  (F.LSET)
2758 E90BD 3            CON(1)  3       OPCODE
2759 E90BE 8280         CON(5)  #828
           0
2760 E90C3 00           CON(2)  0       NO VARIABLES
2761               *
2762               *
2763 E90C5 10           CON(2)  1       REGISTER TESTS
2764 E90C7 4            CON(1)  4       OPCODE MNEMONIC
2765 E90C8 F324         NIBASC  \?B>A  \
           E314
           0202
2766 E90D4 30           CON(2)  (F.LSET)!(F.RETY)
2767 E90D6 3            CON(1)  3       OPCODE
2768 E90D7 4080         CON(5)  #804
           0
2769 E90DC 2            CON(1)  2       GROUP B
2770 E90DD 0            CON(1)  0
2771               *
2772               *
2773 E90DE 20           CON(2)  2       REGISTER ARITHMETIC
2774 E90E0 5            CON(1)  5       OPCODE MNEMONIC
2775 E90E1 34D3         NIBASC  \C=C-A \
```

```
            34D2
            1402
2776 E90ED  00          CON(2)  0
2777 E90EF  3           CON(1)  3       OPCODE
2778 E90F0  2000        CON(5)  #002
            0
2779 E90F5  3           CON(1)  3       GROUP E
2780 E90F6  0           CON(1)  0
2781            *
2782            *
2783 E90F7  20          CON(2)  2       REGISTER ARITHMETIC
2784 E90F9  3           CON(1)  3       OPCODE MNEMONIC
2785 E90FA  4435        NIBASC  \DSR   \
            2502
            0202
2786 E9106  40          CON(2)  (F.TREE)
2787 E9108  3           CON(1)  3       OPCODE
2788 E9109  7000        CON(5)  #007
            0
2789 E910E  4           CON(1)  4       GROUP F
2790 E910F  0           CON(1)  0
2791            *
2792            *
2793 E9110  40          CON(2)  4       BRANCHES
2794 E9112  6           CON(1)  6       OPCODE MNEMONIC
2795 E9113  2554        NIBASC  \REL(4)\
            C482
            4392
2796 E911F  52          CON(2)  (F.LSET)!(F.TREE)!(F.EXPR)
2797 E9121  4           CON(1)  4       OPCODE
2798 E9122  0000        CON(5)  #0
            0
2799 E9127  1           CON(1)  1       FILL.MARK
2800 E9128  4           CON(1)  4       FILL.LENGTH
2801            *
2802            *
2803 E9129  10          CON(2)  1       REGISTER TESTS
2804 E912B  4           CON(1)  4       OPCODE MNEMONIC
2805 E912C  F314        NIBASC  \?A#C  \
            3234
            0202
2806 E9138  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2807 E913A  3           CON(1)  3       OPCODE
2808 E913B  6080        CON(5)  #806
            0
2809 E9140  1           CON(1)  1       GROUP A
2810 E9141  0           CON(1)  0
2811            *
2812            *
2813 E9142  10          CON(2)  1       REGISTER TESTS
2814 E9144  4           CON(1)  4       OPCODE MNEMONIC
2815 E9145  F334        NIBASC  \?C#D  \
            3244
            0202
2816 E9151  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
```

```
2817 E9153 3           CON(1)  3       OPCODE
2818 E9154 7080        CON(5)  #807
           0
2819 E9159 1           CON(1)  1       GROUP A
2820 E915A 0           CON(1)  0
2821           *
2822           *
2823 E915B 20          CON(2)  2       REGISTER ARITHMETIC
2824 E915D 5           CON(1)  5       OPCODE MNEMONIC
2825 E915E 34D3        NIBASC  \C=C-1 \
           34D2
           1302
2826 E916A 40          CON(2)  (F.TREE)
2827 E916C 3           CON(1)  3       OPCODE
2828 E916D E000        CON(5)  #00E
           0
2829 E9172 1           CON(1)  1       GROUP C
2830 E9173 0           CON(1)  0
2831           *
2832           *
2833 E9174 40          CON(2)  4       BRANCHES
2834 E9176 6           CON(1)  6       OPCODE MNEMONIC
2835 E9177 34F4        NIBASC  \CON(2)\
           E482
           2392
2836 E9183 53          CON(2)  (F.LSET)!(F.TREE)!(F.ABSL)!(F.EXPR)
2837 E9185 2           CON(1)  2       OPCODE
2838 E9186 0000        CON(5)  #0
           0
2839 E918B 1           CON(1)  1       FILL.MARK
2840 E918C 2           CON(1)  2       FILL.LENGTH
```

```
2841                    STITLE  HASH TO GROUP 34
2842 E918D      OPCG34
2843 E918D 20           CON(2)  2       REGISTER ARITHMETIC
2844 E918F 5            CON(1)  5       OPCODE MNEMONIC
2845 E9190 34D3         NIBASC  \C=C+1 \
           34B2
           1302
2846 E919C 00           CON(2)  0
2847 E919E 3            CON(1)  3       OPCODE
2848 E919F 6000         CON(5)  #006
           0
2849 E91A4 3            CON(1)  3       GROUP E
2850 E91A5 0            CON(1)  0
2851            *
2852            *
2853 E91A6 20           CON(2)  2       REGISTER ARITHMETIC
2854 E91A8 5            CON(1)  5       OPCODE MNEMONIC
2855 E91A9 14D3         NIBASC  \A=B+A \
           24B2
           1402
2856 E91B5 00           CON(2)  0
2857 E91B7 3            CON(1)  3       OPCODE
2858 E91B8 0000         CON(5)  #000
           0
2859 E91BD 1            CON(1)  1       GROUP A
2860 E91BE 0            CON(1)  0
2861            *
2862            *
2863 E91BF C0           CON(2)  12      DATA POINTER ARITHMETIC
2864 E91C1 6            CON(1)  6       OPCODE MNEMONIC
2865 E91C2 4403         NIBASC  \D0=D0-\
           D344
           03D2
2866 E91CE 12           CON(2)  (F.LSET)!(F.EXPR)
2867 E91D0 3            CON(1)  3       OPCODE
2868 E91D1 0810         CON(5)  #180
           0
2869 E91D6 00           CON(2)  0       NO VARIABLES
2870            *
2871            *
2872 E91D8 10           CON(2)  1       REGISTER TESTS
2873 E91DA 5            CON(1)  5       OPCODE MNEMONIC
2874 E91DB F344         NIBASC  \?D>=C \
           E3D3
           3402
2875 E91E7 30           CON(2)  (F.LSET)!(F.RETY)
2876 E91E9 3            CON(1)  3       OPCODE
2877 E91EA B080         CON(5)  #80B
           0
2878 E91EF 2            CON(1)  2       GROUP B
2879 E91F0 0            CON(1)  0
2880            *
2881            *
2882 E91F1 42           CON(2)  36      PSEUDO-OP
2883 E91F3 3            CON(1)  3       OPCODE MNEMONIC
```

```
2884 E91F4 2494          NIBASC  \BIN   \
           E402
           0202
2885 E9200 42            CON(2)  (F.TREE)!(F.EXPR)
2886 E9202 0             CON(1)  0       OPCODE
2887 E9203 0000          CON(5)  #0
           0
2888 E9208 00            CON(2)  0       NO VARIABLES
2889            *
2890            *
2891 E920A 20            CON(2)  2       REGISTER ARITHMETIC
2892 E920C 5             CON(1)  5       OPCODE MNEMONIC
2893 E920D 34D3          NIBASC  \C=C+A \
           34B2
           1402
2894 E9219 40            CON(2)  (F.TREE)
2895 E921B 3             CON(1)  3       OPCODE
2896 E921C 2000          CON(5)  #002
           0
2897 E9221 1             CON(1)  1       GROUP C
2898 E9222 0             CON(1)  0
2899            *
2900            *
2901 E9223 40            CON(2)  4       BRANCHES
2902 E9225 6             CON(1)  6       OPCODE MNEMONIC
2903 E9226 74F4          NIBASC  \GOVLNG\
           65C4
           E474
2904 E9232 53            CON(2)  (F.LSET)!(F.TREE)!(F.ABSL)!(F.EXPR)
2905 E9234 7             CON(1)  7       OPCODE
2906 E9235 000D          CON(5)  #8D000
           8
2907 E923A 3             CON(1)  3       FILL.MARK
2908 E923B 5             CON(1)  5       FILL.LENGTH
2909            *
2910            *
2911 E923C 10            CON(2)  1       REGISTER TESTS
2912 E923E 4             CON(1)  4       OPCODE MNEMONIC
2913 E923F F334          NIBASC  \?C#B  \
           3224
           0202
2914 E924B 70            CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2915 E924D 3             CON(1)  3       OPCODE
2916 E924E 5080          CON(5)  #805
           0
2917 E9253 1             CON(1)  1       GROUP A
2918 E9254 0             CON(1)  0
2919            *
2920            *
2921 E9255 00            CON(2)  0       NULL
2922 E9257 0             CON(1)  0       OPCODE MNEMONIC
2923 E9258 0202          NIBASC  \      \
           0202
           0202
2924 E9264 40            CON(2)  (F.TREE)
```

```
2925 E9266 0            CON(1)  0       OPCODE
2926 E9267 0000         CON(5)  #0
           0
2927 E926C 00           CON(2)  0       NO VARIABLES
```

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```
2928                    STITLE  HASH TO GROUP 35
2929 E926E      OPCG35
2930 E926E 30           CON(2)  3       REGISTER LOGIC
2931 E9270 5            CON(1)  5       OPCODE MNEMONIC
2932 E9271 34D3         NIBASC  \C=C!A \
           3412
           1402
2933 E927D 10           CON(2)  (F.LSET)
2934 E927F 4            CON(1)  4       OPCODE
2935 E9280 A0E0         CON(5)  #0E0A
           0
2936 E9285 00           CON(2)  0       NO VARIABLES
2937            *
2938            *
2939 E9287 20           CON(2)  2       REGISTER ARITHMETIC
2940 E9289 5            CON(1)  5       OPCODE MNEMONIC
2941 E928A 24D3         NIBASC  \B=B-1 \
           24D2
           1302
2942 E9296 00           CON(2)  0
2943 E9298 3            CON(1)  3       OPCODE
2944 E9299 D000         CON(5)  #00D
           0
2945 E929E 1            CON(1)  1       GROUP C
2946 E929F 0            CON(1)  0
2947            *
2948            *
2949 E92A0 50           CON(2)  5       FIXED
2950 E92A2 5            CON(1)  5       OPCODE MNEMONIC
2951 E92A3 3425         NIBASC  \CR3EX \
           3354
           8502
2952 E92AF 10           CON(2)  (F.LSET)
2953 E92B1 3            CON(1)  3       OPCODE
2954 E92B2 B210         CON(5)  #12B
           0
2955 E92B7 00           CON(2)  0       NO VARIABLES
2956            *
2957            *
2958 E92B9 30           CON(2)  3       REGISTER LOGIC
2959 E92BB 5            CON(1)  5       OPCODE MNEMONIC
2960 E92BC 14D3         NIBASC  \A=B!A \
           2412
           1402
2961 E92C8 10           CON(2)  (F.LSET)
2962 E92CA 4            CON(1)  4       OPCODE
2963 E92CB 80E0         CON(5)  #0E08
           0
2964 E92D0 00           CON(2)  0       NO VARIABLES
2965            *
2966            *
2967 E92D2 30           CON(2)  3       REGISTER LOGIC
2968 E92D4 5            CON(1)  5       OPCODE MNEMONIC
2969 E92D5 34D3         NIBASC  \C=A&C \
           1462
```

```
            3402
2970 E92E1  10          CON(2)  (F.LSET)
2971 E92E3  4           CON(1)  4       OPCODE
2972 E92E4  20E0        CON(5)  #0E02
            0
2973 E92E9  00          CON(2)  0       NO VARIABLES
2974            *
2975            *
2976 E92EB  30          CON(2)  3       REGISTER LOGIC
2977 E92ED  5           CON(1)  5       OPCODE MNEMONIC
2978 E92EE  34D3        NIBASC  \C=C&D \
            3462
            4402
2979 E92FA  50          CON(2)  (F.LSET)!(F.TREE)
2980 E92FC  4           CON(1)  4       OPCODE
2981 E92FD  70E0        CON(5)  #0E07
            0
2982 E9302  00          CON(2)  0       NO VARIABLES
2983            *
2984            *
2985 E9304  50          CON(2)  5       FIXED
2986 E9306  4           CON(1)  4       OPCODE MNEMONIC
2987 E9307  85D4        NIBASC  \XM=0  \
            D303
            0202
2988 E9313  50          CON(2)  (F.LSET)!(F.TREE)
2989 E9315  3           CON(1)  3       OPCODE
2990 E9316  1280        CON(5)  #821
            0
2991 E931B  00          CON(2)  0       NO VARIABLES
2992            *
2993            *
2994 E931D  10          CON(2)  1       REGISTER TESTS
2995 E931F  4           CON(1)  4       OPCODE MNEMONIC
2996 E9320  F334        NIBASC  \?C#0  \
            3203
            0202
2997 E932C  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
2998 E932E  3           CON(1)  3       OPCODE
2999 E932F  E080        CON(5)  #80E
            0
3000 E9334  1           CON(1)  1       GROUP A]
3001 E9335  0           CON(1)  0
3002            *
3003            *
3004 E9336  50          CON(2)  5       FIXED
3005 E9338  5           CON(1)  5       OPCODE MNEMONIC
3006 E9339  1425        NIBASC  \AR2EX \
            2354
            8502
3007 E9345  50          CON(2)  (F.LSET)!(F.TREE)
3008 E9347  3           CON(1)  3       OPCODE
3009 E9348  2210        CON(5)  #122
            0
3010 E934D  00          CON(2)  0       NO VARIABLES
```

```
3011                *
3012                *
3013 E934F 20               CON(2)  2       REGISTER ARITHMETIC
3014 E9351 5                CON(1)  5       OPCODE MNEMONIC
3015 E9352 24D3             NIBASC  \B=B-A \
           24D2
           1402
3016 E935E 40               CON(2)  (F.TREE)
3017 E9360 3                CON(1)  3       OPCODE
3018 E9361 8000             CON(5)  #008
           0
3019 E9366 3                CON(1)  3       GROUP E
3020 E9367 0                CON(1)  0
3021                *
3022                *
3023 E9368 00               CON(2)  0       NULL
3024 E936A 0                CON(1)  0       OPCODE MNEMONIC
3025 E936B 0202             NIBASC  \      \
           0202
           0202
3026 E9377 40               CON(2)  (F.TREE)
3027 E9379 0                CON(1)  0       OPCODE
3028 E937A 0000             CON(5)  #0
           0
3029 E937F 00               CON(2)  0       NO VARIABLES
```

```
3030                    STITLE  HASH TO GROUP 36
3031 E9381      OPCG36
3032 E9381 20           CON(2)  2       REGISTER ARITHMETIC
3033 E9383 5            CON(1)  5       OPCODE MNEMONIC
3034 E9384 24D3         NIBASC  \B=B+1 \
           24B2
           1302
3035 E9390 00           CON(2)  0
3036 E9392 3            CON(1)  3       OPCODE
3037 E9393 5000         CON(5)  #005
           0
3038 E9398 3            CON(1)  3       GROUP E
3039 E9399 0            CON(1)  0
3040               *
3041               *
3042 E939A 10           CON(2)  1       REGISTER TESTS
3043 E939C 4            CON(1)  4       OPCODE MNEMONIC
3044 E939D F324         NIBASC  \?B=C  \
           D334
           0202
3045 E93A9 30           CON(2)  (F.LSET)!(F.RETY)
3046 E93AB 3            CON(1)  3       OPCODE
3047 E93AC 1080         CON(5)  #801
           0
3048 E93B1 1            CON(1)  1       GROUP A
3049 E93B2 0            CON(1)  0
3050               *
3051               *
3052 E93B3 52           CON(2)  37      FORTH
3053 E93B5 5            CON(1)  5       OPCODE MNEMONIC
3054 E93B6 64F4         NIBASC  \FORTH \
           2545
           8402
3055 E93C2 00           CON(2)  0
3056 E93C4 0            CON(1)  0       OPCODE
3057 E93C5 0000         CON(5)  #0
           0
3058 E93CA 00           CON(2)  0       NO VARIABLES
3059               *
3060               *
3061 E93CC 10           CON(2)  1       REGISTER TESTS
3062 E93CE 5            CON(1)  5       OPCODE MNEMONIC
3063 E93CF F314         NIBASC  \?A>=B \
           E3D3
           2402
3064 E93DB 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
3065 E93DD 3            CON(1)  3       OPCODE
3066 E93DE 8080         CON(5)  #808
           0
3067 E93E3 2            CON(1)  2       GROUP B
3068 E93E4 0            CON(1)  0
3069               *
3070               *
3071 E93E5 20           CON(2)  2       REGISTER ARITHMETIC
3072 E93E7 6            CON(1)  6       OPCODE MNEMONIC
```

```
3073 E93E8 24D3          NIBASC  \B=-B-1\
           D224
           D213
3074 E93F4 40            CON(2)  (F.TREE)
3075 E93F6 3             CON(1)  3       OPCODE
3076 E93F7 D000          CON(5)  #00D
           0
3077 E93FC 4             CON(1)  4       GROUP F
3078 E93FD 0             CON(1)  0
3079             *
3080             *
3081 E93FE 20            CON(2)  2       REGISTER ARITHMETIC
3082 E9400 5             CON(1)  5       OPCODE MNEMONIC
3083 E9401 24D3          NIBASC  \B=B+A \
           24B2
           1402
3084 E940D 40            CON(2)  (F.TREE)
3085 E940F 3             CON(1)  3       OPCODE
3086 E9410 8000          CON(5)  #008
           0
3087 E9415 1             CON(1)  1       GROUP C
3088 E9416 0             CON(1)  0
3089             *
3090             *
3091 E9417 40            CON(2)  4       BRANCHES
3092 E9419 3             CON(1)  3       OPCODE MNEMONIC
3093 E941A 74F4          NIBASC  \GOC   \
           3402
           0202
3094 E9426 52            CON(2)  (F.LSET)!(F.TREE)!(F.EXPR)
3095 E9428 3             CON(1)  3       OPCODE
3096 E9429 0040          CON(5)  #400
           0
3097 E942E 2             CON(1)  2       FILL.MARK
3098 E942F 2             CON(1)  2       FILL.LENGTH
```

```
3099                    STITLE  HASH TO GROUP 37
3100 E9430      OPCG37
3101 E9430 30           CON(2)  3       REGISTER LOGIC
3102 E9432 5            CON(1)  5       OPCODE MNEMONIC
3103 E9433 24D3         NIBASC  \B=B!A \
           2412
           1402
3104 E943F 10           CON(2)  (F.LSET)
3105 E9441 4            CON(1)  4       OPCODE
3106 E9442 C0E0         CON(5)  #0E0C
           0
3107 E9447 00           CON(2)  0       NO VARIABLES
3108            *
3109            *
3110 E9449 80           CON(2)  8       POINTER TESTS
3111 E944B 3            CON(1)  3       OPCODE MNEMONIC
3112 E944C F305         NIBASC  \?P=    \
           D302
           0202
3113 E9458 32           CON(2)  (F.LSET)!(F.RETY)!(F.EXPR)
3114 E945A 3            CON(1)  3       OPCODE
3115 E945B 0980         CON(5)  #890
           0
3116 E9460 00           CON(2)  0       NO VARIABLES
3117            *
3118            *
3119 E9462 50           CON(2)  5       FIXED
3120 E9464 4            CON(1)  4       OPCODE MNEMONIC
3121 E9465 2533         NIBASC  \R3=C   \
           D334
           0202
3122 E9471 10           CON(2)  (F.LSET)
3123 E9473 3            CON(1)  3       OPCODE
3124 E9474 B010         CON(5)  #10B
           0
3125 E9479 00           CON(2)  0       NO VARIABLES
3126            *
3127            *
3128 E947B 10           CON(2)  1       REGISTER TESTS
3129 E947D 4            CON(1)  4       OPCODE MNEMONIC
3130 E947E F324         NIBASC  \?B=A   \
           D314
           0202
3131 E948A 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
3132 E948C 3            CON(1)  3       OPCODE
3133 E948D 0080         CON(5)  #800
           0
3134 E9492 1            CON(1)  1       GROUP A
3135 E9493 0            CON(1)  0
3136            *
3137            *
3138 E9494 20           CON(2)  2       REGISTER ARITHMETIC
3139 E9496 5            CON(1)  5       OPCODE MNEMONIC
3140 E9497 14D3         NIBASC  \A=A-1 \
           14D2
```

```
            1302
3141 E94A3  40          CON(2)  (F.TREE)
3142 E94A5  3           CON(1)  3       OPCODE
3143 E94A6  C000        CON(5)  #00C
            0
3144 E94AB  1           CON(1)  1       GROUP C
3145 E94AC  0           CON(1)  0
3146            *
3147            *
3148 E94AD  30          CON(2)  3       REGISTER LOGIC
3149 E94AF  5           CON(1)  5       OPCODE MNEMONIC
3150 E94B0  44D3        NIBASC  \D=C&D \
            3462
            4402
3151 E94BC  50          CON(2)  (F.LSET)!(F.TREE)
3152 E94BE  4           CON(1)  4       OPCODE
3153 E94BF  30E0        CON(5)  #0E03
            0
3154 E94C4  00          CON(2)  0       NO VARIABLES
3155            *
3156            *
3157 E94C6  00          CON(2)  0       NULL
3158 E94C8  0           CON(1)  0       OPCODE MNEMONIC
3159 E94C9  0202        NIBASC  \      \
            0202
            0202
3160 E94D5  40          CON(2)  (F.TREE)
3161 E94D7  0           CON(1)  0       OPCODE
3162 E94D8  0000        CON(5)  #0
            0
3163 E94DD  00          CON(2)  0       NO VARIABLES
```

```
3164                    STITLE  HASH TO GROUP 38
3165 E94DF      OPCG38
3166 E94DF 21           CON(2)  18      LCASC
3167 E94E1 5            CON(1)  5       OPCODE MNEMONIC
3168 E94E2 C434         NIBASC  \LCASC \
           1435
           3402
3169 E94EE 02           CON(2)  (F.EXPR)
3170 E94F0 2            CON(1)  2       OPCODE
3171 E94F1 0300         CON(5)  #30
           0
3172 E94F6 3            CON(1)  3       FILL.MARK
3173 E94F7 2            CON(1)  2       FILL.LENGTH
3174            *
3175            *
3176 E94F8 20           CON(2)  2       REGISTER ARITHMETIC
3177 E94FA 4            CON(1)  4       OPCODE MNEMONIC
3178 E94FB 24D3         NIBASC  \B=-B  \
           D224
           0202
3179 E9507 00           CON(2)  0
3180 E9509 3            CON(1)  3       OPCODE
3181 E950A 9000         CON(5)  #009
           0
3182 E950F 4            CON(1)  4       GROUP F
3183 E9510 0            CON(1)  0
3184            *
3185            *
3186 E9511 91           CON(2)  25      STITLE PSEUDO-OP
3187 E9513 6            CON(1)  6       OPCODE MNEMONIC
3188 E9514 3545         NIBASC  \STITLE\
           9445
           C454
3189 E9520 10           CON(2)  (F.LSET)
3190 E9522 0            CON(1)  0       OPCODE
3191 E9523 0000         CON(5)  #0
           0
3192 E9528 00           CON(2)  0       NO VARIABLES
3193            *
3194            *
3195 E952A 20           CON(2)  2       REGISTER ARITHMETIC
3196 E952C 5            CON(1)  5       OPCODE MNEMONIC
3197 E952D 14D3         NIBASC  \A=A+1 \
           14B2
           1302
3198 E9539 00           CON(2)  0
3199 E953B 3            CON(1)  3       OPCODE
3200 E953C 4000         CON(5)  #004
           0
3201 E9541 3            CON(1)  3       GROUP E
3202 E9542 0            CON(1)  0
3203            *
3204            *
3205 E9543 50           CON(2)  5       FIXED
3206 E9545 6            CON(1)  6       OPCODE MNEMONIC
```

```
3207 E9546 94E4          NIBASC  \INTOFF\
           45F4
           6464
3208 E9552 10            CON(2)  (F.LSET)
3209 E9554 4             CON(1)  4       OPCODE
3210 E9555 F808          CON(5)  #808F
           0
3211 E955A 00            CON(2)  0       NO VARIABLES
3212             *
3213             *
3214 E955C 50            CON(2)  5       FIXED
3215 E955E 4             CON(1)  4       OPCODE MNEMONIC
3216 E955F 2533          NIBASC  \R3=A  \
           D314
           0202
3217 E956B 50            CON(2)  (F.LSET)!(F.TREE)
3218 E956D 3             CON(1)  3       OPCODE
3219 E956E 3010          CON(5)  #103
           0
3220 E9573 00            CON(2)  0       NO VARIABLES
3221             *
3222             *
3223 E9575 A1            CON(2)  26      FORTH WORD
3224 E9577 4             CON(1)  4       OPCODE MNEMONIC
3225 E9578 75F4          NIBASC  \WORD  \
           2544
           0202
3226 E9584 42            CON(2)  (F.TREE)!(F.EXPR)
3227 E9586 0             CON(1)  0       OPCODE
3228 E9587 0000          CON(5)  #0
           0
3229 E958C 00            CON(2)  0       NO VARIABLES
3230             *
3231             *
3232 E958E 10            CON(2)  1       REGISTER TESTS
3233 E9590 4             CON(1)  4       OPCODE MNEMONIC
3234 E9591 F344          NIBASC  \?D=0  \
           D303
           0202
3235 E959D 70            CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
3236 E959F 3             CON(1)  3       OPCODE
3237 E95A0 B080          CON(5)  #80B
           0
3238 E95A5 1             CON(1)  1       GROUP A
3239 E95A6 0             CON(1)  0
3240             *
3241             *
3242 E95A7 20            CON(2)  2       REGISTER ARITHMETIC
3243 E95A9 5             CON(1)  5       OPCODE MNEMONIC
3244 E95AA 14D3          NIBASC  \A=A+A \
           14B2
           1402
3245 E95B6 40            CON(2)  (F.TREE)
3246 E95B8 3             CON(1)  3       OPCODE
3247 E95B9 4000          CON(5)  #004
```

```
            0
3248 E95BE  1           CON(1)  1       GROUP C
3249 E95BF  0           CON(1)  0
3250              *
3251              *
3252 E95C0  20          CON(2)  2       REGISTER ARITHMETIC
3253 E95C2  4           CON(1)  4       OPCODE MNEMONIC
3254 E95C3  2414        NIBASC  \BAEX  \
            5485
            0202
3255 E95CF  40          CON(2)  (F.TREE)
3256 E95D1  3           CON(1)  3       OPCODE
3257 E95D2  C000        CON(5)  #00C
            0
3258 E95D7  2           CON(1)  2       GROUP D
3259 E95D8  0           CON(1)  0
3260              *
3261              *
3262 E95D9  00          CON(2)  0       NULL
3263 E95DB  0           CON(1)  0       OPCODE MNEMONIC
3264 E95DC  0202        NIBASC  \      \
            0202
            0202
3265 E95E8  40          CON(2)  (F.TREE)
3266 E95EA  0           CON(1)  0       OPCODE
3267 E95EB  0000        CON(5)  #0
            0
3268 E95F0  00          CON(2)  0       NO VARIABLES
```

```
3269                    STITLE  HASH TO GROUP 39
3270 E95F2      OPCG39
3271 E95F2 50           CON(2)  5       FIXED
3272 E95F4 5            CON(1)  5       OPCODE MNEMONIC
3273 E95F5 3425         NIBASC  \CR2EX \
           2354
           8502
3274 E9601 10           CON(2)  (F.LSET)
3275 E9603 3            CON(1)  3       OPCODE
3276 E9604 A210         CON(5)  #12A
           0
3277 E9609 00           CON(2)  0       NO VARIABLES
3278               *
3279               *
3280 E960B 50           CON(2)  5       FIXED
3281 E960D 4            CON(1)  4       OPCODE MNEMONIC
3282 E960E 1435         NIBASC  \ASLC  \
           C434
           0202
3283 E961A 10           CON(2)  (F.LSET)
3284 E961C 3            CON(1)  3       OPCODE
3285 E961D 0180         CON(5)  #810
           0
3286 E9622 00           CON(2)  0       NO VARIABLES
3287               *
3288               *
3289 E9624 20           CON(2)  2       REGISTER ARITHMETIC
3290 E9626 6            CON(1)  6       OPCODE MNEMONIC
3291 E9627 44D3         NIBASC  \D=-D-1\
           D244
           D213
3292 E9633 00           CON(2)  0
3293 E9635 3            CON(1)  3       OPCODE
3294 E9636 F000         CON(5)  #00F
           0
3295 E963B 4            CON(1)  4       GROUP F
3296 E963C 0            CON(1)  0
3297               *
3298               *
3299 E963D 10           CON(2)  1       REGISTER TESTS
3300 E963F 5            CON(1)  5       OPCODE MNEMONIC
3301 E9640 F334         NIBASC  \?C<=D \
           C3D3
           4402
3302 E964C 30           CON(2)  (F.LSET)!(F.RETY)
3303 E964E 3            CON(1)  3       OPCODE
3304 E964F B080         CON(5)  #80B
           0
3305 E9654 2            CON(1)  2       GROUP B
3306 E9655 0            CON(1)  0
3307               *
3308               *
3309 E9656 20           CON(2)  2       REGISTER ARITHMETIC
3310 E9658 5            CON(1)  5       OPCODE MNEMONIC
3311 E9659 24D3         NIBASC  \B=C-B \
```

```
            34D2
            2402
3312 E9665  40          CON(2)  (F.TREE)
3313 E9667  3           CON(1)  3       OPCODE
3314 E9668  D000        CON(5)  #00D
            0
3315 E966D  3           CON(1)  3       GROUP E
3316 E966E  0           CON(1)  0
3317            *
3318            *
3319 E966F  01          CON(2)  16      Dx=HEX INSTRUCTIONS
3320 E9671  6           CON(1)  6       OPCODE MNEMONIC
3321 E9672  4413        NIBASC  \D1=HEX\
            D384
            5485
3322 E967E  50          CON(2)  (F.LSET)!(F.TREE)
3323 E9680  4           CON(1)  4       OPCODE
3324 E9681  00D1        CON(5)  #1D00
            0
3325 E9686  3           CON(1)  3       FILL.MARK
3326 E9687  2           CON(1)  2       FILL.LENGTH
3327            *
3328            *
3329 E9688  50          CON(2)  5       FIXED
3330 E968A  5           CON(1)  5       OPCODE MNEMONIC
3331 E968B  05D3        NIBASC  \P=P-1 \
            05D2
            1302
3332 E9697  50          CON(2)  (F.LSET)!(F.TREE)
3333 E9699  2           CON(1)  2       OPCODE
3334 E969A  D000        CON(5)  #0D
            0
3335 E969F  00          CON(2)  0       NO VARIABLES
3336            *
3337            *
3338 E96A1  10          CON(2)  1       REGISTER TESTS
3339 E96A3  5           CON(1)  5       OPCODE MNEMONIC
3340 E96A4  F324        NIBASC  \?B>=A \
            E3D3
            1402
3341 E96B0  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
3342 E96B2  3           CON(1)  3       OPCODE
3343 E96B3  C080        CON(5)  #80C
            0
3344 E96B8  2           CON(1)  2       GROUP B
3345 E96B9  0           CON(1)  0
3346            *
3347            *
3348 E96BA  50          CON(2)  5       FIXED
3349 E96BC  5           CON(1)  5       OPCODE MNEMONIC
3350 E96BD  1425        NIBASC  \AR1EX \
            1354
            8502
3351 E96C9  50          CON(2)  (F.LSET)!(F.TREE)
3352 E96CB  3           CON(1)  3       OPCODE
```

```
3353 E96CC 1210          CON(5)  #121
           0
3354 E96D1 00            CON(2)  0       NO VARIABLES
```

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```
3355                    STITLE  HASH TO GROUP 40
3356 E96D3      OPCG40
3357 E96D3 40           CON(2)  4       BRANCHES
3358 E96D5 6            CON(1)  6       OPCODE MNEMONIC
3359 E96D6 4413         NIBASC  \D1=(5)\
           D382
           5392
3360 E96E2 1B           CON(2)  (F.LSET)!(F.ABSL)!(F.EXPR)!(F.PART)
3361 E96E4 7            CON(1)  7       OPCODE
3362 E96E5 000F         CON(5)  #1F000
           1
3363 E96EA 3            CON(1)  3       FILL.MARK
3364 E96EB 5            CON(1)  5       FILL.LENGTH
3365              *
3366              *
3367 E96EC 20           CON(2)  2       REGISTER ARITHMETIC
3368 E96EE 5            CON(1)  5       OPCODE MNEMONIC
3369 E96EF 24D3         NIBASC  \B=C+B \
           34B2
           2402
3370 E96FB 00           CON(2)  0
3371 E96FD 3            CON(1)  3       OPCODE
3372 E96FE 1000         CON(5)  #001
           0
3373 E9703 1            CON(1)  1       GROUP C
3374 E9704 0            CON(1)  0
3375              *
3376              *
3377 E9705 50           CON(2)  5       FIXED
3378 E9707 5            CON(1)  5       OPCODE MNEMONIC
3379 E9708 05D3         NIBASC  \P=P+1 \
           05B2
           1302
3380 E9714 50           CON(2)  (F.LSET)!(F.TREE)
3381 E9716 2            CON(1)  2       OPCODE
3382 E9717 C000         CON(5)  #0C
           0
3383 E971C 00           CON(2)  0       NO VARIABLES
3384              *
3385              *
3386 E971E 10           CON(2)  1       REGISTER TESTS
3387 E9720 4            CON(1)  4       OPCODE MNEMONIC
3388 E9721 F324         NIBASC  \?B<C  \
           C334
           0202
3389 E972D 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
3390 E972F 3            CON(1)  3       OPCODE
3391 E9730 5080         CON(5)  #805
           0
3392 E9735 2            CON(1)  2       GROUP B
3393 E9736 0            CON(1)  0
3394              *
3395              *
3396 E9737 20           CON(2)  2       REGISTER ARITHMETIC
3397 E9739 4            CON(1)  4       OPCODE MNEMONIC
```

```
3398 E973A 3414          NIBASC  \CAEX  \
           5485
           0202
3399 E9746 40            CON(2)  (F.TREE)
3400 E9748 3             CON(1)  3       OPCODE
3401 E9749 E000          CON(5)  #00E
           0
3402 E974E 2             CON(1)  2       GROUP D
3403 E974F 0             CON(1)  0
```

```
3404                    STITLE  HASH TO GROUP 41
3405 E9750      OPCG41
3406 E9750 20           CON(2)  2       REGISTER ARITHMETIC
3407 E9752 4            CON(1)  4       OPCODE MNEMONIC
3408 E9753 44D3         NIBASC  \D=-D  \
           D244
           0202
3409 E975F 00           CON(2)  0
3410 E9761 3            CON(1)  3       OPCODE
3411 E9762 B000         CON(5)  #00B
           0
3412 E9767 4            CON(1)  4       GROUP F
3413 E9768 0            CON(1)  0
3414            *
3415            *
3416 E9769 20           CON(2)  2       REGISTER ARITHMETIC
3417 E976B 5            CON(1)  5       OPCODE MNEMONIC
3418 E976C 34D3         NIBASC  \C=C-B \
           34D2
           2402
3419 E9778 00           CON(2)  0
3420 E977A 3            CON(1)  3       OPCODE
3421 E977B 9000         CON(5)  #009
           0
3422 E9780 3            CON(1)  3       GROUP E
3423 E9781 0            CON(1)  0
3424            *
3425            *
3426 E9782 50           CON(2)  5       FIXED
3427 E9784 6            CON(1)  6       OPCODE MNEMONIC
3428 E9785 2535         NIBASC  \RSTK=C\
           45B4
           D334
3429 E9791 10           CON(2)  (F.LSET)
3430 E9793 2            CON(1)  2       OPCODE
3431 E9794 6000         CON(5)  #06
           0
3432 E9799 00           CON(2)  0       NO VARIABLES
3433            *
3434            *
3435 E979B 30           CON(2)  3       REGISTER LOGIC
3436 E979D 5            CON(1)  5       OPCODE MNEMONIC
3437 E979E 24D3         NIBASC  \B=C!B \
           3412
           2402
3438 E97AA 10           CON(2)  (F.LSET)
3439 E97AC 4            CON(1)  4       OPCODE
3440 E97AD 90E0         CON(5)  #0E09
           0
3441 E97B2 00           CON(2)  0       NO VARIABLES
3442            *
3443            *
3444 E97B4 40           CON(2)  4       BRANCHES
3445 E97B6 6            CON(1)  6       OPCODE MNEMONIC
3446 E97B7 34F4         NIBASC  \CON(3)\
```

```
            E482
            3392
3447 E97C3  53          CON(2)  (F.LSET)!(F.TREE)!(F.ABSL)!(F.EXPR)
3448 E97C5  3           CON(1)  3       OPCODE
3449 E97C6  0000        CON(5)  #0
            0
3450 E97CB  1           CON(1)  1       FILL.MARK
3451 E97CC  3           CON(1)  3       FILL.LENGTH
3452            *
3453            *
3454 E97CD  40          CON(2)  4       BRANCHES
3455 E97CF  6           CON(1)  6       OPCODE MNEMONIC
3456 E97D0  2554        NIBASC  \REL(5)\
            C482
            5392
3457 E97DC  52          CON(2)  (F.LSET)!(F.TREE)!(F.EXPR)
3458 E97DE  5           CON(1)  5       OPCODE
3459 E97DF  0000        CON(5)  #0
            0
3460 E97E4  1           CON(1)  1       FILL.MARK
3461 E97E5  5           CON(1)  5       FILL.LENGTH
3462            *
3463            *
3464 E97E6  81          CON(2)  24      TITLE PSEUDO-OP
3465 E97E8  5           CON(1)  5       OPCODE MNEMONIC
3466 E97E9  4594        NIBASC  \TITLE \
            45C4
            5402
3467 E97F5  50          CON(2)  (F.LSET)!(F.TREE)
3468 E97F7  0           CON(1)  0       OPCODE
3469 E97F8  0000        CON(5)  #0
            0
3470 E97FD  00          CON(2)  0       NO VARIABLES
3471            *
3472            *
3473 E97FF  10          CON(2)  1       REGISTER TESTS
3474 E9801  4           CON(1)  4       OPCODE MNEMONIC
3475 E9802  F324        NIBASC  \?B<A  \
            C314
            0202
3476 E980E  70          CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
3477 E9810  3           CON(1)  3       OPCODE
3478 E9811  0080        CON(5)  #800
            0
3479 E9816  2           CON(1)  2       GROUP B
3480 E9817  0           CON(1)  0
3481            *
3482            *
3483 E9818  50          CON(2)  5       FIXEDB
3484 E981A  4           CON(1)  4       OPCODE MNEMONIC
3485 E981B  2435        NIBASC  \BSLC  \
            C434
            0202
3486 E9827  50          CON(2)  (F.LSET)!(F.TREE)
3487 E9829  3           CON(1)  3       OPCODE
```

```
3488 E982A 1180          CON(5)  #811
           0
3489 E982F 00            CON(2)  0       NO VARIABLES
```

```
3490                    STITLE  HASH TO GROUP 42
3491 E9831      OPCG42
3492 E9831 50           CON(2)  5       FIXED
3493 E9833 6            CON(1)  6       OPCODE MNEMONIC
3494 E9834 3554         NIBASC  \SETHEX\
           4584
           5485
3495 E9840 10           CON(2)  (F.LSET)
3496 E9842 2            CON(1)  2       OPCODE
3497 E9843 4000         CON(5)  #04
           0
3498 E9848 00           CON(2)  0       NO VARIABLES
3499               *
3500               *
3501 E984A 20           CON(2)  2       REGISTER ARITHMETIC
3502 E984C 5            CON(1)  5       OPCODE MNEMONIC
3503 E984D 34D3         NIBASC  \C=C+B \
           34B2
           2402
3504 E9859 00           CON(2)  0
3505 E985B 3            CON(1)  3       OPCODE
3506 E985C 9000         CON(5)  #009
           0
3507 E9861 1            CON(1)  1       GROUP C
3508 E9862 0            CON(1)  0
3509               *
3510               *
3511 E9863 50           CON(2)  5       FIXED
3512 E9865 5            CON(1)  5       OPCODE MNEMONIC
3513 E9866 3525         NIBASC  \SREQ? \
           5415
           F302
3514 E9872 50           CON(2)  (F.LSET)!(F.TREE)
3515 E9874 3            CON(1)  3       OPCODE
3516 E9875 E080         CON(5)  #80E
           0
3517 E987A 00           CON(2)  0       NO VARIABLES
3518               *
3519               *
3520 E987C 10           CON(2)  1       REGISTER TESTS
3521 E987E 5            CON(1)  5       OPCODE MNEMONIC
3522 E987F F344         NIBASC  \?D<=C \
           C3D3
           3402
3523 E988B 70           CON(2)  (F.LSET)!(F.RETY)!(F.TREE)
3524 E988D 3            CON(1)  3       OPCODE
3525 E988E F080         CON(5)  #80F
           0
3526 E9893 2            CON(1)  2       GROUP B
3527 E9894 0            CON(1)  0
3528               *
3529               *
3530 E9895 50           CON(2)  5       FIXED
3531 E9897 5            CON(1)  5       OPCODE MNEMONIC
3532 E9898 3435         NIBASC  \CSTEX \
```

```
             4554
             8502
   3533 E98A4 50          CON(2)  (F.LSET)!(F.TREE)
   3534 E98A6 2           CON(1)  2       OPCODE
   3535 E98A7 B000        CON(5)  #0B
              0
   3536 E98AC 00          CON(2)  0       NO VARIABLES
```

```
3537                    STITLE  FIT STATS
3538            zSIZE   EQU     (*)-zTHIS
3539            zLEFT   EQU     (zNEXT)-*
3540 E98AE              BSS     zLEFT
3541 E9900              END
```

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F.ABSL Abs 16 #00010 -
17 268 465 570 609 675 1398 1541
1873 2117 2202 2268 2305 2438 2691 2836
2904 3360 3447

F.EXPR Abs 32 #00020 -
18 89 153 172 192 201 259 268
372 381 400 429 465 570 609 675
767 776 852 871 880 899 1002 1020
1077 1152 1180 1199 1312 1369 1398 1436
1455 1541 1561 1570 1664 1712 1778 1825
1843 1873 1987 2071 2108 2117 2127 2164
2202 2268 2305 2381 2390 2438 2467 2505
2663 2672 2691 2796 2836 2866 2885 2904
3094 3113 3169 3226 3360 3447 3457

F.GOYS Abs 8 #00008 -
16 172 353

F.GSUB Abs 64 #00040 -
19 2390 2672

F.LSET Abs 1 #00001 -
13 71 80 89 98 108 117 126
135 144 162 172 182 192 201 211
220 230 240 250 268 278 287 316
325 344 353 362 372 409 447 456
465 475 485 494 503 512 522 551
570 590 599 609 619 628 637 647
656 675 685 694 703 712 721 730
758 767 776 786 796 815 824 843
852 871 880 889 908 917 926 945
973 983 992 1011 1020 1030 1039 1048
1077 1086 1115 1124 1134 1143 1161 1180
1189 1218 1227 1237 1246 1264 1273 1292
1321 1330 1398 1427 1436 1445 1455 1474
1483 1493 1503 1541 1561 1570 1579 1598
1607 1627 1664 1674 1712 1731 1740 1759
1778 1788 1798 1834 1853 1873 1883 1893
1902 1941 1950 1959 1968 1978 1996 2005
2014 2034 2044 2053 2062 2071 2080 2089
2098 2117 2136 2145 2155 2164 2174 2183
2193 2202 2222 2231 2240 2249 2259 2268
2287 2296 2305 2315 2334 2343 2352 2362
2371 2381 2390 2400 2409 2428 2438 2448
2458 2467 2505 2514 2524 2533 2542 2551
2560 2579 2588 2597 2616 2626 2635 2663
2672 2682 2691 2701 2710 2719 2738 2757
2766 2796 2806 2816 2836 2866 2875 2904
2914 2933 2952 2961 2970 2979 2988 2997
3007 3045 3064 3094 3104 3113 3122 3131
3151 3189 3208 3217 3235 3274 3283 3302
3322 3332 3341 3351 3360 3380 3389 3429
3438 3447 3457 3467 3476 3486 3495 3514
3523 3533

F.PART Abs 128 #00080 -
20 465 570 609 1541 1873 2117 2268
2305 2438 2691 3360

F.RETY Abs 2 #00002 -
14 98 162 182 220 230 325 362
372 409 475 512 599 637 767 786
852 889 973 992 1124 1189 1227 1273
1292 1330 1427 1445 1455 1483 1493 1503
1570 1607 1788 1853 1883 1902 1968 2014
2034 2098 2145 2183 2249 2352 2428 2448
2514 2616 2719 2766 2806 2816 2875 2914

				2997	3045	3064	3113	3131	3235	3302	3341
				3389	3476	3523					
F.TREE	Abs	4	#00004 -	15	108	117	126	135	144	220	230
				240	250	259	268	278	287	334	344
				353	362	372	409	419	429	438	503
				512	522	531	541	551	560	619	628
				637	647	656	665	712	721	730	739
				749	786	796	805	815	889	899	908
				917	926	935	945	954	992	1002	1011
				1020	1057	1067	1077	1086	1124	1134	1143
				1152	1208	1218	1227	1237	1246	1255	1302
				1312	1321	1330	1340	1378	1388	1398	1408
				1474	1483	1493	1503	1512	1522	1532	1588
				1598	1607	1617	1627	1636	1674	1683	1693
				1703	1731	1740	1749	1788	1798	1807	1816
				1843	1853	1863	1902	1912	1922	1932	1968
				1978	1987	1996	2034	2044	2053	2062	2089
				2098	2108	2164	2174	2183	2193	2202	2212
				2249	2259	2268	2278	2324	2334	2343	2352
				2362	2390	2400	2409	2448	2458	2467	2476
				2514	2524	2533	2542	2597	2606	2616	2626
				2635	2644	2691	2701	2710	2719	2729	2786
				2796	2806	2816	2826	2836	2885	2894	2904
				2914	2924	2979	2988	2997	3007	3016	3026
				3064	3074	3084	3094	3131	3141	3151	3160
				3217	3226	3235	3245	3255	3265	3312	3322
				3332	3341	3351	3380	3389	3399	3447	3457
				3467	3476	3486	3514	3523	3533		
#NULENT	Abs	947590	#E7586 -	132							
OPCG00	Abs	947415	#E74D7 -	67	23						
OPCG01	Abs	947640	#E75B8 -	149	24						
OPCG02	Abs	948015	#E772F -	292	25						
OPCG03	Abs	948240	#E7810 -	377	26						
OPCG04	Abs	948415	#E78BF -	443	27						
OPCG05	Abs	948740	#E7A04 -	566	28						
OPCG06	Abs	949015	#E7B17 -	671	29						
OPCG07	Abs	949240	#E7BF8 -	754	30						
OPCG08	Abs	949415	#E7CA7 -	820	31						
OPCG09	Abs	949790	#E7E1E -	959	32						
OPCG10	Abs	949965	#E7ECD -	1026	33						
OPCG11	Abs	950140	#E7F7C -	1091	34						
OPCG12	Abs	950315	#E802B -	1157	35						
OPCG13	Abs	950590	#E813E -	1260	36						
OPCG14	Abs	950815	#E821F -	1345	37						
OPCG15	Abs	950990	#E82CE -	1413	38						
OPCG16	Abs	951315	#E8413 -	1537	39						
OPCG17	Abs	951590	#E8526 -	1641	40						
OPCG18	Abs	951765	#E85D5 -	1708	41						
OPCG19	Abs	951890	#E8652 -	1755	42						
OPCG20	Abs	952065	#E8701 -	1821	43						
OPCG21	Abs	952190	#E877E -	1869	44						
OPCG22	Abs	952365	#E882D -	1937	45						
OPCG23	Abs	952540	#E88DC -	2001	46						
OPCG24	Abs	952715	#E898B -	2067	47						
OPCG25	Abs	952840	#E8A08 -	2113	48						

OPCG26	Abs	953115	#E8B1B	-	2218	49
OPCG27	Abs	953290	#E8BCA	-	2283	50
OPCG28	Abs	953515	#E8CAB	-	2367	51
OPCG29	Abs	953640	#E8D28	-	2414	52
OPCG30	Abs	953815	#E8DD7	-	2481	53
OPCG31	Abs	953990	#E8E86	-	2547	54
OPCG32	Abs	954265	#E8F99	-	2649	55
OPCG33	Abs	954490	#E907A	-	2734	56
OPCG34	Abs	954765	#E918D	-	2842	57
OPCG35	Abs	954990	#E926E	-	2929	58
OPCG36	Abs	955265	#E9381	-	3031	59
OPCG37	Abs	955440	#E9430	-	3100	60
OPCG38	Abs	955615	#E94DF	-	3165	61
OPCG39	Abs	955890	#E95F2	-	3270	62
OPCG40	Abs	956115	#E96D3	-	3356	63
OPCG41	Abs	956240	#E9750	-	3405	64
OPCG42	Abs	956465	#E9831	-	3491	65
=OPTABL	Abs	947200	#E7400	-	23	
zLEFT	Abs	82	#00052	-	3539	3540
zNEXT	Abs	956672	#E9900	-	4	3539
zSIZE	Abs	9390	#024AE	-	3538	
zTHIS	Abs	947200	#E7400	-	3	3538

Input Parameters

Source file name is MR&AS0

Listing file name is MR/AS0::65

Object file name is MR%AS0::65

```
                                  111111
                        0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                      TITLE  AS1:_FORTH_ASSEMBLER_VARS
 2                      RDSYMB MR%GTO
 3 E9900                ABS    #E9900
 4              zTHIS   EQU    *
 5              zNEXT   EQU    #EA300
 6              ********************::**********************************
 7              ***
 8              *** MR&AS1      <840504.1037>
 9              ***
10              ***
11              ***  FORTH ASSEMBLER
12              ***  VARIABLES, SOME LOW LEVEL ROUTINES
13              ***
14              ************************************************************
15              ********************************************************************
16              ***
17              ***  +BASE
18              ***
19              *** ( NUM -- PTR )
20              *** ( CONVERT AN OFFSET INTO THE VARIABLE BUFFER TO )
21              *** ( AN ACTUAL ADDRESS )
22              ********************************************************************
23 E9900 0000 =a+BASE CON(5) =DOCOL          : +BASE
         0
24              *
25              * TRY TO FIND VARIABLE BUFFER
26              *
27 E9905 0000          CON(5) =VARID         VARID
         0
28 E990A 0000          CON(5) =AT            @
         0
29 E990F 0000          CON(5) =IOFIND        FINDBF
         0
30 E9914 0000          CON(5) =?DUP          ?DUP
         0
31 E9919 0000          CON(5) =ZBRNH         IF
         0
32 E991E F000          REL(5) %IF1
         0
33              *
34              * FOUND.  ADD BUFFER ADDRESS TO OFFSET
35              *
36 E9923 0000          CON(5) =ADD           +
         0
37 E9928 0000          CON(5) =SEMI          ;
         0
38              *
39              * NOT FOUND.  ABORT WITH Assembler Error.
40              * THIS SHOULD NEVER HAPPEN.  IT WAS PUT IN DURING
41              * TESTING BUT NEVER TAKEN OUT.  IF IT DID OCCUR,
42              * THEN SOMEHOW THE VARIABLE BUFFER GOT TRASHED
43              * OR SOMETHING WAS BEING DONE WITH A VARIABLE
44              * AFTER IT WAS KILLED.  -Geoff
45              *
46 E992D        %IF1
```

```
47                *
48                * ABORT WITH MESSAGE
49                *
50 E992D 0000          CON(5) =CR              CR
         0
51 E9932 0000          CON(5) =PDOTQ           ." Assembler Error"
         0
52 E9937 F0            CON(2) 15
53 E9939 1437          NIBASC \Assemble\
         3756
         D626
         C656
54 E9949 2702          NIBASC \r Error\
         5427
         27F6
         27
55 E9957 0000          CON(5) =aCLEAN          CLEANUP
         0
56 E995C 0000          CON(5) =ABORT           ABORT
         0
57                ****************************************************************
58                ***
59                ***  +STR
60                ***
61                *** ( NUM -- STR )
62                *** ( CONVERT AN OFFSET INTO THE VARIABLE BUFFER TO )
63                *** ( A STRING ADDRESS & COUNT )
64                ****************************************************************
65 E9961 0000 =a+STR   CON(5) =DOCOL           : +STR
         0
66 E9966 0000          CON(5) =TWO+            2+
         0
67 E996B 0099          CON(5) =a+BASE          +BASE
         E
68 E9970 0000          CON(5) =COUNT           COUNT
         0
69 E9975 0000          CON(5) =SEMI            ;             ( * STR * )
         0
70                ****************************************************************
71                ***
72                ***  PASS
73                ***
74                ****************************************************************
75 E997A 0000 =aPASS   CON(5) =DOCOL           : PASS
         0
76 E997F 0000          CON(5) =ZERO            0
         0
77 E9984 0099          CON(5) =a+BASE          +BASE
         E
78 E9989 0000          CON(5) =SEMI            ;
         0
79                ****************************************************************
80                ***
81                ***  LC
82                ***
```

```
                ****************************************************************
E998E 0000 =aLC     CON(5) =DOCOL          : LC
      0
E9993 0000          CON(5) =LIT            5
      0
E9998 5000          CON(5) 5
      0
E999D 0099          CON(5) =a+BASE         +BASE
      E
E99A2 0000          CON(5) =SEMI           ;
      0
                ****************************************************************
                ***
                ***  LAST.REQ
                ***
                ****************************************************************
E99A7 0000 =aLSTRQ CON(5) =DOCOL           : LAST.REQ
      0
E99AC 0000          CON(5) =LIT            10
      0
E99B1 A000          CON(5) 10
      0
E99B6 0099          CON(5) =a+BASE         +BASE
      E
E99BB 0000          CON(5) =SEMI           ;
      0
                ****************************************************************
                ***
                ***  OCCUR
                ***
                *** ( 1=LISTING FILE FULL MESSAGE )
                *** ( 2=FILE TYPE DECLARED )
                *** ( 4=SYMBOL TABLE FULL )
                *** ( 8=ERROR OCCURED THIS SOURCE LINE )
                *** (16=TOKEN KEYWORD ENCOUNTERED )
                ****************************************************************
E99C0 0000 =aOCCUR CON(5) =DOCOL           : OCCUR
      0
E99C5 0000          CON(5) =LIT            15
      0
E99CA F000          CON(5) 15
      0
E99CF 0099          CON(5) =a+BASE         +BASE
      E
E99D4 0000          CON(5) =SEMI           ;
      0
                ****************************************************************
                ***
                ***  KNOWN
                ***
                ****************************************************************
E99D9 0000 =aKNOWN CON(5) =DOCOL           : KNOWN
      0
E99DE 0000          CON(5) =LIT            20
      0
```

```
121 E99E3 4100          CON(5) 20
          0
122 E99E8 0099          CON(5) =a+BASE          +BASE
          E
123 E99ED 0000          CON(5) =SEMI            ;
          0
124               ****************************************************************
125               ***
126               ***  DONE
127               ***
128               ****************************************************************
129 E99F2 0000 =aDONE   CON(5) =DOCOL           : DONE
          0
130 E99F7 0000          CON(5) =LIT             25
          0
131 E99FC 9100          CON(5) 25
          0
132 E9A01 0099          CON(5) =a+BASE          +BASE
          E
133 E9A06 0000          CON(5) =SEMI            ;
          0
134               ****************************************************************
135               ***
136               ***  FILETYPE
137               ***
138               ****************************************************************
139 E9A0B 0000 =aFLTYP CON(5) =DOCOL           : FILETYPE
          0
140 E9A10 0000          CON(5) =LIT             30
          0
141 E9A15 E100          CON(5) 30
          0
142 E9A1A 0099          CON(5) =a+BASE          +BASE
          E
143 E9A1F 0000          CON(5) =SEMI            ;
          0
144               ****************************************************************
145               ***
146               ***  LINECNT
147               ***
148               ****************************************************************
149 E9A24 0000 =aLINEC CON(5) =DOCOL           : LINECNT
          0
150 E9A29 0000          CON(5) =LIT             280
          0
151 E9A2E 8110          CON(5) 280
          0
152 E9A33 0099          CON(5) =a+BASE          +BASE
          E
153 E9A38 0000          CON(5) =SEMI            ;
          0
154               ****************************************************************
155               ***
156               ***  ERROR COUNT
157               ***
```

```
158                ****************************************************************
159 E9A3D 0000 =aERCNT CON(5) =DOCOL          : ERROR COUNT
            0
160 E9A42 0000         CON(5) =LIT           285
            0
161 E9A47 D110         CON(5) 285
            0
162 E9A4C 0099         CON(5) =a+BASE        +BASE
            E
163 E9A51 0000         CON(5) =SEMI          ;
            0
164                ****************************************************************
165                ***
166                ***  TIT
167                ***
168                ****************************************************************
169 E9A56 0000 =aTIT   CON(5) =DOCOL          : TIT
            0
170 E9A5B 0000         CON(5) =LIT           290
            0
171 E9A60 2210         CON(5) 290
            0
172 E9A65 1699         CON(5) =a+STR         +STR
            E
173 E9A6A 0000         CON(5) =SEMI          ;
            0
174                ****************************************************************
175                ***
176                ***  STIT
177                ***
178                ****************************************************************
179 E9A6F 0000 =aSTIT  CON(5) =DOCOL          : STIT
            0
180 E9A74 0000         CON(5) =LIT           374
            0
181 E9A79 6710         CON(5) 374
            0
182 E9A7E 1699         CON(5) =a+STR         +STR
            E
183 E9A83 0000         CON(5) =SEMI          ;
            0
184                ****************************************************************
185                ***
186                ***  SLINE#
187                ***
188                ****************************************************************
189 E9A88 0000 =aSLIN# CON(5) =DOCOL          : SLINE#
            0
190 E9A8D 0000         CON(5) =LIT           35
            0
191 E9A92 3200         CON(5) 35
            0
192 E9A97 0099         CON(5) =a+BASE        +BASE
            E
193 E9A9C 0000         CON(5) =SEMI          ;
```

```
          0
194             ********************************************************************
195             ***
196             ***  SFILE
197             ***
198             ********************************************************************
199 E9AA1 0000 =aSFILE CON(5) =DOCOL         : SFILE
          0
200 E9AA6 0000         CON(5) =LIT           458
          0
201 E9AAB AC10         CON(5) 458
          0
202 E9AB0 1699         CON(5) =a+STR         +STR
          E
203 E9AB5 0000         CON(5) =SEMI          ;
          0
204             ********************************************************************
205             ***
206             ***  SLINE
207             ***
208             ********************************************************************
209 E9ABA 0000 =aSLINE CON(5) =DOCOL         : SLINE
          0
210 E9ABF 0000         CON(5) =LIT           502
          0
211 E9AC4 6F10         CON(5) 502
          0
212 E9AC9 1699         CON(5) =a+STR         +STR
          E
213 E9ACE 0000         CON(5) =SEMI          ;
          0
214             ********************************************************************
215             ***
216             ***  LNOFF
217             ***
218             ********************************************************************
219 E9AD3 0000 =aLNOFF CON(5) =DOCOL         : LNOFF
          0
220 E9AD8 0000         CON(5) =LIT           40
          0
221 E9ADD 8200         CON(5) 40
          0
222 E9AE2 0099         CON(5) =a+BASE        +BASE
          E
223 E9AE7 0000         CON(5) =SEMI          ;
          0
224             ********************************************************************
225             ***
226             ***  LLINE#
227             ***
228             ********************************************************************
229 E9AEC 0000 =aLLIN# CON(5) =DOCOL         : LLINE#
          0
230 E9AF1 0000         CON(5) =LIT           45
          0
```

```
231 E9AF6 D200          CON(5) 45
          0
232 E9AFB 0099          CON(5) =a+BASE          +BASE
          E
233 E9B00 0000          CON(5) =SEMI            ;
          0
234               ****************************************************************
235               ***
236               ***  LLINE
237               ***
238               ****************************************************************
239 E9B05 0000 =aLLINE CON(5) =DOCOL            : LLINE
          0
240 E9B0A 0000          CON(5) =LIT             698
          0
241 E9B0F AB20          CON(5) 698
          0
242 E9B14 1699          CON(5) =a+STR           +STR
          E
243 E9B19 0000          CON(5) =SEMI            ;
          0
244               ****************************************************************
245               ***
246               ***  LISTADDR
247               ***
248               ****************************************************************
249 E9B1E 0000 =aLSTAD CON(5) =DOCOL            : LISTADDR
          0
250 E9B23 0000          CON(5) =LIT             50
          0
251 E9B28 2300          CON(5) 50
          0
252 E9B2D 0099          CON(5) =a+BASE          +BASE
          E
253 E9B32 0000          CON(5) =SEMI            ;
          0
254               ****************************************************************
255               ***
256               ***  LISTFILE
257               ***
258               ****************************************************************
259 E9B37 0000 =aLISTF CON(5) =DOCOL            : LISTFILE
          0
260 E9B3C 0000          CON(5) =LIT             55
          0
261 E9B41 7300          CON(5) 55
          0
262 E9B46 0099          CON(5) =a+BASE          +BASE
          E
263 E9B4B 0000          CON(5) =SEMI            ;
          0
264               ****************************************************************
265               ***
266               ***  PAGENO
267               ***
```

```
268                ****************************************************************
269 E9B50 0000 =aPAGE# CON(5) =DOCOL          : PAGENO
            0
270 E9B55 0000         CON(5) =LIT            60
            0
271 E9B5A C300         CON(5) 60
            0
272 E9B5F 0099         CON(5) =a+BASE         +BASE
            E
273 E9B64 0000         CON(5) =SEMI           ;
            0
274                ****************************************************************
275                ***
276                ***  TOLIST
277                ***
278                ****************************************************************
279 E9B69 0000 =aTOLST CON(5) =DOCOL          : TOLIST
            0
280 E9B6E 0000         CON(5) =LIT            65
            0
281 E9B73 1400         CON(5) 65
            0
282 E9B78 0099         CON(5) =a+BASE         +BASE
            E
283 E9B7D 0000         CON(5) =SEMI           ;
            0
284                ****************************************************************
285                ***
286                ***  OFILE
287                ***
288                ****************************************************************
289 E9B82 0000 =aOFILE CON(5) =DOCOL          : OFILE
            0
290 E9B87 0000         CON(5) =LIT            894
            0
291 E9B8C E730         CON(5) 894
            0
292 E9B91 1699         CON(5) =a+STR          +STR
            E
293 E9B96 0000         CON(5) =SEMI           ;
            0
294                ****************************************************************
295                ***
296                ***  ERR$
297                ***
298                ****************************************************************
299 E9B9B 0000 =aERR$  CON(5) =DOCOL          : ERR$
            0
300 E9BA0 0000         CON(5) =LIT            938
            0
301 E9BA5 AA30         CON(5) 938
            0
302 E9BAA 1699         CON(5) =a+STR          +STR
            E
303 E9BAF 0000         CON(5) =SEMI           ;
```

```
          0
                ****************************************************************
                ***
                ***  LABEL.FIELD
                ***
                ****************************************************************
E9BB4 0000 =aLAB.F CON(5) =DOCOL          : LABEL.FIELD
          0
E9BB9 0000         CON(5) =LIT            1042
          0
E9BBE 2140         CON(5) 1042
          0
E9BC3 1699         CON(5) =a+STR          +STR
          E
E9BC8 0000         CON(5) =SEMI           ;
          0
                ****************************************************************
                ***
                ***  OPCODE.FIELD
                ***
                ****************************************************************
E9BCD 0000 =aOPC.F CON(5) =DOCOL          : OPCODE.FIELD
          0
E9BD2 0000         CON(5) =LIT            1066
          0
E9BD7 A240         CON(5) 1066
          0
E9BDC 1699         CON(5) =a+STR          +STR
          E
E9BE1 0000         CON(5) =SEMI           ;
          0
                ****************************************************************
                ***
                ***  EXPRESSION.FIELD
                ***
                ****************************************************************
E9BE6 0000 =aEXP.F CON(5) =DOCOL          : EXPRESSION.FIELD
          0
E9BEB 0000         CON(5) =LIT            1090
          0
E9BF0 2440         CON(5) 1090
          0
E9BF5 1699         CON(5) =a+STR          +STR
          E
E9BFA 0000         CON(5) =SEMI           ;
          0
                ****************************************************************
                ***
                ***  EXPRCOL
                ***
                ****************************************************************
E9BFF 0000 =aEXPRC CON(5) =DOCOL          : EXPRCOL
          0
E9C04 0000         CON(5) =LIT            215
          0
```

```
341 E9C09 7D00          CON(5) 215
          0
342 E9C0E 0099          CON(5) =a+BASE          +BASE
          E
343 E9C13 0000          CON(5) =SEMI            ;
          0
344               *** ( *** THESE VARIABLES ARE SET WHEN AN OPCODE LOOKUP IS )
345               *** (     MADE, BY THE WORD 'OPC.LOOKUP' *** )
346               ****************************************************************
347               ***
348               ***  OPTYPE
349               ***
350               ****************************************************************
351 E9C18 0000 =aOPTYP CON(5) =DOCOL          : OPTYPE
          0
352 E9C1D 0000          CON(5) =LIT            70
          0
353 E9C22 6400          CON(5) 70
          0
354 E9C27 0099          CON(5) =a+BASE         +BASE
          E
355 E9C2C 0000          CON(5) =SEMI           ;
          0
356               ****************************************************************
357               ***
358               ***  OPFLAGS
359               ***
360               ****************************************************************
361 E9C31 0000 =aOPFLG CON(5) =DOCOL          : OPFLAGS
          0
362 E9C36 0000          CON(5) =LIT            75
          0
363 E9C3B B400          CON(5) 75
          0
364 E9C40 0099          CON(5) =a+BASE         +BASE
          E
365 E9C45 0000          CON(5) =SEMI           ;
          0
366               ****************************************************************
367               ***
368               ***  OPLEN
369               ***
370               ****************************************************************
371 E9C4A 0000 =aOPLEN CON(5) =DOCOL          : OPLEN
          0
372 E9C4F 0000          CON(5) =LIT            80
          0
373 E9C54 0500          CON(5) 80
          0
374 E9C59 0099          CON(5) =a+BASE         +BASE
          E
375 E9C5E 0000          CON(5) =SEMI           ;
          0
376               ****************************************************************
377               ***
```

```
                ***  OP
                ***
                ********************************************************************
E9C63 0000 =aOP     CON(5) =DOCOL          : OP
           0
E9C68 0000          CON(5) =LIT            85
           0
E9C6D 5500          CON(5) 85
           0
E9C72 0099          CON(5) =a+BASE         +BASE
           E
E9C77 0000          CON(5) =SEMI           ;
           0
                ********************************************************************
                ***
                ***  FILL.MARK
                ***
                ********************************************************************
E9C7C 0000 =aFILMK CON(5) =DOCOL           : FILL.MARK
           0
E9C81 0000          CON(5) =LIT            175
           0
E9C86 FA00          CON(5) 175
           0
E9C8B 0099          CON(5) =a+BASE         +BASE
           E
E9C90 0000          CON(5) =SEMI           ;
           0
                ********************************************************************
                ***
                ***  REG.GROUP
                ***
                ********************************************************************
E9C95 0000 =aREGRP CON(5) =DOCOL           : REG.GROUP
           0
E9C9A 0000          CON(5) =LIT            175
           0
E9C9F FA00          CON(5) 175
           0
E9CA4 0099          CON(5) =a+BASE         +BASE
           E
E9CA9 0000          CON(5) =SEMI           ;
           0
                ********************************************************************
                ***
                ***  ARITH.GROUP
                ***
                ********************************************************************
E9CAE 0000 =aARGRP CON(5) =DOCOL           : ARITH.GROUP
           0
E9CB3 0000          CON(5) =LIT            175
           0
E9CB8 FA00          CON(5) 175
           0
E9CBD 0099          CON(5) =a+BASE         +BASE
```

```
          E
415 E9CC2 0000          CON(5) =SEMI            ;
          0
416               ****************************************************************
417               ***
418               ***  FILL.LENGTH
419               ***
420               ****************************************************************
421 E9CC7 0000 =aFILEN CON(5) =DOCOL           : FILL.LENGTH
          0
422 E9CCC 0000          CON(5) =LIT             180
          0
423 E9CD1 4B00          CON(5) 180
          0
424 E9CD6 0099          CON(5) =a+BASE          +BASE
          E
425 E9CDB 0000          CON(5) =SEMI            ;
          0
426               ****************************************************************
427               ***
428               ***  OPCPOS & RTNSTK
429               ***
430               ****************************************************************
431 E9CE0         =aRSTK
432 E9CE0 0000 =aOPCPO CON(5) =DOCOL           : OPCPOS
          0
433 E9CE5 0000          CON(5) =LIT             185
          0
434 E9CEA 9B00          CON(5) 185
          0
435 E9CEF 0099          CON(5) =a+BASE          +BASE
          E
436 E9CF4 0000          CON(5) =SEMI            ;
          0
437               ****************************************************************
438               ***
439               ***  OPCPTR & DATASTK
440               ***
441               ****************************************************************
442 E9CF9         =aDSTK
443 E9CF9 0000 =aOPCPT CON(5) =DOCOL           : OPCPTR
          0
444 E9CFE 0000          CON(5) =LIT             190
          0
445 E9D03 EB00          CON(5) 190
          0
446 E9D08 0099          CON(5) =a+BASE          +BASE
          E
447 E9D0D 0000          CON(5) =SEMI            ;
          0
448               ****************************************************************
449               ***
450               ***  OPCTOP
451               ***
452               ****************************************************************
```

```
453 E9D12 0000 =aOPCTO CON(5) =DOCOL         : OPCTOP
          0
454 E9D17 0000         CON(5) =LIT           195
          0
455 E9D1C 3C00         CON(5) 195
          0
456 E9D21 0099         CON(5) =a+BASE        +BASE
          E
457 E9D26 0000         CON(5) =SEMI          ;
          0
458            ****************************************************************
459            ***
460            ***  VALUE
461            ***
462            ****************************************************************
463 E9D2B 0000 =aVALUE CON(5) =DOCOL         : VALUE
          0
464 E9D30 0000         CON(5) =LIT           200
          0
465 E9D35 8C00         CON(5) 200
          0
466 E9D3A 0099         CON(5) =a+BASE        +BASE
          E
467 E9D3F 0000         CON(5) =SEMI          ;
          0
468            ****************************************************************
469            ***
470            ***  TOKEN
471            ***
472            ****************************************************************
473 E9D44 0000 =aTOKEN CON(5) =DOCOL         : TOKEN
          0
474 E9D49 0000         CON(5) =LIT           205
          0
475 E9D4E DC00         CON(5) 205
          0
476 E9D53 0099         CON(5) =a+BASE        +BASE
          E
477 E9D58 0000         CON(5) =SEMI          ;
          0
478            ****************************************************************
479            ***
480            ***  IDENTIFIER
481            ***
482            ****************************************************************
483 E9D5D 0000 =aIDENT CON(5) =DOCOL         : IDENTIFIER
          0
484 E9D62 0000         CON(5) =LIT           1194
          0
485 E9D67 AA40         CON(5) 1194
          0
486 E9D6C 1699         CON(5) =a+STR         +STR
          E
487 E9D71 0000         CON(5) =SEMI          ;
          0
```

```
488                *** ( *** THESE ARE USED BY VARIOUS PSEUDO-OPS )
489                ****************************************************************
490                ***
491                ***  REVERS
492                ***
493                ****************************************************************
494 E9D76 0000 =aREVER CON(5) =DOCOL          : REVERS
           0
495 E9D7B 0000         CON(5) =LIT           210
           0
496 E9D80 2D00         CON(5) 210
           0
497 E9D85 0099         CON(5) =a+BASE        +BASE
           E
498 E9D8A 0000         CON(5) =SEMI          ;
           0
499                ****************************************************************
500                ***
501                ***  OLDEXPR
502                ***
503                ****************************************************************
504 E9D8F 0000 =aOLDEX CON(5) =DOCOL          : OLDEXPR
           0
505 E9D94 0000         CON(5) =LIT           1218
           0
506 E9D99 2C40         CON(5) 1218
           0
507 E9D9E 1699         CON(5) =a+STR         +STR
           E
508 E9DA3 0000         CON(5) =SEMI          ;
           0
509                ****************************************************************
510                ***
511                ***  HITOK
512                ***
513                ****************************************************************
514 E9DA8 0000 =aHITOK CON(5) =DOCOL          : HITOK
           0
515 E9DAD 0000         CON(5) =LIT           220
           0
516 E9DB2 CD00         CON(5) 220
           0
517 E9DB7 0099         CON(5) =a+BASE        +BASE
           E
518 E9DBC 0000         CON(5) =SEMI          ;
           0
519                ****************************************************************
520                ***
521                ***  LOTOK
522                ***
523                ****************************************************************
524 E9DC1 0000 =aLOTOK CON(5) =DOCOL          : LOTOK
           0
525 E9DC6 0000         CON(5) =LIT           225
           0
```

```
526 E9DCB 1E00          CON(5) 225
          0
527 E9DD0 0099          CON(5) =a+BASE          +BASE
          E
528 E9DD5 0000          CON(5) =SEMI            ;
          0
529               ****************************************************************
530               ***
531               ***  TENT
532               ***
533               ****************************************************************
534 E9DDA 0000 =aTENT  CON(5) =DOCOL           : TENT
          0
535 E9DDF 0000          CON(5) =LIT             230
          0
536 E9DE4 6E00          CON(5) 230
          0
537 E9DE9 0099          CON(5) =a+BASE          +BASE
          E
538 E9DEE 0000          CON(5) =SEMI            ;
          0
539               ****************************************************************
540               ***
541               ***  KENT
542               ***
543               ****************************************************************
544 E9DF3 0000 =aKENT  CON(5) =DOCOL           : KENT
          0
545 E9DF8 0000          CON(5) =LIT             235
          0
546 E9DFD BE00          CON(5) 235
          0
547 E9E02 0099          CON(5) =a+BASE          +BASE
          E
548 E9E07 0000          CON(5) =SEMI            ;
          0
549               ****************************************************************
550               ***
551               ***  SYTAD
552               ***
553               ****************************************************************
554 E9E0C 0000 =aSYTAD CON(5) =DOCOL           : SYTAD
          0
555 E9E11 0000          CON(5) =LIT             240
          0
556 E9E16 0F00          CON(5) 240
          0
557 E9E1B 0099          CON(5) =a+BASE          +BASE
          E
558 E9E20 0000          CON(5) =SEMI            ;
          0
559               ****************************************************************
560               ***
561               ***  SYTSIZE
562               ***
```

```
563                ****************************************************************
564 E9E25 0000 =aSYTSZ CON(5) =DOCOL          : SYTSIZE
          0
565 E9E2A 0000         CON(5) =LIT            245
          0
566 E9E2F 5F00         CON(5) 245
          0
567 E9E34 0099         CON(5) =a+BASE         +BASE
          E
568 E9E39 0000         CON(5) =SEMI           ;
          0
569                ****************************************************************
570                ***
571                ***  SYTLAST
572                ***
573                ****************************************************************
574 E9E3E 0000 =aSYTLS CON(5) =DOCOL          : SYTLAST
          0
575 E9E43 0000         CON(5) =LIT            250
          0
576 E9E48 AF00         CON(5) 250
          0
577 E9E4D 0099         CON(5) =a+BASE         +BASE
          E
578 E9E52 0000         CON(5) =SEMI           ;
          0
579                ****************************************************************
580                ***
581                ***  BTOP
582                ***
583                ****************************************************************
584 E9E57 0000 =aBTOP  CON(5) =DOCOL          : BTOP
          0
585 E9E5C 0000         CON(5) =LIT            255
          0
586 E9E61 FF00         CON(5) 255
          0
587 E9E66 0099         CON(5) =a+BASE         +BASE
          E
588 E9E6B 0000         CON(5) =SEMI           ;
          0
589                ****************************************************************
590                ***
591                ***  BLOW
592                ***
593                ****************************************************************
594 E9E70 0000 =aBLOW  CON(5) =DOCOL          : BLOW
          0
595 E9E75 0000         CON(5) =LIT            260
          0
596 E9E7A 4010         CON(5) 260
          0
597 E9E7F 0099         CON(5) =a+BASE         +BASE
          E
598 E9E84 0000         CON(5) =SEMI           ;
```

```
          0
599             ****************************************************************
600             ***
601             ***  BFOUND
602             ***
603             ****************************************************************
604 E9E89 0000 =aBFOUN CON(5) =DOCOL          : BFOUND
          0
605 E9E8E 0000         CON(5) =LIT           265
          0
606 E9E93 9010         CON(5) 265
          0
607 E9E98 0099         CON(5) =a+BASE        +BASE
          E
608 E9E9D 0000         CON(5) =SEMI          ;
          0
609             ****************************************************************
610             ***
611             ***  OBJFILE
612             ***
613             ****************************************************************
614 E9EA2 0000 =aOBJFL CON(5) =DOCOL          : OBJFILE
          0
615 E9EA7 0000         CON(5) =LIT           270
          0
616 E9EAC E010         CON(5) 270
          0
617 E9EB1 0099         CON(5) =a+BASE        +BASE
          E
618 E9EB6 0000         CON(5) =SEMI          ;
          0
619             ****************************************************************
620             ***
621             ***  FILESIZE
622             ***
623             ****************************************************************
624 E9EBB 0000 =aFLSIZ CON(5) =DOCOL          : FILESIZE
          0
625 E9EC0 0000         CON(5) =LIT           275
          0
626 E9EC5 3110         CON(5) 275
          0
627 E9ECA 0099         CON(5) =a+BASE        +BASE
          E
628 E9ECF 0000         CON(5) =SEMI          ;
          0
629             ****************************************************************
630             ***
631             ***  ERRMSG
632             ***
633             *** ( NUM -- STR )
634             *** ( GET A MESSAGE & ALLOW FOR FOREIGN LANGUAGE )
635             *** ( POLL INTERCEPTS )
636             ****************************************************************
637 E9ED4 0000 =aERMSG CON(5) =DOCOL          : ERRMSG
```

```
          0
638               *
639               * GENERATE A STRING TO PASS TO BASIC WHICH HAS FORM:
640               *      MSG$(47000+xx)
641               * WHERE xx IS THE MESSAGE NUMBER PASSED TO ERRMSG.
642               *
643 E9ED9 0000            CON(5) =QUOTC          " MSG$(47000+"
          0
644 E9EDE B0             CON(2) 11
645 E9EE0 B0             CON(2) 11
646 E9EE2 D435           NIBASC \MSG$(470\
          7442
          8243
          7303
647 E9EF2 0303           NIBASC \00+\
          B2
648 E9EF8 0000            CON(5) =a>PAD          >PAD         ( * NUM STR * )
          0
649 E9EFD 0000            CON(5) =ROT            ROT          ( * STR NUM * )
          0
650 E9F02 0000            CON(5) =DEC            DECIMAL
          0
651 E9F07 0000            CON(5) =aNUM#2         #2
          0
652 E9F0C 0000            CON(5) =S<&            S<&          ( * STR * )
          0
653 E9F11 0000            CON(5) =QUOTC          " )"
          0
654 E9F16 10              CON(2) 1
655 E9F18 10              CON(2) 1
656 E9F1A 92              NIBASC \)\
657 E9F1C 0000            CON(5) =S<&            S<&          ( * STR * )
          0
658               *
659               * CALL BASIC FUNCTION MSG(), WHICH RESIDES IN THE EDITOR
660               * ROM THAT RETURNS THE MESSAGE STRING FROM THE APPROPRIATE
661               * MESSAGE TABLE (DIFFERS FROM ERRM$ IN THAT IT ISSUES A
662               * MESSAGE POLL)
663               *
664 E9F21 AB2A              CON(5) =aBAS$          BASIC$       ( * STR * )
          E
665 E9F26 0000            CON(5) =SEMI           ;            ( * STR * )
          0
666               ********************************************************************
667               ***
668               ***  STR.INIT
669               ***
670               *** ( -- )
671               *** ( INITIALIZE THE STRINGS IN THE VARIABLE BUFFER )
672               ********************************************************************
673 E9F2B 0000 =aSTRIN CON(5) =DOCOL          : STR.INIT
          0
674               *
675               * LABEL FIELD
676               *
```

```
677 E9F30 0000          CON(5) =ZERO            0
          0
678 E9F35 0099          CON(5) =a+BASE          +BASE           ( * PTR * )
          E
679 E9F3A 0000          CON(5) =LIT             1042
          0
680 E9F3F 2140          CON(5) 1042
          0
681 E9F44 0000          CON(5) =OVER            OVER
          0
682 E9F49 0000          CON(5) =ADD             +
          0
683 E9F4E 0000          CON(5) =LIT             10
          0
684 E9F53 A000          CON(5) 10
          0
685 E9F58 0000          CON(5) =SWAP            SWAP
          0
686 E9F5D 0000          CON(5) =STORE           !               ( * PTR * )
          0
687               *
688               * OPCODE FIELD
689               *
690 E9F62 0000          CON(5) =LIT             1066
          0
691 E9F67 A240          CON(5) 1066
          0
692 E9F6C 0000          CON(5) =OVER            OVER
          0
693 E9F71 0000          CON(5) =ADD             +
          0
694 E9F76 0000          CON(5) =LIT             10
          0
695 E9F7B A000          CON(5) 10
          0
696 E9F80 0000          CON(5) =SWAP            SWAP
          0
697 E9F85 0000          CON(5) =STORE           !               ( * PTR * )
          0
698               *
699               * IDENTIFIER
700               *
701 E9F8A 0000          CON(5) =LIT             1194
          0
702 E9F8F AA40          CON(5) 1194
          0
703 E9F94 0000          CON(5) =OVER            OVER
          0
704 E9F99 0000          CON(5) =ADD             +
          0
705 E9F9E 0000          CON(5) =LIT             10
          0
706 E9FA3 A000          CON(5) 10
          0
707 E9FA8 0000          CON(5) =SWAP            SWAP
```

```
          0
708 E9FAD 0000        CON(5) =STORE         !             ( * PTR * )
          0
709               *
710               * SOURCE FILE NAME
711               *
712 E9FB2 0000        CON(5) =LIT           458
          0
713 E9FB7 AC10        CON(5) 458
          0
714 E9FBC 0000        CON(5) =OVER          OVER
          0
715 E9FC1 0000        CON(5) =ADD           +
          0
716 E9FC6 0000        CON(5) =LIT           20
          0
717 E9FCB 4100        CON(5) 20
          0
718 E9FD0 0000        CON(5) =SWAP          SWAP
          0
719 E9FD5 0000        CON(5) =STORE         !             ( * PTR * )
          0
720               *
721               * OBJECT FILE NAME
722               *
723 E9FDA 0000        CON(5) =LIT           894
          0
724 E9FDF E730        CON(5) 894
          0
725 E9FE4 0000        CON(5) =OVER          OVER
          0
726 E9FE9 0000        CON(5) =ADD           +
          0
727 E9FEE 0000        CON(5) =LIT           20
          0
728 E9FF3 4100        CON(5) 20
          0
729 E9FF8 0000        CON(5) =SWAP          SWAP
          0
730 E9FFD 0000        CON(5) =STORE         !             ( * PTR * )
          0
731               *
732               * TITLE STRING
733               *
734 EA002 0000        CON(5) =LIT           290
          0
735 EA007 2210        CON(5) 290
          0
736 EA00C 0000        CON(5) =OVER          OVER
          0
737 EA011 0000        CON(5) =ADD           +
          0
738 EA016 0000        CON(5) =LIT           40
          0
739 EA01B 8200        CON(5) 40
```

```
                0
740 EA020 0000          CON(5) =SWAP            SWAP
                0
741 EA025 0000          CON(5) =STORE           !               ( * PTR * )
                0
742                *
743                * SUB-TITLE STRING
744                *
745 EA02A 0000          CON(5) =LIT             374
                0
746 EA02F 6710          CON(5) 374
                0
747 EA034 0000          CON(5) =OVER            OVER
                0
748 EA039 0000          CON(5) =ADD             +
                0
749 EA03E 0000          CON(5) =LIT             40
                0
750 EA043 8200          CON(5) 40
                0
751 EA048 0000          CON(5) =SWAP            SWAP
                0
752 EA04D 0000          CON(5) =STORE           !               ( * PTR * )
                0
753                *
754                * ERROR STRING
755                *
756 EA052 0000          CON(5) =LIT             938
                0
757 EA057 AA30          CON(5) 938
                0
758 EA05C 0000          CON(5) =OVER            OVER
                0
759 EA061 0000          CON(5) =ADD             +
                0
760 EA066 0000          CON(5) =LIT             50
                0
761 EA06B 2300          CON(5) 50
                0
762 EA070 0000          CON(5) =SWAP            SWAP
                0
763 EA075 0000          CON(5) =STORE           !               ( * PTR * )
                0
764                *
765                * EXPRESSION FIELD
766                *
767 EA07A 0000          CON(5) =LIT             1090
                0
768 EA07F 2440          CON(5) 1090
                0
769 EA084 0000          CON(5) =OVER            OVER
                0
770 EA089 0000          CON(5) =ADD             +
                0
771 EA08E 0000          CON(5) =LIT             50
```

```
          0
772 EA093 2300        CON(5) 50
          0
773 EA098 0000        CON(5) =SWAP          SWAP
          0
774 EA09D 0000        CON(5) =STORE         !             ( * PTR * )
          0
775             *
776             * OLD EXPRESSION
777             *
778 EA0A2 0000        CON(5) =LIT           1218
          0
779 EA0A7 2C40        CON(5) 1218
          0
780 EA0AC 0000        CON(5) =OVER          OVER
          0
781 EA0B1 0000        CON(5) =ADD           +
          0
782 EA0B6 0000        CON(5) =LIT           50
          0
783 EA0BB 2300        CON(5) 50
          0
784 EA0C0 0000        CON(5) =SWAP          SWAP
          0
785 EA0C5 0000        CON(5) =STORE         !             ( * PTR * )
          0
786             *
787             * SOURCE LINE
788             *
789 EA0CA 0000        CON(5) =LIT           502
          0
790 EA0CF 6F10        CON(5) 502
          0
791 EA0D4 0000        CON(5) =OVER          OVER
          0
792 EA0D9 0000        CON(5) =ADD           +
          0
793 EA0DE 0000        CON(5) =LIT           96
          0
794 EA0E3 0600        CON(5) 96
          0
795 EA0E8 0000        CON(5) =SWAP          SWAP
          0
796 EA0ED 0000        CON(5) =STORE         !             ( * PTR * )
          0
797             *
798             * LISTING FILE LINE
799             *
800 EA0F2 0000        CON(5) =LIT           698
          0
801 EA0F7 AB20        CON(5) 698
          0
802 EA0FC 0000        CON(5) =ADD           +
          0
803 EA101 0000        CON(5) =LIT           96
```

```
          0
804 EA106 0600          CON(5) 96
          0
805 EA10B 0000          CON(5) =SWAP            SWAP
          0
806 EA110 0000          CON(5) =STORE           !
          0
807 EA115 0000          CON(5) =SEMI            ;               ( * * )
          0
808               ****************************************************************
809               ***
810               ***  VAR.INIT
811               ***
812               *** ( -- )
813               *** ( INITIALIZE THE VARIABLES WHICH THE ASSEMBLER USES )
814               ****************************************************************
815 EA11A 0000 =aVARIN CON(5) =DOCOL           : VAR.INIT
          0
816               *
817               * MAKE THE GENERAL PURPOSE BUFFER TO PUT VARIABLES IN
818               *
819 EA11F 0000          CON(5) =LIT             1332
          0
820 EA124 4350          CON(5) 1332
          0
821 EA129 0000          CON(5) =IOMAKE          MAKEBF
          0
822 EA12E 0000          CON(5) =ZBRNH           IF              ( * [ADDR ID] * )
          0
823 EA133 D200          REL(5) %IF2
          0
824               *
825               * SUCCESS!  SAVE THE BUFFER ID IN VARIABLE VARID
826               *
827 EA138 0000          CON(5) =VARID           VARID
          0
828 EA13D 0000          CON(5) =STORE           !               ( * ADDR * )
          0
829               *
830               * INITIALIZE THE NUMBERIC VARIABLES TO ZERO
831               *
832 EA142 0000          CON(5) =LIT             290
          0
833 EA147 2210          CON(5) 290
          0
834 EA14C 0000          CON(5) =ZERO            0
          0
835 EA151 0000          CON(5) =NFILL           NFILL           ( * * )
          0
836               *
837               * INITIALIZE THE STRINGS WITH MAX LENGTH & CURRENT LENGTH
838               *
839 EA156 B2F9          CON(5) =aSTRIN          STR.INIT        ( * * )
          E
840 EA15B 0000          CON(5) =SEMI            ;               ( * * )
```

```
          0
841             *
842             * COULDN'T BUILD THE BUFFER
843             *
844 EA160        %IF2                          ELSE        ( * * )
845 EA160 0000          CON(5) =LIT           47
          0
846 EA165 F200          CON(5) 47             'not enough room for assembler'
          0
847 EA16A 4DE9          CON(5) =aERMSG        ERRMSG
          E
848 EA16F 0000          CON(5) =TYPE          TYPE
          0
849 EA174 0000          CON(5) =ABORT         ABORT
          0
850             ********************************************************************
851             ***
852             ***  MEMMOVE
853             ***
854             *** ( -- )
855             *** ( ADJUST ALL POINTERS THAT ARE AFFECTED BY MEMORY )
856             *** ( MOVING )
857             ********************************************************************
858 EA179 0000 =aMEMOV CON(5) =DOCOL          : MEMMOVE
          0
859             *
860             * FIND OBJECT FILE START
861             *
862 EA17E 28B9          CON(5) =aOFILE        OFILE
          E
863 EA183 0000          CON(5) =SWAP          SWAP
          0
864 EA188 0000          CON(5) =DROP          DROP
          0
865 EA18D 0000          CON(5) =ZBRNH         IF
          0
866 EA192 9100          REL(5) %IF3
          0
867 EA197 28B9          CON(5) =aOFILE        OFILE
          E
868 EA19C 0000          CON(5) =FFIND         FFIND
          0
869 EA1A1 2AE9          CON(5) =aOBJFL        OBJFILE
          E
870 EA1A6 0000          CON(5) =STORE         !
          0
871 EA1AB        %IF3                          THEN
872             *
873             * FIND SYMBOL TABLE START
874             *
875 EA1AB 0000          CON(5) =QUOTC         " ASMBSY"
          0
876 EA1B0 60            CON(2) 6
877 EA1B2 60            CON(2) 6
878 EA1B4 1435          NIBASC \ASMBSY\
```

```
          D424
          3595
  879 EA1C0 0000          CON(5) =FFIND          FFIND
          0
  880 EA1C5 0000          CON(5) =LIT            37
          0
  881 EA1CA 5200          CON(5) 37
          0
  882 EA1CF 0000          CON(5) =ADD            +
          0
  883 EA1D4 C0E9          CON(5) =aSYTAD         SYTAD
          E
  884 EA1D9 0000          CON(5) =STORE          !
          0
  885               *
  886               * IS THERE A LISTING FILE ?
  887               *
  888 EA1DE 73B9          CON(5) =aLISTF         LISTFILE
          E
  889 EA1E3 0000          CON(5) =AT             @
          0
  890 EA1E8 0000          CON(5) =ZBRNH          IF
          0
  891 EA1ED 9100          REL(5) %IF4
          0
  892               *
  893               * FIND LISTING FILE START
  894               *
  895 EA1F2 0000          CON(5) =LISTNG         LISTING
          0
  896 EA1F7 0000          CON(5) =FFIND          FFIND
          0
  897 EA1FC 73B9          CON(5) =aLISTF         LISTFILE
          E
  898 EA201 0000          CON(5) =STORE          !
          0
  899 EA206        %IF4                          THEN
  900 EA206 0000          CON(5) =SEMI           ;              ( * * )
          0
  901               ********************************************************************
  902               ***
  903               ***  -1
  904               ***
  905               *** ( -- NUM )
  906               *** ( MINUS ONE IS USED SO OFTEN, IT'S WORTH IT )
  907               ********************************************************************
  908 EA20B 0000 =aNEG1   CON(5) =DOCOL          : -1
          0
  909 EA210 0000          CON(5) =LIT
          0
  910 EA215 FFFF          CON(5) 0-1             -1
          F
  911 EA21A 0000          CON(5) =SEMI           ;
          0
  912               ********************************************************************
```

```
913                ***
914                ***  ONTO PAD 2
915                ***
916                *** ( STR -- )
917                *** ( MOVE THE STRING INTO THE SECOND HALF OF THE PAD )
918                ********************************************************************
919 EA21F 0000 =a>PAD2 CON(5) =DOCOL          : ONTO PAD 2
           0
920                *
921                * SAVE LENGTH
922                *
923 EA224 0000          CON(5) =>R            >R          ( * PTR * )
           0
924                *
925                * POINT TO START OF STRING (INCLUDE MAX & CUR LENGTH)
926                *
927 EA229 0000          CON(5) =LIT           4
           0
928 EA22E 4000          CON(5) 4
           0
929 EA233 0000          CON(5) =MINUS         -           ( * PTR * )
           0
930                *
931                * POINT TO SECOND HALF OF PAD
932                *
933 EA238 0000          CON(5) =PAD           PAD
           0
934 EA23D 000u          CON(5) =LIT           80
           0
935 EA242 0500          CON(5) 80
           0
936 EA247 0000          CON(5) =ADD           +           ( * PTR PTR' * )
           0
937                *
938                * MOVE STRING
939                *
940 EA24C 0000          CON(5) =R>            R>
           0
941 EA251 0000          CON(5) =TWO+          2+          ( * PTR PTR' CNT * )
           0
942 EA256 0000          CON(5) =CMOVE         CMOVE
           0
943 EA25B 0000          CON(5) =SEMI          ;           ( * * )
           0
944                ********************************************************************
945                ***
946                ***  OFF PAD 2
947                ***
948                *** ( -- STR )
949                *** ( RECOVER STRING FROM THE SECOND HALF OF THE PAD )
950                ********************************************************************
951 EA260 0000 =aPAD2> CON(5) =DOCOL          : OFF PAD 2
           0
952                *
953                * POINT TO SECOND HALF OF PAD
```

```
954                *
955 EA265 0000             CON(5) =PAD             PAD          ( * PTR * )
          0
956 EA26A 0000             CON(5) =LIT             82
          0
957 EA26F 2500             CON(5) 82
          0
958 EA274 0000             CON(5) =ADD             +            ( * PTR * )
          0
959                *
960                * EXTRACT STRING
961                *
962 EA279 0000             CON(5) =COUNT           COUNT        ( * STR * )
          0
963 EA27E 0000             CON(5) =SEMI            ;            ( * STR * )
          0
964                ****************************************************************
965                ***
966                ***  MEMORY ABORT
967                ***
968                *** ( -- )
969                *** ( ABORT ASSEMBLER BECAUSE MEMORY ALL GONE )
970                ****************************************************************
971 EA283 0000 =aMEMAB CON(5) =DOCOL          : MEMORY ABORT
          0
972                *
973                * PUT OBJECT FILE NAME INTO LATTER HALF OF PAD
974                *
975 EA288 28B9             CON(5) =aOFILE          OBJFILE      ( * STR * )
          E
976 EA28D F12A             CON(5) =a>PAD2          >PAD2        ( * * )
          E
977                *
978                * KILL OUR VARIABLE BUFFER SO WE HAVE SOME SPACE
979                *
980 EA292 0000             CON(5) =VARID           VARID
          0
981 EA297 0000             CON(5) =AT              @            ( * NUM * )
          0
982 EA29C 0000             CON(5) =IOKILL          KILLBF
          0
983 EA2A1 0000             CON(5) =DROP            DROP         ( * * )
          0
984                *
985                * ABORT WITH NOT ENOUGH MEMORY
986                *
987 EA2A6 0000             CON(5) =LIT             47
          0
988 EA2AB F200             CON(5) 47               'not enough memory for assembler'
          0
989 EA2B0 062A             CON(5) =aPAD2>          PAD2>        ( * NUM STR * )
          E
990 EA2B5 0000             CON(5) =aABRT           ASSEMBLER ABORT
          0
991                ****************************************************************
```

```
 992                ***
 993                ***  BASIC$
 994                ***
 995                *** ( STR -- STR )
 996                *** ( DO A NORMAL 'BASIC$', BUT WITH ERROR TRAPS )
 997                ********************************************************************
 998 EA2BA 0000 =aBAS$  CON(5) =DOCOL          : BASIC$
             0
 999 EA2BF 0000         CON(5) =LIT           MEMORY ABORT
             0
1000 EA2C4 382A         CON(5) =aMEMAB
             E
1001 EA2C9 0000         CON(5) =ONERR         ONERR
             0
1002 EA2CE 0000         CON(5) =STORE         !
             0
1003 EA2D3 0000         CON(5) =BASIC$        BASIC$
             0
1004 EA2D8 0000         CON(5) =ZERO          0
             0
1005 EA2DD 0000         CON(5) =ONERR         ONERR
             0
1006 EA2E2 0000         CON(5) =STORE         !
             0
1007 EA2E7 0000         CON(5) =SEMI          ;           ( * STR * )
             0
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
1008                    STITLE FIT STATS
1009            zSIZE   EQU    (*)-zTHIS
1010            zLEFT   EQU    (zNEXT)-*
1011 EA2EC              BSS    zLEFT
```

```
%IF1     Abs  956717 #E992D -    46    32
%IF2     Abs  958816 #EA160 -   844   823
%IF3     Abs  958891 #EA1AB -   871   866
%IF4     Abs  958982 #EA206 -   899   891
>R       Ext                -   923
?DUP     Ext                -    30
ABORT    Ext                -    56   849
ADD      Ext                -    36   682   693   704   715   726   737   748
                             759   770   781   792   802   882   936   958
AT       Ext                -    28   889   981
BASIC$   Ext                -  1003
CMOVE    Ext                -   942
COUNT    Ext                -    68   962
CR       Ext                -    50
DEC      Ext                -   650
DOCOL    Ext                -    23    65    75    84    94   109   119   129
                             139   149   159   169   179   189   199   209
                             219   229   239   249   259   269   279   289
                             299   309   319   329   339   351   361   371
                             381   391   401   411   421   432   443   453
                             463   473   483   494   504   514   524   534
                             544   554   564   574   584   594   604   614
                             624   637   673   815   858   908   919   951
                             971   998
DROP     Ext                -   864   983
FFIND    Ext                -   868   879   896
IOFIND   Ext                -    29
IOKILL   Ext                -   982
IOMAKE   Ext                -   821
LISTNG   Ext                -   895
LIT      Ext                -    85    95   110   120   130   140   150   160
                             170   180   190   200   210   220   230   240
                             250   260   270   280   290   300   310   320
                             330   340   352   362   372   382   392   402
                             412   422   433   444   454   464   474   484
                             495   505   515   525   535   545   555   565
                             575   585   595   605   615   625   679   683
                             690   694   701   705   712   716   723   727
                             734   738   745   749   756   760   767   771
                             778   782   789   793   800   803   819   832
                             845   880   909   927   934   956   987   999
MINUS    Ext                -   929
NFILL    Ext                -   835
ONERR    Ext                -  1001  1005
OVER     Ext                -   681   692   703   714   725   736   747   758
                             769   780   791
PAD      Ext                -   933   955
PDOTQ    Ext                -    51
QUOTC    Ext                -   643   653   875
R>       Ext                -   940
ROT      Ext                -   649
S<&      Ext                -   652   657
SEMI     Ext                -    37    69    78    88    98   113   123   133
                             143   153   163   173   183   193   203   213
                             223   233   243   253   263   273   283   293
```

					303	313	323	333	343	355	365	375
					385	395	405	415	425	436	447	457
					467	477	487	498	508	518	528	538
					548	558	568	578	588	598	608	618
					628	665	807	840	900	911	943	963
					1007							
STORE	Ext			-	686	697	708	719	730	741	752	763
					774	785	796	806	828	870	884	898
					1002	1006						
SWAP	Ext			-	685	696	707	718	729	740	751	762
					773	784	795	805	863			
TWO+	Ext			-	66	941						
TYPE	Ext			-	848							
VARID	Ext			-	27	827	980					
ZBRNH	Ext			-	31	822	865	890				
ZERO	Ext			-	76	677	834	1004				
=a+BASE	Abs	956672	#E9900	-	23	67	77	87	97	112	122	132
					142	152	162	192	222	232	252	262
					272	282	342	354	364	374	384	394
					404	414	424	435	446	456	466	476
					497	517	527	537	547	557	567	577
					587	597	607	617	627	678		
=a+STR	Abs	956769	#E9961	-	65	172	182	202	212	242	292	302
					312	322	332	486	507			
a>PAD	Ext			-	648							
=a>PAD2	Abs	959007	#EA21F	-	919	976						
aABRT	Ext			-	990							
=aARGRP	Abs	957614	#E9CAE	-	411							
=aBAS$	Abs	959162	#EA2BA	-	998	664						
=aBFOUN	Abs	958089	#E9E89	-	604							
=aBLOW	Abs	958064	#E9E70	-	594							
=aBTOP	Abs	958039	#E9E57	-	584							
aCLEAN	Ext			-	55							
=aDONE	Abs	956914	#E99F2	-	129							
=aDSTK	Abs	957689	#E9CF9	-	442							
=aERCNT	Abs	956989	#E9A3D	-	159							
=aERMSG	Abs	958164	#E9ED4	-	637	847						
=aERR$	Abs	957339	#E9B9B	-	299							
=aEXP.F	Abs	957414	#E9BE6	-	329							
=aEXPRC	Abs	957439	#E9BFF	-	339							
=aFILEN	Abs	957639	#E9CC7	-	421							
=aFILMK	Abs	957564	#E9C7C	-	391							
=aFLSIZ	Abs	958139	#E9EBB	-	624							
=aFLTYP	Abs	956939	#E9A0B	-	139							
=aHITOK	Abs	957864	#E9DA8	-	514							
=aIDENT	Abs	957789	#E9D5D	-	483							
=aKENT	Abs	957939	#E9DF3	-	544							
=aKNOWN	Abs	956889	#E99D9	-	119							
=aLAB.F	Abs	957364	#E9BB4	-	309							
=aLC	Abs	956814	#E998E	-	84							
=aLINEC	Abs	956964	#E9A24	-	149							
=aLISTF	Abs	957239	#E9B37	-	259	888	897					
=aLLIN#	Abs	957164	#E9AEC	-	229							
=aLLINE	Abs	957189	#E9B05	-	239							
=aLNOFF	Abs	957139	#E9AD3	-	219							

```
=aLOTOK  Abs  957889 #E9DC1 -   524
=aLSTAD  Abs  957214 #E9B1E -   249
=aLSTRQ  Abs  956839 #E99A7 -    94
=aMEMAB  Abs  959107 #EA283 -   971  1000
=aMEMOV  Abs  958841 #EA179 -   858
=aNEG1   Abs  958987 #EA20B -   908
 aNUM#2  Ext                   651
=aOBJFL  Abs  958114 #E9EA2 -   614   869
=aOCCUR  Abs  956864 #E99C0 -   109
=aOFILE  Abs  957314 #E9B82 -   289   862   867   975
=aOLDEX  Abs  957839 #E9D8F -   504
=aOP     Abs  957539 #E9C63 -   381
=aOPC.F  Abs  957389 #E9BCD -   319
=aOPCPO  Abs  957664 #E9CE0 -   432
=aOPCPT  Abs  957689 #E9CF9 -   443
=aOPCTO  Abs  957714 #E9D12 -   453
=aOPFLG  Abs  957489 #E9C31 -   361
=aOPLEN  Abs  957514 #E9C4A -   371
=aOPTYP  Abs  957464 #E9C18 -   351
=aPAD2>  Abs  959072 #EA260 -   951   989
=aPAGE#  Abs  957264 #E9B50 -   269
=aPASS   Abs  956794 #E997A -    75
=aREGRP  Abs  957589 #E9C95 -   401
=aREVER  Abs  957814 #E9D76 -   494
=aRSTK   Abs  957664 #E9CE0 -   431
=aSFILE  Abs  957089 #E9AA1 -   199
=aSLIN#  Abs  957064 #E9A88 -   189
=aSLINE  Abs  957114 #E9ABA -   209
=aSTIT   Abs  957039 #E9A6F -   179
=aSTRIN  Abs  958251 #E9F2B -   673   839
=aSYTAD  Abs  957964 #E9E0C -   554   883
=aSYTLS  Abs  958014 #E9E3E -   574
=aSYTSZ  Abs  957989 #E9E25 -   564
=aTENT   Abs  957914 #E9DDA -   534
=aTIT    Abs  957014 #E9A56 -   169
=aTOKEN  Abs  957764 #E9D44 -   473
=aTOLST  Abs  957289 #E9B69 -   279
=aVALUE  Abs  957739 #E9D2B -   463
=aVARIN  Abs  958746 #EA11A -   815
 zLEFT   Abs      20 #00014 -  1010  1011
 zNEXT   Abs  959232 #EA300 -     5  1010
 zSIZE   Abs    2540 #009EC -  1009
 zTHIS   Abs  956672 #E9900 -     4  1009
```

nput Parameters

 Source file name is GN&AS1

 Listing file name is GN/AS1::65

 Object file name is GN%AS1::65

```
                                  111111
                        0123456789012345
```

 Initial flag settings are

rrors

 None

aturn Assembler News

```
 1                      TITLE  AS2:_FORTH_ASSEMBLER_IO
 2                      RDSYMB MR%GTO
 3 EA300                ABS    #EA300
 4              zTHIS   EQU    *
 5              zNEXT   EQU    #EB200
 6
 7              ********************************************************
 8              ***
 9              *** MR&AS2      <840504.1037>
10              ***
11              ***
12              ***  FORTH ASSEMBLER
13              ***  SOURCE, LISTING, OBJECT IO
14              ***
15              ********************************************************
16              ********************************************************************
17              ***
18              ***  11BLANK
19              ***
20              *** ( -- STR )
21              *** ( PUT ELEVEN SPACES IN A STRING )
22              ********************************************************************
23 EA300 0000 =aBLNKB CON(5) =DOCOL          : 11BLANK
         0
24 EA305 0000         CON(5) =QUOTC          "           "
         0
25 EA30A B0           CON(2) 11
26 EA30C B0           CON(2) 11
27 EA30E 0202         NIBASC \        \
         0202
         0202
         0202
28 EA31E 0202         NIBASC \   \
         02
29 EA324 0000         CON(5) =SEMI           ;           ( * STR * )
         0
30              ********************************************************************
31              ***
32              ***  5BLANK
33              ***
34              *** ( -- STR )
35              *** ( PUT FIVE SPACES IN A STRING )
36              ********************************************************************
37 EA329 0000 =aBLNK5 CON(5) =DOCOL          : 5BLANK
         0
38 EA32E 003A         CON(5) =aBLNKB         11BLANK
         E
39 EA333 0000         CON(5) =DROP           DROP
         0
40 EA338 0000         CON(5) =LIT            5
         0
41 EA33D 5000         CON(5) 5
         0
42 EA342 0000         CON(5) =SEMI           ;           ( * STR * )
         0
```

```
43                ****************************************************************
44                ***
45                ***  2BLANK
46                ***
47                *** ( -- STR )
48                *** ( PUT TWO SPACES IN A STRING )
49                ****************************************************************
50 EA347 0000 =aBLNK2 CON(5) =DOCOL          : 2BLANK
          0
51 EA34C 923A         CON(5) =aBLNK5         5BLANK
          E
52 EA351 0000         CON(5) =DROP           DROP
          0
53 EA356 0000         CON(5) =TWO            2
          0
54 EA35B 0000         CON(5) =SEMI           ;            ( * STR * )
          0
55                ****************************************************************
56                ***
57                ***  1BLANK
58                ***
59                *** ( -- STR )
60                *** ( PUT ONE SPACE IN A STRING )
61                ****************************************************************
62 EA360 0000 =aBLNK1 CON(5) =DOCOL          : 1BLANK
          0
63 EA365 743A         CON(5) =aBLNK2         2BLANK
          E
64 EA36A 0000         CON(5) =ONE-           1-
          0
65 EA36F 0000         CON(5) =SEMI           ;            ( * STR * )
          0
66                ****************************************************************
67                ***
68                ***  4DUP
69                ***
70                *** ( STR STR' -- STR STR' STR STR' )
71                *** ( DUPLICATE TWO STRINGS )
72                ****************************************************************
73 EA374 0000 =aDUP4  CON(5) =DOCOL          : 4DUP
          0
74 EA379 0000         CON(5) =OVER2          2OVER
          0
75 EA37E 0000         CON(5) =OVER2          2OVER
          0
76 EA383 0000         CON(5) =SEMI           ;            ( * STR STR' STR STR' *
          0
77                ****************************************************************
78                ***
79                ***  4DROP
80                ***
81                *** ( STR STR' -- )
82                *** ( DROP TWO STRINGS )
83                ****************************************************************
84 EA388 0000 =aDROP4 CON(5) =DOCOL          : 4DROP
```

```
          0
   85 EA38D 0000         CON(5) =2DROP          2DROP
          0
   86 EA392 0000         CON(5) =2DROP          2DROP
          0
   87 EA397 0000         CON(5) =SEMI           ;            ( * * )
          0
   88              ********************************************************************
   89              ***
   90              ***  >PAD
   91              ***
   92              *** ( STR -- STR )
   93              *** ( MOVE THE STRING TO THE PAD )
   94              ********************************************************************
   95 EA39C 0000 =a>PAD  CON(5) =DOCOL          : >PAD
          0
   96 EA3A1 0000         CON(5) =NULL$          NULL$
          0
   97 EA3A6 0000         CON(5) =S>&            S>&
          0
   98 EA3AB 0000         CON(5) =SEMI           ;            ( * STR * )
          0
   99              ********************************************************************
  100              ***
  101              ***  &CLEAR
  102              ***
  103              *** ( -- )
  104              *** ( CLEAR LISTING LINE )
  105              ********************************************************************
  106 EA3B0 0000 =a&CLR  CON(5) =DOCOL          : &CLEAR
          0
  107 EA3B5 0000         CON(5) =NULL$          NULL$
          0
  108 EA3BA 0000         CON(5) =aLLINE         LLINE
          0
  109 EA3BF 0000         CON(5) =S!             S!
          0
  110 EA3C4 0000         CON(5) =SEMI           ;            ( * * )
          0
  111              ********************************************************************
  112              ***
  113              ***  SET.FLAG
  114              ***
  115              *** ( NUM -- )
  116              *** ( SET FLAG IN VARIABLE OCCUR )
  117              ********************************************************************
  118 EA3C9 0000 =aSETF  CON(5) =DOCOL          : SET.FLAG
          0
  119 EA3CE 0000         CON(5) =aOCCUR         OCCUR        ( * NUM PTR * )
          0
  120 EA3D3 0000         CON(5) =AT             @            ( * NUM NUM' * )
          0
  121 EA3D8 0000         CON(5) =OR             OR           ( * NUM * )
          0
  122 EA3DD 0000         CON(5) =aOCCUR         OCCUR        ( * NUM PTR * )
```

```
          0
123 EA3E2 0000         CON(5) =STORE          !            ( * * )
          0
124 EA3E7 0000         CON(5) =SEMI           ;            ( * * )
          0
125              ****************************************************************
126              ***
127              ***  TEST.FLAG
128              ***
129              *** ( NUM -- F )
130              *** ( TEST FLAG IN VARIABLE OCCUR )
131              ****************************************************************
132 EA3EC 0000 =aTESTF CON(5) =DOCOL          : TEST.FLAG
          0
133 EA3F1 0000         CON(5) =aOCCUR         OCCUR        ( * NUM PTR * )
          0
134 EA3F6 0000         CON(5) =AT             @            ( * NUM NUM' * )
          0
135 EA3FB 0000         CON(5) =AND            AND          ( * F * )
          0
136 EA400 0000         CON(5) =SEMI           ;            ( * F * )
          0
137              ****************************************************************
138              ***
139              ***  SP
140              ***
141              *** ( -- )
142              *** ( PUT A SPACE IN A NUMBER FORMAT STRING )
143              ****************************************************************
144 EA405 0000 =aSP    CON(5) =DOCOL          : SP
          0
145 EA40A 0000         CON(5) =LIT            32
          0
146 EA40F 0200         CON(5) 32
          0
147 EA414 0000         CON(5) =HOLD           HOLD
          0
148 EA419 0000         CON(5) =SEMI           ;            ( * * )
          0
149              ****************************************************************
150              ***
151              ***  #1
152              ***
153              *** ( NUM -- STR )
154              *** ( FORMAT A NUMBER WITH ONE DIGIT )
155              ****************************************************************
156 EA41E 0000 =aNUM#1 CON(5) =DOCOL          : #1
          0
157 EA423 0000         CON(5) =ZERO           0            ( * D.NUM * )
          0
158 EA428 0000         CON(5) =LT#            <#
          0
159 EA42D 0000         CON(5) =BRNCH          JUMP
          0
160 EA432 2800         REL(5) %NUM1
```

```
          0
                ****************************************************************
                ***
                ***  #2
                ***
                *** ( NUM -- STR )
                *** ( FORMAT A NUMBER WITH TWO DIGITS )
                ****************************************************************
EA437 0000 =aNUM#2 CON(5) =DOCOL          : #2
          0
EA43C 0000         CON(5) =ZERO           0            ( * D.NUM * )
          0
EA441 0000         CON(5) =LT#            <#
          0
EA446 0000         CON(5) =BRNCH          JUMP
          0
EA44B 4600         REL(5) %NUM2
          0
                ****************************************************************
                ***
                ***  #3
                ***
                *** ( NUM -- STR )
                *** ( FORMAT A NUMBER WITH THREE DIGITS )
                ****************************************************************
EA450 0000 =aNUM#3 CON(5) =DOCOL          : #3
          0
EA455 0000         CON(5) =ZERO           0            ( * D.NUM * )
          0
EA45A 0000         CON(5) =LT#            <#
          0
EA45F 504A         CON(5) =aSP            32 HOLD
          E
EA464 0000         CON(5) =BRNCH          JUMP
          0
EA469 1400         REL(5) %NUM3
          0
                ****************************************************************
                ***
                ***  #4
                ***
                *** ( NUM -- STR )
                *** ( FORMAT A NUMBER WITH FOUR DIGITS )
                ****************************************************************
EA46E 0000 =aNUM#4 CON(5) =DOCOL          : #4
          0
EA473 0000         CON(5) =ZERO           0            ( * D.NUM * )
          0
EA478 0000         CON(5) =LT#            <#
          0
EA47D 504A         CON(5) =aSP            32 HOLD
          E
EA482 0000         CON(5) =BRNCH          JUMP
          0
EA487 E100         REL(5) %NUM4
```

```
          0
199             ********************************************************************
200             ***
201             ***  #5
202             ***
203             *** ( NUM -- STR )
204             *** ( FORMAT A NUMBER WITH FIVE DIGITS )
205             ********************************************************************
206 EA48C 0000 =aNUM#5 CON(5) =DOCOL         : #5
          0
207 EA491 0000         CON(5) =ZERO          0           ( * D.NUM * )
          0
208 EA496 0000         CON(5) =LT#           <#
          0
209 EA49B 504A         CON(5) =aSP           SP
          E
210 EA4A0 0000         CON(5) =N#            #
          0
211 EA4A5 0000  %NUM4  CON(5) =N#            #
          0
212 EA4AA 0000  %NUM3  CON(5) =N#            #
          0
213 EA4AF 0000  %NUM2  CON(5) =N#            #
          0
214 EA4B4 0000  %NUM1  CON(5) =N#            #
          0
215 EA4B9 0000         CON(5) =GT#           #>          ( * STR * )
          0
216 EA4BE 0000         CON(5) =SEMI          ;           ( * STR * )
          0
217             ********************************************************************
218             ***
219             ***  >OPx
220             ***
221             *** ( I -- ADDR )
222             *** ( MOVE TO THE Ith OPCODE )
223             ********************************************************************
224 EA4C3 0000 =a>OPx  CON(5) =DOCOL         : >OPx
          0
225 EA4C8 0000         CON(5) =ONE-          1-
          0
226 EA4CD 0000         CON(5) =LIT           5
          0
227 EA4D2 5000         CON(5) 5
          0
228 EA4D7 0000         CON(5) =MULT          *
          0
229 EA4DC 0000         CON(5) =aOP           OP
          0
230 EA4E1 0000         CON(5) =ADD           +
          0
231 EA4E6 0000         CON(5) =SEMI          ;           ( * ADDR * )
          0
232             ********************************************************************
233             ***
```

```
234                ***  KILL
235                ***
236                *** ( STR -- )
237                *** ( PURGE FILE GIVEN IN 'STR' )
238                ********************************************************************
239 EA4EB 0000     =aKILL  CON(5) =DOCOL          : KILL
           0
240                *
241                * GENEREATE PURGE STRING IN SECOND PART OF PAD
242                *
243 EA4F0 0000             CON(5) =QUOTC          " PURGE "
           0
244 EA4F5 60               CON(2) 6
245 EA4F7 60               CON(2) 6
246 EA4F9 0555             NIBASC \PURGE \
           2574
           5402
247 EA505 C93A             CON(5) =a>PAD          >PAD         ( * STR STR' * )
           E
248 EA50A 0000             CON(5) =SWAP2          2SWAP
           0
249 EA50F 0000             CON(5) =S<&            S<&          ( * STR * )
           0
250                *
251                * SET UP FOR BASICX.  IF MEMORY RUNS OUT, TRAP THAT ERROR.
252                *
253 EA514 0000             CON(5) =LIT            MEMORY ABORT
           0
254 EA519 0000             CON(5) =aMEMAB
           0
255 EA51E 0000             CON(5) =ONERR          ONERR
           0
256 EA523 0000             CON(5) =STORE          !
           0
257 EA528 0000             CON(5) =BASICX         BASICX
           0
258                *
259                * RESET ERROR TRAP
260                *
261 EA52D 0000             CON(5) =ZERO           0
           0
262 EA532 0000             CON(5) =ONERR          ONERR
           0
263 EA537 0000             CON(5) =STORE          !
           0
264 EA53C 0000             CON(5) =SEMI           ;            ( * * )
           0
265                ********************************************************************
266                ***
267                ***  PURGE
268                ***
269                *** ( STR NUM -- F )
270                *** ( PURGE FILE 'STR' ONLY IF TYPE IS 'NUM' )
271                *** ( RETURN TF ONLY IF FILE NO LONGER PRESENT )
272                ********************************************************************
```

```
273 EA541 0000 =aPURGE CON(5) =DOCOL          : PURGE
          0
274             *
275             * CHECK IF FILE EXISTS ALREADY
276             *
277 EA546 0000          CON(5) =>R            >R          ( * STR * )
          0
278 EA54B 0000          CON(5) =2DUP          2DUP
          0
279 EA550 0000          CON(5) =FFIND         FFIND
          0
280 EA555 0000          CON(5) =?DUP          ?DUP
          0
281 EA55A 0000          CON(5) =ZBRNH         IF          ( * STR [ADDR] * )
          0
282 EA55F B400          REL(5) %IF6
          0
283             *
284             * IT DOES, SO CHECK THE FILE TYPE AGAINST THE NUMBER PASSED
285             *
286 EA564 0000          CON(5) =LIT           16
          0
287 EA569 0100          CON(5) 16
          0
288 EA56E 0000          CON(5) =ADD           +
          0
289 EA573 0000          CON(5) =4N@           4N@
          0
290 EA578 0000          CON(5) =R>            R>
          0
291 EA57D 0000          CON(5) =EQUAL         =
          0
292 EA582 0000          CON(5) =ZBRNH         IF          ( * STR * )
          0
293 EA587 4100          REL(5) %IF7
          0
294             *
295             * WE HAVE A MATCH, CALL THE KILL ROUTINE
296             *
297 EA58C BE4A          CON(5) =aKILL         KILL        ( * * )
          E
298 EA591 0000          CON(5) =aNEG1         -1
          0
299 EA596 0000          CON(5) =SEMI          ;           ( * TF * )
          0
300             *
301             * NO MATCH, RETURN CANNOT PURGE FILE
302             *
303 EA59B        %IF7                         ELSE        ( * STR * )
304 EA59B 0000          CON(5) =2DROP         2DROP
          0
305 EA5A0 0000          CON(5) =ZERO          0
          0
306 EA5A5 0000          CON(5) =SEMI          ;           ( * FF * )
          0
```

```
307                *
308                * FILE WASN'T PRESENT, RETURN TRUE (IT'S GONE)
309                *
310 EA5AA           %IF6                        ELSE        ( * STR * )
311 EA5AA 0000             CON(5) =R>            R>
            0
312 EA5AF 0000             CON(5) =DROP          DROP
            0
313 EA5B4 0000             CON(5) =2DROP         2DROP       ( * * )
            0
314 EA5B9 0000             CON(5) =aNEG1         -1
            0
315 EA5BE 0000             CON(5) =SEMI          ;           ( * TF * )
            0
316                ********************************************************************
317                ***
318                ***  REMOVE
319                ***
320                *** ( STR -- F )
321                *** ( PURGE FILE 'STR' ONLY IF TYPE IS TEXT )
322                *** ( RETURN TF ONLY IF FILE NO LONGER PRESENT )
323                ********************************************************************
324 EA5C3 0000 =aREMOV CON(5) =DOCOL             : REMOVE
            0
325 EA5C8 0000             CON(5) =ONE           1           ( * STR NUM * )
            0
326 EA5CD 145A             CON(5) =aPURGE        PURGE       ( * F * )
            E
327 EA5D2 0000             CON(5) =SEMI          ;           ( * F * )
            0
328                ********************************************************************
329                ***
330                ***  CLOSEDOWN
331                ***
332                *** ( -- )
333                *** ( CLEAR UP BUFFERS ETC )
334                ********************************************************************
335 EA5D7 0000 =aCLOSE CON(5) =DOCOL             : CLOSEDOWN
            0
336                *
337                * CLOSE SOURCE FILE
338                *
339 EA5DC 0000             CON(5) =SCFIB         SCRFIB
            0
340 EA5E1 0000             CON(5) =AT            @
            0
341 EA5E6 0000             CON(5) =CLOSF         CLOSEF
            0
342                *
343                * RESET OUTER SCRFIB, IN CASE IN LOADF
344                *
345 EA5EB 0000             CON(5) =LIT           SOURCE.FIB#
            0
346 EA5F0 88CF             CON(5) =oGRAB
            2
```

```
347 EA5F5 0000          CON(5) =AT              @
          0
348 EA5FA 0000          CON(5) =SCFIB           SCRFIB
          0
349 EA5FF 0000          CON(5) =STORE           !
          0
350               *
351               * CLEAN UP VARIABLE BUFFER
352               *
353 EA604 0000          CON(5) =VARID           VARID
          0
354 EA609 0000          CON(5) =AT              @
          0
355 EA60E 0000          CON(5) =IOKILL          KILLBF
          0
356 EA613 0000          CON(5) =DROP            DROP        ( * * )
          0
357 EA618 0000          CON(5) =ZERO            0
          0
358 EA61D 0000          CON(5) =VARID           VARID
          0
359 EA622 0000          CON(5) =STORE           !           ( * * )
          0
360               *
361               * RESET VARIABLE BASE TO ORIGINAL VALUE
362               *
363 EA627 0000          CON(5) =CSP             CSP
          0
364 EA62C 0000          CON(5) =AT              @
          0
365 EA631 0000          CON(5) =BASE            BASE
          0
366 EA636 0000          CON(5) =STORE           !           ( * * )
          0
367               *
368               * RE-ENABLE ATTN KEY
369               *
370 EA63B 0000          CON(5) =ZERO            0
          0
371 EA640 0000          CON(5) =LIT             193601
          0
372 EA645 144F          CON(5) 193601
          2
373 EA64A 0000          CON(5) =N!              N!
          0
374               *
375               * RE-ENABLE ERRORS
376               *
377 EA64F 0000          CON(5) =ZERO            0
          0
378 EA654 0000          CON(5) =ONERR           ONERR
          0
379 EA659 0000          CON(5) =STORE           !
          0
380 EA65E 0000          CON(5) =SEMI            ;           ( * * )
```

```
          0
   381            ********************************************************************
   382            ***
   383            ***  CLEANUP
   384            ***
   385            *** ( -- )
   386            *** ( CLEAR UP RAM AND OTHER CONDITIONS CREATED )
   387            *** ( BY RUNNING THE ASSEMBLER )
   388            ********************************************************************
   389 EA663 0000 =aCLEAN CON(5) =DOCOL          : CLEANUP
          0
   390            *
   391            * REMOVE OBJECT FILE (USING INTERNAL NAME)
   392            *
   393 EA668 0000         CON(5) =QUOTC          " ASMBOB"
          0
   394 EA66D 60           CON(2) 6
   395 EA66F 60           CON(2) 6
   396 EA671 1435         NIBASC \ASMBOB\
          D424
          F424
   397 EA67D 3C5A         CON(5) =aREMOV         REMOVE
          E
   398 EA682 0000         CON(5) =DROP           DROP         ( * * )
          0
   399            *
   400            * REMOVE SYMBOL TABLE
   401            *
   402 EA687 0000         CON(5) =QUOTC          " ASMBSY"
          0
   403 EA68C 60           CON(2) 6
   404 EA68E 60           CON(2) 6
   405 EA690 1435         NIBASC \ASMBSY\
          D424
          3595
   406 EA69C 3C5A         CON(5) =aREMOV         REMOVE
          E
   407 EA6A1 0000         CON(5) =DROP           DROP         ( * * )
          0
   408            *
   409            * CLOSE DOWN THE REST
   410            *
   411 EA6A6 7D5A         CON(5) =aCLOSE         CLOSEDOWN
          E
   412 EA6AB 0000         CON(5) =SEMI           ;            ( * * )
          0
   413            ********************************************************************
   414            ***
   415            ***  ASSEMBLER ABORT
   416            ***
   417            *** ( NUM STR -- )
   418            *** ( PURGE THE FILE IN 'STR' THEN ABORT WITH ERROR )
   419            *** ( IN NUM )
   420            ********************************************************************
   421 EA6B0 0000 =aABRT  CON(5) =DOCOL          : ASSEMBLER ABORT
```

```
          0
422             *
423             * FIRST KILL THE FILE
424             *
425 EA6B5 0000          CON(5) =DUP             DUP
          0
426 EA6BA 0000          CON(5) =ZBRNH           IF          ( * NUM STR * )
          0
427 EA6BF F000          REL(5) %IF304
          0
428 EA6C4 0000          CON(5) =2DUP            2DUP
          0
429 EA6C9 BE4A          CON(5) =aKILL           KILL
          E
430 EA6CE       %IF304                          THEN
431 EA6CE 0000          CON(5) =2DROP           2DROP       ( * NUM * )
          0
432             *
433             * REPORT THE ERROR MESSAGE
434             *
435 EA6D3 0000          CON(5) =aERMSG          ERRMSG      ( * STR * )
          0
436 EA6D8 0000          CON(5) =CR              CR          ( * STR * )
          0
437 EA6DD 0000          CON(5) =TYPE            TYPE        ( * * )
          0
438             *
439             * REMOVE THE LISTING FILE IF IT EXISTS
440             *
441 EA6E2 0000          CON(5) =LISTNG          LISTING
          0
442 EA6E7 0000          CON(5) =FSTX            FSYNTAX
          0
443 EA6EC 0000          CON(5) =ZBRNH           IF          ( * * )
          0
444 EA6F1 F000          REL(5) %IF8
          0
445 EA6F6 0000          CON(5) =LISTNG          LISTING
          0
446 EA6FB 3C5A          CON(5) =aREMOV          REMOVE      ( * F * )
          E
447             *
448             * CLEAN UP THE REST
449             *
450 EA700       %IF8                            THEN        ( * * )
451 EA700 366A          CON(5) =aCLEAN          CLEANUP
          E
452 EA705 0000          CON(5) =ABORT           ABORT
          0
453             ********************************************************************
454             ***
455             ***  SHUTDOWN
456             ***
457             *** ( NUM -- )
458             *** ( REPORT ABORT MESSAGE AND CLEANUP )
```

```
459                ****************************************************************
460 EA70A 0000 =aSHUTD CON(5) =DOCOL          : SHUTDOWN
           0
461 EA70F 0000         CON(5) =aOFILE         OBJFILE     ( * NUM STR * )
           0
462 EA714 0B6A         CON(5) =aABRT          ASSEMBLER ABORT
           E
463                ****************************************************************
464                ***
465                ***  LIST.ABORT
466                ***
467                *** ( -- )
468                *** ( COULDN'T FIND LISTING DEVICE )
469                ****************************************************************
470 EA719 0000 =aLSTAB CON(5) =DOCOL          : LIST.ABORT
           0
471 EA71E 0000         CON(5) =LIT            49
           0
472 EA723 1300         CON(5) 49              'invalid listing file'
           0
473 EA728 A07A         CON(5) =aSHUTD         SHUTDOWN
           E
474                ****************************************************************
475                ***
476                ***  LIST.INIT
477                ***
478                *** ( -- )
479                *** ( OPEN LISTING FILE OR DEVICE )
480                ****************************************************************
481 EA72D 0000 =aLSTIN CON(5) =DOCOL          : LIST.INIT
           0
482                *
483                * ENSURE PAGESIZE VARIABLE IS VALID
484                *
485 EA732 0000         CON(5) =PAGESZ         PAGESIZE
           0
486 EA737 0000         CON(5) =AT             @           ( * NUM * )
           0
487 EA73C 0000         CON(5) =LIT            7
           0
488 EA741 7000         CON(5) 7
           0
489 EA746 0000         CON(5) =GT             >           ( * F * )
           0
490 EA74B 0000         CON(5) =ZBRNH          IF
           0
491 EA750 0910         REL(5) %IF9
           0
492                *
493                * CLEAR LISTING VARIABLES:
494                *  LISTADDR - HPIL ADDRESS FOR LIST DEVICE
495                *  LISTFILE - ADDRESS IN RAM OF LISTING FILE
496                *
497 EA755 0000         CON(5) =ZERO           0
           0
```

```
498 EA75A 0000          CON(5) =aLSTAD          LISTADDR
          0
499 EA75F 0000          CON(5) =STORE           !           ( * * )
          0
500 EA764 0000          CON(5) =ZERO            0
          0
501 EA769 0000          CON(5) =aLISTF          LISTFILE
          0
502 EA76E 0000          CON(5) =STORE           !           ( * * )
          0
503               *
504               * LISTING SPECIFIED?
505               *
506 EA773 0000          CON(5) =LISTNG          LISTING     ( * STR * )
          0
507 EA778 0000          CON(5) =?DUP            ?DUP
          0
508 EA77D 0000          CON(5) =ZBRNH           IF          ( * ADDR [LEN] * )
          0
509 EA782 4510          REL(5) %IF10
          0
510               *
511               * LISTING SPECIFIED, IS IT IN RAM?
512               *
513 EA787 0000          CON(5) =2DUP            2DUP
          0
514 EA78C 0000          CON(5) =FSTX            FSYNTAX
          0
515 EA791 0000          CON(5) =ZBRNH           IF          ( * STR * )
          0
516 EA796 3700          REL(5) %IF11
          0
517               *
518               * RAM FILE SPECIFIED, CREATE A RAM FILE
519               *
520 EA79B 0000          CON(5) =LIT             4
          0
521 EA7A0 4000          CON(5) 4
          0
522 EA7A5 0000          CON(5) =FCREAT          FCREATE
          0
523 EA7AA 0000          CON(5) =?DUP            ?DUP
          0
524 EA7AF 0000          CON(5) =ZBRNH           IF          ( * [ADDR] * )
          0
525 EA7B4 3110          REL(5) %IF12
          0
526               *
527               * RAM FILE CREATED, SAVE ADDRESS IN LISTFILE
528               *
529 EA7B9 0000          CON(5) =DUP             DUP
          0
530 EA7BE 0000          CON(5) =aLISTF          LISTFILE
          0
531 EA7C3 0000          CON(5) =STORE           !           ( * ADDR * )
```

```
          0
532             *
533             * RAM FILE CREATED, STORE LAST RECORD MARK FFFF
534             *
535 EA7C8 0000          CON(5) =aNEG1         -1
          0
536 EA7CD 0000          CON(5) =SWAP          SWAP
          0
537 EA7D2 0000          CON(5) =LIT           37
          0
538 EA7D7 5200          CON(5) 37
          0
539 EA7DC 0000          CON(5) =ADD           +           ( * NUM ADDR * )
          0
540 EA7E1 0000          CON(5) =2DUP          2DUP
          0
541 EA7E6 0000          CON(5) =C!            C!
          0
542 EA7EB 0000          CON(5) =TWO+          2+
          0
543 EA7F0 0000          CON(5) =C!            C!          ( * * )
          0
544             *
545             * RAM FILE CREATED, MARK OFFSET INTO CURRENT RECORD
546             *
547 EA7F5 0000          CON(5) =ZERO          0
          0
548 EA7FA 0000          CON(5) =aLNOFF        LNOFF
          0
549 EA7FF 0000          CON(5) =STORE         !           ( * * )
          0
550 EA804 0000          CON(5) =SEMI          ;           ( * * )
          0
551             *
552             * HPIL DEVICE SPECIFIED, IS IT VALID?  TRAP ON ERROR.
553             *
554 EA809        %IF11
555 EA809 0000          CON(5) =LIT           ['']
          0
556 EA80E 917A          CON(5) =aLSTAB        LIST.ABORT  ( * STR PTR * )
          E
557 EA813 0000          CON(5) =ONERR         ONERR
          0
558 EA818 0000          CON(5) =STORE         !           ( * STR * )
          0
559             *
560             * BUILD DEVADDR('<LISTING>') STRING AND CALL BASICF
561             *
562 EA81D 0000          CON(5) =QUOTC         " DEVADDR('"
          0
563 EA822 90            CON(2) 9
564 EA824 90            CON(2) 9
565 EA826 4454          NIBASC \DEVADDR(\
          6514
          4444
```

```
          2582
566 EA836 72          NIBASC \'\
567 EA838 C93A        CON(5) =a>PAD          >PAD        ( * STR STR' * )
          E
568 EA83D 0000        CON(5) =SWAP2          2SWAP
          0
569 EA842 0000        CON(5) =S<&            S<&         ( * STR * )
          0
570 EA847 0000        CON(5) =QUOTC          " ')"
          0
571 EA84C 20          CON(2) 2
572 EA84E 20          CON(2) 2
573 EA850 7292        NIBASC \')\
574 EA854 0000        CON(5) =S<&            S<&         ( * STR * )
          0
575 EA859 0000        CON(5) =BASF           BASICF      ( * * )
          0
576             *
577             * CHECK IF DEVICE IS ON PRIMARY LOOP.
578             *
579 EA85E 0000        CON(5) =IP             IP
          0
580 EA863 0000        CON(5) =LASTX          LASTX
          0
581 EA868 0000        CON(5) =XEY?           X=Y?
          0
582 EA86D 0000        CON(5) =ZBRNH          IF
          0
583 EA872 0500        REL(5) %IF13
          0
584             *
585             * DEVICE NOT ON A SECONDARY LOOP.  RECOVER FROM BASICF
586             *
587 EA877 0000        CON(5) =FTOI           FTOI        ( * NUM * )
          0
588 EA87C 0000        CON(5) =FROP           FDROP
          0
589 EA881 0000        CON(5) =FROP           FDROP
          0
590 EA886 0000        CON(5) =ZERO           0
          0
591 EA88B 0000        CON(5) =ONERR          ONERR
          0
592 EA890 0000        CON(5) =STORE          !           ( * NUM * )
          0
593             *
594             * CHECK IF DEVICE FOUND.
595             *
596 EA895 0000        CON(5) =DUP            DUP
          0
597 EA89A 0000        CON(5) =aNEG1          -1
          0
598 EA89F 0000        CON(5) =EQUAL          =
          0
599 EA8A4 0000        CON(5) =ZEQ            0=
```

```
          0
600 EA8A9 0000          CON(5) =ZBRNH          IF          ( * NUM * )
          0
601 EA8AE 4100          REL(5) %IF13
          0
602                *
603                * DEVICE SPECIFIED.  SAVE HPIL ADDRESS.
604                *
605 EA8B3 0000          CON(5) =aLSTAD         LISTADDR
          0
606 EA8B8 0000          CON(5) =STORE          !           ( * * )
          0
607 EA8BD 0000          CON(5) =SEMI           ;           ( * * )
          0
608                *
609                * DEVICE SPECIFIED WASN'T PRESENT ON PRIMARY LOOP.
610                *
611 EA8C2                %IF13                  ELSE        ( * NUM * )
612 EA8C2 917A          CON(5) =aLSTAB         LIST.ABORT  ( * * )
          E
613                *
614                * CANNOT CREATE THE RAM FILE SPECIFIED
615                *
616 EA8C7                %IF12                  ELSE        ( * * )
617 EA8C7 0000          CON(5) =LIT            47
          0
618 EA8CC F200          CON(5) 47              'not enough memory for assembler'
          0
619 EA8D1 A07A          CON(5) =aSHUTD         SHUTDOWN
          E
620                *
621                * NO LISTING SPECIFIED
622                *
623 EA8D6                %IF10                  ELSE        ( * ADDR * )
624 EA8D6 0000          CON(5) =DROP           DROP
          0
625 EA8DB 0000          CON(5) =SEMI           ;           ( * * )
          0
626                *
627                * INVALID PAGESIZE (<8)
628                *
629 EA8E0                %IF9                   ELSE
630 EA8E0 0000          CON(5) =LIT            58
          0
631 EA8E5 A300          CON(5) 58              'pagesize too small'
          0
632 EA8EA A07A          CON(5) =aSHUTD         SHUTDOWN
          E
633                ****************************************************************
634                ***
635                ***  SOURCE ABORT
636                ***
637                *** ( -- )
638                *** ( ABORT BECAUSE SOURCE WOULDN'T OPEN )
639                ****************************************************************
```

```
640 EA8EF 0000 =aSRCAB CON(5) =DOCOL         : SOURCE ABORT
          0
641 EA8F4 0000  %IF14  CON(5) =LIT           50
          0
642 EA8F9 2300         CON(5) 50             'cannot open source file'
          0
643 EA8FE A07A         CON(5) =aSHUTD        SHUTDOWN
          E
644             ****************************************************************
645             ***
646             ***  OPEN.SOURCE
647             ***
648             *** ( STR -- )
649             *** ( OPEN SOURCE FILE/SAVE NAME/INITIALIZE VARS )
650             ****************************************************************
651 EA903 0000 =aOPSRC CON(5) =DOCOL         : OPEN.SOURCE
          0
652             *
653             * SAVE OUTER LEVEL SCRFIB, IN CASE IN LOADF
654             *
655 EA908 0000         CON(5) =SCFIB         SCRFIB
          0
656 EA90D 0000         CON(5) =AT            @           ( * STR NUM * )
          0
657 EA912 0000         CON(5) =LIT           SOURCE.FIB#
          0
658 EA917 88CF         CON(5) =oGRAB
          2
659 EA91C 0000         CON(5) =STORE         !
          0
660             *
661             * TRAP ILLEGAL SOURCE FILE NAME
662             *
663 EA921 0000         CON(5) =LIT           ['']
          0
664 EA926 FE8A         CON(5) =aSRCAB        SOURCE ABORT
          E
665 EA92B 0000         CON(5) =ONERR         ONERR
          0
666 EA930 0000         CON(5) =STORE         !
          0
667             *
668             * OPEN SOURCE FILE
669             *
670 EA935 0000         CON(5) =OPNF          OPENF
          0
671 EA93A 0000         CON(5) =ZBRNH         IF          ( * * )
          0
672 EA93F 5BFF         REL(5) %IF14
          F
673             *
674             * RESET TRAP
675             *
676 EA944 0000         CON(5) =ZERO          0
          0
```

```
677 EA949 0000          CON(5) =ONERR          ONERR
          0
678 EA94E 0000          CON(5) =STORE          !
          0
679               *
680               * IS THERE CODE PRESENT IN SOURCE FILE?
681               *
682 EA953 0000          CON(5) =EOF            EOF          ( * F * )
          0
683 EA958 0000          CON(5) =ZBRNH          IF
          0
684 EA95D 4100          REL(5) %IF17
          0
685               *
686               * NO.  MUST ABORT HERE, BECAUSE READ.SOURCE FAILS TO CATCH IT.
687               *
688 EA962 0000          CON(5) =LIT            51
          0
689 EA967 3300          CON(5) 51              'missing/multiple file type'
          0
690 EA96C A07A          CON(5) =aSHUTD         SHUTDOWN
          E
691               *
692               * ALL DONE
693               *
694 EA971                %IF17                 THEN         ( * * )
695 EA971 0000          CON(5) =SEMI           ;            ( * * )
          0
696               ********************************************************************
697               ***
698               ***  RESET.SOURCE
699               ***
700               *** ( -- )
701               *** ( RESET SOURCE FILE TO BEGINNING )
702               ********************************************************************
703 EA976 0000 =aRSSRC CON(5) =DOCOL          : RESET.SOURCE
          0
704 EA97B 0000          CON(5) =ONE            1
          0
705 EA980 0000          CON(5) =BLOCK          BLOCK
          0
706 EA985 0000          CON(5) =DROP           DROP
          0
707 EA98A 0000          CON(5) =SEMI           ;            ( * * )
          0
708               ********************************************************************
709               ***
710               ***  READ.SOURCE
711               ***
712               *** ( -- F )
713               *** ( READ NEXT LINE OF SOURCE, TRUE=NEW LINE READ )
714               ********************************************************************
715 EA98F 0000 =aRDSRC CON(5) =DOCOL          : READ.SOURCE
          0
716               *
```

```
717                 * RETURN FF IF WE'RE AT END OF FILE
718                 *
719 EA994 0000           CON(5) =EOF             EOF
          0
720 EA999 0000           CON(5) =ZBRNH           IF
          0
721 EA99E F000           REL(5) %IF15
          0
722 EA9A3 0000           CON(5) =ZERO            0
          0
723 EA9A8 0000           CON(5) =SEMI            ;               ( * FF * )
          0
724                 *
725                 * READ APPROPRIATE SOURCE LINE
726                 *
727 EA9AD            %IF15
728 EA9AD 0000           CON(5) =aNEG1           -1              ( * TF * )
          0
729 EA9B2 0000           CON(5) =aSLIN#          SLINE#
          0
730 EA9B7 0000           CON(5) =AT              @
          0
731 EA9BC 0000           CON(5) =BLOCK           BLOCK           ( * TF PTR * )
          0
732                 *
733                 * INCREMENT SOURCE LINE COUNT
734                 *
735 EA9C1 0000           CON(5) =ONE             1
          0
736 EA9C6 0000           CON(5) =aSLIN#          SLINE#
          0
737 EA9CB 0000           CON(5) =PSTOR           +!
          0
738                 *
739                 * STORE SOURCE STRING, WITH MAX LENGTH 95, IN SLINE
740                 *
741 EA9D0 0000           CON(5) =DUP             DUP
          0
742 EA9D5 0000           CON(5) =LIT             4
          0
743 EA9DA 4000           CON(5) 4
          0
744 EA9DF 0000           CON(5) =MINUS           -               ( * TF PTR PTR' * )
          0
745 EA9E4 0000           CON(5) =4N@             4N@
          0
746 EA9E9 0000           CON(5) =LIT             95
          0
747 EA9EE F500           CON(5) 96-1
          0
748 EA9F3 0000           CON(5) =MIN             MIN
          0
749 EA9F8 0000           CON(5) =aSLINE          SLINE
          0
750 EA9FD 0000           CON(5) =S!              S!              ( * TF * )
```

```
          0
EAA02 0000          CON(5) =SEMI          ;           ( * TF * )
          0
                ****************************************************************
                ***
                ***  OBJ.INIT
                ***
                *** ( -- )
                *** ( CREATE AN OBJECT FILE IN THE FILE CHAIN )
                ****************************************************************
EAA07 0000 =aOBJIN CON(5) =DOCOL          : OBJ.INIT
          0
                *
                * GENERATE OBJECT FILE NAME
                *
EAA0C 0000          CON(5) =QUOTC         " ASMBOB"   ( * STR * )
          0
EAA11 60            CON(2) 6
EAA13 60            CON(2) 6
EAA15 1435          NIBASC \ASMBOB\
          D424
          F424
                *
                * SAVE IN OBJECT FILE NAME VARIABLE OFILE
                *
EAA21 0000          CON(5) =2DUP          2DUP
          0
EAA26 0000          CON(5) =aOFILE        OFILE
          0
EAA2B 0000          CON(5) =S!            S!          ( * STR * )
          0
                *
                * CREATE FILE
                *
EAA30 0000          CON(5) =ONE           1
          0
EAA35 0000          CON(5) =FCREAT        FCREATE
          0
EAA3A 0000          CON(5) =?DUP          ?DUP
          0
EAA3F 0000          CON(5) =ZBRNH         IF          ( * [ADDR] * )
          0
EAA44 3200          REL(5) %IF16
          0
                *
                * SET LOCATION COUNTER & OBJECT FILE VARIABLE OBJFILE TO FILE STA
                *
EAA49 0000          CON(5) =DUP           DUP
          0
EAA4E 0000          CON(5) =aLC           LC
          0
EAA53 0000          CON(5) =STORE         !           ( * ADDR * )
          0
EAA58 0000          CON(5) =aOBJFL        OBJFILE
          0
```

```
788 EAA5D 0000          CON(5) =STORE           !           ( * * )
          0
789 EAA62 0000          CON(5) =SEMI            ;           ( * * )
          0
790               *
791               * COULDN'T CREATE OBJECT FILE
792               *
793 EAA67          %IF16
794 EAA67 0000          CON(5) =LIT             47
          0
795 EAA6C F200          CON(5) 47               'not enough memory for assembler'
          0
796 EAA71 A07A          CON(5) =aSHUTD          SHUTDOWN    ( * * )
          E
797               ********************************************************************
798               ***
799               ***  OBJ.GROW
800               ***
801               *** ( -- )
802               *** ( GROW THE OBJECT FILE TO THE CORRECT SIZE )
803               ********************************************************************
804 EAA76 0000 =aOBJGR CON(5) =DOCOL           : OBJ.GROW
          0
805               *
806               * FIND BEGINNING OF OBJECT FILE, PAST HEADER
807               *
808 EAA7B 0000          CON(5) =aOFILE          OFILE
          0
809 EAA80 0000          CON(5) =FFIND           FFIND
          0
810 EAA85 0000          CON(5) =LIT             37
          0
811 EAA8A 5200          CON(5) 37
          0
812 EAA8F 0000          CON(5) =ADD             +           ( * ADDR * )
          0
813               *
814               * CALCULATE NUMBER OF BYTES NEEDED TO MAKE FILE CORRECT SIZE
815               *
816 EAA94 0000          CON(5) =aFLSIZ          FILESIZE
          0
817 EAA99 0000          CON(5) =AT              @
          0
818 EAA9E 0000          CON(5) =LIT             38
          0
819 EAAA3 6200          CON(5) 38
          0
820 EAAA8 0000          CON(5) =MINUS           -
          0
821 EAAAD 0000          CON(5) =ZERO            0
          0
822 EAAB2 0000          CON(5) =MAX             MAX         ( * ADDR CNT * )
          0
823               *
824               * GROW THE OBJECT FILE
```

```
825                *
826 EAAB7 0000             CON(5) =FADJ            FADJUST     ( * F * )
          0
827 EAABC 0000             CON(5) =ZEQ             0=
          0
828 EAAC1 0000             CON(5) =ZBRNH           IF          ( * * )
          0
829 EAAC6 4100             REL(5) %IF18
          0
830                *
831                * COULDN'T GROW IT
832                *
833 EAACB 0000             CON(5) =LIT             47
          0
834 EAAD0 F200             CON(5) 47               'not enough memory for assembler'
          0
835 EAAD5 A07A             CON(5) =aSHUTD          SHUTDOWN    ( * * )
          E
836                *
837                * OBJECT FILE GROWTH CAUSES MEMORY MOVEMENT
838                *
839 EAADA                   %IF18                   THEN
840 EAADA 0000             CON(5) =aMEMOV          MEMMOVE
          0
841 EAADF 0000             CON(5) =SEMI            ;           ( * * )
          0
842                ********************************************************************
843                ***
844                ***  OUT.OBJ
845                ***
846                *** ( -- )
847                *** ( OUTPUT OPCODE TO OBJECT FILE )
848                ********************************************************************
849 EAAE4 0000 =aOUTOB CON(5) =DOCOL           : OUT.OBJ
          0
850                *
851                * NIBBLES TO OUTPUT?
852                *
853 EAAE9 0000             CON(5) =aOPLEN          OPLEN
          0
854 EAAEE 0000             CON(5) =AT              @
          0
855 EAAF3 0000             CON(5) =?DUP            ?DUP
          0
856 EAAF8 0000             CON(5) =ZBRNH           IF          ( * NUM * )
          0
857 EAAFD 3700             REL(5) %IF19
          0
858                *
859                * LOOP THROUGH ALL NIBBLES TO OUTPUT
860                *
861 EAB02 0000             CON(5) =ZERO            0
          0
862 EAB07 0000             CON(5) =XDO             DO
          0
```

```
863 EAB0C        %DO2                                    ( * * )
864             *
865             * IF WE'RE AT THE 18TH (OR GREATER) NIBBLE, THEN IT WAS GENERATED
866             * BY THE BSS PSEUDO-OP, AND MUST BE ZERO
867             *
868 EAB0C 00000           CON(5) =R@              I
        0
869 EAB11 00000           CON(5) =LIT             17
        0
870 EAB16 11000           CON(5) 17
        0
871 EAB1B 00000           CON(5) =GT              >
        0
872 EAB20 00000           CON(5) =ZBRNH           IF          ( * * )
        0
873 EAB25 41000           REL(5) %IF20
        0
874 EAB2A 00000           CON(5) =ZERO            0           ( * NIB * )
        0
875 EAB2F 00000           CON(5) =BRNCH           ELSE
        0
876 EAB34 91000           REL(5) %TH20
        0
877 EAB39        %IF20                                   ( * * )
878             *
879             * OTHERWISE, FETCH APPROPRIATE NIBBLE TO STORE
880             *
881 EAB39 00000           CON(5) =R@              I
        0
882 EAB3E 00000           CON(5) =ONE+            1+
        0
883 EAB43 3C4AE           CON(5) =a>OPx           >OPx
884 EAB48 00000           CON(5) =AT              @           ( * NIB * )
        0
885             *
886             * STORE NIBBLE AT LOCATION COUNTER
887             *
888 EAB4D        %TH20                   THEN        ( * NIB * )
889 EAB4D 00000           CON(5) =aLC             LC
        0
890 EAB52 00000           CON(5) =AT              @
        0
891 EAB57 00000           CON(5) =R@              I
        0
892 EAB5C 00000           CON(5) =ADD             +
        0
893 EAB61 00000           CON(5) =N!              N!          ( * * )
        0
894 EAB66 00000           CON(5) =XLOOP           LOOP        ( * * )
        0
895 EAB6B 1AFFF           REL(5) %DO2
896             *
897             * ALL DONE
```

```
                *
EAB70            %IF19                          THEN
EAB70 0000              CON(5) =SEMI            ;           ( * * )
      0
                ******************************************************************
                ***
                ***  EJECT
                ***
                *** ( -- )
                *** ( EJECT NEW PAGE )
                ******************************************************************
EAB75 0000 =aEJECT CON(5) =DOCOL                : EJECT
      0
                *
                * ARE WE LISTING AT THE MOMENT?  (LIST ON?)
                *
EAB7A 0000              CON(5) =aTOLST          TOLIST
      0
EAB7F 0000              CON(5) =AT              @
      0
EAB84 0000              CON(5) =ZBRNH           IF          ( * * )
      0
EAB89 AD00              REL(5) %IF21
      0
                *
                * YES.  START A NEW LINE COUNT
                *
EAB8E 0000              CON(5) =ZERO            0
      0
EAB93 0000              CON(5) =aLLIN#          LLINE#
      0
EAB98 0000              CON(5) =STORE           !           ( * * )
      0
EAB9D 0000              CON(5) =ONE             1
      0
EABA2 0000              CON(5) =aPAGE#          PAGENO
      0
EABA7 0000              CON(5) =PSTOR           +!          ( * * )
      0
                *
                * OUT A FORM FEED
                *
EABAC 0000              CON(5) =LIT             12
      0
EABB1 C000              CON(5) 12
      0
EABB6 0000              CON(5) =CHR$            CHR$
      0
EABBB 99DA              CON(5) =aOUTLI          OUT.LINE    ( * * )
      E
                *
                * GENERATE PAGE xxx STRING
                *
EABC0 0000              CON(5) =aLLINE          LLINE
      0
```

```
936 EABC5 0000          CON(5) =QUOTC         " PAGE "
          0
937 EABCA 50            CON(2) 5
938 EABCC 50            CON(2) 5
939 EABCE 0514          NIBASC \PAGE \
          7454
          02
940 EABD8 0000          CON(5) =S<&           S<&         ( * STR * )
          0
941 EABDD 0000          CON(5) =aPAGE#        PAGENO
          0
942 EABE2 0000          CON(5) =AT            @
          0
943 EABE7 0000          CON(5) =DEC           DECIMAL
          0
944 EABEC 054A          CON(5) =aNUM#3        #3
          E
945 EABF1 0000          CON(5) =S<&           S<&         ( * STR * )
          0
946             *
947             * APPEND TITLE TO PAGE xxx STRING & OUTPUT LINE
948             *
949 EABF6 003A          CON(5) =aBLNKB        11BLANK     ( * STR STR' * )
          E
950 EABFB 0000          CON(5) =S<&           S<&         ( * STR * )
          0
951 EAC00 0000          CON(5) =aTIT          TIT
          0
952 EAC05 0000          CON(5) =S<&           S<&
          0
953 EAC0A 99DA          CON(5) =aOUTLI        OUT.LINE    ( * * )
          E
954             *
955             * GENERATE Forth Assembler STRING
956             *
957 EAC0F 0000          CON(5) =aLLINE        LLINE
          0
958 EAC14 0000          CON(5) =QUOTC         " Forth Assembler     "
          0
959 EAC19 41            CON(2) 20
960 EAC1B 41            CON(2) 20
961 EAC1D 64F6          NIBASC \Forth As\
          2747
          8602
          1437
962 EAC2D 3756          NIBASC \sembler \
          D626
          C656
          2702
963 EAC3D 0202          NIBASC \    \
          0202
964 EAC45 0000          CON(5) =S<&           S<&         ( * STR * )
          0
965             *
966             * APPEND SUB TITLE TO Forth Assembler STRING & OUTPUT LINE
```

```
 967                *
 968 EAC4A 0000             CON(5) =aSTIT          STIT
           0
 969 EAC4F 0000             CON(5) =S<&            S<&          ( * STR * )
           0
 970 EAC54 99DA             CON(5) =aOUTLI         OUT.LINE     ( * * )
           E
 971                *
 972                * OUTPUT A BLANK LINE
 973                *
 974 EAC59 0000             CON(5) =NULL$          NULL$
           0
 975 EAC5E 99DA             CON(5) =aOUTLI         OUT.LINE     ( * * )
           E
 976                *
 977                * ALL DONE
 978                *
 979 EAC63                   %IF21                  THEN
 980 EAC63 0000             CON(5) =SEMI           ;            ( * * )
           0
 981                ********************************************************************
 982                ***
 983                ***  PRINT#
 984                ***
 985                *** ( STR -- )
 986                *** ( APPEND STRING TO END OF LISTING FILE )
 987                ********************************************************************
 988 EAC68 0000 =aPRT#  CON(5) =DOCOL          : PRINT#
           0
 989                *
 990                * SAVE STRING IN VARIABLE LLINE (WE USE THE PAD!)
 991                *
 992 EAC6D 0000             CON(5) =aLLINE         LLINE
           0
 993 EAC72 0000             CON(5) =S!             S!
           0
 994 EAC77 0000             CON(5) =aLLINE         LLINE        ( * STR * )
           0
 995                *
 996                * DO WE HAVE AN EVEN LENGTH STRING?
 997                *
 998 EAC7C 0000             CON(5) =DUP            DUP
           0
 999 EAC81 0000             CON(5) =DUP            DUP
           0
1000 EAC86 0000             CON(5) =TWO/           2/
           0
1001 EAC8B 0000             CON(5) =TWO*           2*
           0
1002 EAC90 0000             CON(5) =EQUAL          =
           0
1003 EAC95 0000             CON(5) =ZEQ            0=
           0
1004 EAC9A 0000             CON(5) =ZBRNH          IF           ( * STR * )
           0
```

```
1005 EAC9F 4100         REL(5) %IF22
           0
1006             *
1007             * NO, TACK AN ASCII 0 ON THE END TO MAKE IT EVEN (LIF1 STANDARD)
1008             *
1009 EACA4 0000         CON(5) =ZERO          0
           0
1010 EACA9 0000         CON(5) =CHR$          CHR$
           0
1011 EACAE 0000         CON(5) =S<&           S<&         ( * STR * )
           0
1012             *
1013             * CALCULATE ADDRESS TO PUT STRING
1014             *
1015 EACB3       %IF22                        THEN        ( * STR * )
1016 EACB3 0000         CON(5) =SWAP          SWAP
           0
1017 EACB8 0000         CON(5) =DROP          DROP        ( * LEN * )
           0
1018 EACBD 0000         CON(5) =aLISTF        LISTFILE
           0
1019 EACC2 0000         CON(5) =AT            @
           0
1020 EACC7 0000         CON(5) =LIT           37
           0
1021 EACCC 5200         CON(5) 37
           0
1022 EACD1 0000         CON(5) =ADD           +           ( * LEN ADDR * )
           0
1023 EACD6 0000         CON(5) =aLNOFF        LNOFF
           0
1024 EACDB 0000         CON(5) =AT            @
           0
1025 EACE0 0000         CON(5) =ADD           +           ( * LEN ADDR * )
           0
1026             *
1027             * ADJUST LISTING FILE TO FIT NEW STRING
1028             *
1029 EACE5 0000         CON(5) =OVER          OVER
           0
1030 EACEA 0000         CON(5) =TWO*          2*
           0
1031 EACEF 0000         CON(5) =FOUR+         4+          ( * LEN ADDR CNT * )
           0
1032 EACF4 0000         CON(5) =2DUP          2DUP
           0
1033 EACF9 0000         CON(5) =FADJ          FADJUST
           0
1034 EACFE 0000         CON(5) =ZBRNH         IF          ( * LEN ADDR CNT * )
           0
1035 EAD03 B400         REL(5) %IF23
           0
1036             *
1037             * SUCCESS.  UPDATE OFFSET FOR NEXT LINE
1038             *
```

```
1039 EAD08 0000          CON(5) =aLNOFF        LNOFF
           0
1040 EAD0D 0000          CON(5) =PSTOR         +!          ( * LEN ADDR * )
           0
1041               *
1042               * STORE LENGTH (FOUR NIBBLES)
1043               *
1044 EAD12 0000          CON(5) =ZERO          0
           0
1045 EAD17 0000          CON(5) =OVER          OVER
           0
1046 EAD1C 0000          CON(5) =C!            C!
           0
1047 EAD21 0000          CON(5) =TWO+          2+          ( * LEN ADDR * )
           0
1048 EAD26 0000          CON(5) =SWAP          SWAP
           0
1049 EAD2B 0000          CON(5) =OVER          OVER
           0
1050 EAD30 0000          CON(5) =C!            C!
           0
1051 EAD35 0000          CON(5) =TWO+          2+          ( * ADDR * )
           0
1052               *
1053               * MOVE LISTING STRING INTO FILE
1054               *
1055 EAD3A 0000          CON(5) =aLLINE        LLINE
           0
1056 EAD3F 0000          CON(5) =ROT           ROT
           0
1057 EAD44 0000          CON(5) =SMOVE         SMOVE       ( * * )
           0
1058 EAD49 0000          CON(5) =SEMI          ;           ( * * )
           0
1059               *
1060               * COULDN'T GROW FILE FOR NEW STRING
1061               *
1062 EAD4E                %IF23
1063 EAD4E 0000          CON(5) =DROP          DROP
           0
1064 EAD53 0000          CON(5) =2DROP         2DROP       ( * * )
           0
1065               *
1066               * HAVE WE ALREADY ISSUED THE listing file full MESSAGE?
1067               *
1068 EAD58 0000          CON(5) =ONE           1
           0
1069 EAD5D CE3A          CON(5) =aTESTF        TEST.FLAG   ( * F * )
           E
1070 EAD62 0000          CON(5) =ZEQ           0=
           0
1071 EAD67 0000          CON(5) =ZBRNH         IF          ( * * )
           0
1072 EAD6C 8200          REL(5) %IF24
           0
```

```
1073                *
1074                * NO, LET'S ISSUE IT.
1075                *
1076 EAD71 0000            CON(5) =ONE          1
           0
1077 EAD76 9C3A            CON(5) =aSETF        SET.FLAG
           E
1078 EAD7B 0000            CON(5) =LIT          44
           0
1079 EAD80 C200            CON(5) 44            'listing file full'
           0
1080 EAD85 0000            CON(5) =aERMSG       ERRMSG
           0
1081 EAD8A 0000            CON(5) =BRNCH        GOTO
           0
1082 EAD8F 0E30            REL(5) %TYPE
           0
1083                *
1084                * ALL DONE
1085                *
1086 EAD94                  %IF24                THEN
1087 EAD94 0000            CON(5) =SEMI         ;           ( * * )
           0
1088                ********************************************************************
1089                ***
1090                ***  OUT.LINE
1091                ***
1092                *** ( STR -- )
1093                *** ( OUTPUT THE STRING TO LISTING FILE/DEVICE )
1094                ********************************************************************
1095 EAD99 0000 =aOUTLI CON(5) =DOCOL        : OUT.LINE
           0
1096                *
1097                * CHECK FOR ATTN KEY
1098                *
1099 EAD9E 0000            CON(5) =aMONAT       MONITOR.ATTN
           0
1100                *
1101                * ARE WE LISTING NOW?  (LIST ON? AND LISTING SPECIFIED)
1102                *
1103 EADA3 0000            CON(5) =aTOLST       TOLIST
           0
1104 EADA8 0000            CON(5) =AT           @           ( * F * )
           0
1105 EADAD 0000            CON(5) =LISTNG       LISTING
           0
1106 EADB2 0000            CON(5) =SWAP         SWAP
           0
1107 EADB7 0000            CON(5) =DROP         DROP        ( * F LEN * )
           0
1108 EADBC 0000            CON(5) =F.AND        F.AND       ( * F * )
           0
1109 EADC1 0000            CON(5) =ZBRNH        IF          ( * STR * )
           0
1110 EADC6 2800            REL(5) %IF300
```

```
          0
1111            *
1112            * ARE WE SENDING THE LISTING TO AN HPIL DEVICE?
1113            *
1114 EADCB 0000        CON(5) =aLSTAD          LISTADDR
          0
1115 EADD0 0000        CON(5) =AT              @
          0
1116 EADD5 0000        CON(5) =?DUP            ?DUP        ( * STR [NUM] * )
          0
1117 EADDA 0000        CON(5) =ZBRNH           IF
          0
1118 EADDF 8200        REL(5) %IF301
          0
1119            *
1120            * YES, OUTPUT LINE
1121            *
1122 EADE4 0000        CON(5) =PRIME           PRIMARY
          0
1123 EADE9 0000        CON(5) =STORE           !           ( * STR * )
          0
1124 EADEE 0000        CON(5) =OUTPUT          OUTUPT
          0
1125 EADF3 0000        CON(5) =CRLF            CRLF
          0
1126 EADF8 0000        CON(5) =OUTPUT          OUTPUT      ( * * )
          0
1127 EADFD 0000        CON(5) =BRNCH           ELSE        ( * STR * )
          0
1128 EAE02 A000        REL(5) %TH301
          0
1129            *
1130            * NO, APPEND LINE TO LISTING FILE
1131            *
1132 EAE07      %IF301
1133 EAE07 86CA        CON(5) =aPRT#           PRINT#
          E
1134            *
1135            * UPDATE LINES THIS PAGE
1136            *
1137 EAE0C      %TH301                          THEN        ( * * )
1138 EAE0C 0000        CON(5) =ONE             1
          0
1139 EAE11 0000        CON(5) =aLLIN#          LLINE#
          0
1140 EAE16 0000        CON(5) =PSTOR           +!          ( * * )
          0
1141            *
1142            * ARE WE AT THE END OF A PAGE?
1143            *
1144 EAE1B 0000        CON(5) =aLLIN#          LLINE#
          0
1145 EAE20 0000        CON(5) =AT              @
          0
1146 EAE25 0000        CON(5) =PAGESZ          PAGESIZE
```

```
          0
1147 EAE2A 0000         CON(5) =AT            @          ( * NUM NUM' * )
          0
1148 EAE2F 0000         CON(5) =GT            >
          0
1149 EAE34 0000         CON(5) =ZBRNH         IF
          0
1150 EAE39 A000         REL(5) %IF303
          0
1151            *
1152            * YES.  DO A FORM FEED.
1153            *
1154 EAE3E 57BA         CON(5) =aEJECT        EJECT      ( * * )
          E
1155            *
1156            * CLEAR STACK AND VARIABLE LLINE
1157            *
1158 EAE43       %IF303                       THEN       ( * * )
1159 EAE43 0000         CON(5) =NULL$         NULL$      ( * STR * )
          0
1160 EAE48       %IF300
1161 EAE48 0000         CON(5) =2DROP         2DROP
          0
1162 EAE4D 0B3A         CON(5) =a&CLR         &CLEAR
          E
1163 EAE52 0000         CON(5) =SEMI          ;          ( * * )
          0
1164            ********************************************************************
1165            ***
1166            ***  OUT.LIST
1167            ***
1168            *** ( -- )
1169            *** ( OUTPUT CURRENT LINE TO LISTING FILE )
1170            ********************************************************************
1171 EAE57 0000 =aOUTLS CON(5) =DOCOL         : OUT.LIST
          0
1172            *
1173            * ARE WE LISTING NOW?   (LIST ON? AND LISTING SPECIFIED)
1174            *
1175 EAE5C 0000         CON(5) =LISTNG        LISTING
          0
1176 EAE61 0000         CON(5) =SWAP          SWAP
          0
1177 EAE66 0000         CON(5) =DROP          DROP       ( * LEN * )
          0
1178 EAE6B 0000         CON(5) =aTOLST        TOLIST
          0
1179 EAE70 0000         CON(5) =AT            @          ( * LEN F * )
          0
1180 EAE75 0000         CON(5) =F.AND         F.AND
          0
1181 EAE7A 0000         CON(5) =ZBRNH         IF         ( * * )
          0
1182 EAE7F 9F10         REL(5) %IF302
          0
```

```
1183                *
1184                * SET UP A LOOP FOR EACH LINE ON THE OUTPUT LISTING.  EACH LINE C
1185                * CONTAIN NO MORE THAN EIGHT (8) NIBBLES OF OPCODE.  NO OPCODE
1186                * (INCLUDING BSS) CAN CREATE MORE THAN THREE LINES OF LISTING
1187                *
1188 EAE84 0000              CON(5) =aOPLEN        OPLEN
               0
1189 EAE89 0000              CON(5) =AT            @
               0
1190 EAE8E 0000              CON(5) =LIT           24
               0
1191 EAE93 8100              CON(5) 24
               0
1192 EAE98 0000              CON(5) =MIN           MIN         ( * NUM * )
               0
1193 EAE9D 0000              CON(5) =LIT           7
               0
1194 EAEA2 7000              CON(5) 7
               0
1195 EAEA7 0000              CON(5) =ADD           +
               0
1196 EAEAC 0000              CON(5) =LIT           8
               0
1197 EAEB1 8000              CON(5) 8
               0
1198 EAEB6 0000              CON(5) =/             /
               0
1199 EAEBB 0000              CON(5) =ONE           1
               0
1200 EAEC0 0000              CON(5) =MAX           MAX
               0
1201 EAEC5 0000              CON(5) =ZERO          0
               0
1202 EAECA 0000              CON(5) =XDO           DO          ( * * )
               0
1203 EAECF             %DO3
1204                *
1205                * CLEAR VARIABLE LLINE TO START OUR BUILDING OF LISTING LINE.
1206                *
1207 EAECF 0B3A              CON(5) =a&CLR         &CLEAR
               E
1208 EAED4 0000              CON(5) =aLLINE        LLINE       ( * STR * )
               0
1209 EAED9 0000              CON(5) =R@            I
               0
1210 EAEDE 0000              CON(5) =ZEQ           0=
               0
1211 EAEE3 0000              CON(5) =ZBRNH         IF          ( * STR * )
               0
1212 EAEE8 8200              REL(5) %IF29
               0
1213                *
1214                * FIRST LINE.  GENERATE LINE NUMBER.
1215                *
1216 EAEED 0000              CON(5) =DEC           DECIMAL
```

```
          0
1217 EAEF2 0000          CON(5) =aSLIN#         SLINE#
          0
1218 EAEF7 0000          CON(5) =AT             @           ( * STR NUM * )
          0
1219 EAEFC 0000          CON(5) =ONE-           1-
          0
1220 EAF01 E64A          CON(5) =aNUM#4         #4          ( * STR STR' * )
          E
1221 EAF06 0000          CON(5) =BRNCH          ELSE        ( * STR * )
          0
1222 EAF0B A000          REL(5) %TH29
          0
1223               *
1224               * NOT FIRST LINE.  GENERATE BLANKS.
1225               *
1226 EAF10         %IF29
1227 EAF10 923A          CON(5) =aBLNK5         "       "   ( * STR STR' * )
          E
1228 EAF15         %TH29                        THEN        ( * STR STR' * )
1229 EAF15 0000          CON(5) =S<&            S<&         ( * STR * )
          0
1230               *
1231               * GENERATE LOCATION COUNTER
1232               *
1233 EAF1A 0000          CON(5) =HEX            HEX
          0
1234 EAF1F 0000          CON(5) =aLC            LC
          0
1235 EAF24 0000          CON(5) =AT             @
          0
1236 EAF29 0000          CON(5) =R@             I
          0
1237 EAF2E 0000          CON(5) =LIT            8
          0
1238 EAF33 8000          CON(5) 8
          0
1239 EAF38 0000          CON(5) =MULT           *
          0
1240 EAF3D 0000          CON(5) =ADD            +           ( * STR NUM * )
          0
1241               *
1242               * CHECK FOR LEX OR BIN FILE TYPE
1243               *
1244 EAF42 0000          CON(5) =aFLTYP         FILETYPE
          0
1245 EAF47 0000          CON(5) =AT             @           ( * STR NUM TYP * )
          0
1246 EAF4C 0000          CON(5) =ONE            1
          0
1247 EAF51 0000          CON(5) =GT             >
          0
1248 EAF56 0000          CON(5) =ZBRNH          IF          ( * STR NUM * )
          0
1249 EAF5B 4100          REL(5) %IF305
```

```
            0
1250             *
1251             * LOCATION COUNTER IS RELATIVE TO START OF FILE.
1252             *
1253 EAF60 0000          CON(5) =aOBJFL        OBJFILE
            0
1254 EAF65 0000          CON(5) =AT            @
            0
1255 EAF6A 0000          CON(5) =MINUS         -
            0
1256 EAF6F         %IF305                      THEN        ( * STR NUM * )
1257 EAF6F C84A          CON(5) =aNUM#5        #5
            E
1258 EAF74 0000          CON(5) =S<&           S<&         ( * STR * )
            0
1259 EAF79 0000          CON(5) =R@            I
            0
1260             *
1261             * SET UP A LOOP FOR 8 NIBBLES OF OPCODE
1262             *
1263 EAF7E 0000          CON(5) =LIT           8
            0
1264 EAF83 8000          CON(5) 8
            0
1265 EAF88 0000          CON(5) =MULT          *
            0
1266 EAF8D 0000          CON(5) =DUP           DUP
            0
1267 EAF92 0000          CON(5) =LIT           8
            0
1268 EAF97 8000          CON(5) 8
            0
1269 EAF9C 0000          CON(5) =ADD           +
            0
1270 EAFA1 0000          CON(5) =SWAP          SWAP
            0
1271 EAFA6 0000          CON(5) =XDO           DO          ( * STR * )
            0
1272 EAFAB         %DO4
1273             *
1274             * HAVE WE REACHED THE END OF THIS OPCODE?
1275             *
1276 EAFAB 0000          CON(5) =R@            I
            0
1277 EAFB0 0000          CON(5) =aOPLEN        OPLEN
            0
1278 EAFB5 0000          CON(5) =AT            @
            0
1279 EAFBA 0000          CON(5) =ONE-          1-
            0
1280 EAFBF 0000          CON(5) =GT            >
            0
1281 EAFC4 0000          CON(5) =ZBRNH         IF          ( * STR * )
            0
1282 EAFC9 4100          REL(5) %IF30
```

```
          0
1283            *
1284            * YES.  GENERATE BLANKS.
1285            *
1286 EAFCE 063AE        CON(5) =aBLNK1        1BLANK      ( * STR STR' * )
1287 EAFD3 00000        CON(5) =BRNCH         ELSE        ( * STR * )
1288 EAFD8 B400         REL(5) %TH30
1289            *
1290            * NO.  GET NIBBLE FROM VARIABLE LOCATIONS.
1291            *
1292 EAFDD       %IF30
1293 EAFDD 00000        CON(5) =R@            I
1294 EAFE2 00000        CON(5) =LIT           17
1295 EAFE7 1100         CON(5) 17
1296 EAFEC 00000        CON(5) =GT            >
1297 EAFF1 00000        CON(5) =ZBRNH         IF          ( * STR * )
1298 EAFF6 4100         REL(5) %IF31
1299            *
1300            * LENGTH > 17.  MUST HAVE BEEN GENEREATED BY THE BSS PSEUDO-OP.
1301            * HENCE, MUST BE ZERO.
1302            *
1303 EAFFB 00000        CON(5) =ZERO          0           ( * STR NUM * )
1304 EB000 00000        CON(5) =BRNCH         ELSE        ( * STR * )
1305 EB005 9100         REL(5) %TH31
1306 EB00A       %IF31
1307 EB00A 00000        CON(5) =R@            I
1308 EB00F 00000        CON(5) =ONE+          1+
1309 EB014 3C4AE        CON(5) =a>OPx         >OPx
1310 EB019 00000        CON(5) =AT            @           ( * STR NUM * )
1311 EB01E       %TH31                       THEN
1312 EB01E E14AE        CON(5) =aNUM#1        #1          ( * STR STR' * )
1313            *
1314            * APPEND NIBBLE TO OUTPUT STRING
1315            *
1316 EB023       %TH30                       THEN
1317 EB023 00000        CON(5) =S<&           S<&         ( * STR * )
1318 EB028 00000        CON(5) =XLOOP         LOOP        ( * STR * )
```

```
          0
1319 EB02D E7FF         REL(5) %DO4
          F
1320              *
1321              * FIRST LINE?
1322              *
1323 EB032 0000         CON(5) =R@              I
          0
1324 EB037 0000         CON(5) =ZEQ             0=
          0
1325 EB03C 0000         CON(5) =ZBRNH           IF              ( * STR * )
          0
1326 EB041 8200         REL(5) %IF32
          0
1327              *
1328              * YES.  APPEND SOURCE LINE (ONLY 75 CHARS) TO LISTING LINE
1329              *
1330 EB046 743A         CON(5) =aBLNK2          2BLANK
          E
1331 EB04B 0000         CON(5) =S<&             S<&             ( * STR * )
          0
1332 EB050 0000         CON(5) =aSLINE          SLINE
          0
1333 EB055 0000         CON(5) =LIT             75
          0
1334 EB05A B400         CON(5) 75
          0
1335 EB05F 0000         CON(5) =MIN             MIN
          0
1336 EB064 0000         CON(5) =S<&             S<&             ( * STR * )
          0
1337              *
1338              * OUTPUT LINE
1339              *
1340 EB069       %IF32                          THEN
1341 EB069 99DA         CON(5) =aOUTLI          OUT.LINE        ( * * )
          E
1342 EB06E 0000         CON(5) =XLOOP           LOOP
          0
1343 EB073 C5EF         REL(5) %DO3
          F
1344              *
1345              * ALL DONE
1346              *
1347 EB078       %IF302
1348 EB078 0000         CON(5) =DEC             DECIMAL
          0
1349 EB07D 0000         CON(5) =SEMI            ;               ( * * )
          0
1350              ****************************************************************
1351              ***
1352              ***  ERROR
1353              ***
1354              *** ( NUM -- )
1355              *** ( REPORT AN ERROR CORRECTLY )
```

```
1356                ********************************************************************
1357 EB082 0000    =aERROR CON(5) =DOCOL          : ERROR
           0
1358                *
1359                * INCREMENT ERROR COUNT
1360                *
1361 EB087 0000            CON(5) =ONE            1
           0
1362 EB08C 0000            CON(5) =aERCNT         ERROR COUNT
           0
1363 EB091 0000            CON(5) =PSTOR          +!
           0
1364                *
1365                * ALL ERROR LINES BEGIN WITH A "*"
1366                *
1367 EB096 0000            CON(5) =QUOTC          " * "       ( * NUM STR * )
           0
1368 EB09B 20              CON(2) 2
1369 EB09D 20              CON(2) 2
1370 EB09F A202            NIBASC \* \
1371                *
1372                * APPEND ERROR MESSAGE TO "*"
1373                *
1374 EB0A3 0000            CON(5) =ROT            ROT         ( * STR NUM * )
           0
1375 EB0A8 0000            CON(5) =aERMSG         ERRMSG      ( * STR STR' * )
           0
1376 EB0AD 0000            CON(5) =S>&            S>&         ( * STR * )
           0
1377                *
1378                * SAVE ERROR MESSAGE
1379                *
1380 EB0B2 0000            CON(5) =aERR$          ERR$
           0
1381 EB0B7 0000            CON(5) =S!             S!          ( * * )
           0
1382                *
1383                * ARE WE LISTING NOW?  (LIST ON? AND LISTING SPECIFIED)
1384                *
1385 EB0BC 0000            CON(5) =aTOLST         TOLIST
           0
1386 EB0C1 0000            CON(5) =AT             @           ( * NUM * )
           0
1387 EB0C6 0000            CON(5) =LISTNG         LISTING
           0
1388 EB0CB 0000            CON(5) =SWAP           SWAP
           0
1389 EB0D0 0000            CON(5) =DROP           DROP        ( * NUM LEN * )
           0
1390 EB0D5 0000            CON(5) =F.AND          F.AND       ( * F * )
           0
1391 EB0DA 0000            CON(5) =ZBRNH          IF          ( * * )
           0
1392 EB0DF B400            REL(5) %IF33
           0
```

```
1393                *
1394                * HAVE WE ISSUED AN ERROR ALREADY THIS LINE?
1395                *
1396 EB0E4 0000          CON(5) =LIT           8
           0
1397 EB0E9 8000          CON(5) 8
           0
1398 EB0EE CE3A          CON(5) =aTESTF        TEST.FLAG   ( * F * )
           E
1399 EB0F3 0000          CON(5) =ZEQ           0=
           0
1400 EB0F8 0000          CON(5) =ZBRNH         IF          ( * * )
           0
1401 EB0FD E100          REL(5) %IF34
           0
1402                *
1403                * NO.  ISSUE A BLANK LINE FIRST TO DELIMIT IT.
1404                *
1405 EB102 0000          CON(5) =LIT           8
           0
1406 EB107 8000          CON(5) 8
           0
1407 EB10C 9C3A          CON(5) =aSETF         SET.FLAG    ( * * )
           E
1408 EB111 0000          CON(5) =NULL$         NULL$
           0
1409 EB116 99DA          CON(5) =aOUTLI        OUT.LINE    ( * * )
           E
1410                *
1411                * OUTPUT ERROR
1412                *
1413 EB11B          %IF34                       THEN
1414 EB11B 0000          CON(5) =aERR$         ERR$
           0
1415 EB120 99DA          CON(5) =aOUTLI        OUT.LINE    ( * * )
           E
1416 EB125 0000          CON(5) =SEMI          ;           ( * * )
           0
1417                *
1418                * NOT LISTING NOW, SO SEND ERROR TO DISPLAY
1419                *
1420 EB12A          %IF33                                 ( * * )
1421 EB12A 0000          CON(5) =aERR$         ERR$        ( * STR * )
           0
1422                *
1423                * APPEND A , in line xxxx STRING TO ERROR MESSAGE
1424                *
1425 EB12F 0000          CON(5) =QUOTC         " , in line "
           0
1426 EB134 A0            CON(2) 10
1427 EB136 A0            CON(2) 10
1428 EB138 C202          NIBASC \, in lin\
           96E6
           0206
           96E6
```

```
1429 EB148 5602          NIBASC \e \
1430 EB14C C93A          CON(5) =a>PAD          >PAD        ( * STR STR' * )
          E
1431 EB151 0000          CON(5) =S>&            S>&         ( * STR * )
          0
1432 EB156 0000          CON(5) =aSLIN#         SLINE#
          0
1433 EB15B 0000          CON(5) =AT             @           ( * STR NUM * )
          0
1434 EB160 0000          CON(5) =ONE-           1-          ( * STR NUM * )
          0
1435 EB165 E64A          CON(5) =aNUM#4         #4
          E
1436 EB16A 0000          CON(5) =S<&            S<&         ( * STR * )
          0
1437              *
1438              * OUTPUT STRING AND ZERO LINECNT (VARIABLE USED IN SHOWP)
1439              *
1440 EB16F         %TYPE                         THEN        ( * STR * )
1441 EB16F 0000          CON(5) =CR             CR
          0
1442 EB174 0000          CON(5) =TYPE           TYPE
          0
1443 EB179 0000          CON(5) =ZERO           0
          0
1444 EB17E 0000          CON(5) =aLINEC         LINECNT
          0
1445 EB183 0000          CON(5) =STORE          !           ( * * )
          0
1446 EB188 0000          CON(5) =SEMI           ;           ( * * )
          0
```

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THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
1447                    STITLE FIT STATS
1448           zSIZE    EQU    (*)-zTHIS
1449           zLEFT    EQU    (zNEXT)-*
1450 EB18D              BSS    zLEFT
1451 EB200              END
```

%DO2	Abs	961292	#EAB0C	-	863	895					
%DO3	Abs	962255	#EAECF	-	1203	1343					
%DO4	Abs	962475	#EAFAB	-	1272	1319					
%IF10	Abs	960726	#EA8D6	-	623	509					
%IF11	Abs	960521	#EA809	-	554	516					
%IF12	Abs	960711	#EA8C7	-	616	525					
%IF13	Abs	960706	#EA8C2	-	611	583	601				
%IF14	Abs	960756	#EA8F4	-	641	672					
%IF15	Abs	960941	#EA9AD	-	727	721					
%IF16	Abs	961127	#EAA67	-	793	780					
%IF17	Abs	960881	#EA971	-	694	684					
%IF18	Abs	961242	#EAADA	-	839	829					
%IF19	Abs	961392	#EAB70	-	899	857					
%IF20	Abs	961337	#EAB39	-	877	873					
%IF21	Abs	961635	#EAC63	-	979	915					
%IF22	Abs	961715	#EACB3	-	1015	1005					
%IF23	Abs	961870	#EAD4E	-	1062	1035					
%IF24	Abs	961940	#EAD94	-	1086	1072					
%IF29	Abs	962320	#EAF10	-	1226	1212					
%IF30	Abs	962525	#EAFDD	-	1292	1282					
%IF300	Abs	962120	#EAE48	-	1160	1110					
%IF301	Abs	962055	#EAE07	-	1132	1118					
%IF302	Abs	962680	#EB078	-	1347	1182					
%IF303	Abs	962115	#EAE43	-	1158	1150					
%IF304	Abs	960206	#EA6CE	-	430	427					
%IF305	Abs	962415	#EAF6F	-	1256	1249					
%IF31	Abs	962570	#EB00A	-	1306	1298					
%IF32	Abs	962665	#EB069	-	1340	1326					
%IF33	Abs	962858	#EB12A	-	1420	1392					
%IF34	Abs	962843	#EB11B	-	1413	1401					
%IF6	Abs	959914	#EA5AA	-	310	282					
%IF7	Abs	959899	#EA59B	-	303	293					
%IF8	Abs	960256	#EA700	-	450	444					
%IF9	Abs	960736	#EA8E0	-	629	491					
%NUM1	Abs	959668	#EA4B4	-	214	160					
%NUM2	Abs	959663	#EA4AF	-	213	172					
%NUM3	Abs	959658	#EA4AA	-	212	185					
%NUM4	Abs	959653	#EA4A5	-	211	198					
%TH20	Abs	961357	#EAB4D	-	888	876					
%TH29	Abs	962325	#EAF15	-	1228	1222					
%TH30	Abs	962595	#EB023	-	1316	1288					
%TH301	Abs	962060	#EAE0C	-	1137	1128					
%TH31	Abs	962590	#EB01E	-	1311	1305					
%TYPE	Abs	962927	#EB16F	-	1440	1082					
/	Ext			-	1198						
2DROP	Ext			-	85	86	304	313	431	1064	1161
2DUP	Ext			-	278	428	513	540	770	1032	
4N@	Ext			-	289	745					
>R	Ext			-	277						
?DUP	Ext			-	280	507	523	778	855	1116	
ABORT	Ext			-	452						
ADD	Ext			-	230	288	539	812	892	1022	1025
					1240	1269					1195
AND	Ext			-	135						
AT	Ext			-	120	134	340	347	354	364	486
											656

			730	817	854	884	890	913	942	1019
			1024	1104	1115	1145	1147	1179	1189	1218
			1235	1245	1254	1278	1310	1386	1433	
BASE	Ext	-	365							
BASF	Ext	-	575							
BASICX	Ext	-	257							
BLOCK	Ext	-	705	731						
BRNCH	Ext	-	159	171	184	197	875	1081	1127	1221
			1287	1304						
C!	Ext	-	541	543	1046	1050				
CHR$	Ext	-	930	1010						
CLOSF	Ext	-	341							
CR	Ext	-	436	1441						
CRLF	Ext	-	1125							
CSP	Ext	-	363							
DEC	Ext	-	943	1216	1348					
DOCOL	Ext	-	23	37	50	62	73	84	95	106
			118	132	144	156	168	180	193	206
			224	239	273	324	335	389	421	460
			470	481	640	651	703	715	759	804
			849	908	988	1095	1171	1357		
DROP	Ext	-	39	52	312	356	398	407	624	706
			1017	1063	1107	1177	1389			
DUP	Ext	-	425	529	596	741	784	998	999	1266
EOF	Ext	-	682	719						
EQUAL	Ext	-	291	598	1002					
F.AND	Ext	-	1108	1180	1390					
FADJ	Ext	-	826	1033						
FCREAT	Ext	-	522	777						
FFIND	Ext	-	279	809						
FOUR*	Ext	-	1031							
FROP	Ext	-	588	589						
FSTX	Ext	-	442	514						
FTOI	Ext	-	587							
GT	Ext	-	489	871	1148	1247	1280	1296		
GT#	Ext	-	215							
HEX	Ext	-	1233							
HOLD	Ext	-	147							
IOKILL	Ext	-	355							
IP	Ext	-	579							
LASTX	Ext	-	580							
LISTNG	Ext	-	441	445	506	1105	1175	1387		
LIT	Ext	-	40	145	226	253	286	345	371	471
			487	520	537	555	617	630	641	657
			663	688	742	746	794	810	818	833
			869	928	1020	1078	1190	1193	1196	1237
			1263	1267	1294	1333	1396	1405		
LT#	Ext	-	156	170	182	195	208			
MAX	Ext	-	822	1200						
MIN	Ext	-	748	1192	1335					
MINUS	Ext	-	744	820	1255					
MULT	Ext	-	228	1239	1265					
N!	Ext	-	373	893						
N#	Ext	-	210	211	212	213	214			
NULL$	Ext	-	96	107	974	1159	1408			

ONE	Ext		-	325	704	735	776	922	1068	1076	1138
				1199	1246	1361					
ONE+	Ext		-	882	1308						
ONE-	Ext		-	64	225	1219	1279	1434			
ONERR	Ext		-	255	262	378	557	591	665	677	
OPNF	Ext		-	670							
OR	Ext		-	121							
OUTPUT	Ext		-	1124	1126						
OVER	Ext		-	1029	1045	1049					
OVER2	Ext		-	74	75						
PAGESZ	Ext		-	485	1146						
PRIME	Ext		-	1122							
PSTOR	Ext		-	737	924	1040	1140	1363			
QUOTC	Ext		-	24	243	393	402	562	570	763	936
				958	1367	1425					
R>	Ext		-	290	311						
R@	Ext		-	868	881	891	1209	1236	1259	1276	1293
				1307	1323						
ROT	Ext		-	1056	1374						
S!	Ext		-	109	750	772	993	1381			
S<&	Ext		-	249	569	574	940	945	950	952	964
				969	1011	1229	1258	1317	1331	1336	1436
S>&	Ext		-	97	1376	1431					
SCFIB	Ext		-	339	348	655					
SEMI	Ext		-	29	42	54	65	76	87	98	110
				124	136	148	216	231	264	299	306
				315	327	380	412	550	607	625	695
				707	723	751	789	841	900	980	1058
				1087	1163	1349	1416	1446			
SMOVE	Ext		-	1057							
STORE	Ext		-	128	256	263	349	359	366	379	499
				502	531	549	558	592	606	659	666
				678	786	788	921	1123	1445		
SWAP	Ext		-	536	1016	1048	1106	1176	1270	1388	
SWAP2	Ext		-	248	568						
TWO	Ext		-	53							
TWO*	Ext		-	1001	1030						
TWO+	Ext		-	542	1047	1051					
TWO/	Ext		-	1000							
TYPE	Ext		-	437	1442						
VARID	Ext		-	353	358						
XDO	Ext		-	862	1202	1271					
XEY?	Ext		-	581							
XLOOP	Ext		-	894	1318	1342					
ZBRNH	Ext		-	281	292	426	443	490	508	515	524
				582	600	671	683	720	779	828	856
				872	914	1004	1034	1071	1109	1117	1149
				1181	1211	1248	1281	1297	1325	1391	1400
ZEQ	Ext		-	599	827	1003	1070	1210	1324	1399	
ZERO	Ext		-	157	169	181	194	207	261	305	357
				370	377	497	500	547	590	676	722
				821	861	874	919	1009	1044	1201	1303
				1443							
=a&CLR	Abs	959408	#EA3B0	-	106	1162	1207				
=a>OPx	Abs	959683	#EA4C3	-	224	883	1309				

```
=a PAD   Abs  959388 #EA39C -    95   247   567  1430
=aABRT   Abs  960176 #EA6B0 -   421   462
=aBLNK1  Abs  959328 #EA360 -    62  1286
=aBLNK2  Abs  959303 #EA347 -    50    63  1330
=aBLNK5  Abs  959273 #EA329 -    37    51  1227
=aBLNKB  Abs  959232 #EA300 -    23    38   949
=aCLEAN  Abs  960099 #EA663 -   389   451
=aCLOSE  Abs  959959 #EA5D7 -   335   411
=aDROP4  Abs  959368 #EA388 -    84
=aDUP4   Abs  959348 #EA374 -    73
=aEJECT  Abs  961397 #EAB75 -   908  1154
 aERCNT  Ext                 -  1362
 aERMSG  Ext                 -   435  1080  1375
 aERR$   Ext                 -  1380  1414  1421
=aERROR  Abs  962690 #EB082 -  1357
 aFLSIZ  Ext                 -   816
 aFLTYP  Ext                 -  1244
=aKILL   Abs  959723 #EA4EB -   239   297   429
 aLC     Ext                 -   785   889  1234
 aLINEC  Ext                 -  1444
 aLISTF  Ext                 -   501   530  1018
 aLLIN#  Ext                 -   920  1139  1144
 aLLINE  Ext                 -   108   935   957   992   994  1055  1208
 aLNOFF  Ext                 -   548  1023  1039
=aLSTAB  Abs  960281 #EA719 -   470   556   612
 aLSTAD  Ext                 -   498   605  1114
=aLSTIN  Abs  960301 #EA72D -   481
 aMEMAB  Ext                 -   254
 aMEMOV  Ext                 -   840
 aMONAT  Ext                 -  1099
 aNEG1   Ext                 -   298   314   535   597   728
=aNUM#1  Abs  959518 #EA41E -   156  1312
=aNUM#2  Abs  959543 #EA437 -   168
=aNUM#3  Abs  959568 #EA450 -   180   944
=aNUM#4  Abs  959598 #EA46E -   193  1220  1435
=aNUM#5  Abs  959628 #EA48C -   206  1257
 aOBJFL  Ext                 -   787  1253
=aOBJGR  Abs  961142 #EAA76 -   804
=aOBJIN  Abs  961031 #EAA07 -   759
 aOCCUR  Ext                 -   119   122   133
 aOFILE  Ext                 -   461   771   808
 aOP     Ext                 -   229
 aOPLEN  Ext                 -   853  1188  1277
=aOPSRC  Abs  960771 #EA903 -   651
=aOUTLI  Abs  961945 #EAD99 -  1095   931   953   970   975  1341  1409  1415
=aOUTLS  Abs  962135 #EAE57 -  1171
=aOUTOB  Abs  961252 #EAAE4 -   849
 aPAGE#  Ext                 -   923   941
=aPRT#   Abs  961640 #EAC68 -   988  1133
=aPURGE  Abs  959809 #EA541 -   273   326
=aRDSRC  Abs  960911 #EA98F -   715
=aREMOV  Abs  959939 #EA5C3 -   324   397   406   446
=aRSSRC  Abs  960886 #EA976 -   703
=aSETF   Abs  959433 #EA3C9 -   118  1077  1407
=aSHUTD  Abs  960266 #EA70A -   460   473   619   632   643   690   796   835
```

aSLIN#	Ext			-	729	736	1217	1432
aSLINE	Ext			-	749	1332		
=aSP	Abs	959493	#EA405	-	144	183	196	209
=aSRCAB	Abs	960751	#EA8EF	-	640	664		
aSTIT	Ext			-	968			
=aTESTF	Abs	959468	#EA3EC	-	132	1069	1398	
aTIT	Ext			-	951			
aTOLST	Ext			-	912	1103	1178	1385
zLEFT	Abs	115	#00073	-	1449	1450		
zNEXT	Abs	963072	#EB200	-	5	1449		
zSIZE	Abs	3725	#00E8D	-	1448			
zTHIS	Abs	959232	#EA300	-	4	1448		

Input Parameters

Source file name is GN&AS2

Listing file name is GN/AS2::65

Object file name is GN%AS2::65

```
                                  111111
                         0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                    TITLE  AS3:_FORTH_ASSEMBLER_SYT
 2                    RDSYMB MR%GTO
 3 EB200              ABS    #EB200
 4             zTHIS  EQU    *
 5             zNEXT  EQU    #EBB00
 6
 7             ********************************************************
 8             ***
 9             *** MR&AS3     <840504.1037>
10             ***
11             ***
12             ***  FORTH ASSEMBLER
13             *** SYMBOL TABLE
14             ***
15             ********************************************************
16             ********************************************************************
17             ***
18             ***  SYT.INIT
19             ***
20             *** ( -- )
21             *** ( INITIALIZE THE SYMBOL TABLE )
22             ********************************************************************
23 EB200 0000 =aSYTIN CON(5) =DOCOL          : SYT.INIT
          0
24                  *
25                  * CREATE SYMBOL TABLE
26                  *
27 EB205 0000         CON(5) =QUOTC          "
          0
28 EB20A 60           CON(2) 6
29 EB20C 60           CON(2) 6
30 EB20E 1435         NIBASC \ASMBSY\
         D424
         3595
31 EB21A 0000         CON(5) =LIT            18          ( * STR NUM * )
          0
32 EB21F 2100         CON(5) 18
          0
33 EB224 0000         CON(5) =FCREAT         FCREATE
          0
34 EB229 0000         CON(5) =?DUP           ?DUP
          0
35 EB22E 0000         CON(5) =ZBRNH          IF          ( * [ADDR] * )
          0
36 EB233 B400         REL(5) %IF35
          0
37                  *
38                  * SAVE START OF SYMBOL TABLE
39                  *
40 EB238 0000         CON(5) =LIT            37
          0
41 EB23D 5200         CON(5) 37
          0
42 EB242 0000         CON(5) =ADD            +           ( * ADDR * )
          0
```

```
     43 EB247 0000          CON(5) =DUP            DUP
              0
     44 EB24C 0000          CON(5) =aSYTAD         SYTAD
              0
     45 EB251 0000          CON(5) =STORE          !            ( * ADDR * )
              0
     46                *
     47                * PUT IN HIGHEST POSSIBLE ENTRY INTO SYMBOL TABLE.  THIS HELPS
     48                * MAKE SEARCHING & INSERTING NEW ENTRIES MUCH EASIER.
     49                *
     50 EB256 0000          CON(5) =LIT            9
              0
     51 EB25B 9000          CON(5) 9
              0
     52 EB260 0000          CON(5) =aNEG1          -1
              0
     53 EB265 0000          CON(5) =FILL           FILL         ( * * )
              0
     54 EB26A 0000          CON(5) =ONE            1
              0
     55 EB26F 0000          CON(5) =aSYTSZ         SYTSIZE
              0
     56 EB274 0000          CON(5) =STORE          !            ( * * )
              0
     57 EB279 0000          CON(5) =SEMI           ;            ( * * )
              0
     58                *
     59                * COULDN'T CREATE SYMBOL TABLE - MUST MEAN NO MEMORY AVAILABLE
     60                *
     61 EB27E                %IF35                  ELSE
     62 EB27E 0000          CON(5) =LIT            47
              0
     63 EB283 F200          CON(5) 47              'not enought memory for assembler'
              0
     64 EB288 0000          CON(5) =aSHUTD         SHUTDOWN     ( * * )
              0
     65 EB28D 0000          CON(5) =SEMI           ;            ( * * )
              0
     66                ****************************************************************
     67                ***
     68                ***  >ADR
     69                ***
     70                *** ( POS -- PTR )
     71                *** ( CALCULATE ADDRESS OF SYMBOL TABLE ENTRY POS )
     72                ****************************************************************
     73 EB292 0000 =a>ADR   CON(5) =DOCOL          : >ADR
              0
     74                *
     75                * ADDR = <SYMBOL TABLE ADDRESS> + <ENTRY LENGTH> * <POSITION - 1>
     76                *
     77 EB297 0000          CON(5) =ONE-           1-
              0
     78 EB29C 0000          CON(5) =LIT            18
              0
     79 EB2A1 2100          CON(5) 18
```

```
          0
 80 EB2A6 0000         CON(5) =MULT          *
          0
 81 EB2AB 0000         CON(5) =aSYTAD        SYTAD
          0
 82 EB2B0 0000         CON(5) =AT            @
          0
 83 EB2B5 0000         CON(5) =ADD           +
          0
 84 EB2BA 0000         CON(5) =SEMI          ;           ( * PTR * )
          0
 85                    ********************************************************************
 86                    ***
 87                    ***  ENSURE8LONG
 88                    ***
 89                    *** ( STR -- STR )
 90                    *** ( APPEND SPACES AND ENSURE STRING EIGHT LONG )
 91                    ********************************************************************
 92 EB2BF 0000 =aENS8L CON(5) =DOCOL         : ENSURE8LONG
          0
 93                    *
 94                    * SAVE CURRENT STRING IN ERR$ STRING VARIABLE
 95                    *
 96 EB2C4 0000         CON(5) =LIT           42
          0
 97 EB2C9 A200         CON(5) 42
          0
 98 EB2CE 0000         CON(5) =MIN           MIN         ( * STR * )
          0
 99 EB2D3 0000         CON(5) =aERR$         ERR$
          0
100 EB2D8 0000         CON(5) =S!            S!
          0
101 EB2DD 0000         CON(5) =aERR$         ERR$        ( * STR * )
          0
102                    *
103                    * APPEND EIGHT (8) BLANKS TO THE END OF IT
104                    *
105 EB2E2 0000         CON(5) =QUOTC         "
          0
106 EB2E7 80           CON(2) 8
107 EB2E9 80           CON(2) 8
108 EB2EB 0202         NIBASC \        \
          0202
          0202
          0202
109 EB2FB 0000         CON(5) =S<&           S<&         ( * STR * )
          0
110                    *
111                    * TAKE FIRST EIGHT (8) CHARACTERS
112                    *
113 EB300 0000         CON(5) =DROP          DROP
          0
114 EB305 0000         CON(5) =LIT           8
          0
```

```
115 EB30A 8000          CON(5) 8
          0
116 EB30F 0000          CON(5) =SEMI            ;           ( * STR * )
          0
117               ********************************************************************
118               ***
119               ***  ENSURE6LONG
120               ***
121               *** ( STR -- STR )
122               *** ( APPEND SPACES AND ENSURE STRING SIX LONG )
123               ********************************************************************
124 EB314 0000 =aENS6L CON(5) =DOCOL          : ENSURE6LONG
          0
125 EB319 FB2B          CON(5) =aENS8L        ENSURE8LONG
          E
126 EB31E 0000          CON(5) =DROP          DROP
          0
127 EB323 0000          CON(5) =LIT           6
          0
128 EB328 6000          CON(5) 6
          0
129 EB32D 0000          CON(5) =SEMI          ;           ( * STR * )
          0
130               ********************************************************************
131               ***
132               ***  DROP LEADING c
133               ***
134               *** ( STR c -- STR )
135               *** ( DROP LEADING CHARACTER IF IT IS c )
136               ********************************************************************
137 EB332 0000 =aDROPc CON(5) =DOCOL          : DROP LEADING c
          0
138               *
139               * GET FIRST CHARACTER FROM STRING
140               *
141 EB337 0000          CON(5) =>R            >R          ( * STR * )
          0
142 EB33C 0000          CON(5) =OVER          OVER        ( * STR ADDR * )
          0
143 EB341 0000          CON(5) =CAT           C@          ( * STR C * )
          0
144 EB346 0000          CON(5) =R>            R>          ( * STR C c * )
          0
145 EB34B 0000          CON(5) =EQUAL         =           ( * STR F * )
          0
146               *
147               * ENSURE THERE IS A CHARACTER IN THE STRING
148               *
149 EB350 0000          CON(5) =OVER          OVER        ( * STR F LEN * )
          0
150 EB355 0000          CON(5) =AND           AND         ( * STR F * )
          0
151 EB35A 0000          CON(5) =ZBRNH         IF          ( * STR * )
          0
152 EB35F F000          REL(5) %IF44
```

```
          0
153             *
154             * DROP FIRST CHARACTER FROM STRING
155             *
156 EB364 0000          CON(5) =C@+             C@+
          0
157 EB369 0000          CON(5) =DROP            DROP        ( * STR * )
          0
158             *
159             * ALL DONE
160             *
161 EB36E        %IF44                          THEN        ( * STR * )
162 EB36E 0000          CON(5) =SEMI            ;           ( * STR * )
          0
163             ********************************************************************
164             ***
165             ***  LOOKUP
166             ***
167             *** ( STR -- PTR )
168             *** ( LOOKUP STRING IN SYMBOL TABLE )
169             ********************************************************************
170 EB373 0000 =aLUKUP CON(5) =DOCOL          : LOOKUP
          0
171             *
172             * DROP LEADING = SIGN
173             *
174 EB378 0000          CON(5) =LIT             \=\         ( * STR NUM * )
          0
175 EB37D D300          CON(5) \=\
          0
176 EB382 233B          CON(5) =aDROPc          DROPc       ( * STR * )
          E
177             *
178             * INITIALIZE VARIABLES
179             *   STR - MAX SIX CHARACTERS LONG
180             *   BFOUND - FALSE, NOT FOUND.
181             *   BLOW - ONE (1), FIRST ENTRY.
182             *   BTOP - <SYMBOL TABLE SIZE>, LAST ENTRY.
183             *
184 EB387 413B          CON(5) =aENS6L          ENSURE6LONG ( * STR * )
          E
185 EB38C 0000          CON(5) =ZERO            0
          0
186 EB391 0000          CON(5) =aBFOUN          BFOUND
          0
187 EB396 0000          CON(5) =STORE           !           ( * STR * )
          0
188 EB39B 0000          CON(5) =ONE             1
          0
189 EB3A0 0000          CON(5) =aBLOW           BLOW
          0
190 EB3A5 0000          CON(5) =STORE           !           ( * STR * )
          0
191 EB3AA 0000          CON(5) =aSYTSZ          SYTSIZE
          0
```

```
192 EB3AF 0000          CON(5) =AT              @
          0
193 EB3B4 0000          CON(5) =aBTOP           BTOP
          0
194 EB3B9 0000          CON(5) =STORE           !               ( * STR * )
          0
195                *
196                * while BLOW <= BTOP and NOT BFOUND do
197                *
198 EB3BE           %BG1                       BEGIN           ( * STR * )
199 EB3BE 0000          CON(5) =aBLOW           BLOW
          0
200 EB3C3 0000          CON(5) =AT              @
          0
201 EB3C8 0000          CON(5) =aBTOP           BTOP
          0
202 EB3CD 0000          CON(5) =AT              @
          0
203 EB3D2 0000          CON(5) =GT              >               ( * [STR] F * )
          0
204 EB3D7 0000          CON(5) =aBFOUN          BFOUND
          0
205 EB3DC 0000          CON(5) =AT              @
          0
206 EB3E1 0000          CON(5) =OR              OR
          0
207 EB3E6 0000          CON(5) =ZEQ             0=              ( * [STR] F * )
          0
208 EB3EB 0000          CON(5) =ZBRNH           WHILE           ( * STR * )
          0
209 EB3F0 DC00          REL(5) %RP1
          0
210                *
211                * CALCULATE MIDDLE ENTRY ((BTOP + BLOW) / 2)
212                *
213 EB3F5 0000          CON(5) =aBTOP           BTOP
          0
214 EB3FA 0000          CON(5) =AT              @
          0
215 EB3FF 0000          CON(5) =aBLOW           BLOW
          0
216 EB404 0000          CON(5) =AT              @
          0
217 EB409 0000          CON(5) =ADD             +
          0
218 EB40E 0000          CON(5) =TWO/            2/              ( * STR MID * )
          0
219                *
220                * SAVE LAST ENTRY LOOKED AT IN VARIABLE SYTLAST.  THIS
221                * MARKS WHERE TO INSERT THE ENTRY IF IT ISN'T FOUND.
222                *
223 EB413 0000          CON(5) =DUP             DUP
          0
224 EB418 0000          CON(5) =aSYTLS          SYTLAST
          0
```

```
225 EB41D 0000          CON(5) =STORE          !
          0
226               *
227               * EXTRACT STRING FROM THAT ENTRY
228               *
229 EB422 292B          CON(5) =a>ADR          >ADR
          E
230 EB427 0000          CON(5) =LIT            6            ( * STR STR' * )
          0
231 EB42C 6000          CON(5) 6
          0
232 EB431 0000          CON(5) =aDUP4          4DUP
          0
233 EB436 0000          CON(5) =S=             S=
          0
234 EB43B 0000          CON(5) =ZBRNH          IF           ( * STR STR' * )
          0
235 EB440 3200          REL(5) %IF36
          0
236               *
237               * FOUND IT!  SET VARIABLE BFOUND
238               *
239 EB445 0000          CON(5) =aDROP4         4DROP        ( * * )
          0
240 EB44A 0000          CON(5) =aNEG1          -1
          0
241 EB44F 0000          CON(5) =aBFOUN         BFOUND
          0
242 EB454 0000          CON(5) =STORE          !            ( * * )
          0
243 EB459 0000          CON(5) =BRNCH          ELSE         ( * STR STR' * )
          0
244 EB45E 5500          REL(5) %TH36
          0
245               *
246               * STRINGS NOT THE SAME.  DO WE GO UP OR DOWN?
247               *
248 EB463        %IF36
249 EB463 0000          CON(5) =OVER2          2OVER
          0
250 EB468 0000          CON(5) =S<             S<
          0
251 EB46D 0000          CON(5) =ZBRNH          IF           ( * STR * )
          0
252 EB472 8200          REL(5) %IF37
          0
253               *
254               * WE GO UP
255               *
256 EB477 0000          CON(5) =aSYTLS         SYTLAST
          0
257 EB47C 0000          CON(5) =AT             @            ( * STR POS * )
          0
258 EB481 0000          CON(5) =ONE+           1+
          0
```

```
259 EB486 0000          CON(5) =aBLOW          BLOW
          0
260 EB48B 0000          CON(5) =STORE          !            ( * STR * )
          0
261 EB490 0000          CON(5) =BRNCH          ELSE         ( * STR * )
          0
262 EB495 E100          REL(5) %TH37
          0
263               *
264               * WE GO DOWN
265               *
266 EB49A        %IF37
267 EB49A 0000          CON(5) =aSYTLS         SYTLAST
          0
268 EB49F 0000          CON(5) =AT             @            ( * STR POS * )
          0
269 EB4A4 0000          CON(5) =ONE-           1-
          0
270 EB4A9 0000          CON(5) =aBTOP          BTOP
          0
271 EB4AE 0000          CON(5) =STORE          !            ( * STR * )
          0
272 EB4B3        %TH37                         THEN         ( * STR * )
273               *
274               * end while
275               *
276 EB4B3        %TH36                         THEN         ( * [STR] * )
277 EB4B3 0000          CON(5) =BRNCH          REPEAT       ( * [STR] * )
          0
278 EB4B8 60FF          REL(5) %BG1
          F
279               *
280               * IF FOUND, RETURN ADDRESS OF ENTRY
281               *
282 EB4BD        %RP1
283 EB4BD 0000          CON(5) =aBFOUN         BFOUND
          0
284 EB4C2 0000          CON(5) =AT             @
          0
285 EB4C7 0000          CON(5) =ZBRNH          IF           ( * [STR] * )
          0
286 EB4CC 9100          REL(5) %IF38
          0
287 EB4D1 0000          CON(5) =aSYTLS         SYTLAST
          0
288 EB4D6 0000          CON(5) =AT             @
          0
289 EB4DB 292B          CON(5) =a>ADR          >ADR         ( * PTR * )
          E
290 EB4E0 0000          CON(5) =SEMI           ;            ( * PTR * )
          0
291               *
292               * IF NOT FOUND, SAVE ADDRESS OF PLACE TO INSERT AND RETURN FF
293               *
294 EB4E5        %IF38                         ELSE         ( * STR * )
```

```
295 EB4E5 0000          CON(5) =aSYTLS          SYTLAST
          0
296 EB4EA 0000          CON(5) =AT              @
          0
297 EB4EF 0000          CON(5) =aBLOW           BLOW
          0
298 EB4F4 0000          CON(5) =AT              @           ( * STR LST LOW * )
          0
299 EB4F9 0000          CON(5) =MAX             MAX
          0
300 EB4FE 0000          CON(5) =aSYTLS          SYTLAST
          0
301 EB503 0000          CON(5) =STORE           !           ( * STR * )
          0
302 EB508 0000          CON(5) =2DROP           2DROP
          0
303 EB50D 0000          CON(5) =ZERO            0           ( * PTR * )
          0
304 EB512 0000          CON(5) =SEMI            ;           ( * PTR * )
          0
305               ****************************************************************
306               ***
307               ***  SYT>
308               ***
309               *** ( STR -- NUM )
310               *** ( RETRIEVE A VALUE FROM THE SYMBOL TABLE )
311               *** ( IF FOUND, THEN VARIABLE KNOWN IS SET TRUE )
312               ****************************************************************
313 EB517 0000 =aSYT>  CON(5) =DOCOL           : SYT>
          0
314               *
315               * LOOK UP VALUE FIRST
316               *
317 EB51C 373B          CON(5) =aLUKUP          LOOKUP
          E
318 EB521 0000          CON(5) =?DUP            ?DUP
          0
319 EB526 0000          CON(5) =ZBRNH           IF          ( * [PTR] * )
          0
320 EB52B F500          REL(5) %IF39
          0
321               *
322               * FOUND, RETURN VALUE
323               *
324 EB530 0000          CON(5) =LIT             12
          0
325 EB535 C000          CON(5) 12
          0
326 EB53A 0000          CON(5) =ADD             +           ( * PTR * )
          0
327 EB53F 0000          CON(5) =DUP             DUP         ( * PTR PTR * )
          0
328 EB544 0000          CON(5) =AT              @           ( * PTR NUM * )
          0
329               *
```

```
330                * LOOK AT TYPE NIBBLE:
331                *   1 = LABEL
332                *   2 = EQUATE
333                *
334 EB549 0000          CON(5) =SWAP          SWAP        ( * NUM PTR * )
          0
335 EB54E 0000          CON(5) =FIVE+         5+          ( * NUM PTR * )
          0
336 EB553 0000          CON(5) =N@            N@          ( * NUM NIB * )
          0
337 EB558 0000          CON(5) =ONE           1
          0
338 EB55D 0000          CON(5) =AND           AND         ( * NUM BIT0 * )
          0
339 EB562 0000          CON(5) =ZBRNH         IF
          0
340 EB567 4100          REL(5) %IF313
          0
341 EB56C 0000          CON(5) =aNEG1         -1          ( * NUM -1 * ) LABEL
          0
342 EB571 0000          CON(5) =BRNCH         ELSE
          0
343 EB576 A000          REL(5) %TH313
          0
344 EB57B        %IF313
345 EB57B 0000          CON(5) =ONE           1           ( * NUM 1 * )  EQUATE
          0
346 EB580        %TH313                       THEN
347 EB580 0000          CON(5) =BRNCH         ELSE
          0
348 EB585 F000          REL(5) %TH39
          0
349                *
350                * NOT FOUND, RETURN 0 AND FALSE IN VARIABLE KNOWN
351                *
352 EB58A        %IF39
353 EB58A 0000          CON(5) =ZERO          0
          0
354 EB58F 0000          CON(5) =ZERO          0           ( * NUM 0 * )  NOT FOUN
          0
355                *
356                * SET VARIABLE KNOWN:
357                *   0 = NOT KNOWN
358                *   1 = EQUATE
359                *  -1 = LABEL
360                *
361 EB594        %TH39                        THEN        ( * NUM TYP * )
362 EB594 0000          CON(5) =aKNOWN        KNOWN       ( * NUM TYP ADDR * )
          0
363 EB599 0000          CON(5) =STORE         !           ( * NUM * )
          0
364 EB59E 0000          CON(5) =SEMI          ;           ( * NUM * )
          0
365                ****************************************************************
366                ***
```

```
367                *** LABEL.OK?
368                ***
369                *** ( STR -- F )
370                *** ( F TRUE MEANS THE LABEL IS A VALID LABEL )
371                ****************************************************************
372 EB5A3 0000 =aLABOK CON(5) =DOCOL          : LABEL.OK?
            0
373                *
374                * DROP LEADING =
375                *
376 EB5A8 0000          CON(5) =LIT           61          ( * STR NUM * )
            0
377 EB5AD D300          CON(5) \=\
            0
378 EB5B2 233B          CON(5) =aDROPc        DROPc       ( * STR * )
            E
379                *
380                * EXTRACT FIRST CHARACTER
381                *
382 EB5B7 0000          CON(5) =OVER          OVER        ( * STR ADDR * )
            0
383 EB5BC 0000          CON(5) =CAT           C@          ( * STR C * )
            0
384                *
385                * FIRST CHARACTER A '#' ?
386                *
387 EB5C1 0000          CON(5) =DUP           DUP         ( * STR C C * )
            0
388 EB5C6 0000          CON(5) =LIT           35          ( * STR C NUM * )
            0
389 EB5CB 3200          CON(5) \#\
            0
390 EB5D0 0000          CON(5) =EQUAL         =           ( * STR C F * )
            0
391                *
392                * FIRST CHARACTER A ''' ?
393                *
394 EB5D5 0000          CON(5) =OVER          OVER        ( * STR C F C * )
            0
395 EB5DA 0000          CON(5) =LIT           39          ( * STR C F C NUM * )
            0
396 EB5DF 7200          CON(5) \'\
            0
397 EB5E4 0000          CON(5) =EQUAL         =           ( * STR C F F' * )
            0
398 EB5E9 0000          CON(5) =OR            OR          ( * STR C F * )
            0
399                *
400                * FIRST CHARACTER A '('
401                *
402 EB5EE 0000          CON(5) =OVER          OVER        ( * STR C F C * )
            0
403 EB5F3 0000          CON(5) =LIT           40          ( * STR C F C NUM * )
            0
404 EB5F8 8200          CON(5) \(\
```

```
          0
405 EB5FD 0000          CON(5) =EQUAL           =           ( * STR C F F' * )
          0
406 EB602 0000          CON(5) =OR              OR          ( * STR C F * )
          0
407                *
408                * FIRST CHARACTER A DECIMAL DIGIT ?
409                *
410 EB607 0000          CON(5) =OVER            OVER        ( * STR C F C * )
          0
411 EB60C 0000          CON(5) =aDIG10          DIGIT.10    ( * STR C F F * )
          0
412 EB611 0000          CON(5) =OR              OR          ( * STR C F * )
          0
413                *
414                * FIRST CHARACTER A '-' ?
415                *
416 EB616 0000          CON(5) =SWAP            SWAP        ( * STR F C * )
          0
417 EB61B 0000          CON(5) =LIT             45          ( * STR F C NUM * )
          0
418 EB620 D200          CON(5) \-\
          0
419 EB625 0000          CON(5) =EQUAL           =           ( * STR F F * )
          0
420 EB62A 0000          CON(5) =OR              OR          ( * STR F * )
          0
421                *
422                * BURY THIS FLAG, IT'S USED IN THE LOOP
423                *
424 EB62F 0000          CON(5) =ROT             ROT
          0
425 EB634 0000          CON(5) =ROT             ROT         ( * F STR * )
          0
426 EB639 0000          CON(5) =ZERO            0           ( * F ADDR LEN 0 * )
          0
427                *
428                * LOOP THROUGH EACH CHARACTER
429                *
430 EB63E 0000          CON(5) =XDO             DO          ( * F ADDR * )
          0
431 EB643           %DO20
432                *
433                * EXTRACT CHARACTER
434                *
435 EB643 0000          CON(5) =DUP             DUP         ( * F ADDR ADDR * )
          0
436 EB648 0000          CON(5) =CAT             C@          ( * F ADDR C * )
          0
437                *
438                * IS THE CHARACTER A ',' ?
439                *
440 EB64D 0000          CON(5) =DUP             DUP         ( * F ADDR C C * )
          0
441 EB652 0000          CON(5) =LIT             44          ( * F ADDR C C NUM * )
```

```
          0
442 EB657 C200          CON(5) \,\
          0
443 EB65C 0000          CON(5) =EQUAL           =           ( * F ADDR C F' * )
          0
444                *
445                * IS THE CHARACTER A ')' ?
446                *
447 EB661 0000          CON(5) =SWAP            SWAP        ( * F ADDR F' C * )
          0
448 EB666 0000          CON(5) =LIT             41          ( * F ADDR F' C NUM * )
          0
449 EB66B 9200          CON(5) \)\
          0
450 EB670 0000          CON(5) =EQUAL           =           ( * F ADDR F' F" * )
          0
451 EB675 0000          CON(5) =OR              OR          ( * F ADDR F' * )
          0
452 EB67A 0000          CON(5) =ROT             ROT         ( * ADDR F' F * )
          0
453 EB67F 0000          CON(5) =OR              OR          ( * ADDR F * )
          0
454                *
455                * BUMP ADDRESS TO NEXT CHARACTER
456                *
457 EB684 0000          CON(5) =SWAP            SWAP        ( * F ADDR * )
          0
458 EB689 0000          CON(5) =TWO+            2+          ( * F ADDR * )
          0
459 EB68E 0000          CON(5) =XLOOP           LOOP        ( * F ADDR * )
          0
460 EB693 0BFF          REL(5) %DO20
          F
461                *
462                * RETURN FALSE IF ANY OF ABOVE QUESTIONS TRUE
463                *
464 EB698 0000          CON(5) =DROP            DROP        ( * F * )
          0
465 EB69D 0000          CON(5) =ZEQ             0=          ( * F * )
          0
466 EB6A2 0000          CON(5) =SEMI            ;           ( * F * )
          0
467                ****************************************************************
468                ***
469                ***   >SYT
470                ***
471                *** ( NUM STR -- )
472                *** ( PUT A VALUE FOR A LABEL IN THE SYMBOL TABLE )
473                ****************************************************************
474 EB6A7 0000 =a>SYT  CON(5) =DOCOL           : >SYT
          0
475                *
476                * VALID LABEL?
477                *
478 EB6AC 0000          CON(5) =2DUP            2DUP        ( * NUM STR STR * )
```

```
          0
479 EB6B1 3A5B          CON(5) =aLABOK          LABEL.OK?    ( * NUM STR F * )
          E
480 EB6B6 0000          CON(5) =ZBRNH           IF           ( * NUM STR * )
          0
481 EB6BB 7D00          REL(5) %IF309
          0
482               *
483               * YES.  DOES IT ALREADY EXIST?
484               *
485 EB6C0 373B          CON(5) =aLUKUP          LOOKUP
          E
486 EB6C5 0000          CON(5) =ZBRNH           IF           ( * NUM * )
          0
487 EB6CA F000          REL(5) %IF40
          0
488               *
489               * YES.  THIS ISN'T THE ROUTINE TO REPORT THE ERROR.  IF FIRST PAS
490               * ERROR SHOULD BE ISSUED.  DUPLICATE LABEL ERRORS ARE GENERATED B
491               * THE VALUE FOR THE LABEL IS DIFFERENT THAN THE ONE IN THE SYMBOL
492               * NOT BECAUSE OF AN EXPLICIT CHECK.
493               *
494 EB6CF 0000          CON(5) =DROP            DROP         ( * * )
          0
495 EB6D4 0000          CON(5) =SEMI            ;            ( * * )
          0
496               *
497               * NEW LABEL
498               *
499 EB6D9           %IF40                       ELSE         ( * NUM * )
500 EB6D9 0000          CON(5) =ONE             1
          0
501 EB6DE 0000          CON(5) =aSYTSZ          SYTSIZE
          0
502 EB6E3 0000          CON(5) =PSTOR           +!           ( * NUM * )
          0
503               *
504               * GET PLACE TO INSERT LABEL
505               *
506 EB6E8 0000          CON(5) =aSYTLS          SYTLAST
          0
507 EB6ED 0000          CON(5) =AT              @
          0
508 EB6F2 292B          CON(5) =a>ADR           >ADR         ( * NUM PTR * )
          E
509               *
510               * ADJUST SYMBOL TABLE TO INCLUDE LABEL
511               *
512 EB6F7 0000          CON(5) =DUP             DUP
          0
513 EB6FC 0000          CON(5) =LIT             18
          0
514 EB701 2100          CON(5) 18
          0
515 EB706 0000          CON(5) =FADJ            FADJUST
```

```
          0
516 EB70B 0000          CON(5) =ZBRNH           IF          ( * NUM PTR * )
          0
517 EB710 3700          REL(5) %IF41
          0
518               *
519               * SUCCESS.  LOOKUP PUT THE LABEL INTO ERR$ (ACTUALLY, ENSURE6LONG
520               * DID, BUT WHO'S LOOKING?)  MOVE THE STRING INTO THE NEW ENTRY
521               *
522 EB715 0000          CON(5) =DUP             DUP
          0
523 EB71A 0000          CON(5) =>R              >R          ( * NUM PTR * )
          0
524 EB71F 0000          CON(5) =aERR$           ERR$
          0
525 EB724 0000          CON(5) =DROP            DROP        ( * NUM PTR ADDR * )
          0
526 EB729 0000          CON(5) =SWAP            SWAP
          0
527 EB72E 0000          CON(5) =LIT             6
          0
528 EB733 6000          CON(5) 6
          0
529 EB738 0000          CON(5) =CMOVE           CMOVE
          0
530 EB73D 0000          CON(5) =R>              R>          ( * NUM PTR * )
          0
531               *
532               * ASSUME FOR NOW, THAT THIS IS A LABEL:  STORE 1 IN TYPE NIBBLE.
533               *
534 EB742 0000          CON(5) =DUP             DUP         ( * NUM PTR PTR * )
          0
535 EB747 0000          CON(5) =LIT             17
          0
536 EB74C 1100          CON(5) 17
          0
537 EB751 0000          CON(5) =ADD             +           ( * NUM PTR PTR' * )
          0
538 EB756 0000          CON(5) =ONE             1
          0
539 EB75B 0000          CON(5) =SWAP            SWAP
          0
540 EB760 0000          CON(5) =N!              N!          ( * NUM PTR * )
          0
541               *
542               * STORE VALUE FOR LABEL INTO NEW ENTRY.
543               *
544 EB765 0000          CON(5) =LIT             12
          0
545 EB76A C000          CON(5) 12
          0
546 EB76F 0000          CON(5) =ADD             +
          0
547 EB774 0000          CON(5) =STORE           !           ( * * )
          0
```

```
548                *
549                * MEMORY MOVED, THE SYMBOL TABLE GREW.
550                *
551 EB779 0000              CON(5) =aMEMOV        MEMMOVE     ( * * )
          0
552 EB77E 0000              CON(5) =SEMI          ;           ( * * )
          0
553                *
554                * FADJUST FAILED.  NO ROOM.
555                *
556 EB783             %IF41                       ELSE
557 EB783 0000              CON(5) =LIT           42
          0
558 EB788 A200              CON(5) 42             'symbol table full'
          0
559 EB78D 0000              CON(5) =aSHUTD        SHUTDOWN    ( * * )
          0
560                *
561                * INVALID LABEL.  IGNORE FOR NOW.  SEE NOTE ABOVE ON DUPLICATE LA
562                *
563 EB792             %IF309                      ELSE        ( * NUM STR * )
564 EB792 0000              CON(5) =2DROP         2DROP       ( * NUM * )
          0
565 EB797 0000              CON(5) =DROP          DROP        ( * * )
          0
566 EB79C 0000              CON(5) =SEMI          ;           ( * * )
          0
567                ****************************************************************
568                ***
569                ***  OUT.SYT
570                ***
571                *** ( -- )
572                *** ( PRINT OUT THE SYMBOL TABLE )
573                ****************************************************************
574 EB7A1 0000 =aOUTSY CON(5) =DOCOL          : OUT.SYT
          0
575                *
576                * NEW SUBTITLE FOR SYMBOL TABLE PAGE
577                *
578 EB7A6 0000              CON(5) =QUOTC         "
          0
579 EB7AB 61                CON(2) 22
580 EB7AD 61                CON(2) 22
581 EB7AF A2A2              NIBASC \**** SYM\
          A2A2
          0235
          95D4
582 EB7BF 24F4              NIBASC \BOL TABL\
          C402
          4514
          24C4
583 EB7CF 5402              NIBASC \E ****\
          A2A2
          A2A2
584 EB7DB 0000              CON(5) =aSTIT         STIT
```

```
          0
585 EB7E0 0000          CON(5) =S!              S!
          0
586                *
587                * START NEW PAGE
588                *
589 EB7E5 0000          CON(5) =aEJECT          EJECT
          0
590 EB7EA 0000          CON(5) =a&CLR           &CLEAR
          0
591 EB7EF 0000          CON(5) =aSYTAD          SYTAD
          0
592 EB7F4 0000          CON(5) =AT              @
          0
593 EB7F9 0000          CON(5) =HEX             HEX         ( * PTR * )
          0
594                *
595                * while <SYMBOL TABLE ENTRIES> do
596                *
597 EB7FE        %BG2                           BEGIN       ( * PTR * )
598 EB7FE 0000          CON(5) =DUP             DUP
          0
599 EB803 0000          CON(5) =AT              @
          0
600 EB808 0000          CON(5) =aNEG1           -1
          0
601 EB80D 0000          CON(5) =EQUAL           =
          0
602 EB812 0000          CON(5) =ZEQ             0=          ( * PTR F * )
          0
603 EB817 0000          CON(5) =ZBRNH           WHILE       ( * PTR * )
          0
604 EB81C 7D00          REL(5) %RP2
          0
605                *
606                * EXTRACT LABEL FROM ENTRY
607                *
608 EB821 0000          CON(5) =DUP             DUP
          0
609 EB826 0000          CON(5) =LIT             6           ( * PTR STR * )
          0
610 EB82B 6000          CON(5) 6
          0
611                *
612                * APPEND TO LISTING LINE
613                *
614 EB830 0000          CON(5) =aLLINE          LLINE
          0
615 EB835 0000          CON(5) =SWAP2           2SWAP
          0
616 EB83A 0000          CON(5) =S<&             S<&         ( * PTR STR * )
          0
617 EB83F 0000          CON(5) =aBLNK2          2BLANK
          0
618 EB844 0000          CON(5) =S<&             S<&         ( * PTR STR * )
```

```
          0
619             *
620             * EXTRACT VALUE FROM ENTRY
621             *
622 EB849 0000          CON(5) =ROT             ROT
          0
623 EB84E 0000          CON(5) =LIT             12
          0
624 EB853 C000          CON(5) 12
          0
625 EB858 0000          CON(5) =ADD             +
          0
626 EB85D 0000          CON(5) =DUP             DUP
          0
627 EB862 0000          CON(5) =AT              @           ( * STR PTR NUM * )
          0
628 EB867 0000          CON(5) =OVER            OVER        ( * STR PTR NUM PTR * )
          0
629             *
630             * CHECK IF A LABEL AND WE'RE NOT A FORTH FILE (LEX OR BIN)
631             *
632 EB86C 0000          CON(5) =FIVE+           5+          ( * STR PTR NUM PTR' *
          0
633 EB871 0000          CON(5) =N@              N@          ( * STR PTR NUM F * )
          0
634 EB876 0000          CON(5) =ONE             1
          0
635 EB87B 0000          CON(5) =AND             AND         ( * STR PTR NUM F * )
          0
636 EB880 0000          CON(5) =aFLTYP          FILETYPE
          0
637 EB885 0000          CON(5) =AT              @           ( * STR PTR NUM F TYP *
          0
638 EB88A 0000          CON(5) =ONE             1
          0
639 EB88F 0000          CON(5) =GT              >
          0
640 EB894 0000          CON(5) =AND             AND         ( * STR PTR NUM F * )
          0
641 EB899 0000          CON(5) =ZBRNH           IF          ( * STR PTR NUM * )
          0
642 EB89E 4100          REL(5) %IF310
          0
643             *
644             * WE ARE:  THEN VALUE IN SYMBOL TABLE SHOULD BE RELATIVE TO START
645             * OF FILE.
646             *
647 EB8A3 0000          CON(5) =aOBJFL          OBJFILE     ( * STR PTR NUM ADDR *
          0
648 EB8A8 0000          CON(5) =AT              @
          0
649 EB8AD 0000          CON(5) =MINUS           -           ( * STR PTR NUM * )
          0
650 EB8B2       %IF310                          THEN        ( * STR PTR NUM * )
651             *
```

```
652            * APPEND VALUE TO LISTING LINE
653            *
654 EB8B2 0000          CON(5) =aNUM#5        #5          ( * STR PTR STR' * )
          0
655 EB8B7 0000          CON(5) =ROT           ROT
          0
656 EB8BC 0000          CON(5) =>R            >R          ( * STR STR' * )
          0
657 EB8C1 0000          CON(5) =S<&           S<&         ( * STR * )
          0
658 EB8C6 0000          CON(5) =R>            R>
          0
659            *
660            * OUTPUT THIS LINE
661            *
662 EB8CB 0000          CON(5) =ROT           ROT
          0
663 EB8D0 0000          CON(5) =ROT           ROT         ( * PTR STR * )
          0
664 EB8D5 0000          CON(5) =aOUTLI        OUT.LINE
          0
665            *
666            * NEXT ENTRY
667            *
668 EB8DA 0000          CON(5) =LIT           6
          0
669 EB8DF 6000          CON(5) 6
          0
670 EB8E4 0000          CON(5) =ADD           +           ( * PTR * )
          0
671 EB8E9 0000          CON(5) =BRNCH         REPEAT      ( * PTR * )
          0
672 EB8EE 01FF          REL(5) %BG2
          F
673            *
674            * end while
675            *
676 EB8F3       %RP2
677 EB8F3 0000          CON(5) =DROP          DROP        ( * * )
          0
678            *
679            * START ASSEMBLY STATISTICS
680            *
681 EB8F8 0000          CON(5) =NULL$         NULL$       ( * STR * )
          0
682 EB8FD 0000          CON(5) =aSTIT         STITLE
          0
683 EB902 0000          CON(5) =S!            S!          ( * * )
          0
684 EB907 0000          CON(5) =DEC           DECIMAL     ( * * )
          0
685            *
686            * SIX (6) BLANK LINES
687            *
688 EB90C 0000          CON(5) =LIT           6
```

```
          0
689 EB911 6000          CON(5) 6
          0
690 EB916 0000          CON(5) =ZERO          0
          0
691 EB91B 0000          CON(5) =XDO           DO          ( * * )
          0
692 EB920         %DO5
693 EB920 0000          CON(5) =NULL$         NULL$
          0
694 EB925 0000          CON(5) =aOUTLI        OUT.LINE    ( * * )
          0
695 EB92A 0000          CON(5) =XLOOP         LOOP        ( * * )
          0
696 EB92F 1FFF          REL(5) %DO5
          F
697               *
698               * REPORT SOURCE FILE NAME
699               *
700 EB934 0000          CON(5) =QUOTC         "  SOURCE : "
          0
701 EB939 A0            CON(2) 10
702 EB93B A0            CON(2) 10
703 EB93D 0235          NIBASC \ SOURCE \
          F455
          2534
          5402
704 EB94D A302          NIBASC \: \
705 EB951 0000          CON(5) =a>PAD         >PAD        ( * STR * )
          0
706 EB956 0000          CON(5) =aSFILE        SFILE
          0
707 EB95B 0000          CON(5) =S<&           S<&
          0
708 EB960 0000          CON(5) =aOUTLI        OUT.LINE    ( * * )
          0
709 EB965 0000          CON(5) =NULL$         NULL$
          0
710 EB96A 0000          CON(5) =aOUTLI        OUT.LINE    ( * * )
          0
711               *
712               * REPORT OBJECT FILE NAME
713               *
714 EB96F 0000          CON(5) =QUOTC         "  OBJECT : "
          0
715 EB974 A0            CON(2) 10
716 EB976 A0            CON(2) 10
717 EB978 02F4          NIBASC \ OBJECT \
          24A4
          5434
          4502
718 EB988 A302          NIBASC \: \
719 EB98C 0000          CON(5) =a>PAD         >PAD        ( * STR * )
          0
720 EB991 0000          CON(5) =aOFILE        OFILE
```

```
            0
721 EB996 0000          CON(5) =?DUP            ?DUP
            0
722 EB99B 0000          CON(5) =ZEQ             0=
            0
723 EB9A0 0000          CON(5) =ZBRNH           IF          ( * STR ADDR [LEN] * )
            0
724 EB9A5 3200          REL(5) %IF43
            0
725                *
726                * SUBSTITUTE FORTHRAM WHEN NOT CREATING LEX OR BIN
727                *
728 EB9AA 0000          CON(5) =DROP            DROP
            0
729 EB9AF 0000          CON(5) =QUOTC           " FORTHRAM"
            0
730 EB9B4 80            CON(2) 8
731 EB9B6 80            CON(2) 8
732 EB9B8 64F4          NIBASC \FORTHRAM\
            2545
            8425
            14D4
733 EB9C8         %IF43                         THEN        ( * STR STR' * )
734 EB9C8 0000          CON(5) =S<&             S<&
            0
735 EB9CD 0000          CON(5) =aOUTLI          OUT.LINE    ( * * )
            0
736 EB9D2 0000          CON(5) =NULL$           NULL$
            0
737 EB9D7 0000          CON(5) =aOUTLI          OUT.LINE    ( * * )
            0
738                *
739                * REPORT LISTING FILE/DEVICE
740                *
741 EB9DC 0000          CON(5) =QUOTC           " LISTING : "
            0
742 EB9E1 A0            CON(2) 10
743 EB9E3 A0            CON(2) 10
744 EB9E5 C494          NIBASC \LISTING \
            3545
            94E4
            7402
745 EB9F5 A302          NIBASC \: \
746 EB9F9 0000          CON(5) =a>PAD           >PAD        ( * STR * )
            0
747 EB9FE 0000          CON(5) =LISTING         LISTING
            0
748 EBA03 0000          CON(5) =S<&             S<&
            0
749 EBA08 0000          CON(5) =aOUTLI          OUT.LINE    ( * * )
            0
750 EBA0D 0000          CON(5) =NULL$           NULL$
            0
751 EBA12 0000          CON(5) =aOUTLI          OUT.LINE
            0
```

```
752 EBA17 0000          CON(5) =aLLINE        LLINE       ( * STR * )
          0
753             *
754             * REPORT TIME AND DATE
755             *
756 EBA1C 0000          CON(5) =QUOTC         "    DATE : "
          0
757 EBA21 A0            CON(2) 10
758 EBA23 A0            CON(2) 10
759 EBA25 0202          NIBASC \   DATE \
          0244
          1445
          5402
760 EBA35 A302          NIBASC \: \
761 EBA39 0000          CON(5) =S<&           S<&         ( * STR * )
          0
762 EBA3E 0000          CON(5) =QUOTC         " TIME$"
          0
763 EBA43 50            CON(2) 5
764 EBA45 50            CON(2) 5
765 EBA47 4594          NIBASC \TIME$\
          D454
          42
766 EBA51 0000          CON(5) =aBAS$         BASIC$
          0
767 EBA56 0000          CON(5) =S<&           S<&         ( * STR * )
          0
768 EBA5B 0000          CON(5) =QUOTC         "  on "
          0
769 EBA60 40            CON(2) 4
770 EBA62 40            CON(2) 4
771 EBA64 02F6          NIBASC \ on \
          E602
772 EBA6C 0000          CON(5) =S<&           S<&         ( * STR * )
          0
773 EBA71 0000          CON(5) =QUOTC         " DATE$"
          0
774 EBA76 50            CON(2) 5
775 EBA78 50            CON(2) 5
776 EBA7A 4414          NIBASC \DATE$\
          4554
          42
777 EBA84 0000          CON(5) =aBAS$         BASIC$
          0
778 EBA89 0000          CON(5) =S<&           S<&         ( * STR * )
          0
779 EBA8E 0000          CON(5) =aOUTLI        OUT.LINE    ( * * )
          0
780 EBA93 0000          CON(5) =NULL$         NULL$
          0
781 EBA98 0000          CON(5) =aOUTLI        OUT.LINE
          0
782             *
783             * REPORT NUMBER OF ERRORS
784             *
```

```
785 EBA9D 0000          CON(5) =QUOTC          "  ERRORS : "
          0
786 EBAA2 A0            CON(2) 10
787 EBAA4 A0            CON(2) 10
788 EBAA6 0254          NIBASC \ ERRORS \
          2525
          F425
          3502
789 EBAB6 A302          NIBASC \: \
790 EBABA 0000          CON(5) =a>PAD          >PAD
          0
791 EBABF 0000          CON(5) =aERCNT         ERROR COUNT
          0
792 EBAC4 0000          CON(5) =AT             @
          0
793 EBAC9 0000          CON(5) =aNUM#3         #3
          0
794 EBACE 0000          CON(5) =S<&            S<&
          0
795 EBAD3 0000          CON(5) =aOUTLI         OUT.LINE
          0
796             *
797             * DO A PAGE EJECT.  SUBTRACT ONE FROM VARIABLE LLINE# SO THAT
798             * THE NEW LINE WON'T CAUSE A PAGE EJECT ITSELF.
799             *
800 EBAD8 0000          CON(5) =aNEG1          -1
          0
801 EBADD 0000          CON(5) =aLLIN#         LLINE#
          0
802 EBAE2 0000          CON(5) =PSTOR          +!          ( * * )
          5
803 EBAE7 0000          CON(5) =LIT            12
          0
804 EBAEC C000          CON(5) 12
          0
805 EBAF1 0000          CON(5) =CHR$           CHR$
          0
806 EBAF6 0000          CON(5) =aOUTLI         OUT.LINE
          0
807 EBAFB 0000          CON(5) =SEMI           ;           ( * * )
          0
```

```
808                     STITLE FIT STATS
809             zSIZE   EQU    (*)-zTHIS
810             zLEFT   EQU    (zNEXT)-*
811 EBB00               BSS    zLEFT
812 EBB00               END
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
%BG1    Abs  963518 #EB3BE -   198   278
%BG2    Abs  964606 #EB7FE -   597   672
%DO20   Abs  964163 #EB643 -   431   460
%DO5    Abs  964896 #EB920 -   692   696
%IF309  Abs  964498 #EB792 -   563   481
%IF310  Abs  964786 #EB8B2 -   650   642
%IF313  Abs  963963 #EB57B -   344   340
%IF35   Abs  963198 #EB27E -    61    36
%IF36   Abs  963683 #EB463 -   248   235
%IF37   Abs  963738 #EB49A -   266   252
%IF38   Abs  963813 #EB4E5 -   294   286
%IF39   Abs  963978 #EB58A -   352   320
%IF40   Abs  964313 #EB6D9 -   499   487
%IF41   Abs  964483 #EB783 -   556   517
%IF43   Abs  965064 #EB9C8 -   733   724
%IF44   Abs  963438 #EB36E -   161   152
%RP1    Abs  963773 #EB4BD -   282   209
%RP2    Abs  964851 #EB8F3 -   676   604
%TH313  Abs  963968 #EB580 -   346   343
%TH36   Abs  963763 #EB4B3 -   276   244
%TH37   Abs  963763 #EB4B3 -   272   262
%TH39   Abs  963988 #EB594 -   361   348
2DROP   Ext                -   302   564
2DUP    Ext                -   478
>R      Ext                -   141   523   656
?DUP    Ext                -    34   318   721
ADD     Ext                -    42    83   217   326   537   546   625   670
AND     Ext                -   150   338   635   640
AT      Ext                -    82   192   200   202   205   214   216   257
                           268   284   288   296   298   328   507   592
                           599   627   637   648   792
BRNCH   Ext                -   243   261   277   342   347   671
C@+     Ext                -   156
CAT     Ext                -   143   383   436
CHR$    Ext                -   805
CMOVE   Ext                -   529
DEC     Ext                -   684
DOCOL   Ext                -    23    73    92   124   137   170   313   372
                           474   574
DROP    Ext                -   113   126   157   464   494   525   565   677
                           728
DUP     Ext                -    43   223   327   387   435   440   512   522
                           534   598   608   626
EQUAL   Ext                -   145   390   397   405   419   443   450   601
FADJ    Ext                -   515
FCREAT  Ext                -    33
FILL    Ext                -    53
FIVE+   Ext                -   335   632
GT      Ext                -   203   639
HEX     Ext                -   593
LISTNG  Ext                -   747
LIT     Ext                -    31    40    50    62    78    96   114   127
                           174   230   324   376   388   395   403   417
                           441   448   513   527   535   544   557   609
                           623   668   686   803
```

```
 MAX      Ext                  -   299
 MIN      Ext                  -    98
 MINUS    Ext                  -   649
 MULT     Ext                  -    80
 N!       Ext                  -   540
 N@       Ext                  -   336   633
 NULL$    Ext                  -   681   693   709   736   750   780
 ONE      Ext                  -    54   188   337   345   500   538   634   638
 ONE+     Ext                  -   258
 ONE-     Ext                  -    77   269
 OR       Ext                  -   206   398   406   412   420   451   453
 OVER     Ext                  -   142   149   382   394   402   410   628
 OVER2    Ext                  -   249
 PSTOR    Ext                  -   502   802
 QUOTC    Ext                  -    27   105   578   700   714   729   741   756
                                  762   768   773   785
 R>       Ext                  -   144   530   658
 ROT      Ext                  -   424   425   452   622   655   662   663
 S!       Ext                  -   100   585   683
 S<       Ext                  -   250
 S<&      Ext                  -   109   616   618   657   707   734   748   761
                                  767   772   778   794
 S=       Ext                  -   233
 SEMI     Ext                  -    57    65    84   116   129   162   290   304
                                  364   466   495   552   566   807
 STORE    Ext                  -    45    56   187   190   194   225   242   260
                                  271   301   363   547
 SWAP     Ext                  -   334   416   447   457   526   539
 SWAP2    Ext                  -   615
 TWO+     Ext                  -   458
 TWO/     Ext                  -   218
 XDO      Ext                  -   430   691
 XLOOP    Ext                  -   459   695
 ZBRNH    Ext                  -    35   151   208   234   251   285   319   339
                                  480   486   516   603   641   723
 ZEQ      Ext                  -   207   465   602   722
 ZERO     Ext                  -   185   303   353   354   426   690
 a&CLR    Ext                  -   590
=a>ADR    Abs  963218 #EB292   -    73   229   289   508
 a>PAD    Ext                  -   705   719   746   790
=a>SYT    Abs  964263 #EB6A7   -   474
 aBAS$    Ext                  -   766   777
 aBFOUN   Ext                  -   186   204   241   283
 aBLNK2   Ext                  -   617
 aBLOW    Ext                  -   189   199   215   259   297
 aBTOP    Ext                  -   193   201   213   270
 aDIG10   Ext                  -   411
 aDROP4   Ext                  -   239
=aDROPc   Abs  963378 #EB332   -   137   176   378
 aDUP4    Ext                  -   232
 aEJECT   Ext                  -   589
=aENS6L   Abs  963348 #EB314   -   124   184
=aENS8L   Abs  963263 #EB2BF   -    92   125
 aERCNT   Ext                  -   791
 aERR$    Ext                  -    99   101   524
```

aFLTYP	Ext		-	636							
aKNOWN	Ext		-	362							
aLABOK	Abs	964003 #EB5A3	-	372	479						
aLLIN#	Ext		-	801							
aLLINE	Ext		-	614	752						
aLUKUP	Abs	963443 #EB373	-	170	317	485					
aMEMOV	Ext		-	551							
aNEG1	Ext		-	52	240	341	600	800			
aNUM#3	Ext		-	793							
aNUM#5	Ext		-	654							
aOBJFL	Ext		-	647							
aOFILE	Ext		-	720							
aOUTLI	Ext		-	664	694	708	710	735	737	749	751
				779	781	795	806				
aOUTSY	Abs	964513 #EB7A1	-	574							
aSFILE	Ext		-	706							
aSHUTD	Ext		-	64	559						
aSTIT	Ext		-	584	682						
aSYT>	Abs	963863 #EB517	-	313							
aSYTAD	Ext		-	44	81	591					
aSYTIN	Abs	963072 #EB200	-	23							
aSYTLS	Ext		-	224	256	267	287	295	300	506	
aSYTSZ	Ext		-	55	191	501					
zLEFT	Abs	0 #00000	-	810	811						
zNEXT	Abs	965376 #EBB00	-	5	810						
zSIZE	Abs	2304 #00900	-	809							
zTHIS	Abs	963072 #EB200	-	4	809						

Input Parameters

Source file name is GN&AS3

Listing file name is GN/AS3::65

Object file name is GN%AS3::65

```
                                  111111
                        0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                      TITLE  AS4:_FORTH_ASSEMBLER_EXPRESSIONS
 2                      RDSYMB MR%GTO
 3 EBB00                ABS    #EBB00
 4              zTHIS   EQU    *
 5              zNEXT   EQU    #EC600
 6
 7              ******************************************************
 8              ***
 9              *** MR&AS4      <840504.1037>
10              ***
11              ***
12              ***  FORTH ASSEMBLER
13              ***  LEXICAL ANALYSIS, EXPRESSION EVALUATION
14              ***
15              ******************************************************
16              ********************************************************************
17              ***
18              ***  +DIGIT
19              ***
20              *** ( DIG BASE -- )
21              *** ( ADD A DIGIT TO THE VARIABLE VALUE )
22              ********************************************************************
23 EBB00 0000 =a+DIGI CON(5) =DOCOL          : +DIGIT
         0
24              *
25              * SHIFT VARIABLE VALUE ONE DIGIT
26              *
27 EBB05 0000         CON(5) =aVALUE         VALUE
         0
28 EBB0A 0000         CON(5) =AT             @
         0
29 EBB0F 0000         CON(5) =MULT           *
         0
30              *
31              * ADD IN NEW DIGIT
32              *
33 EBB14 0000         CON(5) =ADD            +            ( * NUM * )
         0
34 EBB19 0000         CON(5) =aVALUE         VALUE
         0
35 EBB1E 0000         CON(5) =STORE          !
         0
36 EBB23 0000         CON(5) =SEMI           ;            ( * * )
         0
37              ********************************************************************
38              ***
39              ***  ?DIGIT.10
40              ***
41              *** ( C -- F )
42              *** ( IS C A DECIMAL DIGIT ? )
43              ********************************************************************
44 EBB28 0000 =aDIG10 CON(5) =DOCOL          : ?DIGIT.10
         0
45              *
46              * IS C A DECIMAL DIGIT ?
```

```
47                *
48 EBB2D 0000             CON(5) =LIT             10
         0
49 EBB32 A000             CON(5) 10
         0
50 EBB37 0000             CON(5) =DIGIT           DIGIT
         0
51 EBB3C 0000             CON(5) =ZBRNH           IF              ( * [NUM] * )
         0
52 EBB41 4100             REL(5) %IF44
         0
53                *
54                * RETURN TRUE FLAG, NOT CONVERTED VALUE
55                *
56 EBB46 0000             CON(5) =DROP            DROP
         0
57 EBB4B 0000             CON(5) =aNEG1           -1              ( * TF * )
         0
58 EBB50 0000             CON(5) =SEMI            ;               ( * TF * )
         0
59                *
60                * RETURN FALSE FLAG.
61                *
62 EBB55           %IF44
63 EBB55 0000             CON(5) =ZERO            0
         0
64 EBB5A 0000             CON(5) =SEMI            ;               ( * F * )
         0
65                ****************************************************************
66                ***
67                ***  CONSTANT.10
68                ***
69                *** ( STR1 -- STR2 1 )
70                *** ( CONVERT DECIMAL DIGITS IN STR1 INTO 'VALUE' )
71                ****************************************************************
72 EBB5F 0000 =aCON10 CON(5) =DOCOL           : CONSTANT.10
         0
73                *
74                * INITIALIZE VARIABLE VALUE
75                *
76 EBB64 0000             CON(5) =ZERO            0
         0
77 EBB69 0000             CON(5) =aVALUE          VALUE
         0
78 EBB6E 0000             CON(5) =STORE           !               ( * STR * )
         0
79                *
80                * while <CHARACTERS ARE DECIMAL DIGITS> do
81                *
82 EBB73           %BG3                           BEGIN           ( * STR * )
83 EBB73 0000             CON(5) =OVER            OVER
         0
84 EBB78 0000             CON(5) =CAT             C@
         0
85 EBB7D 82BB             CON(5) =aDIG10          ?DIGIT.10       ( * STR F * )
```

```
          E
   86 EBB82 0000          CON(5) =OVER           OVER
          0
   87 EBB87 0000          CON(5) =AND            AND          ( * STR F * )
          0
   88 EBB8C 0000          CON(5) =ZBRNH          WHILE        ( * STR * )
          0
   89 EBB91 7300          REL(5) %RP3
          0
   90               *
   91               * EXTRACT DIGIT
   92               *
   93 EBB96 0000          CON(5) =C@+            C@+
          0
   94 EBB9B 0000          CON(5) =LIT            10
          0
   95 EBBA0 A000          CON(5) 10
          0
   96 EBBA5 0000          CON(5) =DIGIT          DIGIT        ( * STR NUM TF * )
          0
   97 EBBAA 0000          CON(5) =DROP           DROP
          0
   98               *
   99               * ADD VALUE TO VARIABLE VALUE
  100               *
  101 EBBAF 0000          CON(5) =LIT            10
          0
  102 EBBB4 A000          CON(5) 10
          0
  103 EBBB9 00BB          CON(5) =a+DIGI         +DIGIT       ( * STR * )
          E
  104 EBBBE 0000          CON(5) =BRNCH          REPEAT
          0
  105 EBBC3 0BFF          REL(5) %BG3
          F
  106               *
  107               * end while
  108               *
  109 EBBC8          %RP3
  110               *
  111               * RETURN CONSTANT TOKEN (1) TO LEXSCAN
  112               *
  113 EBBC8 0000          CON(5) =ONE            1
          0
  114 EBBCD 0000          CON(5) =SEMI           ;            ( * STR 1 * )
          0
  115               ****************************************************************
  116               ***
  117               ***  ?DIGIT.16
  118               ***
  119               *** ( C -- F )
  120               *** ( IS C A HEXIDECIMAL DIGIT ? )
  121               ****************************************************************
  122 EBBD2 0000 =aDIG16 CON(5) =DOCOL          : ?DIGIT.16
          0
```

```
123                *
124                * IS C A HEXIDECIMAL DIGIT ?
125                *
126 EBBD7 0000              CON(5) =LIT           16
          0
127 EBBDC 0100              CON(5) 16
          0
128 EBBE1 0000              CON(5) =DIGIT         DIGIT
          0
129 EBBE6 0000              CON(5) =ZBRNH         IF          ( * [NUM] * )
          0
130 EBBEB 4100              REL(5) %IF45
          0
131                *
132                * RETURN TRUE FLAG, NOT VALUE
133                *
134 EBBF0 0000              CON(5) =DROP          DROP
          0
135 EBBF5 0000              CON(5) =aNEG1         -1          ( * TF * )
          0
136 EBBFA 0000              CON(5) =SEMI          ;           ( * TF * )
          0
137                *
138                * RETURN FALSE FLAG.
139                *
140 EBBFF             %IF45
141 EBBFF 0000              CON(5) =ZERO          0
          0
142 EBC04 0000              CON(5) =SEMI          ;           ( * F * )
          0
143                ********************************************************************
144                ***
145                ***  CONSTANT.16
146                ***
147                *** ( STR1 -- STR2 1 )
148                *** ( CONVERT HEX DIGITS IN STR1 INTO 'VALUE' )
149                ********************************************************************
150 EBC09 0000 =aCON16 CON(5) =DOCOL         : CONSTANT.16
          0
151                *
152                * INITIALIZE VARIABLE VALUE
153                *
154 EBC0E 0000              CON(5) =ZERO          0
          0
155 EBC13 0000              CON(5) =aVALUE        VALUE
          0
156 EBC18 0000              CON(5) =STORE         !           ( * STR * )
          0
157                *
158                * while <CHARACTERS HEXIDECIMAL DIGITS> do
159                *
160 EBC1D             %BG4                        BEGIN       ( * STR * )
161 EBC1D 0000              CON(5) =OVER          OVER
          0
162 EBC22 0000              CON(5) =CAT           C@
```

```
          0
163 EBC27 2DBB          CON(5) =aDIG16          ?DIGIT.16    ( * STR F * )
          E
164 EBC2C 0000          CON(5) =OVER            OVER
          0
165 EBC31 0000          CON(5) =AND             AND          ( * STR F * )
          0
166 EBC36 0000          CON(5) =ZBRNH           WHILE        ( * STR * )
          0
167 EBC3B 7300          REL(5) %RP4
          0
168               *
169               * EXTRACT CHARACTER
170               *
171 EBC40 0000          CON(5) =C@+             C@+
          0
172 EBC45 0000          CON(5) =LIT             16
          0
173 EBC4A 0100          CON(5) 16
          0
174 EBC4F 0000          CON(5) =DIGIT           DIGIT        ( * STR NUM TF * )
          0
175 EBC54 0000          CON(5) =DROP            DROP
          0
176               *
177               * ADD DIGIT TO VARIABLE VALUE
178               *
179 EBC59 0000          CON(5) =LIT             16
          0
180 EBC5E 0100          CON(5) 16
          0
181 EBC63 00BB          CON(5) =a+DIGI          +DIGIT       ( * STR * )
          E
182 EBC68 0000          CON(5) =BRNCH           REPEAT
          0
183 EBC6D 0BFF          REL(5) %BG4
          F
184               *
185               * end while
186               *
187 EBC72                %RP4
188               *
189               * RETURN CONSTANT TOKEN (1) TO LEXSCAN
190               *
191 EBC72 0000          CON(5) =ONE             1
          0
192 EBC77 0000          CON(5) =SEMI            ;            ( * STR 1 * )
          0
193               ****************************************************************
194               ***
195               ***  CONSTANT.ASC
196               ***
197               *** ( STR1 -- STR2 1 )
198               *** ( CONVERT ASCII TO A VALUE )
199               ****************************************************************
```

```
200 EBC7C 0000 =aCONFF CON(5) =DOCOL          : CONSTANT.ASC
          0
201            *
202            * INITIALIZE VARIABLE VALUE
203            *
204 EBC81 0000         CON(5) =ZERO           0
          0
205 EBC86 0000         CON(5) =aVALUE         VALUE
          0
206 EBC8B 0000         CON(5) =STORE          !            ( * STR * )
          0
207            *
208            * while <CHARACTER # '> do
209            *
210 EBC90       %BG5                          BEGIN        ( * STR * )
211 EBC90 0000         CON(5) =OVER           OVER
          0
212 EBC95 0000         CON(5) =CAT            C@
          0
213 EBC9A 0000         CON(5) =LIT            39
          0
214 EBC9F 7200         CON(5) \'\
          0
215 EBCA4 0000         CON(5) =EQUAL          =            ( * STR F * )
          0
216 EBCA9 0000         CON(5) =ZEQ            0=
          0
217 EBCAE 0000         CON(5) =OVER           OVER
          0
218 EBCB3 0000         CON(5) =AND            AND          ( * STR F * )
          0
219 EBCB8 0000         CON(5) =ZBRNH          WHILE        ( * STR * )
          0
220 EBCBD 3200         REL(5) %RP5
          0
221            *
222            * EXTRACT CHARACTER
223            *
224 EBCC2 0000         CON(5) =C@+            C@+
          0
225            *
226            * ADD VALUE TO VARIABLE VALUE
227            *
228 EBCC7 0000         CON(5) =LIT            256
          0
229 EBCCC 0010         CON(5) 256
          0
230 EBCD1 00BB         CON(5) =a+DIGI         +DIGIT       ( * STR * )
          E
231 EBCD6 0000         CON(5) =BRNCH          REPEAT
          0
232 EBCDB 5BFF         REL(5) %BG5
          F
233            *
234            * end while
```

```
235                *
236 EBCE0           %RP5
237                *
238                * RETURN CONSTANT TOKEN (1) TO LEXSCAN
239                *
240 EBCE0 0000             CON(5) =ONE             1
          0
241 EBCE5 0000             CON(5) =SEMI            ;               ( * STR 1 * )
          0
242                ****************************************************************
243                ***
244                ***  ?SINGLE.TOKEN
245                ***
246                *** ( C -- F )
247                *** ( IS C ONE OF THE SINGLE TOKENS ? )
248                ****************************************************************
249 EBCEA 0000 =a?STOK CON(5) =DOCOL           : ?SINGLE.TOKEN
          0
250 EBCEF 0000             CON(5) =DUP             DUP             ( * C C * )
          0
251                *
252                * CHARACTER = BL ?  (SPACE)
253                *
254 EBCF4 0000             CON(5) =BL              BL
          0
255 EBCF9 0000             CON(5) =EQUAL           =               ( * C F * )
          0
256                *
257                * CHARACTER = ! ?   (BOOLEAN OR)
258                *
259 EBCFE 0000             CON(5) =OVER            OVER            ( * C F C * )
          0
260 EBD03 0000             CON(5) =LIT             33
          0
261 EBD08 1200             CON(5) \!\
          0
262 EBD0D 0000             CON(5) =EQUAL           =
          0
263 EBD12 0000             CON(5) =OR              OR              ( * C F * )
          0
264                *
265                * CHARACTER = & ?   (BOOLEAN AND)
266                *
267 EBD17 0000             CON(5) =OVER            OVER            ( * C F C * )
          0
268 EBD1C 0000             CON(5) =LIT             38
          0
269 EBD21 6200             CON(5) \&\
          0
270 EBD26 0000             CON(5) =EQUAL           =
          0
271 EBD2B 0000             CON(5) =OR              OR              ( * C F * )
          0
272                *
273                * CHARACTER = ( ?   (LEFT PAREN)
```

```
274                *
275 EBD30 0000              CON(5) =OVER          OVER        ( * C F C * )
          0
276 EBD35 0000              CON(5) =LIT           40
          0
277 EBD3A 8200              CON(5) \(\
          0
278 EBD3F 0000              CON(5) =EQUAL         =
          0
279 EBD44 0000              CON(5) =OR            OR          ( * C F * )
          0
280                *
281                * CHARACTER = ) ?   (RIGHT PAREN)
282                *
283 EBD49 0000              CON(5) =OVER          OVER        ( * C F C * )
          0
284 EBD4E 0000              CON(5) =LIT           41
          0
285 EBD53 9200              CON(5) \)\
          0
286 EBD58 0000              CON(5) =EQUAL         =
          0
287 EBD5D 0000              CON(5) =OR            OR          ( * C F * )
          0
288                *
289                * CHARACTER = * ?   (TIMES)
290                *
291 EBD62 0000              CON(5) =OVER          OVER        ( * C F C * )
          0
292 EBD67 0000              CON(5) =LIT           42
          0
293 EBD6C A200              CON(5) \*\
          0
294 EBD71 0000              CON(5) =EQUAL         =
          0
295 EBD76 0000              CON(5) =OR            OR          ( * C F * )
          0
296                *
297                * CHARACTER = + ?   (PLUS)
298                *
299 EBD7B 0000              CON(5) =OVER          OVER        ( * C F C * )
          0
300 EBD80 0000              CON(5) =LIT           43
          0
301 EBD85 B200              CON(5) \+\
          0
302 EBD8A 0000              CON(5) =EQUAL         =
          0
303 EBD8F 0000              CON(5) =OR            OR          ( * C F * )
          0
304                *
305                * CHARACTER = - ?   (MINUS)
306                *
307 EBD94 0000              CON(5) =OVER          OVER        ( * C F C * )
          0
```

```
308 EBD99 0000          CON(5) =LIT             45
          0
309 EBD9E D200          CON(5) \-\
          0
310 EBDA3 0000          CON(5) =EQUAL           =
          0
311 EBDA8 0000          CON(5) =OR              OR          ( * C F * )
          0
312               *
313               * CHARACTER = / ?   (DIVIDE)
314               *
315 EBDAD 0000          CON(5) =SWAP            SWAP        ( * F C * )
          0
316 EBDB2 0000          CON(5) =LIT             47
          0
317 EBDB7 F200          CON(5) \/\
          0
318 EBDBC 0000          CON(5) =EQUAL           =
          0
319 EBDC1 0000          CON(5) =OR              OR          ( * C F * )
          0
320               *
321               * IF ANY OF ABOVE QUESTIONS TRUE, THEN CHARACTER IS A SINGLE
322               * TOKEN.   RETURN THAT TOKEN TO LEXSCAN
323               *
324 EBDC6 0000          CON(5) =SEMI            ;           ( * F * )
          0
325               ********************************************************************
326               ***
327               ***  ?END.LABEL
328               ***
329               *** ( C -- F )
330               *** ( IS C ONE OF THE CHARACTERS THAT MARKS END OF LABEL ? )
331               ********************************************************************
332 EBDCB 0000 =a?ELAB CON(5) =DOCOL          : ?END.LABEL
          0
333               *
334               * CHARACTER A BL ?  (BLANK)
335               *
336 EBDD0 0000          CON(5) =DUP             DUP
          0
337 EBDD5 0000          CON(5) =BL              BL
          0
338 EBDDA 0000          CON(5) =EQUAL           =           ( * C F * )
          0
339               *
340               * CHARACTER A ) ?   (RIGHT PAREN)
341               *
342 EBDDF 0000          CON(5) =SWAP            SWAP        ( * F C * )
          0
343 EBDE4 0000          CON(5) =LIT             41
          0
344 EBDE9 9200          CON(5) \)\
          0
345 EBDEE 0000          CON(5) =EQUAL           =
```

```
          0
346 EBDF3 0000          CON(5) =OR              OR          ( * F * )
          0
347               *
348               * IF EITHER QUESTION IS TRUE, THEN RETURN TRUE.
349               *
350 EBDF8 0000          CON(5) =SEMI            ;           ( * F * )
          0
351               ********************************************************************
352               ***
353               ***  DO.LABEL
354               ***
355               *** ( STR1 -- STR2 2 )
356               *** ( PROCESS AN IDENTIFIER )
357               ********************************************************************
358 EBDFD 0000 =aDOLAB CON(5) =DOCOL          : DO.LABEL
          0
359               *
360               * SAVE BEGINNING ADDRESS
361               *
362 EBE02 0000          CON(5) =OVER            OVER
          0
363 EBE07 0000          CON(5) =>R              >R          ( * STR * )
          0
364               *
365               * while <NOT AT END OF LABEL> do
366               *
367 EBE0C          %BG6                         BEGIN       ( * STR * )
368 EBE0C 0000          CON(5) =OVER            OVER
          0
369 EBE11 0000          CON(5) =CAT             C@
          0
370 EBE16 BCDB          CON(5) =a?ELAB          ?END.LABEL  ( * STR F * )
          E
371 EBE1B 0000          CON(5) =ZEQ             0=
          0
372 EBE20 0000          CON(5) =OVER            OVER
          0
373 EBE25 0000          CON(5) =AND             AND         ( * STR F * )
          0
374 EBE2A 0000          CON(5) =ZBRNH           WHILE
          0
375 EBE2F 9100          REL(5) %RP6
          0
376               *
377               * DROP CHARACTERS FROM STRING
378               *
379 EBE34 0000          CON(5) =C@+             C@+
          0
380 EBE39 0000          CON(5) =DROP            DROP
          0
381 EBE3E 0000          CON(5) =BRNCH           REPEAT      ( * STR * )
          0
382 EBE43 9CFF          REL(5) %BG6
          F
```

```
383 EBE48        %RP6
384              *
385              * end while
386              *
387              *
388              * CALCULATE NUMBER OF CHARACTERS IN LABEL
389              *
390 EBE48 0000          CON(5) =OVER           OVER
          0
391 EBE4D 0000          CON(5) =R@             R@
          0
392 EBE52 0000          CON(5) =MINUS          -
          0
393 EBE57 0000          CON(5) =TWO/           2/
          0
394              *
395              * RECOVER ADDRESS FROM RETURN STACK
396              *
397 EBE5C 0000          CON(5) =R>             R>          ( * STR LEN ADDR * )
          0
398 EBE61 0000          CON(5) =SWAP           SWAP
          0
399              *
400              * SAVE STRING IN VARIABLE IDENTIFIER
401              *
402 EBE66 0000          CON(5) =LIT            10
          0
403 EBE6B A000          CON(5) 10
          0
404 EBE70 0000          CON(5) =MIN            MIN         ( * STR * )
          0
405 EBE75 0000          CON(5) =aIDENT         IDENTIFIER
          0
406 EBE7A 0000          CON(5) =S!             S!
          0
407              *
408              * RETURN IDENTIFIER TOKEN (2) TO LEXSCAN
409              *
410 EBE7F 0000          CON(5) =TWO            2
          0
411 EBE84 0000          CON(5) =SEMI           ;           ( * STR 2 * )
          0
412              ****************************************************************
413              ***
414              ***  LEXSCAN
415              ***
416              *** ( STR1 -- STR2 )
417              *** ( SCAN STRING FOR A TOKEN )
418              ****************************************************************
419 EBE89 0000 =aLEXSC CON(5) =DOCOL          : LEXSCAN
          0
420              *
421              * END OF STRING?
422              *
423 EBE8E 0000          CON(5) =DUP            DUP
```

```
          0
424 EBE93 0000          CON(5) =ZEQ             0=
          0
425 EBE98 0000          CON(5) =ZBRNH           IF
          0
426 EBE9D 4100          REL(5) %IF46
          0
427               *
428               * YES.  PASS ON END TOKEN (0)
429               *
430 EBEA2 0000          CON(5) =ZERO            0           ( * STR 0 * )
          0
431 EBEA7 0000          CON(5) =BRNCH           ELSE        ( * STR * )
          0
432 EBEAC 5410          REL(5) %TH46
          0
433               *
434               * CHECK FOR DECIMAL CONSTANT
435               *
436 EBEB1        %IF46
437 EBEB1 0000          CON(5) =OVER            OVER
          0
438 EBEB6 0000          CON(5) =CAT             C@          ( * STR C * )
          0
439 EBEBB 0000          CON(5) =DUP             DUP
          0
440 EBEC0 82BB          CON(5) =aDIG10          ?DIGIT.10
          E
441 EBEC5 0000          CON(5) =ZBRNH           IF
          0
442 EBECA 9100          REL(5) %IF47
          0
443 EBECF 0000          CON(5) =DROP            DROP
          0
444 EBED4 F5BB          CON(5) =aCON10          CONSTANT.10
          E
445 EBED9 0000          CON(5) =BRNCH           ELSE
          0
446 EBEDE 3110          REL(5) %TH47
          0
447               *
448               * CHECK FOR HEXIDECIMAL CONSTANT (LEADING #)
449               *
450 EBEE3        %IF47
451 EBEE3 0000          CON(5) =DUP             DUP
          0
452 EBEE8 0000          CON(5) =LIT             35
          0
453 EBEED 3200          CON(5) \#\
          0
454 EBEF2 0000          CON(5) =EQUAL           =
          0
455 EBEF7 0000          CON(5) =ZBRNH           IF
          0
456 EBEFC 3200          REL(5) %IF48
```

```
          0
457 EBF01 0000          CON(5) =DROP            DROP
          0
458 EBF06 0000          CON(5) =C@+             C@+
          0
459 EBF0B 0000          CON(5) =DROP            DROP
          0
460 EBF10 90CB          CON(5) =aCON16          CONSTANT.16
          E
461 EBF15 0000          CON(5) =BRNCH           ELSE
          0
462 EBF1A 7D00          REL(5) %TH48
          0
463               *
464               * CHECK FOR ASCII CONSTANT (LEADING ')
465               *
466 EBF1F          %IF48
467 EBF1F 0000          CON(5) =DUP             DUP
          0
468 EBF24 0000          CON(5) =LIT             39
          0
469 EBF29 7200          CON(5) \'\
          0
470 EBF2E 0000          CON(5) =EQUAL           =
          0
471 EBF33 0000          CON(5) =ZBRNH           IF
          0
472 EBF38 F500          REL(5) %IF49
          0
473 EBF3D 0000          CON(5) =DROP            DROP
          0
474 EBF42 0000          CON(5) =C@+             C@+
          0
475 EBF47 0000          CON(5) =DROP            DROP
          0
476 EBF4C C7CB          CON(5) =aCONFF          CONSTANT.ASC
          E
477 EBF51 0000          CON(5) =>R              >R          ( * STR * )
          0
478 EBF56 0000          CON(5) =C@+             C@+
          0
479 EBF5B 0000          CON(5) =LIT             39
          0
480 EBF60 7200          CON(5) \'\
          0
481 EBF65 0000          CON(5) =EQUAL           =
          0
482 EBF6A 0000          CON(5) =ZEQ             0=
          0
483 EBF6F 0000          CON(5) =ZBRNH           IF
          0
484 EBF74 4100          REL(5) %IF43
          0
485 EBF79 0000          CON(5) =LIT             24
          0
```

```
 486 EBF7E 8100         CON(5) 24              'invalid quoted string'
           0
 487 EBF83 0000         CON(5) =aERROR         ERROR
           0
 488 EBF88       %IF43                         THEN
 489 EBF88 0000         CON(5) =R>             R>          ( * STR TOK * )
           0
 490 EBF8D 0000         CON(5) =BRNCH          ELSE
           0
 491 EBF92 F500         REL(5) %TH49
           0
 492            *
 493            * CHECK FOR SINGLE TOKEN (ALL OPERATORS & PARENTHESIS)
 494            *
 495 EBF97       %IF49
 496 EBF97 0000         CON(5) =DUP            DUP
           0
 497 EBF9C AECB         CON(5) =a?STOK         ?SINGLE.TOKEN
           E
 498 EBFA1 0000         CON(5) =ZBRNH          IF
           0
 499 EBFA6 9100         REL(5) %IF50
           0
 500 EBFAB 0000         CON(5) =DROP           DROP
           0
 501 EBFB0 0000         CON(5) =C@+            C@+
           0
 502 EBFB5 0000         CON(5) =BRNCH          ELSE
           0
 503 EBFBA 7300         REL(5) %TH50
           0
 504            *
 505            * CHECK FOR LABEL
 506            *
 507 EBFBF       %IF50
 508 EBFBF 0000         CON(5) =DUP            DUP
           0
 509 EBFC4 0000         CON(5) =LIT            61
           0
 510 EBFC9 D300         CON(5) \=\
           0
 511 EBFCE 0000         CON(5) =EQUAL          =
           0
 512 EBFD3 0000         CON(5) =ZBRNH          IF
           0
 513 EBFD8 F000         REL(5) %IF51
           0
 514 EBFDD 0000         CON(5) =DROP           DROP
           0
 515 EBFE2 0000         CON(5) =C@+            C@+
           0
 516            *
 517            * NONE OF ABOVE.  ASSUME LABEL, AND LET IT GENERATE ANY ERRORS.
 518            *
 519 EBFE7       %IF51
```

```
520 EBFE7 0000          CON(5) =DROP            DROP
          0
521 EBFEC DFDB          CON(5) =aDOLAB          DO.LABEL
          E
522               *
523               * STORE TOKEN IN VARIABLE TOKEN
524               *
525 EBFF1          %TH50                         THEN        ( * STR NUM * )
526 EBFF1          %TH49                         THEN
527 EBFF1          %TH48                         THEN
528 EBFF1          %TH47                         THEN        ( * STR NUM * )
529 EBFF1          %TH46                         THEN
530 EBFF1 0000          CON(5) =aTOKEN          TOKEN
          0
531 EBFF6 0000          CON(5) =STORE           !
          0
532 EBFFB 0000          CON(5) =SEMI            ;           ( * STR * )
          0
533               ********************************************************************
534               ***
535               ***  BASE MODULE
536               ***
537               *** ( STR -- STR NUM )
538               *** ( RECURSIVE DESCENT: MODULE identifiers )
539               ********************************************************************
540 EC000 0000 =amBASE CON(5) =DOCOL          : BASE MODULE
          0
541               *
542               * ENSURE WE'RE NOT OVERFLOWING ANY STACKS
543               *
544 EC005 CF3C          CON(5) =aDEPCK          DEPTH CHECK
          E
545               *
546               * select TOKEN
547               *
548 EC00A 0000          CON(5) =aTOKEN          TOKEN
          0
549 EC00F 0000          CON(5) =AT              @ CASE
          0
550               *
551               * case 1 of
552               *
553 EC014 0000          CON(5) =ONE             1
          0
554 EC019 0000          CON(5) =OVER            OF
          0
555 EC01E 0000          CON(5) =EQUAL
          0
556 EC023 0000          CON(5) =ZBRNH
          0
557 EC028 E100          REL(5) %OF1
          0
558               *
559               * TOKEN IS A CONSTANT, RETURN IT'S VALUE
560               *
```

```
561 EC02D 0000          CON(5) =DROP                    ( * STR * )
          0
562 EC032 0000          CON(5) =aVALUE          VALUE
          0
563 EC037 0000          CON(5) =AT              @       ( * STR NUM * )
          0
564 EC03C 0000          CON(5) =BRNCH           ENDOF
          0
565 EC041 D110          REL(5) %EC1
          0
566             *
567             * case 2 of
568             *
569 EC046        %OF1
570 EC046 0000          CON(5) =TWO             2
          0
571 EC04B 0000          CON(5) =OVER            OF
          0
572 EC050 0000          CON(5) =EQUAL
          0
573 EC055 0000          CON(5) =ZBRNH
          0
574 EC05A 6400          REL(5) %OF2
          0
575             *
576             * TOKEN IS AN IDENTIFIER, RETURN IT'S VALUE
577             *
578 EC05F 0000          CON(5) =DROP                    ( * STR * )
          0
579 EC064 0000          CON(5) =aIDENT          IDENTIFIER
          0
580 EC069 0000          CON(5) =aSYT>           SYT>    ( * STR NUM * )
          0
581 EC06E 0000          CON(5) =aKNOWN          KNOWN
          0
582 EC073 0000          CON(5) =AT              @
          0
583 EC078 0000          CON(5) =ZEQ             0=
          0
584 EC07D 0000          CON(5) =ZBRNH           IF      ( * STR NUM * )
          0
585 EC082 4100          REL(5) %IF52
          0
586             *
587             * VALUE OF IDENTIFIER NOT KNOWN
588             *
589 EC087 0000          CON(5) =LIT             37
          0
590 EC08C 5200          CON(5) 37               'unrecognized label'
          0
591 EC091 A05C          CON(5) =aP2ERR          PASS 2 ERROR
          E
592 EC096        %IF52                          THEN    ( * STR NUM * )
593 EC096 0000          CON(5) =BRNCH           ENDOF
          0
```

```
 594 EC09B 3C00          REL(5) %EC1
           0
 595               *
 596               * case 40 of
 597               *
 598 EC0A0          %OF2
 599 EC0A0 0000          CON(5) =LIT             40
           0
 600 EC0A5 8200          CON(5) \(\
           0
 601 EC0AA 0000          CON(5) =OVER            OF
           0
 602 EC0AF 0000          CON(5) =EQUAL
           0
 603 EC0B4 0000          CON(5) =ZBRNH
           0
 604 EC0B9 5500          REL(5) %OF3
           0
 605               *
 606               * TOKEN IS LEFT PARENETHESIS, MAKE RECURSIVE CALL BACK TO TOP LEV
 607               *
 608 EC0BE 0000          CON(5) =DROP                    ( * STR * )
           0
 609 EC0C3 98EB          CON(5) =aLEXSC          LEXSCAN
           E
 610 EC0C8 843C          CON(5) =amTERM          TERM    ( * STR NUM * )
           E
 611               *
 612               * ENSURE TOKEN AFTER RECURSIVE CALL IS A RIGHT PARENTHESIS
 613               *
 614 EC0CD 0000          CON(5) =aTOKEN          TOKEN
           0
 615 EC0D2 0000          CON(5) =AT              @       ( * STR NUM TOK * )
           0
 616 EC0D7 0000          CON(5) =LIT             41
           0
 617 EC0DC 9200          CON(5) \)\
           0
 618 EC0E1 0000          CON(5) =EQUAL           =
           0
 619 EC0E6 0000          CON(5) =ZEQ             0=
           0
 620 EC0EB 0000          CON(5) =ZBRNH           IF      ( * STR NUM * )
           0
 621 EC0F0 4100          REL(5) %IF53
           0
 622               *
 623               * REPORT MISMATCHED PARENTHESES
 624               *
 625 EC0F5 0000          CON(5) =LIT             38
           0
 626 EC0FA 6200          CON(5) 38               'mismatched parentheses'
           0
 627 EC0FF A05C          CON(5) =aP2ERR          PASS 2 ERROR ( * STR NUM * )
           E
```

```
628 EC104        %IF53                          THEN
629 EC104 0000           CON(5) =BRNCH          ENDOF
          0
630 EC109 5500           REL(5) %EC1
          0
631              *
632              * case 42 of
633              *
634 EC10E        %OF3
635 EC10E 0000           CON(5) =LIT            42
          0
636 EC113 A200           CON(5) \*\
          0
637 EC118 0000           CON(5) =OVER           OF
          0
638 EC11D 0000           CON(5) =EQUAL
          0
639 EC122 0000           CON(5) =ZBRNH
          0
640 EC127 E100           REL(5) %OF4
          0
641              *
642              * TOKEN IS *, RETURN CURRENT LOCATION COUNTER
643              *
644 EC12C 0000           CON(5) =DROP                        ( * STR * )
          0
645 EC131 0000           CON(5) =aLC            LC
          0
646 EC136 0000           CON(5) =AT             @            ( * STR NUM * )
          0
647 EC13B 0000           CON(5) =BRNCH          ENDOF
          0
648 EC140 E100           REL(5) %EC1
          0
649              *
650              * case ELSE
651              *
652 EC145        %OF4
653              *
654              * TOKEN IS SOMETHING ELSE,  REPORT EXPRESSION SYNTAX ERROR
655              *
656 EC145 0000           CON(5) =DROP           DROP
          0
657 EC14A 0000           CON(5) =LIT            39
          0
658 EC14F 7200           CON(5) 39              'illegal expression'
          0
659 EC154 A05C           CON(5) =aP2ERR         PASS 2 ERROR
          E
660 EC159 0000           CON(5) =ZERO           0
          0
661              *
662              * end case
663              *
664 EC15E        %EC1                           ENDCASE      ( * STR NUM * )
```

```
665                *
666                * DO A PRE-SCAN FOR NEXT ROUTINE
667                *
668 EC15E 00000          CON(5) =>R              >R
          0
669 EC163 98EB           CON(5) =aLEXSC          LEXSCAN
          E
670 EC168 00000          CON(5) =R>              R>
          0
671 EC16D 00000          CON(5) =SEMI            ;             ( * STR NUM * )
          0
672                ****************************************************************
673                ***
674                ***  UNARY MINUS MODULE
675                ***
676                *** ( STR -- STR NUM )
677                *** ( RECURSIVE DESCENT: MODULE unary - )
678                ****************************************************************
679 EC172 00000 =amUN-  CON(5) =DOCOL           : UNARY MINUS MODULE
          0
680                *
681                * ENSURE WE'RE NOT OVERFLOWING ANY STACKS
682                *
683 EC177 CF3C           CON(5) =aDEPCK          DEPTH CHECK
          E
684                *
685                * IS CURRENT TOKEN A MINUS SIGN (-) ?
686                *
687 EC17C 00000          CON(5) =aTOKEN          TOKEN
          0
688 EC181 00000          CON(5) =AT              @
          0
689 EC186 00000          CON(5) =LIT             45
          0
690 EC18B D200           CON(5) \-\
          0
691 EC190 00000          CON(5) =EQUAL           =
          0
692 EC195 00000          CON(5) =ZBRNH           IF            ( * STR * )
          0
693 EC19A 91000          REL(5) %IF55
          0
694                *
695                * YES.  CONTINUE THROUGH DESCENT, THEN NEGATE RESULT
696                *
697 EC19F 98EB           CON(5) =aLEXSC          LEXSCAN       ( * STR * )
          E
698 EC1A4 000C           CON(5) =amBASE          BASE          ( * STR NUM * )
          E
699 EC1A9 00000          CON(5) =NEGAT           NEGATE        ( * STR NUM * )
          0
700 EC1AE 00000          CON(5) =SEMI            ;             ( * STR * )
          0
701                *
702                * NO.  CONTINUE THROUGH DESCENT.
```

```
703                *
704 EC1B3           %IF55                       ELSE        ( * STR * )
705 EC1B3 000C              CON(5) =amBASE        BASE        ( * STR NUM * )
          E
706 EC1B8 0000              CON(5) =SEMI          ;           ( * STR NUM * )
          0
707                ****************************************************************
708                ***
709                ***  BOOLEAN MODULE
710                ***
711                *** ( STR -- STR NUM )
712                *** ( RECURSIVE DESCENT: MODULE &! )
713                ****************************************************************
714 EC1BD 0000 =amBOOL CON(5) =DOCOL          : BOOLEAN MODULE
          0
715                *
716                * ENSURE WE'RE NOT OVERFLOWING ANY STACKS
717                *
718 EC1C2 CF3C              CON(5) =aDEPCK        DEPTH CHECK
          E
719                *
720                * DO THE DESCENT
721                *
722 EC1C7 271C              CON(5) =amUN-         UNARY -     ( * STR NUM * )
          E
723                *
724                * while <TOKEN = &> or <TOKEN = !> do
725                *
726 EC1CC           %BG7                        BEGIN       ( * STR NUM * )
727 EC1CC 0000              CON(5) =aTOKEN        TOKEN
          0
728 EC1D1 0000              CON(5) =AT            @           ( * STR NUM TOK * )
          0
729 EC1D6 0000              CON(5) =DUP           DUP
          0
730 EC1DB 0000              CON(5) =LIT           38
          0
731 EC1E0 6200              CON(5) \&\
          0
732 EC1E5 0000              CON(5) =EQUAL         =           ( * STR NUM TOK F * )
          0
733 EC1EA 0000              CON(5) =OVER          OVER
          0
734 EC1EF 0000              CON(5) =LIT           33
          0
735 EC1F4 1200              CON(5) \!\
          0
736 EC1F9 0000              CON(5) =EQUAL         =
          0
737 EC1FE 0000              CON(5) =OR            OR          ( * STR NUM TOK F * )
          0
738 EC203 0000              CON(5) =ZBRNH         WHILE       ( * STR NUM TOK * )
          0
739 EC208 F500              REL(5) %RP7
          0
```

```
740                *
741                * SAVE CURRENT VALUE AND CURRENT TOKEN ON DATA STACK
742                *
743 EC20D 00000            CON(5) =SWAP2          2SWAP
          0
744                *
745                * CONTINUE DESCENT
746                *
747 EC212 98EBE            CON(5) =aLEXSC         LEXSCAN     ( * NUM TOK STR * )
748 EC217 271CE            CON(5) =amUN-          UNARY -
749                *
750                * PERFORM OPERATION ON NEWLY ACQUIRED NUMBER
751                *
752 EC21C 00000            CON(5) =>R             >R          ( * NUM TOK STR * )
          0
753 EC221 00000            CON(5) =SWAP2          2SWAP       ( * STR NUM TOK * )
          0
754 EC226 00000            CON(5) =LIT            38
          0
755 EC22B 62000            CON(5) \&\
          0
756 EC230 00000            CON(5) =EQUAL          =           ( * STR NUM * )
          0
757 EC235 00000            CON(5) =ZBRNH          IF
          0
758 EC23A 91000            REL(5) %IF54
          0
759 EC23F 00000            CON(5) =R>             R>          ( * STR NUM NUM' * )
          0
760 EC244 00000            CON(5) =AND            AND
          0
761 EC249 00000            CON(5) =BRNCH
          0
762 EC24E E7FFF            REL(5) %BG7            REPEAT
763 EC253       %IF54                             ELSE        ( * STR NUM * )
764 EC253 00000            CON(5) =R>             R>          ( * STR NUM NUM' * )
          0
765 EC258 00000            CON(5) =OR             OR
          0
766 EC25D 00000            CON(5) =BRNCH          REPEAT
          0
767 EC262 A6FFF            REL(5) %BG7
768                *
769                * end while
770                *
771 EC267       %RP7
772 EC267 00000            CON(5) =DROP           DROP
          0
773 EC26C 00000            CON(5) =SEMI           ;           ( * STR NUM * )
          0
774                ********************************************************************
```

```
775                ***
776                ***  FACTOR MODULE
777                ***
778                *** ( STR -- STR NUM )
779                *** ( RECURSIVE DESCENT: MODULE */ )
780                ********************************************************************
781 EC271 0000 =amFACT CON(5) =DOCOL          : FACTOR MODULE
            0
782                *
783                * ENSURE WE'RE NOT OVERFLOWING ANY STACKS
784                *
785 EC276 CF3C           CON(5) =aDEPCK         DEPTH CHECK
            E
786                *
787                * DO DESCENT
788                *
789 EC27B DB1C           CON(5) =amBOOL         BOOLEAN      ( * STR NUM * )
            E
790                *
791                * while <TOKEN = *> or <TOKEN = /> do
792                *
793 EC280            %BG9                       BEGIN        ( * STR NUM * )
794 EC280 0000           CON(5) =aTOKEN         TOKEN
            0
795 EC285 0000           CON(5) =AT             @            ( * STR NUM TOK * )
            0
796 EC28A 0000           CON(5) =DUP            DUP
            0
797 EC28F 0000           CON(5) =LIT            42
            0
798 EC294 A200           CON(5) \*\
            0
799 EC299 0000           CON(5) =EQUAL          =            ( * STR NUM TOK F * )
            0
800 EC29E 0000           CON(5) =OVER           OVER
            0
801 EC2A3 0000           CON(5) =LIT            47
            0
802 EC2A8 F200           CON(5) \/\
            0
803 EC2AD 0000           CON(5) =EQUAL          =
            0
804 EC2B2 0000           CON(5) =OR             OR           ( * STR NUM TOK F * )
            0
805 EC2B7 0000           CON(5) =ZBRNH          WHILE        ( * STR NUM TOK * )
            0
806 EC2BC 2800           REL(5) %RP9
            0
807                *
808                * SAVE CURRENT VALUE AND CURRENT TOKEN ON DATA STACK
809                *
810 EC2C1 0000           CON(5) =SWAP2          2SWAP
            0
811                *
812                * CONTINUE DESCENT
```

```
813                *
814 EC2C6 98EB             CON(5) =aLEXSC          LEXSCAN     ( * NUM TOK STR * )
          E
815 EC2CB DB1C             CON(5) =amBOOL          BOOLEAN
          E
816                *
817                * DO OPERATION ON NEWLY ACQUIRED VALUE
818                *
819 EC2D0 0000             CON(5) =>R              >R
          0
820 EC2D5 0000             CON(5) =SWAP2           2SWAP       ( * STR NUM TOK * )
          0
821 EC2DA 0000             CON(5) =LIT             42
          0
822 EC2DF A200             CON(5) \*\
          0
823 EC2E4 0000             CON(5) =EQUAL           =
          0
824 EC2E9 0000             CON(5) =ZBRNH           IF
          0
825 EC2EE 9100             REL(5) %IF56
          0
826 EC2F3 0000             CON(5) =R>              R>          ( * STR NUM NUM' * )
          0
827 EC2F8 0000             CON(5) =MULT            *
          0
828 EC2FD 0000             CON(5) =BRNCH           REPEAT
          0
829 EC302 E7FF             REL(5) %BG9
          F
830 EC307       %IF56                              ELSE        ( * STR NUM * )
831 EC307 0000             CON(5) =R>              R>          ( * STR NUM NUM' * )
          0
832                *
833                * CHECK FOR DIVIDE BY ZERO
834                *
835 EC30C 0000             CON(5) =DUP             DUP
          0
836 EC311 0000             CON(5) =ZEQ             0=
          0
837 EC316 0000             CON(5) =ZBRNH           IF          ( * STR NUM NUM' * )
          0
838 EC31B 4100             REL(5) %IF61
          0
839 EC320 0000             CON(5) =LIT             39
          0
840 EC325 7200             CON(5) 39               'illegal expression'
          0
841 EC32A A05C             CON(5) =aP2ERR          ERROR
          E
842 EC32F       %IF61                              THEN        ( * STR NUM NUM' * )
843 EC32F 0000             CON(5) =/               /
          0
844 EC334 0000             CON(5) =BRNCH           REPEAT
          0
```

```
845 EC339 74FF          REL(5) %BG9
          F
846               *
847               * end while
848               *
849 EC33E          %RP9
850 EC33E 0000          CON(5) =DROP            DROP
          0
851 EC343 0000          CON(5) =SEMI            ;           ( * STR NUM * )
          0
852               ********************************************************************
853               ***
854               ***  TERM MODULE
855               ***
856               *** ( STR -- STR NUM )
857               *** ( RECURSIVE DESCENT: MODULE +- )
858               ********************************************************************
859 EC348 0000 =amTERM CON(5) =DOCOL           : TERM MODULE
          0
860               *
861               * ENSURE WE'RE NOT OVERFLOWING ANY STACKS
862               *
863 EC34D CF3C          CON(5) =aDEPCK          DEPTH CHECK
          E
864               *
865               * DO DESCENT
866               *
867 EC352 172C          CON(5) =amFACT          FACTOR      ( * STR NUM * )
          E
868               *
869               * while <TOKEN = +> or <TOKEN = -> do
870               *
871 EC357          %BG11                       BEGIN       ( * STR NUM * )
872 EC357 0000          CON(5) =aTOKEN          TOKEN
          0
873 EC35C 0000          CON(5) =AT              @           ( * STR NUM TOK * )
          0
874 EC361 0000          CON(5) =DUP             DUP
          0
875 EC366 0000          CON(5) =LIT             43
          0
876 EC36B B200          CON(5) \+\
          0
877 EC370 0000          CON(5) =EQUAL           =           ( * STR NUM TOK F * )
          0
878 EC375 0000          CON(5) =OVER            OVER
          0
879 EC37A 0000          CON(5) =LIT             45
          0
880 EC37F D200          CON(5) \-\
          0
881 EC384 0000          CON(5) =EQUAL           =
          0
882 EC389 0000          CON(5) =OR              OR          ( * STR NUM TOK F * )
          0
```

```
883 EC38E 0000          CON(5) =ZBRNH          WHILE       ( * STR NUM TOK * )
          0
884 EC393 F500          REL(5) %RP11
          0
885             *
886             * SAVE CURRENT VALUE AND CURRENT TOKEN ON DATA STACK
887             *
888 EC398 0000          CON(5) =SWAP2          2SWAP
          0
889             *
890             * CONTINUE DESCENT
891             *
892 EC39D 98EB          CON(5) =aLEXSC         LEXSCAN     ( * NUM TOK STR * )
          E
893 EC3A2 172C          CON(5) =amFACT         FACTOR
          E
894 EC3A7 0000          CON(5) =>R             >R          ( * NUM TOK STR * )
          0
895             *
896             * PERFORM OPPERATION ON NEWLY ACQUIRED NUMBER
897             *
898 EC3AC 0000          CON(5) =SWAP2          2SWAP       ( * STR NUM TOK * )
          0
899 EC3B1 0000          CON(5) =LIT            43
          0
900 EC3B6 B200          CON(5) \+\
          0
901 EC3BB 0000          CON(5) =EQUAL          =           ( * STR NUM * )
          0
902 EC3C0 0000          CON(5) =ZBRNH          IF
          0
903 EC3C5 9100          REL(5) %IF57
          0
904 EC3CA 0000          CON(5) =R>             R>          ( * STR NUM NUM' * )
          0
905 EC3CF 0000          CON(5) =ADD            +
          0
906 EC3D4 0000          CON(5) =BRNCH          REPEAT
          0
907 EC3D9 E7FF          REL(5) %BG11
          F
908 EC3DE       %IF57                          ELSE        ( * STR NUM * )
909 EC3DE 0000          CON(5) =R>             R>          ( * STR NUM NUM' * )
          0
910 EC3E3 0000          CON(5) =MINUS          -
          0
911 EC3E8 0000          CON(5) =BRNCH          REPEAT
          0
912 EC3ED A6FF          REL(5) %BG11
          F
913             *
914             * end while
915             *
916 EC3F2       %RP11
917 EC3F2 0000          CON(5) =DROP           DROP
```

```
          0
  918 EC3F7 0000        CON(5) =SEMI          ;           ( * STR NUM * )
          0
  919                   ***************************************************************
  920                   ***
  921                   ***  DEPTH CHECK
  922                   ***
  923                   *** ( -- )
  924                   *** ( CHECK THE RETURN STACK TO SEE IF IT IS OVERFLOWING INTO )
  925                   *** ( THE TERMINAL INPUT BUFFER.  IF IT IS, CLEAN UP THE RETURN )
  926                   *** ( AND DATA STACKS TO REFLECT AN ABNORMAL END TO 'EXPRESSION'
  927                   *** ( AND REPORT 'illegal expression' )
  928                   ***************************************************************
  929 EC3FC 0000 =aDEPCK CON(5) =DOCOL          : DEPTH CHECK
          0
  930 EC401 0000        CON(5) =RP@           RP@         ( * PTR * )
          0
  931 EC406 0000        CON(5) =TIB           TIB
          0
  932 EC40B 0000        CON(5) =LIT           234
          0
  933 EC410 AE00        CON(5) (96+1)*2+7*5+5
          0
  934                   *
  935                   * NINETY SIX (96) CHARS IN TIB + ONE (1) MORE FOR NULL
  936                   * EACH MODULE IN THE DESCENT CALLS SEVEN (7) LEVELS OF
  937                   * RETURN STACK WHEN IT CALLS LEXSCAN.  EACH LEVEL REQUIRES
  938                   * FIVE (5) NIBBLES.  AN EXTRA FIVE (5) FOR ENSURING NO OVERFLOW.
  939                   *
  940 EC415 0000        CON(5) =ADD           +
          0
  941 EC41A 0000        CON(5) =LT            <
          0
  942 EC41F 0000        CON(5) =ZBRNH         IF
          0
  943 EC424 D700        REL(5) %IF60
          0
  944                   *
  945                   * RESET THE RETURN STACK
  946                   *
  947 EC429              %BG1                 BEGIN       ( * * )
  948 EC429 0000        CON(5) =RP@           RP@
          0
  949 EC42E 0000        CON(5) =aRSTK         RTNSTK
          0
  950 EC433 0000        CON(5) =AT            @
          0
  951 EC438 0000        CON(5) =LT            <
          0
  952 EC43D 0000        CON(5) =ZBRNH         WHILE
          0
  953 EC442 9100        REL(5) %RP1
          0
  954 EC447 0000        CON(5) =R>            R>
          0
```

```
955 EC44C 0000          CON(5) =DROP            DROP
          0
956 EC451 0000          CON(5) =BRNCH           REPEAT
          0
957 EC456 3DFF          REL(5) %BG1
          F
958 EC45B       %RP1
959             *
960             * RESET THE DATA STACK
961             *
962 EC45B       %BG2                            BEGIN       ( * * )
963 EC45B 0000          CON(5) =SP@             SP@
          0
964 EC460 0000          CON(5) =aDSTK           DATASTK
          0
965 EC465 0000          CON(5) =AT              @
          0
966 EC46A 0000          CON(5) =LT              <
          0
967 EC46F 0000          CON(5) =ZBRNH           WHILE
          0
968 EC474 4100          REL(5) %RP2
          0
969 EC479 0000          CON(5) =DROP            DROP
          0
970 EC47E 0000          CON(5) =BRNCH           REPEAT
          0
971 EC483 8DFF          REL(5) %BG2
          F
972 EC488       %RP2                                        ( * STR * )
973             *
974             * AT THIS POINT, BOTH RETURN AND DATA STACKS SHOULD BE RETURNED
975             * TO THEIR ORIGINAL (CALLING ROUTINE'S POSITION).  WE WANT TO
976             * REMOVE THE ORIGINAL STRING FROM THE STACK AND RETURN A ZERO
977             *
978 EC488 0000          CON(5) =2DROP           2DROP       ( * * )
          0
979 EC48D 0000          CON(5) =ZERO            0           ( * NUM * )
          0
980 EC492 0000          CON(5) =LIT             39
          0
981 EC497 7200          CON(5) 39               'illegal expression'
          0
982 EC49C A05C          CON(5) =aP2ERR          PASS 2 ERROR
          E
983 EC4A1       %IF60                           ELSE        ( * * )
984 EC4A1 0000          CON(5) =SEMI            ;           ( * * )
          0
985             ****************************************************************
986             ***
987             ***  EXPRESSION
988             ***
989             *** ( STR -- NUM )
990             *** ( EVALUATE THE EXPRESSION IN THE STRING )
991             ****************************************************************
```

```
 992 EC4A6 0000 =aEXPRS CON(5) =DOCOL         : EXPRESSION
           0
 993            *
 994            * SAVE ORIGINAL RETURN STACK
 995            *
 996 EC4AB 0000         CON(5) =RP@           RP@
           0
 997 EC4B0 0000         CON(5) =aRSTK         RTNSTK
           0
 998 EC4B5 0000         CON(5) =STORE         !
           0
 999            *
1000            * SAVE ORIGINAL DATA POINTER
1001            *
1002 EC4BA 0000         CON(5) =SP@           SP@
           0
1003 EC4BF 0000         CON(5) =aDSTK         DATASTK
           0
1004 EC4C4 0000         CON(5) =STORE         !
           0
1005            *
1006            * DO RECURSIVE DESCENT
1007            *
1008 EC4C9 98EB         CON(5) =aLEXSC        LEXSCAN
           E
1009 EC4CE 843C         CON(5) =amTERM        TERM        ( * STR NUM * )
           E
1010            *
1011            * REMOVE ORIGINAL STRING FROM STACK
1012            *
1013 EC4D3 0000         CON(5) =>R            >R
           0
1014 EC4D8 0000         CON(5) =2DROP         2DROP
           0
1015 EC4DD 0000         CON(5) =R>            R>          ( * NUM * )
           0
1016            *
1017            * CHECK FOR EXCESS CHARACTERS
1018            *
1019 EC4E2 0000         CON(5) =aTOKEN        TOKEN
           0
1020 EC4E7 0000         CON(5) =AT            @
           0
1021 EC4EC 0000         CON(5) =ZBRNH         IF          ( * NUM * )
           0
1022 EC4F1 4100         REL(5) %IF58
           0
1023 EC4F6 0000         CON(5) =LIT           40
           0
1024 EC4FB 8200         CON(5) 40             'excess characters in expression'
           0
1025 EC500 A05C         CON(5) =aP2ERR        PASS 2 ERROR
           E
1026 EC505       %IF58                        THEN
1027 EC505 0000         CON(5) =SEMI          ;           ( * NUM * )
```

```
          0
1028            ****************************************************************
1029            ***
1030            ***  PASS 2 ERROR
1031            ***
1032            *** ( NUM --- )
1033            *** ( REPORT THE ERROR IF IN PASS 2 ONLY )
1034            ****************************************************************
1035 EC50A 0000 =aP2ERR CON(5) =DOCOL          : PASS 2 ERROR
          0
1036            *
1037            * CHECK IF WE'RE PASS 1
1038            *
1039 EC50F 0000         CON(5) =a?PAS1         ?PASS=1
          0
1040 EC514 0000         CON(5) =ZBRNH          IF          ( * NUM * )
          0
1041 EC519 F000         REL(5) %IF59
          0
1042            *
1043            * YES, DO NOTHING FOR NOW.
1044            *
1045 EC51E 0000         CON(5) =DROP           DROP
          0
1046 EC523 0000         CON(5) =SEMI           ;           ( * * )
          0
1047            *
1048            * NO, ERRORS SHOULD BE REPORTED NOW.
1049            *
1050 EC528       %IF59                         ELSE        ( * NUM * )
1051 EC528 0000         CON(5) =aERROR         ERROR
          0
1052 EC52D 0000         CON(5) =SEMI           ;           ( * * )
          0
```

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THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
1053                    STITLE FIT STATS
1054            zSIZE   EQU    (*)-zTHIS
1055            zLEFT   EQU    (zNEXT)-*
1056 EC532              BSS    zLEFT
1057 EC600              END
```

%BG1	Abs	967721	#EC429	-	947	957					
%BG11	Abs	967511	#EC357	-	871	907	912				
%BG2	Abs	967771	#EC45B	-	962	971					
%BG3	Abs	965491	#EBB73	-	82	105					
%BG4	Abs	965661	#EBC1D	-	160	183					
%BG5	Abs	965776	#EBC90	-	210	232					
%BG6	Abs	966156	#EBE0C	-	367	382					
%BG7	Abs	967116	#EC1CC	-	726	762	767				
%BG9	Abs	967296	#EC280	-	793	829	845				
%EC1	Abs	967006	#EC15E	-	664	565	594	630	648		
%IF43	Abs	966536	#EBF88	-	488	484					
%IF44	Abs	965461	#EBB55	-	62	52					
%IF45	Abs	965631	#EBBFF	-	140	130					
%IF46	Abs	966321	#EBEB1	-	436	426					
%IF47	Abs	966371	#EBEE3	-	450	442					
%IF48	Abs	966431	#EBF1F	-	466	456					
%IF49	Abs	966551	#EBF97	-	495	472					
%IF50	Abs	966591	#EBFBF	-	507	499					
%IF51	Abs	966631	#EBFE7	-	519	513					
%IF52	Abs	966806	#EC096	-	592	585					
%IF53	Abs	966916	#EC104	-	628	621					
%IF54	Abs	967251	#EC253	-	763	758					
%IF55	Abs	967091	#EC1B3	-	704	693					
%IF56	Abs	967431	#EC307	-	830	825					
%IF57	Abs	967646	#EC3DE	-	908	903					
%IF58	Abs	967941	#EC505	-	1026	1022					
%IF59	Abs	967976	#EC528	-	1050	1041					
%IF60	Abs	967841	#EC4A1	-	983	943					
%IF61	Abs	967471	#EC32F	-	842	838					
%OF1	Abs	966726	#EC046	-	569	557					
%OF2	Abs	966816	#EC0A0	-	598	574					
%OF3	Abs	966926	#EC10E	-	634	604					
%OF4	Abs	966981	#EC145	-	652	640					
%RP1	Abs	967771	#EC45B	-	958	953					
%RP11	Abs	967666	#EC3F2	-	916	884					
%RP2	Abs	967816	#EC488	-	972	968					
%RP3	Abs	965576	#EBBC8	-	109	89					
%RP4	Abs	965746	#EBC72	-	187	167					
%RP5	Abs	965856	#EBCE0	-	236	220					
%RP6	Abs	966216	#EBE48	-	383	375					
%RP7	Abs	967271	#EC267	-	771	739					
%RP9	Abs	967486	#EC33E	-	849	806					
%TH46	Abs	966641	#EBFF1	-	529	432					
%TH47	Abs	966641	#EBFF1	-	528	446					
%TH48	Abs	966641	#EBFF1	-	527	462					
%TH49	Abs	966641	#EBFF1	-	526	491					
%TH50	Abs	966641	#EBFF1	-	525	503					
/	Ext			-	843						
2DROP	Ext			-	978	1014					
>R	Ext			-	363	477	668	752	819	894	1013
ADD	Ext			-	33	905	940				
AND	Ext			-	87	165	218	373	760		
AT	Ext			-	28	549	563	582	615	646	688	728
					795	873	950	965	1020			
BL	Ext			-	254	337					

BRNCH	Ext	-	104	182	231	381	431	445	461	490
			502	564	593	629	647	761	766	828
			844	906	911	956	970			
C@+	Ext	-	93	171	224	379	458	474	478	501
			515							
CAT	Ext	-	84	162	212	369	438			
DIGIT	Ext	-	50	96	128	174				
DOCOL	Ext	-	23	44	72	122	150	200	249	332
			358	419	540	679	714	781	859	929
			992	1035						
DROP	Ext	-	56	97	134	175	380	443	457	459
			473	475	500	514	520	561	578	608
			644	656	772	850	917	955	969	1045
DUP	Ext	-	250	336	423	439	451	467	496	508
			729	796	835	874				
EQUAL	Ext	-	215	255	262	270	278	286	294	302
			310	318	338	345	454	470	481	511
			555	572	602	618	638	691	732	736
			756	799	803	823	877	881	901	
LIT	Ext	-	48	94	101	126	172	179	213	228
			260	268	276	284	292	300	308	316
			343	402	452	468	479	485	509	589
			599	616	625	635	657	689	730	734
			754	797	801	821	839	875	879	899
			932	980	1023					
LT	Ext	-	941	951	966					
MIN	Ext	-	404							
MINUS	Ext	-	392	910						
MULT	Ext	-	29	827						
NEGAT	Ext	-	699							
ONE	Ext	-	113	191	240	553				
OR	Ext	-	263	271	279	287	295	303	311	319
			346	737	765	804	882			
OVER	Ext	-	83	86	161	164	211	217	259	267
			275	283	291	299	307	362	368	372
			390	437	554	571	601	637	733	800
			878							
R>	Ext	-	397	489	670	759	764	826	831	904
			909	954	1015					
R@	Ext	-	391							
RP@	Ext	-	930	948	996					
S!	Ext	-	406							
SEMI	Ext	-	36	58	64	114	136	142	192	241
			324	350	411	532	671	700	706	773
			851	918	984	1027	1046	1052		
SP@	Ext	-	963	1002						
STORE	Ext	-	35	78	156	206	531	998	1004	
SWAP	Ext	-	315	342	398					
SWAP2	Ext	-	743	753	810	820	888	898		
TIB	Ext	-	931							
TWO	Ext	-	410	570						
TWO/	Ext	-	393							
ZBRNH	Ext	-	51	88	129	166	219	374	425	441
			455	471	483	498	512	556	573	584
			603	620	639	692	738	757	805	824

					837	883	902	942	952	967	1021	1040
ZEQ	Ext			-	216	371	424	482	583	619	836	
ZERO	Ext			-	63	76	141	154	204	430	660	979
=a+DIGI	Abs	965376	#EBB00	-	23	103	181	230				
=a?ELAB	Abs	966091	#EBDCB	-	332	370						
a?PAS1	Ext			-	1039							
=a?STOK	Abs	965866	#EBCEA	-	249	497						
=aCON10	Abs	965471	#EBB5F	-	72	444						
=aCON16	Abs	965641	#EBC09	-	150	460						
=aCONFF	Abs	965756	#EBC7C	-	200	476						
=aDEPCK	Abs	967676	#EC3FC	-	929	544	683	718	785	863		
=aDIG10	Abs	965416	#EBB28	-	44	85	440					
=aDIG16	Abs	965586	#EBBD2	-	122	163						
=aDOLAB	Abs	966141	#EBDFD	-	358	521						
aDSTK	Ext			-	964	1003						
aERROR	Ext			-	487	1051						
=aEXPRS	Abs	967846	#EC4A6	-	992							
aIDENT	Ext			-	405	579						
aKNOWN	Ext			-	581							
aLC	Ext			-	645							
=aLEXSC	Abs	966281	#EBE89	-	419	609	669	697	747	814	892	1008
aNEG1	Ext			-	57	135						
=aP2ERR	Abs	967946	#EC50A	-	1035	591	627	659	841	982	1025	
aRSTK	Ext			-	949	997						
aSYT>	Ext			-	580							
aTOKEN	Ext			-	530	548	614	687	727	794	872	1019
aVALUE	Ext			-	27	34	77	155	205	562		
=amBASE	Abs	966656	#EC000	-	540	698	705					
=amBOOL	Abs	967101	#EC1BD	-	714	789	815					
=amFACT	Abs	967281	#EC271	-	781	867	893					
=amTERM	Abs	967496	#EC348	-	859	610	1009					
=amUN-	Abs	967026	#EC172	-	679	722	748					
zLEFT	Abs	206	#000CE	-	1055	1056						
zNEXT	Abs	968192	#EC600	-	5	1055						
zSIZE	Abs	2610	#00A32	-	1054							
zTHIS	Abs	965376	#EBB00	-	4	1054						

Input Parameters

Source file name is GN&AS4

Listing file name is GN/AS4::65

Object file name is GN%AS4::65

```
                                  111111
                        0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                    TITLE  AS5:_FORTH_ASSEMBLER_OPCODES
 2                    RDSYMB MR%GTO
 3 EC600              ABS    #EC600
 4             zTHIS  EQU    *
 5             zNEXT  EQU    #ED700
 6
 7             ********************************************************
 8             ***
 9             *** MR&AS5      <840504.1037>
10             ***
11             ***
12             ***  FORTH ASSEMBLER
13             ***  ALL OPCODES OF SASM
14             ***
15             ********************************************************
16             ********************************************************************
17             ***
18             ***  OP1
19             ***
20             ********************************************************************
21 EC600 0000 =aOP1   CON(5) =DOCOL          : OP1
          0
22 EC605 0000         CON(5) =aOP            OP
          0
23 EC60A 0000         CON(5) =SEMI           ;
          0
24             ********************************************************************
25             ***
26             ***  OP2
27             ***
28             ********************************************************************
29 EC60F 0000 =aOP2   CON(5) =DOCOL          : OP2
          0
30 EC614 0000         CON(5) =aOP            OP
          0
31 EC619 0000         CON(5) =FIVE+          5+
          0
32 EC61E 0000         CON(5) =SEMI           ;
          0
33             ********************************************************************
34             ***
35             ***  OP3
36             ***
37             ********************************************************************
38 EC623 0000 =aOP3   CON(5) =DOCOL          : OP3
          0
39 EC628 0000         CON(5) =aOP            OP
          0
40 EC62D 0000         CON(5) =LIT            10
          0
41 EC632 A000         CON(5) 10
          0
42 EC637 0000         CON(5) =ADD            +
          0
43 EC63C 0000         CON(5) =SEMI           ;
```

```
          0
44              ****************************************************************
45              ***
46              ***  OP4
47              ***
48              ****************************************************************
49 EC641 0000 =aOP4   CON(5) =DOCOL          : OP4
          0
50 EC646 0000         CON(5) =aOP            OP
          0
51 EC64B 0000         CON(5) =LIT            15
          0
52 EC650 F000         CON(5) 15
          0
53 EC655 0000         CON(5) =ADD            +
          0
54 EC65A 0000         CON(5) =SEMI           ;
          0
55              ****************************************************************
56              ***
57              ***  GET.FLAG
58              ***
59              *** ( NUM -- F )
60              *** ( RETURN OPFLAGS BIT SPECIFIED BY NUM )
61              ****************************************************************
62 EC65F 0000 =aGFLAG CON(5) =DOCOL          : GET.FLAG
          0
63 EC664 0000         CON(5) =aOPFLG         OPFLAGS
          0
64 EC669 0000         CON(5) =AT             @
          0
65 EC66E 0000         CON(5) =AND            AND
          0
66 EC673 0000         CON(5) =SEMI           ;
          0
67              ****************************************************************
68              ***
69              ***  LENGTH.SET
70              ***
71              *** ( -- F )
72              *** ( RETURN OPFLAGS BIT 1 )
73              ****************************************************************
74 EC678 0000 =aLENST CON(5) =DOCOL          : LENGTH.SET
          0
75 EC67D 0000         CON(5) =ONE            1
          0
76 EC682 F56C         CON(5) =aGFLAG         GET.FLAG
          E
77 EC687 0000         CON(5) =SEMI           ;           ( * F * )
          0
78              ****************************************************************
79              ***
80              ***  REQ.YES
81              ***
82              *** ( -- F )
```

```
 83            *** ( RETURN OPFLAGS BIT 2 )
 84            ****************************************************************
 85 EC68C 0000 =aRQYES CON(5) =DOCOL         : REQ.YES
          0
 86 EC691 0000         CON(5) =TWO           2
          0
 87 EC696 F56C         CON(5) =aGFLAG        GET.FLAG
          E
 88 EC69B 0000         CON(5) =SEMI          ;           ( * F * )
          0
 89            ****************************************************************
 90            ***
 91            ***  IS.GOYES
 92            ***
 93            *** ( -- F )
 94            *** ( RETURN OPFLAGS BIT 8 )
 95            ****************************************************************
 96 EC6A0 0000 =aISGYS CON(5) =DOCOL         : IS.GOYES
          0
 97 EC6A5 0000         CON(5) =LIT           8
          0
 98 EC6AA 8000         CON(5) 8
          0
 99 EC6AF F56C         CON(5) =aGFLAG        GET.FLAG
          E
100 EC6B4 0000         CON(5) =SEMI          ;           ( * F * )
          0
101           ****************************************************************
102           ***
103           ***  IS.ABS
104           ***
105           *** ( -- F )
106           *** ( RETURN OPFLAGS BIT 16 )
107           ****************************************************************
108 EC6B9 0000 =aISABS CON(5) =DOCOL         : IS.ABS
          0
109 EC6BE 0000         CON(5) =LIT           16
          0
110 EC6C3 0100         CON(5) 16
          0
111 EC6C8 F56C         CON(5) =aGFLAG        GET.FLAG
          E
112 EC6CD 0000         CON(5) =SEMI          ;           ( * F * )
          0
113           ****************************************************************
114           ***
115           ***  IS.GSUB
116           ***
117           *** ( -- F )
118           *** ( RETURN OPFLAGS BIT 64 )
119           ****************************************************************
120 EC6D2 0000 =aISGSB CON(5) =DOCOL         : IS.GSUB
          0
121 EC6D7 0000         CON(5) =LIT           64
          0
```

```
122 EC6DC 0400          CON(5) 64
          0
123 EC6E1 F56C          CON(5) =aGFLAG          GET.FLAG
          E
124 EC6E6 0000          CON(5) =SEMI            ;           ( * F * )
          0
125             ********************************************************************
126             ***
127             ***  FIELD.SELECT
128             ***
129             *** ( -- NUM )
130             *** ( RETURN WHICH FIELD SELECT CHOSEN IN EXPRESSION )
131             ********************************************************************
132 EC6EB 0000 =aFS     CON(5) =DOCOL          : FIELD.SELECT
          0
133             *
134             * EXAMINE EXPRESSION FIELD FOR:
135             *
136 EC6F0 0000          CON(5) =aEXP.F         EXPRESSION.FIELD
          0
137             *
138             * "A" - ADDRESS FIELD SELECT (9)
139             *
140 EC6F5 0000          CON(5) =2DUP           2DUP
          0
141 EC6FA 0000          CON(5) =QUOTC          "
          0
142 EC6FF 10            CON(2) 1
143 EC701 10            CON(2) 1
144 EC703 14            NIBASC \A\
145 EC705 0000          CON(5) =S=             S=
          0
146 EC70A 0000          CON(5) =ZBRNH          IF
          0
147 EC70F 9100          REL(5) %IF59
          0
148 EC714 0000          CON(5) =LIT            9
          0
149 EC719 9000          CON(5) 9
          0
150 EC71E 0000          CON(5) =BRNCH
          0
151 EC723 7910          REL(5) %TH59
          0
152             *
153             * "W" - WORD FIELD SELECT (8)
154             *
155 EC728        %IF59                         ELSE        ( * STR * )
156 EC728 0000          CON(5) =2DUP           2DUP
          0
157 EC72D 0000          CON(5) =QUOTC          "
          0
158 EC732 10            CON(2) 1
159 EC734 10            CON(2) 1
160 EC736 75            NIBASC \W\
```

```
161 EC738 0000          CON(5) =S=              S=
          0
162 EC73D 0000          CON(5) =ZBRNH           IF
          0
163 EC742 9100          REL(5) %IF60
          0
164 EC747 0000          CON(5) =LIT             8
          0
165 EC74C 8000          CON(5) 8
          0
166 EC751 0000          CON(5) =BRNCH
          0
167 EC756 4610          REL(5) %TH60
          0
168             *
169             * "P" - POINTER SELECT FIELD SELECT (1)
170             *
171 EC75B        %IF60                          ELSE        ( * STR * )
172 EC75B 0000          CON(5) =2DUP            2DUP
          0
173 EC760 0000          CON(5) =QUOTC           "
          0
174 EC765 10            CON(2) 1
175 EC767 10            CON(2) 1
176 EC769 05            NIBASC \P\
177 EC76B 0000          CON(5) =S=              S=
          0
178 EC770 0000          CON(5) =ZBRNH           IF
          0
179 EC775 4100          REL(5) %IF65
          0
180 EC77A 0000          CON(5) =ONE             1
          0
181 EC77F 0000          CON(5) =BRNCH
          0
182 EC784 6310          REL(5) %TH65
          0
183             *
184             * "B" - BYTE (OR EXPONENT) FIELD SELECT (7)
185             *
186 EC789        %IF65                          ELSE        ( * STR * )
187 EC789 0000          CON(5) =2DUP            2DUP
          0
188 EC78E 0000          CON(5) =QUOTC           "
          0
189 EC793 10            CON(2) 1
190 EC795 10            CON(2) 1
191 EC797 24            NIBASC \B\
192 EC799 0000          CON(5) =S=              S=
          0
193 EC79E 0000          CON(5) =ZBRNH           IF
          0
194 EC7A3 9100          REL(5) %IF61
          0
195 EC7A8 0000          CON(5) =LIT             7
```

```
          0
196 EC7AD 7000          CON(5) 7
          0
197 EC7B2 0000          CON(5) =BRNCH
          0
198 EC7B7 3010          REL(5) %TH61
          0
199               *
200               * "S" - SIGN FIELD SELECT (5)
201               *
202 EC7BC          %IF61                          ELSE        ( * STR * )
203 EC7BC 0000          CON(5) =2DUP               2DUP
          0
204 EC7C1 0000          CON(5) =QUOTC              "
          0
205 EC7C6 10            CON(2) 1
206 EC7C8 10            CON(2) 1
207 EC7CA 35            NIBASC \S\
208 EC7CC 0000          CON(5) =S=                 S=
          0
209 EC7D1 0000          CON(5) =ZBRNH              IF
          0
210 EC7D6 9100          REL(5) %IF62
          0
211 EC7DB 0000          CON(5) =LIT                5
          0
212 EC7E0 5000          CON(5) 5
          0
213 EC7E5 0000          CON(5) =BRNCH
          0
214 EC7EA 0D00          REL(5) %TH62
          0
215               *
216               * "X" - EXPONENT FIELD SELECT (4)
217               *
218 EC7EF          %IF62                          ELSE        ( * STR * )
219 EC7EF 0000          CON(5) =2DUP               2DUP
          0
220 EC7F4 0000          CON(5) =QUOTC              "
          0
221 EC7F9 10            CON(2) 1
222 EC7FB 10            CON(2) 1
223 EC7FD 85            NIBASC \X\
224 EC7FF 0000          CON(5) =S=                 S=
          0
225 EC804 0000          CON(5) =ZBRNH              IF
          0
226 EC809 9100          REL(5) %IF63
          0
227 EC80E 0000          CON(5) =LIT                4
          0
228 EC813 4000          CON(5) 4
          0
229 EC818 0000          CON(5) =BRNCH
          0
```

```
230 EC81D D900          REL(5) %TH63
          0
231             *
232             * "M" - MANTISSA FIELD SELECT (6)
233             *
234 EC822        %IF63                          ELSE        ( * STR * )
235 EC822 0000          CON(5) =2DUP           2DUP
          0
236 EC827 0000          CON(5) =QUOTC          "
          0
237 EC82C 10            CON(2) 1
238 EC82E 10            CON(2) 1
239 EC830 D4            NIBASC \M\
240 EC832 0000          CON(5) =S=             S=
          0
241 EC837 0000          CON(5) =ZBRNH          IF
          0
242 EC83C 9100          REL(5) %IF64
          0
243 EC841 0000          CON(5) =LIT            6
          0
244 EC846 6000          CON(5) 6
          0
245 EC84B 0000          CON(5) =BRNCH
          0
246 EC850 A600          REL(5) %TH64
          0
247             *
248             * "XS" - EXPONENT & SIGN FIELD SELECT (3)
249             *
250 EC855        %IF64                          ELSE        ( * STR * )
251 EC855 0000          CON(5) =2DUP           2DUP
          0
252 EC85A 0000          CON(5) =QUOTC          "
          0
253 EC85F 20            CON(2) 2
254 EC861 20            CON(2) 2
255 EC863 8535          NIBASC \XS\
256 EC867 0000          CON(5) =S=             S=
          0
257 EC86C 0000          CON(5) =ZBRNH          IF
          0
258 EC871 4100          REL(5) %IF66
          0
259 EC876 0000          CON(5) =THREE          3
          0
260 EC87B 0000          CON(5) =BRNCH
          0
261 EC880 A300          REL(5) %TH66
          0
262             *
263             * "WP" - WORD POINTER FIELD SELECT (2)
264             *
265 EC885        %IF66                          ELSE        ( * STR * )
266 EC885 0000          CON(5) =2DUP           2DUP
```

```
          0
    267 EC88A 0000          CON(5) =QUOTC           "
          0
    268 EC88F 20            CON(2) 2
    269 EC891 20            CON(2) 2
    270 EC893 7505          NIBASC \WP\
    271 EC897 0000          CON(5) =S=              S=
          0
    272 EC89C 0000          CON(5) =ZBRNH           IF
          0
    273 EC8A1 4100          REL(5) %IF67
          0
    274 EC8A6 0000          CON(5) =TWO             2
          0
    275 EC8AB 0000          CON(5) =BRNCH
          0
    276 EC8B0 A000          REL(5) %TH67
          0
    277               *
    278               * NONE OF THE ABOVE
    279               *
    280 EC8B5          %IF67                        ELSE        ( * STR * )
    281 EC8B5 0000          CON(5) =ZERO            0
          0
    282 EC8BA          %TH67                        THEN
    283 EC8BA          %TH66                        THEN
    284 EC8BA          %TH65                        THEN
    285 EC8BA          %TH64                        THEN
    286 EC8BA          %TH63                        THEN
    287 EC8BA          %TH62                        THEN
    288 EC8BA          %TH61                        THEN
    289 EC8BA          %TH60                        THEN
    290 EC8BA          %TH59                        THEN        ( * STR NUM * )
    291               *
    292               * DROP STRING FROM STACK
    293               *
    294 EC8BA 0000          CON(5) =>R              >R
          0
    295 EC8BF 0000          CON(5) =2DROP           2DROP
          0
    296 EC8C4 0000          CON(5) =R>              R>
          0
    297 EC8C9 0000          CON(5) =SEMI            ;           ( * NUM * )
          0
    298               ********************************************************************
    299               ***
    300               ***  EXPR
    301               ***
    302               *** ( -- NUM )
    303               *** ( EVALUATE EXPRESSION.FIELD )
    304               ********************************************************************
    305 EC8CE 0000 =aEXPR  CON(5) =DOCOL            : EXPR
          0
    306 EC8D3 0000          CON(5) =aEXP.F          EXPRESSION.FIELD
          0
```

```
    307 EC8D8 0000          CON(5) =aEXPRS          EXPRESSION
              0
    308 EC8DD 0000          CON(5) =SEMI            ;           ( * NUM * )
              0
    309                     ********************************************************************
    310                     ***
    311                     ***  0<=EXP<=15
    312                     ***
    313                     *** ( -- NUM F )
    314                     *** ( EVALUATE EXPRESSION.FIELD BETWEEN 0 AND 15 )
    315                     ********************************************************************
    316 EC8E2 0000 =aEXP15 CON(5) =DOCOL            : 0<=EXP<=15
              0
    317                     *
    318                     * EVALUATE EXPRESSION FIELD
    319                     *
    320 EC8E7 EC8C          CON(5) =aEXPR           EXPR
              E
    321 EC8EC 0000          CON(5) =DUP             DUP         ( * NUM NUM * )
              0
    322                     *
    323                     * NUM >= 0 ?
    324                     *
    325 EC8F1 0000          CON(5) =aNEG1           -1
              0
    326 EC8F6 0000          CON(5) =GT              >
              0
    327 EC8FB 0000          CON(5) =OVER            OVER
              0
    328                     *
    329                     * NUM <= 15 ?
    330                     *
    331 EC900 0000          CON(5) =LIT             16
              0
    332 EC905 0100          CON(5) 16
              0
    333 EC90A 0000          CON(5) =LT              <
              0
    334                     *
    335                     * AND
    336                     *
    337 EC90F 0000          CON(5) =AND             AND
              0
    338 EC914 0000          CON(5) =SEMI            ;           ( * NUM F * )
              0
    339                     ********************************************************************
    340                     ***
    341                     ***  1<=EXP<=16
    342                     ***
    343                     *** ( -- NUM F )
    344                     *** ( EVALUATE EXPRESSION.FIELD BETWEEN 1 AND 16 )
    345                     ********************************************************************
    346 EC919 0000 =aEXP16 CON(5) =DOCOL            : 1<=EXP<=16
              0
    347                     *
```

```
348            * EVALUATE EXPRESSION FIELD
349            *
350 EC91E EC8C         CON(5) =aEXPR          EXPR
          E
351            *
352            * NUM > 0
353            *
354 EC923 0000         CON(5) =DUP            DUP          ( * NUM NUM * )
          0
355 EC928 0000         CON(5) =GTZ            0>
          0
356 EC92D 0000         CON(5) =OVER           OVER
          0
357            *
358            * NUM <= 16
359            *
360 EC932 0000         CON(5) =LIT            17
          0
361 EC937 1100         CON(5) 17
          0
362 EC93C 0000         CON(5) =LT             <
          0
363            *
364            * AND
365            *
366 EC941 0000         CON(5) =AND            AND
          0
367 EC946 0000         CON(5) =SEMI           ;            ( * NUM F * )
          0
368            ********************************************************************
369            ***
370            ***  RANGE
371            ***
372            *** ( DEST CURR NIBS -- OFFSET FLAG )
373            *** ( ENSURE THE DIFFERENCE BETWEEN DEST AND CURR FITS IN
374            ***   A SIGNED NUMBER OF LENGTH NIBS.  RETURN THE DIFFERENCE
375            ***   DEST-CURR & A FLAG.
376            ***
377            ********************************************************************
378 EC94B 059C =aRANGE CON(5) $RANGE          primitive RANGE
          E
379 EC950       $RANGE
380            *
381            * GET NUMBER OF NIBBLES INTO P
382            *
383 EC950 147          C=DAT1 A
384 EC953 174          D1=D1+ 5               POP FIRST ELEMENT
385 EC956 80D0         P=C    0
386 EC95A 0D           P=P-1
387            *
388            * GET CURRENT LOCATION & DESTINATION LOCATION
389            *
390 EC95C AF2          C=0    W
391 EC95F 147          C=DAT1 A
392 EC962 174          D1=D1+ 5
```

```
393 EC965 AF7          D=C    W
394 EC968 147          C=DAT1 A
395 EC96B D0           A=0    A              INITIALIZE RETURN FLAG
396             *
397             * RETURN OFFSET TO STACK & MAKE OUR OFFSET POSITIVE
398             *
399 EC96D B7B          C=C-D  W
400 EC970 145          DAT1=C A
401 EC973 550          GONC   POS            POSITIVE RESULT
402 EC976 BFE          C=-C-1 W              -1 IS FOR LARGER NEGATIVE RANGE
403             *
404             * CHECK IF DOUBLING NUMBER CREATES OVERFLOW.
405             *
406 EC979 A16  POS      C=C+C  WP
407 EC97C 411          GOC    FAIL
408             *
409             * SHIFT NUMBER OUT OF C REGISTER
410             *
411 EC97F BF6  SHIFT    CSR    W
412 EC982 0D           P=P-1
413 EC984 5AF          GONC   SHIFT
414             *
415             * SIGN FIELD LEFT IN C.  ENSURE SIGN IS ZERO
416             *
417 EC987 CE           C=C-1  A
418 EC989 540          GONC   FAIL
419             *
420             * RETURN FLAG
421             *
422 EC98C CC   SUCC     A=A-1  A              TRUE FLAG
423 EC98E 1C4  FAIL     D1=D1- 5              PUSH FLAG TO STACK
424 EC991 141          DAT1=A A
425 EC994 03           RTNCC
426             ********************************************************************
427             ***
428             ***  FILL.OP
429             ***
430             *** ( NUM PTR CNT -- )
431             *** ( PUT CNT NIBBLES OF NUM INTO OP[PTR] )
432             ********************************************************************
433 EC996 0000 =aFILOP CON(5) =DOCOL          : FILL.OP
          0
434 EC99B 0000         CON(5) =OVER           OVER
          0
435 EC9A0 0000         CON(5) =ADD            +
          0
436 EC9A5 0000         CON(5) =SWAP           SWAP
          0
437 EC9AA 0000         CON(5) =XDO            DO          ( * NUM * )
          0
438             *
439             * LOOP THROUGH EACH OP[PTR]
440             *
441 EC9AF       %DO7
442             *
```

```
443                * EXTRACT DIGIT
444                *
445 EC9AF 0000          CON(5) =DUP             DUP
          0
446 EC9B4 0000          CON(5) =LTZ             0<
          0
447 EC9B9 0000          CON(5) =LIT             16
          0
448 EC9BE 0100          CON(5) 16
          0
449 EC9C3 0000          CON(5) =UDIV            UM/MOD
          0
450                *
451                * STORE IN APPROPRIATE OP[PTR]
452                *
453 EC9C8 0000          CON(5) =SWAP            SWAP        ( * QUO REM * )
          0
454 EC9CD 0000          CON(5) =R@              I
          0
455 EC9D2 0000          CON(5) =a>OPx           >OPx
          0
456 EC9D7 0000          CON(5) =STORE           !           ( * QUO * )
          0
457 EC9DC 0000          CON(5) =XLOOP           LOOP
          0
458 EC9E1 ECFF          REL(5) %DO7
          F
459                *
460                * RETURN NOTHING
461                *
462 EC9E6 0000          CON(5) =DROP            DROP
          0
463 EC9EB 0000          CON(5) =SEMI            ;           ( * * )
          0
464                ********************************************************************
465                ***
466                ***  ?PASS=1
467                ***
468                *** ( -- F )
469                *** ( RETURN FLAG TRUE IF PASS ONE )
470                ********************************************************************
471 EC9F0 0000 =a?PAS1 CON(5) =DOCOL         : ?PASS=1
          0
472 EC9F5 0000          CON(5) =aPASS           PASS
          0
473 EC9FA 0000          CON(5) =AT              @
          0
474 EC9FF 0000          CON(5) =ONE             1
          0
475 ECA04 0000          CON(5) =EQUAL           =
          0
476 ECA09 0000          CON(5) =SEMI            ;           ( * F * )
          0
477                ********************************************************************
478                ***
```

```
479                *** REGTEST
480                ***
481                *** ( -- )
482                *** ( REGISTER TEST OPCODES )
483                ********************************************************************
484 ECA0E 0000 =aREGTE CON(5) =DOCOL          : REGTEST
          0
485                *
486                * FIELD SELECT
487                *
488 ECA13 BE6C          CON(5) =aFS           FIELD.SELECT
          E
489                *
490                * VALID FIELD SELECT ?
491                *
492 ECA18 0000          CON(5) =?DUP          ?DUP
          0
493 ECA1D 0000          CON(5) =ZBRNH         IF
          0
494 ECA22 B900          REL(5) %IF68
          0
495                *
496                * YES.
497                *
498 ECA27 0000          CON(5) =DUP           DUP         ( * NUM NUM * )
          0
499 ECA2C 0000          CON(5) =LIT           9
          0
500 ECA31 9000          CON(5) 9
          0
501 ECA36 0000          CON(5) =EQUAL         =
          0
502 ECA3B 0000          CON(5) =ZBRNH         IF          ( * NUM * )
          0
503 ECA40 3200          REL(5) %IF69
          0
504                *
505                * FIELD SELECT "A"
506                *
507 ECA45 0000          CON(5) =aREGRP        REG.GROUP
          0
508 ECA4A 0000          CON(5) =AT            @
          0
509 ECA4F 0000          CON(5) =ADD           +
          0
510 ECA54 F06C          CON(5) =aOP2          OP2
          E
511 ECA59 0000          CON(5) =STORE         !           ( * * )
          0
512 ECA5E 0000          CON(5) =SEMI          ;           ( * * )
          0
513                *
514                * ALL OTHER FIELD SELECTS
515                *
516 ECA63          %IF69                      ELSE        ( * NUM * )
```

```
517 ECA63 0000         CON(5) =LIT           9
          0
518 ECA68 9000         CON(5) 9
          0
519 ECA6D 006C         CON(5) =aOP1          OP1
          E
520 ECA72 0000         CON(5) =STORE         !
          0
521 ECA77 0000         CON(5) =ONE-          1-
          0
522 ECA7C F06C         CON(5) =aOP2          OP2
          E
523 ECA81 0000         CON(5) =STORE         !           ( * * )
          0
524             *
525             * IF REGISTER GROUP 2, THEN OP2 = OP2 + 8
526             *
527 ECA86 0000         CON(5) =aREGRP        REG.GROUP
          0
528 ECA8B 0000         CON(5) =AT            @
          0
529 ECA90 0000         CON(5) =TWO           2
          0
530 ECA95 0000         CON(5) =EQUAL         =
          0
531 ECA9A 0000         CON(5) =ZBRNH         IF
          0
532 ECA9F 9100         REL(5) %IF70
          0
533 ECAA4 0000         CON(5) =LIT           8
          0
534 ECAA9 8000         CON(5) 8
          0
535 ECAAE F06C         CON(5) =aOP2          OP2
          E
536 ECAB3 0000         CON(5) =PSTOR         +!
          0
537 ECAB8       %IF70                        THEN        ( * * )
538 ECAB8 0000         CON(5) =SEMI          ;           ( * * )
          0
539             *
540             * INVALID FIELD SELECT
541             *
542 ECABD       %IF68
543 ECABD 0000         CON(5) =LIT           27
          0
544 ECAC2 B100         CON(5) 27             'illegal word select'
          0
545 ECAC7 0000         CON(5) =aERROR        ERROR
          0
546 ECACC 0000         CON(5) =SEMI          ;           ( * * )
          0
547             ****************************************************************
548             ***
549             ***  REGARITH
```

```
550                ***
551                *** ( -- [NUM] )
552                *** ( REGISTER ARITHMETIC OPCODES )
553                ********************************************************************
554 ECAD1 0000      =aREGAR CON(5) =DOCOL          : REGARITH
          0
555 ECAD6 0F9C             CON(5) =a?PAS1         ?PASS=1
          E
556 ECADB 0000             CON(5) =ZBRNH          IF          ( * * )
          0
557 ECAE0 7300             REL(5) %IF71
          0
558                *
559                * PASS 1 HANDLER
560                *
561 ECAE5 BE6C             CON(5) =aFS            FIELD.SELECT
          E
562 ECAEA 0000             CON(5) =LIT            9
          0
563 ECAEF 9000             CON(5) 9
          0
564 ECAF4 0000             CON(5) =EQUAL          =           ( * F * )
          0
565 ECAF9 0000             CON(5) =ZBRNH          IF
          0
566 ECAFE F000             REL(5) %IF72
          0
567                *
568                * FIELD SELECT "A" - RETURN LENGTH 2
569                *
570 ECB03 0000             CON(5) =TWO            2
          0
571 ECB08 0000             CON(5) =SEMI           ;           ( * NUM * )
          0
572                *
573                * ALL OTHER FIELD SELECT - RETURN LENGTH 3
574                *
575 ECB0D                   %IF72                  ELSE        ( * * )
576 ECB0D 0000             CON(5) =THREE          3
          0
577 ECB12 0000             CON(5) =SEMI           ;           ( * NUM * )
          0
578                *
579                * PASS 2 HANDLER
580                *
581 ECB17                   %IF71                  ELSE        ( * * )
582 ECB17 BE6C             CON(5) =aFS            FIELD.SELECT
          E
583                *
584                * VALID FIELD SELECT ?
585                *
586 ECB1C 0000             CON(5) =?DUP           ?DUP
          0
587 ECB21 0000             CON(5) =ZBRNH          IF
          0
```

```
588 ECB26 6E00          REL(5) %IF73
          0
589 ECB2B 0000          CON(5) =DUP             DUP          ( * NUM NUM * )
          0
590 ECB30 0000          CON(5) =LIT             9
          0
591 ECB35 9000          CON(5) 9
          0
592 ECB3A 0000          CON(5) =EQUAL           =
          0
593 ECB3F 0000          CON(5) =ZBRNH           IF           ( * NUM * )
          0
594 ECB44 5500          REL(5) %IF74
          0
595             *
596             * FIELD SELECT "A"
597             *   OP2 = OP3
598             *   OP1 = 11 + ARITHMETIC GROUP
599             *
600 ECB49 0000          CON(5) =DROP            DROP
          0
601 ECB4E 0000          CON(5) =TWO             2
          0
602 ECB53 0000          CON(5) =aOPLEN          OPLEN
          0
603 ECB58 0000          CON(5) =STORE           !            ( * * )
          0
604 ECB5D 326C          CON(5) =aOP3            OP3
          E
605 ECB62 0000          CON(5) =AT              @
          0
606 ECB67 F06C          CON(5) =aOP2            OP2
          E
607 ECB6C 0000          CON(5) =STORE           !            ( * * )
          0
608 ECB71 0000          CON(5) =aARGRP          ARITH.GROUP
          0
609 ECB76 0000          CON(5) =AT              @            ( * NUM * )
          0
610 ECB7B 0000          CON(5) =LIT             11
          0
611 ECB80 B000          CON(5) 11
          0
612 ECB85 0000          CON(5) =ADD             +
          0
613 ECB8A 006C          CON(5) =aOP1            OP1
          E
614 ECB8F 0000          CON(5) =STORE           !
          0
615 ECB94 0000          CON(5) =SEMI            ;            ( * * )
          0
616             *
617             * ALL OTHER FIELD SELECTS
618             *   OP1 = 10 (IF REGISTER GROUP C OR D)
619             *   OP1 = 11 (IF REGISTER GROUP E OR F)
```

```
620            *   OP2 = <FIELD SELECT> - 1 + 0 (IF REGISTER GROUP C OR E)
621            *   OP2 = <FILED SELECT> - 1 + 8 (IF REGISTER GROUP D OR F)
622            *
623 ECB99       %IF74                          ELSE        ( * NUM * )
624 ECB99 0000          CON(5) =ONE-           1-
          0
625 ECB9E F06C          CON(5) =aOP2           OP2
          E
626 ECBA3 0000          CON(5) =STORE          !           ( * * )
          0
627 ECBA8 0000          CON(5) =aARGRP         ARITH.GROUP
          0
628 ECBAD 0000          CON(5) =AT             @
          0
629 ECBB2 0000          CON(5) =DUP            DUP         ( * NUM NUM * )
          0
630 ECBB7 0000          CON(5) =ONE-           1-
          0
631 ECBBC 0000          CON(5) =TWO/           2/
          0
632 ECBC1 0000          CON(5) =LIT            10
          0
633 ECBC6 A000          CON(5) 10
          0
634 ECBCB 0000          CON(5) =ADD            +
          0
635 ECBD0 006C          CON(5) =aOP1           OP1
          E
636 ECBD5 0000          CON(5) =STORE          !           ( * NUM * )
          0
637 ECBDA 0000          CON(5) =DUP            DUP
          0
638 ECBDF 0000          CON(5) =TWO/           2/
          0
639 ECBE4 0000          CON(5) =TWO*           2*
          0
640 ECBE9 0000          CON(5) =EQUAL          =           ( * F * )
          0
641 ECBEE 0000          CON(5) =LIT            -8
          0
642 ECBF3 8FFF          CON(5) 0-8
          F
643 ECBF8 0000          CON(5) =MULT           *
          0
644 ECBFD F06C          CON(5) =aOP2           OP2
          E
645 ECC02 0000          CON(5) =PSTOR          +!
          0
646 ECC07 0000          CON(5) =SEMI           ;           ( * * )
          0
647            *
648            * INVALID FIELD SELECT
649            *
650 ECC0C       %IF73                          ELSE        ( * * )
651 ECC0C 0000          CON(5) =LIT            27
```

```
          0
652 ECC11 B100          CON(5) 27               'illegal word select'
          0
653 ECC16 0000          CON(5) =aERROR          ERROR
          0
654 ECC1B 0000          CON(5) =SEMI            ;           ( * * )
          0
655               ****************************************************************
656               ***
657               ***  REGLOGIC
658               ***
659               *** ( -- )
660               *** ( REGISTER LOGIC OPCODES )
661               ****************************************************************
662 ECC20 0000 =aREGLO CON(5) =DOCOL          : REGLOGIC
          0
663 ECC25 BE6C          CON(5) =aFS             FIELD.SELECT
          E
664               *
665               * VALID FIELD SELECT ?
666               *
667 ECC2A 0000          CON(5) =?DUP            ?DUP
          0
668 ECC2F 0000          CON(5) =ZBRNH           IF
          0
669 ECC34 6400          REL(5) %IF75
          0
670 ECC39 0000          CON(5) =DUP             DUP         ( * NUM NUM * )
          0
671 ECC3E 0000          CON(5) =LIT             9
          0
672 ECC43 9000          CON(5) 9
          0
673 ECC48 0000          CON(5) =EQUAL           =
          0
674 ECC4D 0000          CON(5) =ZBRNH           IF          ( * NUM * )
          0
675 ECC52 4100          REL(5) %IF76
          0
676               *
677               * FIELD SELECT A
678               *   OP3 = 15
679               *
680 ECC57 0000          CON(5) =LIT             7
          0
681 ECC5C 7000          CON(5) 7
          0
682 ECC61 0000          CON(5) =ADD             +
          0
683               *
684               * ALL OTHER FIELD SELECTS
685               *   OP3 = <FIELD SELECT> - 1
686               *
687 ECC66         %IF76                         THEN        ( * NUM * )
688 ECC66 0000          CON(5) =ONE-            1-
```

```
          0
689 ECC6B 326C          CON(5) =aOP3           OP3
          E
690 ECC70 0000          CON(5) =STORE          !
          0
691 ECC75 0000          CON(5) =SEMI           ;            ( * * )
          0
692               *
693               * INVALID FIELD SELECT
694               *
695 ECC7A          %IF75
696 ECC7A 0000          CON(5) =LIT            27
          0
697 ECC7F B100          CON(5) 27              'illegal word select'
          0
698 ECC84 0000          CON(5) =aERROR         ERROR
          0
699 ECC89 0000          CON(5) =SEMI           ;            ( * * )
          0
700               ********************************************************************
701               ***
702               ***  BRANCHES
703               ***
704               *** ( -- )
705               *** ( ABSOLUTE AND RELATIVE BRANCHES )
706               ********************************************************************
707 ECC8E 0000 -aBRANC CON(5) =DOCOL          : BRANCHES
          0
708               *
709               * CHECK IF WE'RE A GOYES STATEMENT AND THE PREVIOUS
710               * LINE WAS A TEST INSTRUCTION
711               *
712 ECC93 0000          CON(5) =aLSTRQ         LAST.REQ
          0
713 ECC98 0000          CON(5) =AT             @
          0
714 ECC9D 0000          CON(5) =ZEQ            0=           ( * F * )
          0
715 ECCA2 0A6C          CON(5) =aISGYS         IS.GOYES
          E
716 ECCA7 0000          CON(5) =AND            AND
          0
717 ECCAC 0000          CON(5) =ZBRNH          IF           ( * * )
          0
718 ECCB1 4100          REL(5) %IF77
          0
719               *
720               * CHECK FAILS
721               *
722 ECCB6 0000          CON(5) =LIT            29
          0
723 ECCBB D100          CON(5) 29              'needs previous test instruction'
          0
724 ECCC0 0000          CON(5) =aERROR         ERROR        ( * * )
          0
```

```
                *
                * EVALUATE EXPRESSION FIELD
                *
ECCC5            %IF77                          THEN
ECCC5 EC8C              CON(5) =aEXPR           EXPR
      E
                *
                * CHECK IF BRANCH IS RELATIVE
                *
ECCCA 9B6C              CON(5) =aISABS          IS.ABS
      E
ECCCF 0000              CON(5) =ZEQ             0=
      0
ECCD4 0000              CON(5) =ZBRNH           IF          ( * NUM * )
      0
ECCD9 F500              REL(5) %IF78
      0
                *
                * RELATIVE BRANCH
                *
ECCDE 0000              CON(5) =aLC             LC
      0
ECCE3 0000              CON(5) =AT              @
      0
                *
                * GOSUBS REQUIRE RELATIVE BRANCH FROM END OF INSTRUCTION
                *
ECCE8 2D6C              CON(5) =aISGSB          IS.GSUB
      E
ECCED 0000              CON(5) =ZBRNH           IF          ( * NUM NUM' * )
      0
ECCF2 9100              REL(5) %IF79
      0
ECCF7 0000              CON(5) =aOPLEN          OPLEN
      0
ECCFC 0000              CON(5) =AT              @           ( * NUM NUM' NUM" * )
      0
ECD01 0000              CON(5) =BRNCH           ELSE        ( * NUM NUM' * )
      0
ECD06 4100              REL(5) %TH79
      0
                *
                * OTHER BRANCHES REQUIRE RELATIVE BRANCH FROM BEGINNING OF OFFSET
                * FIELD.
                *
ECD0B            %IF79
ECD0B 0000              CON(5) =aFILMK          FILL.MARK
      0
ECD10 0000              CON(5) =AT              @
      0
ECD15 0000              CON(5) =ONE-            1-          ( * NUM NUM' NUM" * )
      0
                *
                * CALCULATE RELATIVE OFFSET
                *
```

```
763 ECD1A       %TH79                           THEN
764 ECD1A 0000          CON(5) =ADD             +
          0
765             *
766             * ENSURE IN RANGE
767             *
768 ECD1F 0000          CON(5) =aFILEN          FILL.LENGTH
          0
769 ECD24 0000          CON(5) =AT              @           ( * DEST CURR NIBS * )
          0
770 ECD29 B49C          CON(5) =aRANGE          RANGE       ( * OFF F * )
          E
771 ECD2E 0000          CON(5) =ZBRNH           IF          ( * NUM * )
          0
772 ECD33 3200          REL(5) %IF80
          0
773             *
774             * FILL OPCODES CORRESPONDING TO OFFSET FIELD
775             *
776 ECD38       %IF78                                       ( * EXPR * )
777 ECD38 0000          CON(5) =aFILMK          FILL.MARK
          0
778 ECD3D 0000          CON(5) =AT              @           ( * NUM PTR * )
          0
779 ECD42 0000          CON(5) =aFILEN          FILL.LENGTH
          0
780 ECD47 0000          CON(5) =AT              @           ( * NUM PTR CNT * )
          0
781 ECD4C 699C          CON(5) =aFILOP          FILL.OP     ( * * )
          E
782 ECD51 0000          CON(5) =SEMI            ;           ( * * )
          0
783             *
784             * OFFSET TOO LARGE FOR OFFSET FIELD
785             *
786 ECD56       %IF80                           ELSE        ( * NUM * )
787 ECD56 0000          CON(5) =DROP            DROP
          0
788 ECD5B 0000          CON(5) =LIT             28
          0
789 ECD60 C100          CON(5) 28               'jump or value too large'
          0
790 ECD65 0000          CON(5) =aERROR          ERROR
          0
791 ECD6A 0000          CON(5) =SEMI            ;           ( * * )
          0
792             ********************************************************************
793             ***
794             ***  RTNYES
795             ***
796             *** ( -- )
797             *** ( RTNYES OPCODE )
798             ********************************************************************
799 ECD6F 0000 =aRTNYS CON(5) =DOCOL           : RTNYES
          0
```

```
800                *
801                * SINCE WE'RE A RINYES INSTRUCTION, ALL WE HAVE TO DO IS CHECK
802                * IF THE PREVIOUS LINE WAS A TEST INSTRUCTION
803                *
804 ECD74 0000             CON(5) =aLSTRQ        LAST.REQ
           0
805 ECD79 0000             CON(5) =AT            @
           0
806 ECD7E 0000             CON(5) =ZEQ           0=
           0
807 ECD83 0000             CON(5) =ZBRNH         IF          ( * * )
           0
808 ECD88 4100             REL(5) %IF81
           0
809                *
810                * CHECK FAILED
811                *
812 ECD8D 0000             CON(5) =LIT           29
           0
813 ECD92 D100             CON(5) 29             'needs previous test instruction'
           0
814 ECD97 0000             CON(5) =aERROR        ERROR
           0
815                *
816                * ALL DONE
817                *
818 ECD9C           %IF81                        THEN
819 ECD9C 0000             CON(5) =SEMI          ;           ( * * )
           0
820                ********************************************************************
821                ***
822                ***  PTRTEST
823                ***
824                *** ( -- )
825                *** ( POINTER TEST OPCODES )
826                ********************************************************************
827 ECDA1 0000 =aPTRTE CON(5) =DOCOL             : PTRTEST
           0
828                *
829                * EVALUATE EXPRESSION FIELD
830                *
831 ECDA6 2E8C             CON(5) =aEXP15        0<=EXP<=15
           E
832 ECDAB 0000             CON(5) =ZBRNH         IF          ( * NUM * )
           0
833 ECDB0 4100             REL(5) %IF82
           0
834                *
835                * EXPRESSION IN RANGE [0,15]
836                *
837 ECDB5 326C             CON(5) =aOP3          OP3
           E
838 ECDBA 0000             CON(5) =STORE         !
           0
839 ECDBF 0000             CON(5) =SEMI          ;           ( * * )
```

```
          0
840             *
841             * EXPRESSION OUT OF RANGE
842             *
843 ECDC4        %IF82                          ELSE        ( * NUM * )
844 ECDC4 0000            CON(5) =DROP           DROP
          0
845 ECDC9 0000            CON(5) =LIT            30
          0
846 ECDCE E100            CON(5) 30              'illegal pointer position'
          0
847 ECDD3 0000            CON(5) =aERROR         ERROR
          0
848 ECDD8 0000            CON(5) =SEMI           ;           ( * * )
          0
849             ********************************************************************
850             ***
851             ***  STATTEST
852             ***
853             *** ( -- )
854             *** ( STATUS TEST OPCODES )
855             ********************************************************************
856 ECDDD 0000 =aSTATT CON(5) =DOCOL          : STATTEST
          0
857             *
858             * EVALUATE EXPRESSION
859             *
860 ECDE2 2E8C            CON(5) =aEXP15         0<=EXP<=15
          E
861 ECDE7 0000            CON(5) =ZBRNH          IF
          0
862 ECDEC 4100            REL(5) %IF83
          0
863             *
864             * EXPRESSION IN RANGE [0,15]
865             *
866 ECDF1 326C            CON(5) =aOP3           OP3
          E
867 ECDF6 0000            CON(5) =STORE          !
          0
868 ECDFB 0000            CON(5) =SEMI           ;           ( * * )
          0
869             *
870             * EXPRESSION OUT OF RANGE
871             *
872 ECE00        %IF83                          ELSE        ( * NUM * )
873 ECE00 0000            CON(5) =DROP           DROP
          0
874 ECE05 0000            CON(5) =LIT            31
          0
875 ECE0A F100            CON(5) 31              'illegal status bit'
          0
876 ECE0F 0000            CON(5) =aERROR         ERROR
          0
877 ECE14 0000            CON(5) =SEMI           ;           ( * * )
```

```
          0
    878           ********************************************************************
    879           ***
    880           ***  SETPTR
    881           ***
    882           *** ( -- )
    883           *** ( SET POINTER OPCODES )
    884           ********************************************************************
    885 ECE19 0000 =aSETPT CON(5) =DOCOL         : SETPTR
          0
    886           *
    887           * EVALUATE EXPRESSION
    888           *
    889 ECE1E 2E8C         CON(5) =aEXP15        0<=EXP<=15
          E
    890 ECE23 0000         CON(5) =ZBRNH         IF          ( * NUM * )
          0
    891 ECE28 E100         REL(5) %IF84
          0
    892           *
    893           * EXPRESSION IN RANGE [0,15].  STORE EXPRESSION NIBBLE AT END
    894           * OF INSTRUCTION.
    895           *
    896 ECE2D 0000         CON(5) =aOPLEN        OPLEN
          0
    897 ECE32 0000         CON(5) =AT            @
          0
    898 ECE37 0000         CON(5) =a>OPx         >OPx
          0
    899 ECE3C 0000         CON(5) =STORE         !
          0
    900 ECE41 0000         CON(5) =SEMI          ;           ( * * )
          0
    901           *
    902           * EXPRESSION OUT OF RANGE
    903           *
    904 ECE46       %IF84                       ELSE        ( * NUM * )
    905 ECE46 0000         CON(5) =DROP          DROP
          0
    906 ECE4B 0000         CON(5) =LIT           30
          0
    907 ECE50 E100         CON(5) 30             'illegal pointer position'
          0
    908 ECE55 0000         CON(5) =aERROR        ERROR
          0
    909 ECE5A 0000         CON(5) =SEMI          ;           ( * * )
          0
    910           ********************************************************************
    911           ***
    912           ***  SETSTAT
    913           ***
    914           *** ( -- )
    915           *** ( SET STATUS OPCODES )
    916           ********************************************************************
    917 ECE5F 0000 =aSETST CON(5) =DOCOL         : SETSTAT
```

```
          0
  918             *
  919             * EVALUATE EXPRESSION
  920             *
  921 ECE64 2E8C          CON(5) =aEXP15          0<=EXP<=15
          E
  922 ECE69 0000          CON(5) =ZBRNH           IF          ( * NUM * )
          0
  923 ECE6E 4100          REL(5) %IF85
          0
  924             *
  925             * EXPRESSION IN RANGE [0,15]
  926             *
  927 ECE73 326C          CON(5) =aOP3            OP3
          E
  928 ECE78 0000          CON(5) =STORE           !
          0
  929 ECE7D 0000          CON(5) =SEMI            ;           ( * * )
          0
  930             *
  931             * EXPRESSION OUT OF RANGE
  932             *
  933 ECE82        %IF85                          ELSE        ( * NUM * )
  934 ECE82 0000          CON(5) =LIT             31
          0
  935 ECE87 F100          CON(5) 31               'illegal status bit'
          0
  936 ECE8C 0000          CON(5) =aERROR          ERROR
          0
  937 ECE91 0000          CON(5) =DROP            DROP
          0
  938 ECE96 0000          CON(5) =SEMI            ;           ( * * )
          0
  939             ********************************************************************
  940             ***
  941             ***  DPARITH
  942             ***
  943             *** ( -- )
  944             *** ( DATA POINTER ARITHMETIC OPCODES )
  945             ********************************************************************
  946 ECE9B 0000 =aDPARI CON(5) =DOCOL            : DPARITH
          0
  947             *
  948             * EVALUATE EXPRESSION
  949             *
  950 ECEA0 919C          CON(5) =aEXP16          1<=EXP<=16
          E
  951 ECEA5 0000          CON(5) =ZBRNH           IF
          0
  952 ECEAA 9100          REL(5) %IF86
          0
  953             *
  954             * EXPRESSION IN RANGE [1,16]
  955             *
  956 ECEAF 0000          CON(5) =ONE-            1-
```

```
          0
    957 ECEB4 326C        CON(5) =aOP3          OP3
          E
    958 ECEB9 0000        CON(5) =STORE         !
          0
    959 ECEBE 0000        CON(5) =SEMI          ;           ( * * )
          0
    960           *
    961           * EXPRESSION OUT OF RANGE
    962           *
    963 ECEC3      %IF86                        ELSE        ( * NUM * )
    964 ECEC3 0000        CON(5) =LIT           32
          0
    965 ECEC8 0200        CON(5) 32             'illegal dp arith value'
          0
    966 ECECD 0000        CON(5) =aERROR        ERROR
          0
    967 ECED2 0000        CON(5) =DROP          DROP
          0
    968 ECED7 0000        CON(5) =SEMI          ;           ( * * )
          0
    969           ********************************************************************
    970           ***
    971           ***  DATATRANS
    972           ***
    973           *** ( -- [NUM] )
    974           *** ( DATA TRANSFER OPCODES )
    975           ********************************************************************
    976 ECEDC 0000 =aDATAT CON(5) =DOCOL        : DATATRANS
          0
    977           *
    978           * FIELD SELECT
    979           *
    980 ECEE1 BE6C        CON(5) =aFS           FIELD.SELEC ( * NUM * )
          E
    981 ECEE6 0F9C        CON(5) =a?PAS1        ?PASS=1
          E
    982 ECEEB 0000        CON(5) =ZBRNH         IF          ( * NUM * )
          0
    983 ECEF0 5500        REL(5) %IF87
          0
    984           *
    985           * PASS 1 PROCESSING.
    986           *
    987 ECEF5 0000        CON(5) =DUP           DUP
          0
    988 ECEFA 0000        CON(5) =LIT           FS 'B'
          0
    989 ECEFF 7000        CON(5) 7
          0
    990 ECF04 0000        CON(5) =EQUAL         =
          0
    991 ECF09 0000        CON(5) =SWAP          SWAP
          0
    992 ECF0E 0000        CON(5) =LIT           FS 'A'
```

```
           0
 993 ECF13 9000          CON(5) 9
           0
 994 ECF18 0000          CON(5) =EQUAL          =
           0
 995 ECF1D 0000          CON(5) =OR             OR          ( * F * )
           0
 996 ECF22 0000          CON(5) =ZBRNH          IF
           0
 997 ECF27 F000          REL(5) %IF88
           0
 998                *
 999                * IF FIELD SELECT IS "A" OR "B" THEN RETURN LENGTH 3
1000                *
1001 ECF2C 0000          CON(5) =THREE          3
           0
1002 ECF31 0000          CON(5) =SEMI           ;           ( * NUM * )
           0
1003                *
1004                * OTHER FIELD SELECTS RETURN LEGNTH 4
1005                *
1006 ECF36         %IF88
1007 ECF36 0000          CON(5) =LIT            4
           0
1008 ECF3B 4000          CON(5) 4
           0
1009 ECF40 0000          CON(5) =SEMI           ;           ( * NUM * )
           0
1010                *
1011                * PASS 2 PROCESSING.
1012                *
1013 ECF45         %IF87                        ELSE        ( * NUM * )
1014                *
1015                * VALID FIELD SELECT ?
1016                *
1017 ECF45 0000          CON(5) =?DUP           ?DUP
           0
1018 ECF4A 0000          CON(5) =ZBRNH          IF          ( * [NUM] * )
           0
1019 ECF4F 3C00          REL(5) %IF89
           0
1020 ECF54 0000          CON(5) =DUP            DUP         ( * NUM NUM * )
           0
1021 ECF59 0000          CON(5) =LIT            9
           0
1022 ECF5E 9000          CON(5) 9
           0
1023 ECF63 0000          CON(5) =EQUAL          =
           0
1024 ECF68 0000          CON(5) =ZBRNH          IF          ( * NUM * )
           0
1025 ECF6D 2300          REL(5) %IF90
           0
1026                *
1027                * FIELD SELECT A
```

```
1028                *   OP2 = 4
1029                *
1030 ECF72 0000            CON(5) =DROP            DROP
          0
1031 ECF77 0000            CON(5) =THREE           3
          0
1032 ECF7C 0000            CON(5) =aOPLEN          OPLEN
          0
1033 ECF81 0000            CON(5) =STORE           !           ( * * )
          0
1034 ECF86 0000            CON(5) =LIT             4
          0
1035 ECF8B 4000            CON(5) 4
          0
1036 ECF90 F06C            CON(5) =aOP2            OP2
          E
1037 ECF95 0000            CON(5) =STORE           !
          0
1038 ECF9A 0000            CON(5) =SEMI            ;           ( * * )
          0
1039 ECF9F          %IF90                          ELSE        ( * NUM * )
1040 ECF9F 0000            CON(5) =DUP             DUP
          0
1041 ECFA4 0000            CON(5) =LIT             7
          0
1042 ECFA9 7000            CON(5) 7
          0
1043 ECFAE 0000            CON(5) =EQUAL           =
          0
1044 ECFB3 0000            CON(5) =ZBRNH           IF          ( * NUM * )
          0
1045 ECFB8 6400            REL(5) %IF91
          0
1046                *
1047                * FIELD SELECT B
1048                *   OP2 = 4
1049                *   OP3 = OP3 + 8
1050                *
1051 ECFBD 0000            CON(5) =DROP            DROP
          0
1052 ECFC2 0000            CON(5) =THREE           3
          0
1053 ECFC7 0000            CON(5) =aOPLEN          OPLEN
          0
1054 ECFCC 0000            CON(5) =STORE           !           ( * * )
          0
1055 ECFD1 0000            CON(5) =LIT             4
          0
1056 ECFD6 4000            CON(5) 4
          0
1057 ECFDB F06C            CON(5) =aOP2            OP2
          E
1058 ECFE0 0000            CON(5) =STORE           !           ( * * )
          0
1059 ECFE5 0000            CON(5) =LIT             8
```

```
          0
1060 ECFEA 8000          CON(5) 8
          0
1061 ECFEF 326C          CON(5) =aOP3          OP3
          E
1062 ECFF4 0000          CON(5) =PSTOR         +!          ( * * )
          0
1063 ECFF9 0000          CON(5) =SEMI          ;           ( * * )
          0
1064            *
1065            * ALL OTHER FIELD SELECTS
1066            *   OP4 = <FIELD SELECT> - 1
1067            *
1068 ECFFE       %IF91                        ELSE        ( * NUM * )
1069 ECFFE 0000          CON(5) =ONE-          1-
          0
1070 ED003 146C          CON(5) =aOP4          OP4
          E
1071 ED008 0000          CON(5) =STORE         !
          0
1072 ED00D 0000          CON(5) =SEMI          ;           ( * * )
          0
1073            *
1074            * FIELD SELECT FAILED.  LOOK FOR EXPRESSION
1075            *
1076 ED012       %IF89                        ELSE        ( * * )
1077 ED012 919C          CON(5) =aEXP16        1<=EXP<=16
          E
1078 ED017 0000          CON(5) =ZBRNH         IF          ( * NUM * )
          0
1079 ED01C D200          REL(5) %IF92
          0
1080            *
1081            * EXPRESSION IN RANGE [1,16]
1082            *   OP3 = OP3 + 8
1083            *   OP4 = <EXPRESSION> - 1
1084            *
1085 ED021 0000          CON(5) =LIT           8
          0
1086 ED026 8000          CON(5) 8
          0
1087 ED02B 326C          CON(5) =aOP3          OP3
          E
1088 ED030 0000          CON(5) =PSTOR         +!          ( * NUM * )
          0
1089 ED035 0000          CON(5) =ONE-          1-
          0
1090 ED03A 146C          CON(5) =aOP4          OP4
          E
1091 ED03F 0000          CON(5) =STORE         !
          0
1092 ED044 0000          CON(5) =SEMI          ;           ( * * )
          0
1093            *
1094            * NEITHER FIELD SELECT NOR EXPRESSION IN RANGE
```

```
1095           *
1096 ED049      %IF92                          ELSE        ( * NUM * )
1097 ED049 0000         CON(5) =LIT           33
           0
1098 ED04E 1200         CON(5) 33             'illegal transfer value'
           0
1099 ED053 0000         CON(5) =aERROR        ERROR
           0
1100 ED058 0000         CON(5) =DROP          DROP
           0
1101 ED05D 0000         CON(5) =SEMI          ;           ( * * )
           0
1102           ****************************************************************
1103           ***
1104           ***  MAXMIN
1105           ***
1106           *** ( STR NUM -- STR NUM )
1107           *** ( ENSURE LENGTH OF STRING WITHIN LIMITS )
1108           ****************************************************************
1109 ED062 0000 =aMAXMI CON(5) =DOCOL          : MAXMIN
           0
1110 ED067 0000         CON(5) =ZERO          0
           0
1111 ED06C 0000         CON(5) =MAX           MAX
           0
1112 ED071 0000         CON(5) =LIT           16
           0
1113 ED076 0100         CON(5) 16
           0
1114 ED07B 0000         CON(5) =MIN           MIN         ( * STR NUM * )
           0
1115           *
1116           * CONSTANT CAN BE IN [0,16], WHOLE INSTRUCTION INCLUDES OPCODES T
1117           *
1118 ED080 0000         CON(5) =aOPLEN        OPLEN
           0
1119 ED085 0000         CON(5) =AT            @
           0
1120 ED08A 0000         CON(5) =ADD           +
           0
1121 ED08F 0000         CON(5) =SEMI          ;           ( * STR NUM * )
           0
1122           ****************************************************************
1123           ***
1124           ***  CALCLENHEX
1125           ***
1126           *** ( -- STR NUM )
1127           *** ( CALCULATE THE LENGTH OF THE HEX EXPRESSION )
1128           ****************************************************************
1129 ED094 0000 =aCLCHX CON(5) =DOCOL          : CALCLENHEX
           0
1130 ED099 0000         CON(5) =aEXP.F        EXPRESSION.FIELD
           0
1131           *
1132           * DROP LEADING # SIGN (OPTIONAL)
```

```
1133                *
1134 ED09E 0000             CON(5) =LIT             35
          0
1135 ED0A3 3200             CON(5) \#\
          0
1136 ED0A8 0000             CON(5) =aDROPc          DROPc       ( * STR * )
          0
1137 ED0AD 0000             CON(5) =DUP             DUP         ( * STR LEN * )
          0
1138                *
1139                * TRIM STRING TO CORRECT LENGTH
1140                *
1141 ED0B2 260D             CON(5) =aMAXMI          MAXMIN
          E
1142 ED0B7 0000             CON(5) =SEMI            ;           ( * STR LEN * )
          0
1143                ****************************************************************
1144                ***
1145                ***  STORENIB
1146                ***
1147                *** ( POS CHR -- )
1148                *** ( STORE A HEXIDECIMAL CHARACTER AT OPx )
1149                ****************************************************************
1150 ED0BC 0000 =aSTNIB CON(5) =DOCOL          : STORENIB
          0
1151 ED0C1 0000             CON(5) =DUP             DUP
          0
1152                *
1153                * LOOK AT DIGIT
1154                *
1155 ED0C6 0000             CON(5) =aDIG16          ?DIGIT.16
          0
1156 ED0CB 0000             CON(5) =ZBRNH           IF          ( * POS C * )
          0
1157 ED0D0 3200             REL(5) %IF94
          0
1158                *
1159                * ENSURE A HEX DIGIT
1160                *
1161 ED0D5 0000             CON(5) =LIT             16
          0
1162 ED0DA 0100             CON(5) 16
          0
1163 ED0DF 0000             CON(5) =DIGIT           DIGIT
          0
1164 ED0E4 0000             CON(5) =DROP            DROP        ( * POS NUM * )
          0
1165 ED0E9 0000             CON(5) =BRNCH           ELSE
          0
1166 ED0EE E100             REL(5) %TH94
          0
1167                *
1168                * NON - HEX DIGIT PRESENT
1169                *
1170 ED0F3          %IF94                           ELSE        ( * POS C * )
```

```
1171 ED0F3 0000         CON(5) =DROP          DROP
           0
1172 ED0F8 0000         CON(5) =ZERO          0
           0
1173 ED0FD 0000         CON(5) =LIT           34
           0
1174 ED102 2200         CON(5) 34             'non-hexidecimal digit present'
           0
1175 ED107 0000         CON(5) =aERROR        ERROR
           0
1176            *
1177            * VALID DIGIT.  STORE INTO OP[PTR]
1178            *
1179 ED10C       %TH94                        THEN        ( * POS C * )
1180 ED10C 0000         CON(5) =SWAP          SWAP
           0
1181 ED111 0000         CON(5) =a>OPx         >OPx
           0
1182 ED116 0000         CON(5) =STORE         !
           0
1183 ED11B 0000         CON(5) =SEMI          ;           ( * * )
           0
1184            ********************************************************************
1185            ***
1186            ***  LASTCHECKHEX
1187            ***
1188            *** ( STR -- )
1189            *** ( ENSURE WE HAVE NO EXTRA HEX CHARACTERS )
1190            ********************************************************************
1191 ED120 0000 =aLSCHX CON(5) =DOCOL         : LASTCHECKHEX
           0
1192            *
1193            * STRING HAVE LENGTH ZERO (0) ?
1194            *
1195 ED125 0000         CON(5) =ZBRNH         IF
           0
1196 ED12A 4100         REL(5) %IF95
           0
1197            *
1198            * NO.  CHARACTERS STILL REMAIN
1199            *
1200 ED12F 0000         CON(5) =LIT           35
           0
1201 ED134 3200         CON(5) 35             'too many hex digits present'
           0
1202 ED139 0000         CON(5) =aERROR        ERROR
           0
1203            *
1204            * YES.  NO PROBLEM.
1205            *
1206 ED13E       %IF95                        THEN
1207 ED13E 0000         CON(5) =DROP          DROP
           0
1208 ED143 0000         CON(5) =SEMI          ;           ( * * )
           0
```

```
1209                ********************************************************************
1210                ***
1211                ***  NIBHEX
1212                ***
1213                *** ( -- [NUM] )
1214                *** ( NIBHEX STATEMENT )
1215                ********************************************************************
1216 ED148 0000 =aNIBHX CON(5) =DOCOL          : NIBHEX
          0
1217                *
1218                * CALCULATE LENGTH
1219                *
1220 ED14D 490D           CON(5) =aCLCHX        CALCLENHEX  ( * STR NUM * )
          E
1221 ED152 0F9C           CON(5) =a?PAS1        ?PASS=1
          E
1222 ED157 0000           CON(5) =ZBRNH         IF          ( * STR NUM * )
          0
1223 ED15C 9100           REL(5) %IF96
          0
1224                *
1225                * PASS 1 PROCESSING
1226                *
1227 ED161 0000           CON(5) =>R            >R
          0
1228 ED166 0000           CON(5) =2DROP         2DROP
          0
1229 ED16B 0000           CON(5) =R>            R>          ( * NUM * )
          0
1230 ED170 0000           CON(5) =SEMI          ;           ( * NUM * )
          0
1231                *
1232                * PASS 2 PROCESSING
1233                *
1234 ED175         %IF96
1235                *
1236                * SAVE OPCODE LENGTH
1237                *
1238 ED175 0000           CON(5) =DUP           DUP
          0
1239 ED17A 0000           CON(5) =aOPLEN        OPLEN
          0
1240 ED17F 0000           CON(5) =STORE         !           ( * STR NUM * )
          0
1241                *
1242                * LOOP THROUGH EACH CHARACTER
1243                *
1244 ED184 0000           CON(5) =ONE           1
          0
1245 ED189 0000           CON(5) =MAX           MAX
          0
1246 ED18E 0000           CON(5) =ZERO          0
          0
1247 ED193 0000           CON(5) =XDO           DO          ( * STR * )
          0
```

```
1248 ED198       %DO8
1249            *
1250            * EXTRACT CHARACTER & STORE IN APPROPRIATE OPCODE
1251            *
1252 ED198 0000         CON(5) =C@+            C@+
           0
1253 ED19D 0000         CON(5) =R@             I
           0
1254 ED1A2 0000         CON(5) =ONE+           1+
           0
1255 ED1A7 0000         CON(5) =SWAP           SWAP        ( * STR I C * )
           0
1256 ED1AC CB0D         CON(5) =aSTNIB         STORENIB    ( * STR * )
           E
1257 ED1B1 0000         CON(5) =XLOOP          LOOP        ( * STR * )
           0
1258 ED1B6 2EFF         REL(5) %DO8
           F
1259            *
1260            * LOOP UNTIL MAXIMUM CHARACTERS CHECKED, THEN ENSURE NONE
1261            * LEFT OVER.
1262            *
1263 ED1BB 021D         CON(5) =aLSCHX         LASTCHCKHEX ( * * )
           E
1264 ED1C0 0000         CON(5) =SEMI           ;           ( * * )
           0
1265            ********************************************************************
1266            ***
1267            ***  LCHEX
1268            ***
1269            *** ( -- [NUM] )
1270            *** ( LCHEX STATEMENT )
1271            ********************************************************************
1272 ED1C5 0000 =aLCHEX CON(5) =DOCOL          : LCHEX
           0
1273            *
1274            * CALCULATE LENGTH
1275            *
1276 ED1CA 490D         CON(5) =aCLCHX         CALCLENHEX  ( * STR LEN * )
           E
1277 ED1CF 0F9C         CON(5) =a?PAS1         ?PASS=1
           E
1278 ED1D4 0000         CON(5) =ZBRNH          IF          ( * STR LEN * )
           0
1279 ED1D9 9100         REL(5) %IF97
           0
1280            *
1281            * PASS 1 PROCESSING.
1282            *
1283 ED1DE 0000         CON(5) =>R             >R
           0
1284 ED1E3 0000         CON(5) =2DROP          2DROP
           0
1285 ED1E8 0000         CON(5) =R>             R>          ( * LEN * )
           0
```

```
1286 ED1ED 0000         CON(5) =SEMI            ;           ( * LEN * )
           0
1287               *
1288               * PASS 2 PROCESSING.
1289               *
1290 ED1F2          %IF97
1291               *
1292               * SAVE OPCODE LENGTH
1293               *
1294 ED1F2 0000         CON(5) =DUP             DUP
           0
1295 ED1F7 0000         CON(5) =aOPLEN          OPLEN
           0
1296 ED1FC 0000         CON(5) =STORE           !           ( * STR LEN * )
           0
1297               *
1298               * SET VARIABLE REVERS BECAUSE DIGITS ARE REVERSED!
1299               *
1300 ED201 0000         CON(5) =DUP             DUP
           0
1301 ED206 0000         CON(5) =aREVER          REVERS
           0
1302 ED20B 0000         CON(5) =STORE           !
           0
1303 ED210 0000         CON(5) =TWO-            2-
           0
1304 ED215 0000         CON(5) =ONE             1
           0
1305 ED21A 0000         CON(5) =MAX             MAX
           0
1306 ED21F 0000         CON(5) =ZERO            0
           0
1307 ED224 0000         CON(5) =XDO             DO          ( * STR * )
           0
1308 ED229          %DO9
1309               *
1310               * LOOP THROUGH EACH CHARACTER
1311               *
1312 ED229 0000         CON(5) =C@+             C@+
           0
1313 ED22E 0000         CON(5) =aREVER          REVERS
           0
1314 ED233 0000         CON(5) =AT              @
           0
1315 ED238 0000         CON(5) =R@              I
           0
1316               *
1317               * CALCULATE APPROPRIATE OPCODE
1318               *
1319 ED23D 0000         CON(5) =MINUS           -           ( * STR C x * )
           0
1320 ED242 0000         CON(5) =SWAP            SWAP
           0
1321               *
1322               * STORE NIBBLE AWAY
```

```
1323                *
1324 ED247 CB0D             CON(5) =aSTNIB          STORENIB    ( * STR * )
           E
1325 ED24C 0000             CON(5) =XLOOP           LOOP
           0
1326 ED251 8DFF             REL(5) %DO9
           F
1327                *
1328                * LOOP THROUGH MAXIMUM CHARACTERS ALLOWED, THEN CHECK IF
1329                * ANY LEFT OVER
1330                *
1331 ED256 021D             CON(5) =aLSCHX          LASTCHECKHEX  ( * * )
           E
1332                *
1333                * STORE LENGTH OF EXPRESSION IN OP2
1334                *
1335 ED25B 0000             CON(5) =aREVER          REVERS
           0
1336 ED260 0000             CON(5) =AT              @
           0
1337 ED265 0000             CON(5) =THREE           3
           0
1338 ED26A 0000             CON(5) =MINUS           -
           0
1339 ED26F 0000             CON(5) =ZERO            0
           0
1340 ED274 0000             CON(5) =MAX             MAX
           0
1341 ED279 F06C             CON(5) =aOP2            OP2
           E
1342 ED27E 0000             CON(5) =STORE           !           ( * * )
           0
1343 ED283 0000             CON(5) =SEMI            ;           ( * * )
           0
1344                ********************************************************************
1345                ***
1346                ***  Dx=HEX
1347                ***
1348                *** ( -- )
1349                *** ( D0=HEX AND D1=HEX STATEMENTS )
1350                ********************************************************************
1351 ED288 0000 =Dx=HX  CON(5) =DOCOL          : Dx=HEX
           0
1352 ED28D 0000             CON(5) =aEXP.F          EXPRESSION.FIELD
           0
1353                *
1354                * DROP LEADING # (OPTIONAL)
1355                *
1356 ED292 0000             CON(5) =LIT             35
           0
1357 ED297 3200             CON(5) \#\
           0
1358 ED29C 0000             CON(5) =aDROPc          DROPc       ( * STR * )
           0
1359                *
```

```
1360            * STORE FIRST CHARACTER IN OP4
1361            *
1362 ED2A1 0000         CON(5) =C@+            C@+
           0
1363 ED2A6 0000         CON(5) =LIT            4
           0
1364 ED2AB 4000         CON(5) 4
           0
1365 ED2B0 0000         CON(5) =SWAP           SWAP
           0
1366 ED2B5 CB0D         CON(5) =aSTNIB         STORENIB    ( * STR * )
           E
1367            *
1368            * STORE SECOND CHARACTER IN OP3
1369            *
1370 ED2BA 0000         CON(5) =C@+            C@+
           0
1371 ED2BF 0000         CON(5) =THREE          3
           0
1372 ED2C4 0000         CON(5) =SWAP           SWAP
           0
1373 ED2C9 CB0D         CON(5) =aSTNIB         STORENIB    ( * STR * )
           E
1374            *
1375            * ENSURE NO EXTRA CHARACTERS
1376            *
1377 ED2CE 021D         CON(5) =aLSCHX         LASTCHECKHEX
           E
1378 ED2D3 0000         CON(5) =SEMI           ;           ( * * )
           0
1379            ***************************************************************
1380            ***
1381            ***  LASTCHR
1382            ***
1383            *** ( STR -- STR C )
1384            *** ( GET A COPY OF THE LAST CHARACTER OF THE STRING )
1385            ***************************************************************
1386 ED2D8 0000 =aLSTCH CON(5) =DOCOL         : LASTCHR
           0
1387 ED2DD 0000         CON(5) =DUP            DUP         ( * STR LEN * )
           0
1388 ED2E2 0000         CON(5) =ZBRNH          IF          ( * STR * )
           0
1389 ED2E7 3200         REL(5) %IF104
           0
1390            *
1391            * GO TO END OF STRING AND GET THAT CHARACTER
1392            *
1393 ED2EC 0000         CON(5) =2DUP           2DUP
           0
1394 ED2F1 0000         CON(5) =ONE-           1-
           0
1395 ED2F6 0000         CON(5) =TWO*           2*
           0
1396 ED2FB 0000         CON(5) =ADD            +
```

```
          0
1397 ED300 0000         CON(5) =CAT             C@
          0
1398 ED305 0000         CON(5) =SEMI            ;           ( * STR C * )
          0
1399              *
1400              * NULL LENGTH STRING
1401              *
1402 ED30A         %IF104                       ELSE        ( * STR * )
1403 ED30A 0000         CON(5) =ZERO            0
          0
1404 ED30F 0000         CON(5) =SEMI            ;           ( * STR C * )
          0
1405              ********************************************************************
1406              ***
1407              ***  QUOTED.STRING
1408              ***
1409              *** ( STR -- STR )
1410              *** ( REMOVE SINGLE QUOTE MARKS FROM FRONT AND BACK )
1411              ********************************************************************
1412 ED314 0000 =aQ"STR CON(5) =DOCOL          : QUOTED.STRING
          0
1413              *
1414              * LOOK AT FIRST CHARACTER
1415              *
1416 ED319 0000         CON(5) =OVER            OVER
          0
1417 ED31E 0000         CON(5) =CAT             C@
          0
1418 ED323 0000         CON(5) =LIT             39
          0
1419 ED328 7200         CON(5) \'\
          0
1420 ED32D 0000         CON(5) =EQUAL           =
          0
1421 ED332 0000         CON(5) =OVER            OVER
          0
1422 ED337 0000         CON(5) =AND             AND         ( * STR F * )
          0
1423 ED33C 0000         CON(5) =DUP             DUP
          0
1424              *
1425              * SAVE FLAG ON RETURN STACK
1426              *
1427 ED341 0000         CON(5) =>R              >R
          0
1428 ED346 0000         CON(5) =ZBRNH           IF          ( * STR * )
          0
1429 ED34B F000         REL(5) %IF99
          0
1430              *
1431              * FIRST CHARACTER IS A '
1432              *
1433 ED350 0000         CON(5) =C@+             C@+
          0
```

```
1434 ED355 0000         CON(5) =DROP            DROP        ( * STR * )
           0
1435            *
1436            * LOOK AT LAST CHARACTER
1437            *
1438 ED35A       %IF99                          THEN        ( * STR * )
1439 ED35A 8D2D         CON(5) =aLSTCH          LASTCHR
           E
1440 ED35F 0000         CON(5) =LIT             39
           0
1441 ED364 7200         CON(5) \'\
           0
1442 ED369 0000         CON(5) =EQUAL           =           ( * STR F * )
           0
1443 ED36E 0000         CON(5) =DUP             DUP
           0
1444            *
1445            * SAVE FLAG ON RETURN STACK
1446            *
1447 ED373 0000         CON(5) =>R              >R
           0
1448 ED378 0000         CON(5) =ZBRNH           IF          ( * STR * )
           0
1449 ED37D A000         REL(5) %IF100
           0
1450            *
1451            * LAST CHARACTER IS A '
1452            *
1453 ED382 0000         CON(5) =ONE-            1-
           0
1454            *
1455            * LOOK AT FLAGS.  IF EITHER FALSE, THEN REPORT ERROR
1456            *
1457 ED387       %IF100                         THEN        ( * STR * )
1458 ED387 0000         CON(5) =R>              R>
           0
1459 ED38C 0000         CON(5) =R>              R>          ( * STR F F' * )
           0
1460 ED391 0000         CON(5) =AND             AND
           0
1461 ED396 0000         CON(5) =ZEQ             0=
           0
1462 ED39B 0000         CON(5) =ZBRNH           IF          ( * STR * )
           0
1463 ED3A0 4100         REL(5) %IF98
           0
1464 ED3A5 0000         CON(5) =LIT             24
           0
1465 ED3AA 8100         CON(5) 24               'invalid quoted string'
           0
1466 ED3AF 0000         CON(5) =aP2ERR          PASS 2 ERROR
           0
1467            *
1468            * ALL DONE]
1469            *
```

```
ED3B4        %IF98                          THEN        ( * STR * )
ED3B4 0000          CON(5) =SEMI            ;           ( * STR * )
      0
             ******************************************************************
             ***
             ***  TRIM.BLANKS
             ***
             *** ( STR -- STR )
             *** ( TRIM LEADING & TRAILING SPACES.  IGNORE CHARS AFTER )
             *** ( ANY INTERNAL SPACE )
             ******************************************************************
ED3B9 0000 =aTRIM  CON(5) =DOCOL           : TRIM.BLANKS
      0
             *
             * TACK A TRAILING ZERO ON STRING, SO ENCLOSE SUCCEEDS IN THAT CAS
             *
ED3BE 0000          CON(5) =TWO*            2*          ( * ADDR NIBS * )
      0
ED3C3 0000          CON(5) =OVER            OVER        ( * ADDR NIBS ADDR * )
      0
ED3C8 0000          CON(5) =ADD             +           ( * ADDR ADDR' * )
      0
ED3CD 0000          CON(5) =ZERO            0
      0
ED3D2 0000          CON(5) =SWAP            SWAP        ( * ADDR 0 ADDR' * )
      0
ED3D7 0000          CON(5) =C!              C!          ( * ADDR * )
      0
ED3DC 0000          CON(5) =LIT             32
      0
ED3E1 0200          CON(5) 32
      0
             *
             * ENCLOSE STRING USING BLANKS AS DELIMITER
             *
ED3E6 0000          CON(5) =ENCL            ENCLOSE     ( * ADDR N1 N2 N3 * )
      0
             *
             * CALCULATE RESULTING STRING
             *   ADDR = ADDR + N1
             *   LEN = (N1 - MIN(N2,N3))/2
             *
ED3EB 0000          CON(5) =MIN             MIN         ( * ADDR N1 N2 * )
      0
ED3F0 0000          CON(5) =OVER            OVER        ( * ADDR N1 N2 N1 * )
      0
ED3F5 0000          CON(5) =MINUS           -
      0
ED3FA 0000          CON(5) =TWO/            2/          ( * ADDR N1 LEN * )
      0
ED3FF 0000          CON(5) =>R              >R          ( * ADDR N1 * )
      0
ED404 0000          CON(5) =ADD             +           ( * ADDR * )
      0
ED409 0000          CON(5) =R>              R>          ( * STR * )
```

```
          0
ED40E 0000          CON(5) =SEMI          ;           ( * STR * )
          0
              ****************************************************************
              ***
              ***  CALCLENASC
              ***
              *** ( -- STR LEN )
              *** ( CALCULATE THE LENGTH OF THE ASCII EXPRESSION )
              ****************************************************************
ED413 0000 =aCLCFF CON(5) =DOCOL          : CALCLENASC
          0
ED418 0000          CON(5) =aEXP.F        EXPRESSION  ( * STR * )
          0
ED41D 413D          CON(5) =aQ"STR        QUOTED      ( * STR * )
          E
ED422 0000          CON(5) =DUP           DUP
          0
ED427 0000          CON(5) =TWO*          2*
          0
ED42C 260D          CON(5) =aMAXMI        MAXMIN
          E
ED431 0000          CON(5) =SEMI          ;           ( * STR LEN * )
          0
              ****************************************************************
              ***
              ***  STARTLOOP
              ***
              *** ( STR LEN -- STR HIGH LOW )
              *** ( START THE CHARACTER BY CHARACTER LOOP )
              ****************************************************************
ED436 0000 =aSTLUP CON(5) =DOCOL          : STARTLOOP
          0
ED43B 0000          CON(5) =DUP           DUP
          0
ED440 0000          CON(5) =aOPLEN        OPLEN
          0
ED445 0000          CON(5) =STORE         !           ( * STR LEN * )
          0
ED44A 0000          CON(5) =aREVER        REVERS
          0
ED44F 0000          CON(5) =STORE         !
          0
              *
              * ENSURE NULL STRING NOT PRESENT
              *
ED454 0000          CON(5) =DUP           DUP
          0
ED459 0000          CON(5) =ZEQ           0=
          0
ED45E 0000          CON(5) =ZBRNH         IF
          0
ED463 4100          REL(5) %IF58
          0
ED468 0000          CON(5) =LIT           39
```

```
           0
1544 ED46D 7200         CON(5) 39              'illegal expression'
           0
1545 ED472 0000         CON(5) =aERROR         ERROR
           0
1546 ED477       %IF58                         THEN        ( * STR * )
1547            *
1548            * SET UP LOOP PARAMETERS
1549            *
1550 ED477 0000         CON(5) =DUP            DUP         ( * STR LEN * )
           0
1551 ED47C 0000         CON(5) =LIT            8
           0
1552 ED481 8000         CON(5) 8
           0
1553 ED486 0000         CON(5) =MIN            MIN
           0
1554 ED48B 0000         CON(5) =ONE            1
           0
1555 ED490 0000         CON(5) =MAX            MAX
           0
1556 ED495 0000         CON(5) =ZERO           0
           0
1557 ED49A 0000         CON(5) =SEMI           ;           ( * STR HIGH LOW * )
           0
1558            ********************************************************************
1559            ***
1560            ***  LASTCHECKASC
1561            ***
1562            *** ( STR -- )
1563            *** ( ENSURE NO TRAILING CHARACTERS IN QUOTED STRING )
1564            ********************************************************************
1565 ED49F 0000 =aLSCFF CON(5) =DOCOL          : LASTCHECKASC
           0
1566            *
1567            * NULL STRING ?
1568            *
1569 ED4A4 0000         CON(5) =ZBRNH          IF
           0
1570 ED4A9 4100         REL(5) %IF101
           0
1571            *
1572            * NO.  REPORT ERROR
1573            *
1574 ED4AE 0000         CON(5) =LIT            36
           0
1575 ED4B3 4200         CON(5) 36              'too many ascii chars present'
           0
1576 ED4B8 0000         CON(5) =aERROR         ERROR
           0
1577            *
1578            * YES.  ALL OK
1579            *
1580 ED4BD       %IF101                        THEN
1581 ED4BD 0000         CON(5) =DROP           DROP
```

```
          0
1582 ED4C2 0000         CON(5) =SEMI            ;           ( * * )
          0
1583                ***************************************************************
1584                ***
1585                ***  NIBASC
1586                ***
1587                *** ( -- [NUM] )
1588                *** ( NIBASC STATEMENT )
1589                ***************************************************************
1590 ED4C7 0000 -aNIBFF CON(5) -DOCOL            : NIBASC
          0
1591                *
1592                * CALCULATE LENGTH OF INSTRUCTION
1593                *
1594 ED4CC 314D         CON(5) =aCLCFF          CALCLENASC  ( * STR LEN * )
          E
1595 ED4D1 0F9C         CON(5) =a?PAS1          ?PASS=1
          E
1596 ED4D6 0000         CON(5) =ZBRNH           IF          ( * STR LEN * )
          0
1597 ED4DB 9100         REL(5) %IF102
          0
1598                *
1599                * PASS 1 PROCESSING
1600                *
1601 ED4E0 0000         CON(5) =>R              >R
          0
1602 ED4E5 0000         CON(5) =2DROP           2DROP
          0
1603 ED4EA 0000         CON(5) =R>              R>          ( * NUM * )
          0
1604 ED4EF 0000         CON(5) =SEMI            ;           ( * NUM * )
          0
1605                *
1606                * PASS 2 PROCESSING
1607                *
1608 ED4F4       %IF102                         ELSE        ( * NUM * )
1609 ED4F4 634D         CON(5) =aSTLUP          STARTLOOP
          E
1610 ED4F9 0000         CON(5) =XDO             DO          ( * STR * )
          0
1611                *
1612                * LOOP THROUGH EACH CHARACTER IN EXPRESSION FIELD
1613                *
1614 ED4FE       %DO10
1615 ED4FE 0000         CON(5) =C@+             C@+
          0
1616                *
1617                * CALCULATE LEAST SIGNIFICANT NIBBLE
1618                *
1619 ED503 0000         CON(5) =DUP             DUP         ( * STR C C * )
          0
1620 ED508 0000         CON(5) =LIT             16
          0
```

```
1621 ED50D 0100          CON(5) 16
           0
1622 ED512 0000          CON(5) =/              /
           0
1623 ED517 0000          CON(5) =DUP            DUP          ( * STR C N N * )
           0
1624             *
1625             * CALCULATE OPCODE NIBBLE ADDRESS
1626             *
1627 ED51C 0000          CON(5) =R@             I
           0
1628 ED521 0000          CON(5) =ONE+           1+
           0
1629 ED526 0000          CON(5) =TWO*           2*           ( * STR C N N PTR * )
           0
1630 ED52B 0000          CON(5) =a>OPx          >OPx
           0
1631             *
1632             * SAVE POSITION ON RETURN STACK
1633             *
1634 ED530 0000          CON(5) =DUP            DUP
           0
1635 ED535 0000          CON(5) =>R             >R
           0
1636             *
1637             * STORE LEAST SIGNIFICANT NIBBLE
1638             *
1639 ED53A 0000          CON(5) =STORE          !            ( * STR C N * )
           0
1640 ED53F 0000          CON(5) =LIT            16
           0
1641 ED544 0100          CON(5) 16
           0
1642 ED549 0000          CON(5) =MULT           *
           0
1643 ED54E 0000          CON(5) =MINUS          -            ( * STR N * )
           0
1644             *
1645             * STORE MOST SIGNIFICANT NIBBLE
1646             *
1647 ED553 0000          CON(5) =R>             R>
           0
1648 ED558 0000          CON(5) =FIVE-          5-
           0
1649 ED55D 0000          CON(5) =STORE          !            ( * STR * )
           0
1650 ED562 0000          CON(5) =XLOOP          LOOP         ( * STR * )
           0
1651 ED567 79FF          REL(5) %0010
           F
1652 ED56C F94D          CON(5) =aLSCFF         LASTCHECKASC
           E
1653 ED571 0000          CON(5) =SEMI           ;            ( * * )
           0
1654             ********************************************************************
```

```
1655            ***
1656            ***  LCASC
1657            ***
1658            *** ( -- [NUM] )
1659            *** ( LCASC STATEMENT )
1660            ********************************************************************
1661 ED576 0000 =aLCASC CON(5) =DOCOL          : LCASC
           0
1662            *
1663            * CALCULATE LENGTH OF INSTRUCTION
1664            *
1665 ED57B 314D         CON(5) =aCLCFF         CALCLENASC  ( * STR LEN * )
           E
1666 ED580 0F9C         CON(5) =a?PAS1         ?PASS=1
           E
1667 ED585 0000         CON(5) =ZBRNH          IF          ( * STR LEN * )
           0
1668 ED58A 9100         REL(5) %IF103
           0
1669            *
1670            * PASS 1 PROCESSING
1671            *
1672 ED58F 0000         CON(5) =>R             >R
           0
1673 ED594 0000         CON(5) =2DROP          2DROP
           0
1674 ED599 0000         CON(5) =R>             R>          ( * NUM * )
           0
1675 ED59E 0000         CON(5) =SEMI           ;           ( * NUM * )
           0
1676            *
1677            * PASS 2 PROCESSING
1678            *
1679 ED5A3       %IF103                                    ( * NUM * )
1680 ED5A3 634D         CON(5) =aSTLUP         STARTLOOP
           E
1681 ED5A8 0000         CON(5) =XDO            DO          ( * STR * )
           0
1682            *
1683            * LOOP THROUGH EACH CHARACTER
1684            *
1685 ED5AD       %DO11
1686 ED5AD 0000         CON(5) =C@+            C@+
           0
1687            *
1688            * CALCULATE LEAST SIGNIFICANT NIBBLE
1689            *
1690 ED5B2 0000         CON(5) =DUP            DUP         ( * STR C C * )
           0
1691 ED5B7 0000         CON(5) =LIT            16
           0
1692 ED5BC 0100         CON(5) 16
           0
1693 ED5C1 0000         CON(5) =/              /
           0
```

```
1694                *
1695                * CALCULATE OPCODE POSITION
1696                *
1697 ED5C6 0000        CON(5) =DUP          DUP
           0
1698 ED5CB 0000        CON(5) =aREVER       REVERS
           0
1699 ED5D0 0000        CON(5) =AT           @          ( * STR C N N MAX * )
           0
1700 ED5D5 0000        CON(5) =R@           I
           0
1701 ED5DA 0000        CON(5) =TWO*         2*
           0
1702 ED5DF 0000        CON(5) =MINUS        -
           0
1703 ED5E4 0000        CON(5) =LIT          4
           0
1704 ED5E9 4000        CON(5) 4
           0
1705 ED5EE 0000        CON(5) =MAX          MAX
           0
1706 ED5F3 0000        CON(5) =a>OPx        >OPx       ( * STR C N N PTR * )
           0
1707                *
1708                * SAVE OPCODE POSITION ON RETURN STACK
1709                *
1710 ED5F8 0000        CON(5) =DUP          DUP
           0
1711 ED5FD 0000        CON(5) =>R           >R
           0
1712                *
1713                * STORE LEAST SIGNIFICANT NIBBLE
1714                *
1715 ED602 0000        CON(5) =STORE        !          ( * STR C N * )
           0
1716                *
1717                * CALCULATE MOST SIGNIFICANT NIBBLE
1718                *
1719 ED607 0000        CON(5) =LIT          16
           0
1720 ED60C 0100        CON(5) 16
           0
1721 ED611 0000        CON(5) =MULT         *
           0
1722 ED616 0000        CON(5) =MINUS        -
           0
1723                *
1724                * STORE MOST SIGNIFICANT NIBBLE
1725                *
1726 ED61B 0000        CON(5) =R>           R>
           0
1727 ED620 0000        CON(5) =FIVE-        5-
           0
1728 ED625 0000        CON(5) =STORE        !          ( * STR * )
           0
```

```
1729 ED62A 0000          CON(5) =XLOOP          LOOP          ( * STR * )
           0
1730 ED62F E7FF          REL(5) %DO11
           F
1731              *
1732              * ENSURE NO EXTRA CHARACTERS
1733              *
1734 ED634 F94D          CON(5) =aLSCFF         LASTCHEKASC ( * * )
           E
1735              *
1736              * STORE CONSTANT LENGTH IN OP2
1737              *
1738 ED639 0000          CON(5) =aREVER         REVERS
           0
1739 ED63E 0000          CON(5) =AT             @
           0
1740 ED643 0000          CON(5) =THREE          3
           0
1741 ED648 0000          CON(5) =MINUS          -
           0
1742 ED64D 0000          CON(5) =ZERO           0
           0
1743 ED652 0000          CON(5) =MAX            MAX
           0
1744 ED657 F06C          CON(5) =aOP2           OP2
           E
1745 ED65C 0000          CON(5) =STORE          !             ( * * )
           0
1746 ED661 0000          CON(5) =SEMI           ;             ( * * )
           0
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
1747                    STITLE FIT STATS
1748            zSIZE   EQU    (*)-zTHIS
1749            zLEFT   EQU    (zNEXT)-*
1750 ED666              BSS    zLEFT
1751 ED700              END
```

$RANGE	Abs	969040	#EC950 -	379	378
%DO10	Abs	972030	#ED4FE -	1614	1651
%DO11	Abs	972205	#ED5AD -	1685	1730
%DO7	Abs	969135	#EC9AF -	441	458
%DO8	Abs	971160	#ED198 -	1248	1258
%DO9	Abs	971305	#ED229 -	1308	1326
%IF100	Abs	971655	#ED387 -	1457	1449
%IF101	Abs	971965	#ED4BD -	1580	1570
%IF102	Abs	972020	#ED4F4 -	1608	1597
%IF103	Abs	972195	#ED5A3 -	1679	1668
%IF104	Abs	971530	#ED30A -	1402	1389
%IF58	Abs	971895	#ED477 -	1546	1542
%IF59	Abs	968488	#EC728 -	155	147
%IF60	Abs	968539	#EC75B -	171	163
%IF61	Abs	968636	#EC7BC -	202	194
%IF62	Abs	968687	#EC7EF -	218	210
%IF63	Abs	968738	#EC822 -	234	226
%IF64	Abs	968789	#EC855 -	250	242
%IF65	Abs	968585	#EC789 -	186	179
%IF66	Abs	968837	#EC885 -	265	258
%IF67	Abs	968885	#EC8B5 -	280	273
%IF68	Abs	969405	#ECABD -	542	494
%IF69	Abs	969315	#ECA63 -	516	503
%IF70	Abs	969400	#ECAB8 -	537	532
%IF71	Abs	969495	#ECB17 -	581	557
%IF72	Abs	969485	#ECB0D -	575	566
%IF73	Abs	969740	#ECC0C -	650	588
%IF74	Abs	969625	#ECB99 -	623	594
%IF75	Abs	969850	#ECC7A -	695	669
%IF76	Abs	969830	#ECC66 -	687	675
%IF77	Abs	969925	#ECCC5 -	728	718
%IF78	Abs	970040	#ECD38 -	776	736
%IF79	Abs	969995	#ECD0B -	756	747
%IF80	Abs	970070	#ECD56 -	786	772
%IF81	Abs	970140	#ECD9C -	818	808
%IF82	Abs	970180	#ECDC4 -	843	833
%IF83	Abs	970240	#ECE00 -	872	862
%IF84	Abs	970310	#ECE46 -	904	891
%IF85	Abs	970370	#ECE82 -	933	923
%IF86	Abs	970435	#ECEC3 -	963	952
%IF87	Abs	970565	#ECF45 -	1013	983
%IF88	Abs	970550	#ECF36 -	1006	997
%IF89	Abs	970770	#ED012 -	1076	1019
%IF90	Abs	970655	#ECF9F -	1039	1025
%IF91	Abs	970750	#ECFFE -	1068	1045
%IF92	Abs	970825	#ED049 -	1096	1079
%IF94	Abs	970995	#ED0F3 -	1170	1157
%IF95	Abs	971070	#ED13E -	1206	1196
%IF96	Abs	971125	#ED175 -	1234	1223
%IF97	Abs	971250	#ED1F2 -	1290	1279
%IF98	Abs	971700	#ED3B4 -	1470	1463
%IF99	Abs	971610	#ED35A -	1438	1429
%TH59	Abs	968890	#EC8BA -	290	151
%TH60	Abs	968890	#EC8BA -	289	167
%TH61	Abs	968890	#EC8BA -	288	198

```
%TH62   Abs  968890 #EC8BA -   287   214
%TH63   Abs  968890 #EC8BA -   286   230
%TH64   Abs  968890 #EC8BA -   285   246
%TH65   Abs  968890 #EC8BA -   284   182
%TH66   Abs  968890 #EC8BA -   283   261
%TH67   Abs  968890 #EC8BA -   282   276
%TH79   Abs  970010 #ECD1A -   763   751
%TH94   Abs  971020 #ED10C -  1179  1166
/       Ext         -  1622  1693
2DROP   Ext         -   295  1228  1284  1602  1673
2DUP    Ext         -   140   156   172   187   203   219   235   251
                        266  1393
>R      Ext         -   294  1227  1283  1427  1447  1505  1601  1635
                       1672  1711
?DUP    Ext         -   492   586   667  1017
ADD     Ext         -    42    53   435   509   612   634   682   764
                       1120  1396  1486  1506
AND     Ext         -    65   337   366   716  1422  1460
AT      Ext         -    64   473   508   528   605   609   628   713
                        741   749   758   769   778   780   805   897
                       1119  1314  1336  1699  1739
BRNCH   Ext         -   150   166   181   197   213   229   245   260
                        275   750  1165
C!      Ext         -  1489
C@+     Ext         -  1252  1312  1362  1370  1433  1615  1686
CAT     Ext         -  1397  1417
DIGIT   Ext         -  1163
DOCOL   Ext         -    21    29    38    49    62    74    85    96
                        108   120   132   305   316   346   433   471
                        484   554   662   707   799   827   856   885
                        917   946   976  1109  1129  1150  1191  1216
                       1272  1351  1386  1412  1480  1516  1530  1565
                       1590  1661
DROP    Ext         -   462   600   787   844   873   905   937   967
                       1030  1051  1100  1164  1171  1207  1434  1581
DUP     Ext         -   321   354   445   498   589   629   637   670
                        987  1020  1040  1137  1151  1238  1294  1300
                       1387  1423  1443  1519  1531  1539  1550  1619
                       1623  1634  1690  1697  1710
=Dx=HX  Abs  971400 #ED288 -  1351
ENCL    Ext         -  1495
EQUAL   Ext         -   475   501   530   564   592   640   673   990
                        994  1023  1043  1420  1442
FAIL    Abs  969102 #EC98E -   423   407   418
FIVE+   Ext         -    31
FIVE-   Ext         -  1648  1727
GT      Ext         -   326
GTZ     Ext         -   355
LIT     Ext         -    40    51    97   109   121   148   164   195
                        211   227   243   331   360   447   499   517
                        533   543   562   590   610   632   641   651
                        671   680   696   722   788   812   845   874
                        906   934   964   988   992  1007  1021  1034
                       1041  1055  1059  1085  1097  1112  1134  1161
                       1173  1200  1356  1363  1418  1440  1464  1490
```

				1543	1551	1574	1620	1640	1691	1703	1719	
LT	Ext		-	333	362							
LTZ	Ext		-	446								
MAX	Ext		-	1111	1245	1305	1340	1555	1705	1743		
MIN	Ext		-	1114	1501	1553						
MINUS	Ext		-	1319	1338	1503	1643	1702	1722	1741		
MULT	Ext		-	643	1642	1721						
ONE	Ext		-	75	180	474	1244	1304	1554			
ONE+	Ext		-	1254	1628							
ONE-	Ext		-	521	624	630	688	759	956	1069	1089	
				1394	1453							
OR	Ext		-	995								
OVER	Ext		-	327	356	434	1416	1421	1485	1502		
POS	Abs	969081 #EC979	-	406	401							
PSTOR	Ext		-	536	645	1062	1088					
QUOTC	Ext		-	141	157	173	188	204	220	236	252	
				267								
R>	Ext		-	296	1229	1285	1458	1459	1507	1603	1647	
				1674	1726							
R@	Ext		-	454	1253	1315	1627	1700				
S=	Ext		-	145	161	177	192	208	224	240	256	
				271								
SEMI	Ext		-	23	32	43	54	66	77	88	100	
				112	124	297	308	338	367	463	476	
				512	538	546	571	577	615	646	654	
				691	699	782	791	819	839	848	868	
				877	900	909	929	938	959	968	1002	
				1009	1038	1063	1072	1092	1101	1121	1142	
				1183	1208	1230	1264	1286	1343	1378	1398	
				1404	1471	1508	1522	1557	1582	1604	1653	
				1675	1746							
SHIFT	Abs	969087 #EC97F	-	411	413							
STORE	Ext		-	456	511	520	523	603	607	614	626	
				636	690	838	867	899	928	958	1033	
				1037	1054	1058	1071	1091	1182	1240	1296	
				1302	1342	1533	1535	1639	1649	1715	1728	
				1745								
SUCC	Abs	969100 #EC98C	-	422								
SWAP	Ext		-	436	453	991	1180	1255	1320	1365	1372	
				1488								
THREE	Ext		-	259	576	1001	1031	1052	1337	1371	1740	
TWO	Ext		-	86	274	529	570	601				
TWO*	Ext		-	639	1395	1484	1520	1629	1701			
TWO-	Ext		-	1303								
TWO/	Ext		-	631	638	1504						
UDIV	Ext		-	449								
XDO	Ext		-	437	1247	1307	1610	1681				
XLOOP	Ext		-	457	1257	1325	1650	1729				
ZBRNH	Ext		-	146	162	178	193	209	225	241	257	
				272	493	502	531	556	565	587	593	
				668	674	717	735	746	771	807	832	
				861	890	922	951	982	996	1018	1024	
				1044	1078	1156	1195	1222	1278	1388	1428	
				1448	1462	1541	1569	1596	1667			
ZEQ	Ext		-	714	734	806	1461	1540				

```
 ZERO    Ext                  -   281  1110  1172  1246  1306  1339  1403  1487
                                 1556  1742
 a>OPx   Ext                  -   455   898  1181  1630  1706
=a?PAS1  Abs  969200 #EC9F0  -   471   555   981  1221  1277  1595  1666
 aARGRP  Ext                  -   608   627
=aBRANC  Abs  969870 #ECC8E  -   707
=aCLCFF  Abs  971795 #ED413  -  1516  1594  1665
=aCLCHX  Abs  970900 #ED094  -  1129  1220  1276
=aDATAT  Abs  970460 #ECEDC  -   976
 aDIG16  Ext                  -  1155
=aDPARI  Abs  970395 #ECE9B  -   946
 aDROPc  Ext                  -  1136  1358
 aERROR  Ext                  -   545   653   698   724   790   814   847   876
                                  908   936   966  1099  1175  1202  1545  1576
 aEXP.F  Ext                  -   136   306  1130  1352  1517
=aEXP15  Abs  968930 #EC8E2  -   316   831   860   889   921
=aEXP16  Abs  968985 #EC919  -   346   950  1077
=aEXPR   Abs  968910 #EC8CE  -   305   320   350   729
 aEXPRS  Ext                  -   307
 aFILEN  Ext                  -   768   779
 aFILMK  Ext                  -   757   777
=aFILOP  Abs  969110 #EC996  -   433   781
=aFS     Abs  968427 #EC6EB  -   132   488   561   582   663   980
=aGFLAG  Abs  968287 #EC65F  -    62    76    87    99   111   123
=aISABS  Abs  968377 #EC6B9  -   108   733
=aISGSB  Abs  968402 #EC6D2  -   120   745
=aISGYS  Abs  968352 #EC6A0  -    96   715
 aLC     Ext                  -   740
=aLCASC  Abs  972150 #ED576  -  1661
=aLCHEX  Abs  971205 #ED1C5  -  1272
=aLENST  Abs  968312 #EC678  -    74
=aLSCFF  Abs  971935 #ED49F  -  1565  1652  1734
=aLSCHX  Abs  971040 #ED120  -  1191  1263  1331  1377
=aLSTCH  Abs  971480 #ED2D8  -  1386  1439
 aLSTRQ  Ext                  -   712   804
=aMAXMI  Abs  970850 #ED062  -  1109  1141  1521
 aNEG1   Ext                  -   325
=aNIBFF  Abs  971975 #ED4C7  -  1590
=aNIBHX  Abs  971080 #ED148  -  1216
 aOP     Ext                  -    22    30    39    50
=aOP1    Abs  968192 #EC600  -    21   519   613   635
=aOP2    Abs  968207 #EC60F  -    29   510   522   535   606   625   644  1036
                                 1057  1341  1744
=aOP3    Abs  968227 #EC623  -    38   604   689   837   866   927   957  1061
                                 1087
=aOP4    Abs  968257 #EC641  -    49  1070  1090
 aOPFLG  Ext                  -    63
 aOPLEN  Ext                  -   602   748   896  1032  1053  1118  1239  1295
                                 1532
 aP2ERR  Ext                  -  1466
 aPASS   Ext                  -   472
=aPTRTE  Abs  970145 #ECDA1  -   827
=aQ"STR  Abs  971540 #ED314  -  1412  1518
=aRANGE  Abs  969035 #EC94B  -   378   770
=aREGAR  Abs  969425 #ECAD1  -   554
```

```
=aREGLO  Abs  969760 #ECC20 -   662
 aREGRP  Ext                -   507   527
=aREGTE  Abs  969230 #ECA0E -   484
 aREVER  Ext                -  1301  1313  1335  1534  1698  1738
=aRQYES  Abs  968332 #EC68C -    85
=aRTNYS  Abs  970095 #ECD6F -   799
=aSETPT  Abs  970265 #ECE19 -   885
=aSETST  Abs  970335 #ECE5F -   917
=aSTATT  Abs  970205 #ECDDD -   856
=aSTLUP  Abs  971830 #ED436 -  1530  1609  1680
=aSTNIB  Abs  970940 #ED0BC -  1150  1256  1324  1366  1373
=aTRIM   Abs  971705 #ED3B9 -  1480
 zLEFT   Abs     154 #0009A -  1749  1750
 zNEXT   Abs  972544 #ED700 -     5  1749
 zSIZE   Abs    4198 #01066 -  1748
 zTHIS   Abs  968192 #EC600 -     4  1748
```

Input Parameters

Source file name is GN&AS5

Listing file name is GN/AS5::65

Object file name is GN%AS5::65

```
                                  111111
                        0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

```
 1                      TITLE  AS6:_FORTH_ASSEMBLER_PSEUDO-OPS
 2                      RDSYMB MR%GTO
 3 ED700                ABS    #ED700
 4              zTHIS   EQU    *
 5              zNEXT   EQU    #EEF00
 6
 7              ********************************************************
 8              ***
 9              *** MR&AS6      <840504.1037>
10              ***
11              ***
12              ***  FORTH ASSEMBLER
13              ***  PSEUDO OPS:  CONTROL, CONSTANT, AND MACRO EXPANSION
14              ***
15              ********************************************************
16              ********************************************************************
17              ***
18              ***  BSS
19              ***
20              *** ( -- [NUM] )
21              *** ( BLOCK OF ZEROS )
22              ********************************************************************
23 ED700 0000 =aBSS    CON(5) =DOCOL          : BSS
          0
24 ED705 0000          CON(5) =aEXPR          EXPR          ( * NUM * )
          0
25 ED70A 0000          CON(5) =a?PAS1         ?PASS=1
          0
26 ED70F 0000          CON(5) =ZBRNH          IF            ( * NUM * )
          0
27 ED714 F000          REL(5) %IF104
          0
28              *
29              * PASS 1 PROCESSING
30              *
31 ED719 0000          CON(5) =ABS            ABS           ( * NUM * )
          0
32 ED71E 0000          CON(5) =SEMI           ;             ( * NUM * )
          0
33              *
34              * PASS 2 PROCESSING
35              *
36 ED723        %IF104                        ELSE          ( * NUM * )
37 ED723 0000          CON(5) =DUP            DUP
          0
38 ED728 0000          CON(5) =LTZ            0<            ( * NUM F * )
          0
39 ED72D 0000          CON(5) =ZBRNH          IF            ( * NUM * )
          0
40 ED732 9100          REL(5) %IF151
          0
41              *
42              * NEGATIVE BSS GIVEN.  REPORT ERROR & TAKE ABSOLUTE VALUE
43              *
44 ED737 0000          CON(5) =ABS            ABS           ( * NUM * )
```

```
          0
45 ED73C 0000         CON(5) =LIT           39
          0
46 ED741 7200         CON(5) 39             'illegal expression'
          0
47 ED746 0000         CON(5) =aERROR        ERROR       ( * NUM * )
          0
48                *
49                * SAVE OPCODE LENGTH
50                *
51 ED74B         %IF151                     THEN        ( * NUM * )
52 ED74B 0000         CON(5) =DUP           DUP
          0
53 ED750 0000         CON(5) =aOPLEN        OPLEN
          0
54 ED755 0000         CON(5) =STORE         !           ( * NUM * )
          0
55                *
56                * PUT ZERO IN (AT MOST 18) OPCODES
57                *
58 ED75A 0000         CON(5) =LIT           18
          0
59 ED75F 2100         CON(5) 18
          0
60 ED764 0000         CON(5) =MIN           MIN
          0
61 ED769 0000         CON(5) =ONE           1
          0
62 ED76E 0000         CON(5) =MAX           MAX
          0
63 ED773 0000         CON(5) =ZERO          0
          0
64 ED778 0000         CON(5) =XDO           DO          ( * * )
          0
65 ED77D         %DO12
66 ED77D 0000         CON(5) =ZERO          0
          0
67 ED782 0000         CON(5) =R@            I
          0
68 ED787 0000         CON(5) =ONE+          1+
          0
69 ED78C 0000         CON(5) =a>OPx         >OPx
          0
70 ED791 0000         CON(5) =STORE         !           ( * * )
          0
71 ED796 0000         CON(5) =XLOOP         LOOP        ( * * )
          0
72 ED79B 2EFF         REL(5) %DO12
          F
73                *
74                * ALL DONE
75                *
76 ED7A0 0000         CON(5) =SEMI          ;           ( * * )
          0
77                ****************************************************************
```

```
 78                ***
 79                ***  END
 80                ***
 81                *** ( -- [NUM] )
 82                *** ( END OF SOURCE )
 83                ********************************************************************
 84 ED7A5 0000 =aEND   CON(5) =DOCOL          : END
          0
 85 ED7AA 0000         CON(5) =a?PAS1         ?PASS=1
          0
 86 ED7AF 0000         CON(5) =ZBRNH          IF          ( * * )
          0
 87 ED7B4 A000         REL(5) %IF105
          0
 88                *
 89                * PASS 1 PROCESSING
 90                *
 91 ED7B9 0000         CON(5) =ZERO           0
          0
 92                *
 93                * PASS 1 & 2 PROCESSING
 94                *
 95 ED7BE       %IF105                        THEN
 96                *
 97                * SET VARIABLE DONE TRUE
 98                *
 99 ED7BE 0000         CON(5) =aNEG1          -1
          0
100 ED7C3 0000         CON(5) =aDONE          DONE
          0
101 ED7C8 0000         CON(5) =STORE          !
          0
102 ED7CD 0000         CON(5) =SEMI           ;           ( * [NUM] * )
          0
103                ********************************************************************
104                ***
105                ***  EQU
106                ***
107                *** ( -- [NUM] )
108                *** ( EQUATE A SYMBOL )
109                ********************************************************************
110 ED7D2 0000 =aEQU   CON(5) =DOCOL          : EQU
          0
111                *
112                * CHECK IF LABEL EXISTS AND IS VALID
113                *
114 ED7D7 0000         CON(5) =aLAB.F         LABEL.FIELD ( * STR * )
          0
115 ED7DC 0000         CON(5) =SWAP           SWAP
          0
116 ED7E1 0000         CON(5) =DROP           DROP        ( * NUM * )
          0
117 ED7E6 0000         CON(5) =aLAB.F         LABEL.FIELD ( * NUM STR * )
          0
118 ED7EB 0000         CON(5) =aLABOK         LABEL.OK?   ( * NUM F * )
```

```
          0
119 ED7F0 0000         CON(5) =AND           AND          ( * F * )
          0
120 ED7F5 0000         CON(5) =ZBRNH         IF           ( * * )
          0
121 ED7FA FF00         REL(5) %IF142
          0
122               *
123               * ALL OK.
124               *
125 ED7FF 0000         CON(5) =aLAB.F        LABEL.FIELD  ( * STR * )
          0
126 ED804 0000         CON(5) =aLUKUP        LOOKUP       ( * PTR * )
          0
127 ED809 0000         CON(5) =a?PAS1        ?PASS=1      ( * PTR F * )
          0
128 ED80E 0000         CON(5) =ZBRNH         IF           ( * PTR * )
          0
129 ED813 5500         REL(5) %IF144
          0
130               *
131               * PASS 1 PROCESSING
132               *
133 ED818 0000         CON(5) =ZERO          0            ( * PTR NUM * )
          0
134 ED81D 0000         CON(5) =SWAP          SWAP         ( * NUM PTR * )
          0
135 ED822 0000         CON(5) =ZEQ           0=           ( * NUM F * )
          0
136 ED827 0000         CON(5) =ZBRNH         IF           ( * NUM * )
          0
137 ED82C 5F00         REL(5) %IF143
          0
138               *
139               * NEW EQUATE.  LET'S PUT IT INTO THE SYMBOL TABLE
140               *
141 ED831 0000         CON(5) =aEXPR         EXPRESSION   ( * NUM NUM' * )
          0
142 ED836 0000         CON(5) =aLAB.F        LABEL.FIELD  ( * NUM NUM' STR * )
          0
143 ED83B 0000         CON(5) =a>SYT         >SYT         ( * NUM * )
          0
144               *
145               * SET TYPE NIBBLE TO ZERO (EQUATE)
146               *
147 ED840 0000         CON(5) =ZERO          0            ( * NUM NUM' * )
          0
148 ED845 0000         CON(5) =aLAB.F        LABEL.FIELD  ( * NUM NUM' STR * )
          0
149 ED84A 0000         CON(5) =aLUKUP        LOOKUP       ( * NUM NUM' PTR * )
          0
150 ED84F 0000         CON(5) =LIT           17           ( * NUM NUM' PTR NUM' *
          0
151 ED854 1100         CON(5) 17
          0
```

```
152 ED859 0000          CON(5) =ADD             +           ( * NUM NUM' PTR * )
          0
153 ED85E 0000          CON(5) =N!              N!          ( * NUM * )
          0
154 ED863 0000          CON(5) =SEMI            ;           ( * NUM * )
          0
155               *
156               * PASS 2 PROCESSING
157               *
158 ED868          %IF144                       ELSE        ( * PTR * )
159 ED868 0000          CON(5) =DUP             DUP         ( * PTR PTR * )
          0
160 ED86D 0000          CON(5) =LIT             17          ( * PTR PTR 17 * )
          0
161 ED872 1100          CON(5) 17
          0
162 ED877 0000          CON(5) =ADD             +           ( * PTR PTR' * )
          0
163 ED87C 0000          CON(5) =DUP             DUP         ( * PTR PTR' PTR' * )
          0
164 ED881 0000          CON(5) =N@              N@          ( * PTR PTR' NIB * )
          0
165 ED886 0000          CON(5) =ZBRNH           IF          ( * PTR PTR' * )
          0
166 ED88B E100          REL(5) %IF145
          0
167               *
168               * ENTRY IN SYMBOL TABLE IS LABEL, NOT EQUATE.  WE HAVE CONFLICT!
169               *
170 ED890 0000          CON(5) =2DROP           2DROP       ( * * )
          0
171 ED895 0000          CON(5) =LIT             41          ( * NUM * )
          0
172 ED89A 9200          CON(5) 41               'duplicate label'
          0
173 ED89F 0000          CON(5) =aERROR          ERROR       ( * * )
          0
174 ED8A4 0000          CON(5) =SEMI            ;           ( * * )
          0
175               *
176               * ENTRY IN SYMBOL TABLE IS EQUATE.  SET TYPE NIBBLE TO 2 (EQUATE
177               *
178 ED8A9          %IF145                       ELSE        ( * PTR PTR' * )
179 ED8A9 0000          CON(5) =TWO             2           ( * PTR PTR' NUM * )
          0
180 ED8AE 0000          CON(5) =SWAP            SWAP        ( * PTR NUM PTR' * )
          0
181 ED8B3 0000          CON(5) =N!              N!          ( * PTR * )
          0
182 ED8B8 0000          CON(5) =LIT             12
          0
183 ED8BD C000          CON(5) 12
          0
184 ED8C2 0000          CON(5) =ADD             +           ( * PTR * )
          0
```

```
185 ED8C7 0000          CON(5) =AT              @           ( * NUM * )
          0
186 ED8CC 0000          CON(5) =aEXPR           EXPRESSION  ( * NUM NUM' * )
          0
187 ED8D1 0000          CON(5) =EQUAL           =           ( * F * )
          0
188 ED8D6 0000          CON(5) =ZEQ             0=          ( * F * )
          0
189 ED8DB 0000          CON(5) =ZBRNH           IF          ( * * )
          0
190 ED8E0 1400          REL(5) %IF143
          0
191                *
192                * VALUE IN SYMBOL TABLE DIFFERS FROM PASS 2 VALUE
193                *
194 ED8E5 0000          CON(5) =LIT             57          ( * NUM * )
          0
195 ED8EA 9300          CON(5) 57               'cannot resolve equate'
          0
196 ED8EF 0000          CON(5) =aERROR          ERROR       ( * * )
          0
197 ED8F4 0000          CON(5) =SEMI            ;           ( * * )
          0
198                *
199                * INVALID OR MISSING LABEL
200                *
201 ED8F9                %IF142                 ELSE        ( * * )
202 ED8F9 0000          CON(5) =a?PAS1          ?PASS=1     ( * F * )
          0
203 ED8FE 0000          CON(5) =ZBRNH           IF          ( * * )
          0
204 ED903 F000          REL(5) %IF146
          0
205 ED908 0000          CON(5) =ZERO            0           ( * NUM * )
          0
206 ED90D 0000          CON(5) =SEMI            ;           ( * NUM * )
          0
207                *
208                * PASS 2 - REPORT ERROR
209                *
210 ED912                %IF146                 ELSE        ( * * )
211 ED912 0000          CON(5) =LIT             22          ( * NUM * )
          0
212 ED917 6100          CON(5) 22               'illegal/missing label'
          0
213 ED91C 0000          CON(5) =aERROR          ERROR       ( * * )
          0
214                *
215                * ALL DONE
216                *
217 ED921                %IF143
218 ED921 0000          CON(5) =SEMI            ;           ( * [NUM] * )
          0
219                ****************************************************************
220                ***
```

```
221                *** LIST
222                ***
223                *** ( -- )
224                *** ( TURN ON AND OFF THE LISTING )
225                ********************************************************************
226 ED926 0000 =aLIST  CON(5) =DOCOL          : LIST
          0
227 ED92B 0000         CON(5) =aEXP.F         EXPRESSION  ( * STR * )
          0
228 ED930 0000         CON(5) =2DUP           2DUP
          0
229 ED935 0000         CON(5) =QUOTC          " ON"       ( * STR STR STR' * )
          0
230 ED93A 20           CON(2) 2
231 ED93C 20           CON(2) 2
232 ED93E F4E4         NIBASC \ON\
233 ED942 0000         CON(5) =S=             S=          ( * STR F * )
          0
234 ED947 0000         CON(5) =ZBRNH          IF          ( * STR * )
          0
235 ED94C E100         REL(5) %IF107
          0
236                *
237                * EXPRESSION FIELD IS ON.  SET VARIABLE TOLIST TRUE
238                *
239 ED951 0000         CON(5) =2DROP          2DROP       ( * * )
          0
240 ED956 0000         CON(5) =aNEG1          -1
          0
241 ED95B 0000         CON(5) =aTOLST         TOLIST
          0
242 ED960 0000         CON(5) =STORE          !           ( * * )
          0
243 ED965 0000         CON(5) =SEMI           ;           ( * * )
          0
244 ED96A       %IF107                        ELSE        ( * STR * )
245 ED96A 0000         CON(5) =QUOTC          "           ( * STR STR' * )
          0
246 ED96F 30           CON(2) 3
247 ED971 30           CON(2) 3
248 ED973 F464         NIBASC \OFF\
          64
249 ED979 0000         CON(5) =S=             S=          ( * F * )
          0
250 ED97E 0000         CON(5) =ZBRNH          IF          ( * * )
          0
251 ED983 9100         REL(5) %IF108
          0
252                *
253                * EXPRESSION FIELD IS OFF.  SET VARIABLE TOLIST FALSE
254                *
255 ED988 0000         CON(5) =ZERO           0
          0
256 ED98D 0000         CON(5) =aTOLST         TOLIST
          0
```

```
257 ED992 0000          CON(5) =STORE           !           ( * * )
          0
258 ED997 0000          CON(5) =SEMI            ;           ( * * )
          0
259               *
260               * EXPRESSION FIELD IS NEITHER ON NOR OFF
261               *
262 ED99C          %IF108
263 ED99C 0000          CON(5) =LIT             23
          0
264 ED9A1 7100          CON(5) 23               'invalid listing arguement'
          0
265 ED9A6 0000          CON(5) =aERROR          ERROR       ( * * )
          0
266 ED9AB 0000          CON(5) =SEMI            ;           ( * * )
          0
267               ********************************************************************
268               ***
269               ***  SKIP LABEL
270               ***
271               *** ( STR -- STR )
272               *** ( SKIP OVER CHARACTERS IN STRING EQUAL TO THE CHARACTERS IN T
273               *** ( LABEL FIELD )
274               ********************************************************************
275 ED9B0 0000 =a+LAB  CON(5) =DOCOL          : SKIP LABEL
          0
276               *
277               * GET LENGTH OF LABEL FIELD
278               *
279 ED9B5 0000          CON(5) =SWAP            SWAP        ( * LEN ADDR * )
          0
280 ED9BA 0000          CON(5) =aLAB.F          LABEL.FIELD ( * LEN ADDR STR * )
          0
281 ED9BF 0000          CON(5) =SWAP            SWAP
          0
282 ED9C4 0000          CON(5) =DROP            DROP        ( * LEN ADDR LEN' * )
          0
283               *
284               * UPDATE ADDRESS BY CHARACTERS*2
285               *
286 ED9C9 0000          CON(5) =DUP             DUP
          0
287 ED9CE 0000          CON(5) =>R              >R
          0
288 ED9D3 0000          CON(5) =TWO*            2*          ( * LEN ADDR CNT * )
          0
289 ED9D8 0000          CON(5) =ADD             +           ( * LEN ADDR' * )
          0
290 ED9DD 0000          CON(5) =SWAP            SWAP        ( * STR * )
          0
291               *
292               * UPDATE LENGTH BY CHARACTERS
293               *
294 ED9E2 0000          CON(5) =R>              R>
          0
```

```
295 ED9E7 00000         CON(5) =MINUS          -           ( * STR * )
          0
296 ED9EC 00000         CON(5) =SEMI           ;           ( * STR * )
          0
297             ********************************************************************
298             ***
299             ***  EXTRACT
300             ***
301             *** ( -- STR )
302             *** ( SUCK STITLE OR TITLE STRING FROM SOURCE LINE )
303             ********************************************************************
304 ED9F1 00000 =aXTRCT CON(5) =DOCOL          : EXTRACT
          0
305             *
306             * FIND TITLE/STITLE PSEUDO-OP IN SOURCE LINE
307             *
308 ED9F6 00000         CON(5) =QUOTC          " TITLE"    ( * STR * )
          0
309 ED9FB 50           CON(2) 5
310 ED9FD 50           CON(2) 5
311 ED9FF 45945C4     NIBASC \TITLE\
          54
312 EDA09 00000         CON(5) =aSLINE         SLINE
          0
313 EDA0E 0B9DE         CON(5) =a+LAB          SKIP LABEL  ( * STR STR' * )
314 EDA13 00000         CON(5) =POS            POS         ( * NUM * )
          0
315             *
316             * EXTRACT TEXT FOLLOWING TITLE OR STITLE PSEUDO-OP
317             *
318 EDA18 00000         CON(5) =?DUP           ?DUP
          0
319 EDA1D 00000         CON(5) =ZBRNH          IF          ( * [NUM] * )
          0
320 EDA22 E600          REL(5) %IF109
          0
321 EDA27 00000         CON(5) =FIVE+          5+
          0
322 EDA2C 00000         CON(5) =aSLINE         SLINE       ( * COL STR * )
          0
323 EDA31 0B9DE         CON(5) =a+LAB          SKIP LABEL
324 EDA36 00000         CON(5) =ROT            ROT
          0
325 EDA3B 00000         CON(5) =END$           END$        ( * STR * )
          0
326             *
327             * TRIM OFF LEADING BLANKS
328             *
329 EDA40        %BG13                         BEGIN       ( * STR * )
330 EDA40 00000         CON(5) =OVER           OVER
          0
331 EDA45 00000         CON(5) =CAT            C@
```

```
          0
332 EDA4A 0000          CON(5) =BL              BLANK
          0
333 EDA4F 0000          CON(5) =EQUAL           =           ( * STR F * )
          0
334 EDA54 0000          CON(5) =OVER            OVER
          0
335 EDA59 0000          CON(5) =F.AND           F.AND       ( * STR F * )
          0
336 EDA5E 0000          CON(5) =ZBRNH           WHILE
          0
337 EDA63 9100          REL(5) %RP13
          0
338 EDA68 0000          CON(5) =C@+             C@+
          0
339 EDA6D 0000          CON(5) =DROP            DROP        ( * STR * )
          0
340 EDA72 0000          CON(5) =BRNCH           REPEAT
          0
341 EDA77 9CFF          REL(5) %BG13
          F
342 EDA7C       %RP13
343             *
344             * TRIM TO CORRECT LENGTH
345             *
346 EDA7C 0000          CON(5) =LIT             40
          0
347 EDA81 8200          CON(5) 40
          0
348 EDA86 0000          CON(5) =MIN             MIN         ( * STR * )
          0
349 EDA8B 0000          CON(5) =SEMI            ;           ( * STR * )
          0
350 EDA90       %IF109
351 EDA90 0000          CON(5) =aBLNK1          1BLANK
          0
352 EDA95 0000          CON(5) =SEMI            ;           ( * STR * )
          0
353             ********************************************************************
354             ***
355             ***  STITLE
356             ***
357             *** ( -- )
358             *** ( SET THE SUBTITLE LINE )
359             ********************************************************************
360 EDA9A 0000 =aSTITL CON(5) =DOCOL           : STITLE
          0
361 EDA9F 1F9D          CON(5) =aXTRCT          EXTRACT
          E
362 EDAA4 0000          CON(5) =aSTIT           STIT
          0
363 EDAA9 0000          CON(5) =S!              S!
          0
364 EDAAE 0000          CON(5) =aEJECT          EJECT
          0
```

```
365 EDAB3 0000          CON(5) =SEMI            ;           ( * * )
          0
366               ****************************************************************
367               ***
368               ***  TITLE
369               ***
370               *** ( -- )
371               *** ( SET THE TITLE LINE )
372               ****************************************************************
373 EDAB8 0000 =aTITLE CON(5) =DOCOL           : TITLE
          0
374 EDABD 1F9D          CON(5) =aXTRCT          EXTRACT
          E
375 EDAC2 0000          CON(5) =aTIT            TIT
          0
376 EDAC7 0000          CON(5) =S!              S!
          0
377 EDACC 0000          CON(5) =SEMI            ;           ( * * )
          0
378               ****************************************************************
379               ***
380               ***  SIM.LINE
381               ***
382               *** ( STR -- )
383               *** ( PASS A SIMULATED LINE TO THE ASSEMBLER )
384               ****************************************************************
385 EDAD1 0000 =aSIMLN CON(5) =DOCOL           : SIM.LINE
          0
386               *
387               * SAVE STRING ON STACK IN VARIABLE SOURCE LINE
388               *
389 EDAD6 0000          CON(5) =aSLINE          SLINE
          0
390 EDADB 0000          CON(5) =S!              S!
          0
391               *
392               * CALL HIGH LEVEL ROUTINE TO PROCESS ONE LINE
393               *
394 EDAE0 0000          CON(5) =aDOLIN          DO.LINE
          0
395               *
396               * RESET VARIABLE LLINE
397               *
398 EDAE5 0000          CON(5) =a&CLR           &CLEAR
          0
399 EDAEA 0000          CON(5) =SEMI            ;           ( * * )
          0
400               ****************************************************************
401               ***
402               ***  WRAPUPOLD
403               ***
404               *** ( -- )
405               *** ( SAVE CURRENT EXPRESSION & FINISH PROCESSING LINE )
406               ****************************************************************
407 EDAEF 0000 =aWRUOL CON(5) =DOCOL           : WRAPUPOLD
```

```
          0
408             *
409             * CURRENT LINE IS A MACRO-EXPANSION PSEUDO-OP, WHICH GENERATES
410             * NO CODE ON THIS LINE, BUT IT'S NOT DONE.  THE FULL STEPS FOR
411             * PROCESSING A LINE ARE:
412             *   PARSE - PROCESS - SPIT - LC+
413             * SINCE WE'RE IN THE MIDDLE OF PROCESSING, AND WE WANT TO WRAP
414             * UP THIS LINE, BUT CONTINUE, WE ONLY DO THE LATTER PARTS.
415             *
416             *
417             * GENERATE NO CODE THIS LINE
418             *
419 EDAF4 0000         CON(5) =ZERO          0
          0
420 EDAF9 0000         CON(5) =aOPLEN        OPLEN
          0
421 EDAFE 0000         CON(5) =STORE         !           ( * * )
          0
422             *
423             * SAVE THIS EXPRESSION FIELD, JUST ABOUT EVERY ROUTINE USES IT.
424             *
425 EDB03 0000         CON(5) =aEXP.F        EXPRESSION  ( * STR * )
          0
426 EDB08 0000         CON(5) =aOLDEX        OLDEXPR
          0
427 EDB0D 0000         CON(5) =S!            S!          ( * * )
          0
428             *
429             * SPIT
430             *
431 EDB12 0000         CON(5) =aSPIT         SPIT
          0
432             *
433             * LC+
434             *
435 EDB17 0000         CON(5) =aLC+          LC+
          0
436             *
437             * CLEAR VARIABLE LLINE
438             *
439 EDB1C 0000         CON(5) =a&CLR         &CLEAR
          0
440 EDB21 0000         CON(5) =SEMI          ;           ( * * )
          0
441             ****************************************************************
442             ***
443             ***  STARTUPNEW
444             ***
445             *** ( STR -- )
446             *** ( USE STR TO START A NEW LINE )
447             ****************************************************************
448 EDB26 0000 =aSTUNW CON(5) =DOCOL         : STARTUPNEW
          0
449             *
450             * START UP NEW, LIKE WRAP UP OLD, IS CALLED WHEN MACRO-EXPANSION
```

```
451                * ARE ENCOUNTERD.  WHEN WE EXIT BACK TO WHAT CALLED US, DOLINE WI
452                * WITH SPIT & LC+.  SO FOR THE LINE WE'RE SIMULATING, WE ONLY WAN
453                * THE FIRST TWO STEPS:  PARSE & PROCESS
454                *
455 EDB2B 0000          CON(5) =aSLINE        SLINE
           0
456 EDB30 0000          CON(5) =S!            S!
           0
457 EDB35 0000          CON(5) =aPARSE        PARSE
           0
458 EDB3A 0000          CON(5) =aPROCS        PROCESS
           0
459 EDB3F 0000          CON(5) =SEMI          ;             ( * * )
           0
460                ****************************************************************
461                ***
462                ***  ?1ST TIME THROUGH
463                ***
464                *** ( -- F )
465                *** ( CHECK TO SEE IF FILETYPE ALREADY DECLARED )
466                ****************************************************************
467 EDB44 0000 =a?1ST   CON(5) =DOCOL         : ?1ST TIME THROUGH
           0
468 EDB49 0000          CON(5) =a?PAS1        ?PASS=1
           0
469 EDB4E 0000          CON(5) =ZEQ           0-            ( * F * )
           0
470 EDB53 0000          CON(5) =ZBRNH         IF            ( * * )
           0
471 EDB58 1400          REL(5) %IF148
           0
472                *
473                * PASS 2 PROCESSING
474                *
475 EDB5D 0000          CON(5) =TWO           2
           0
476 EDB62 0000          CON(5) =aTESTF        TEST.FLAG     ( * F * )
           0
477 EDB67 0000          CON(5) =ZEQ           0=            ( * F * )
           0
478 EDB6C 0000          CON(5) =ZBRNH         IF            ( * * )
           0
479 EDB71 9100          REL(5) %IF147
           0
480                *
481                * HAVEN'T BEEN HERE BEFORE.  SET FLAG SO WE'LL RECOGNIZE IT WHEN
482                *
483 EDB76 0000          CON(5) =TWO           2             ( * NUM * )
           0
484 EDB7B 0000          CON(5) =aSETF         SET.FLAG
           0
485 EDB80 0000          CON(5) =aNEG1         -1            ( * TF * )
           0
486 EDB85 0000          CON(5) =SEMI          ;             ( * TF * )
           0
```

```
                *
                * BEEN IN THIS ROUTINE BEFORE!
                *
EDB8A            %IF147
EDB8A 0000              CON(5) =LIT             51          ( * NUM * )
      0
EDB8F 3300              CON(5) 51               'multiple file type'
      0
EDB94 0000              CON(5) =aERROR          ERROR       ( * * )
      0
                *
                * PASS 1 PROCESSING
                *
EDB99            %IF148
EDB99 0000              CON(5) =ZERO            0           ( * FF * )
      0
EDB9E 0000              CON(5) =SEMI            ;           ( * FF * )
      0
                ********************************************************************
                ***
                ***  FILE.IS.FORTH
                ***
                *** ( -- )
                *** ( 'FORTH' PSEUDO-OP FOUND. )
                *** ( IF FIRST PASS: PURGE ASMBOB & SET LC TO FORTHRAM )
                *** ( IF SECOND PASS: ALLOT SPACE, ISSUE MULTIPLE FILETYPE ERRORS
                ********************************************************************
EDBA3 0000 =aFIL4T CON(5) =DOCOL        : FILE.IS.FORTH
      0
EDBA8 0000              CON(5) =aFLTYP          FILETYPE    ( * PTR * )
      0
EDBAD 0000              CON(5) =AT              @           ( * NUM * )
      0
EDBB2 0000              CON(5) =ZEQ             0=          ( * F * )
      0
EDBB7 0000              CON(5) =ZBRNH           IF          ( * * )
      0
EDBBC 5600              REL(5) %IF149
      0
                *
                * FIRST TIME THROUGH, WE'RE A FORTH ASSEMBLY
                *
EDBC1 0000              CON(5) =ONE             1           ( * NUM * )
      0
EDBC6 0000              CON(5) =aFLTYP          FILETYPE
      0
EDBCB 0000              CON(5) =STORE           !           ( * * )
      0
                *
                * NO OBJECT FILE REQUIRED:  FORTHRAM IS OUR OBJECT FILE
                *
EDBD0 0000              CON(5) =QUOTC           " ASMBOB"
      0
EDBD5 60                CON(2) 6
EDBD7 60                CON(2) 6
```

```
527 EDBD9 1435          NIBASC \ASMBOB\
          D424
          F424
528 EDBE5 0000          CON(5) =aKILL          KILL         ( * * )
          0
529 EDBEA 0000          CON(5) =aMEMOV         MEMMOVE      ( * * )
          0
530               *
531               * MARK THE LOSS OF AN OBJECT FILE
532               *
533 EDBEF 0000          CON(5) =NULL$          NULL$
          0
534 EDBF4 0000          CON(5) =aOFILE         OFILE
          0
535 EDBF9 0000          CON(5) =S!             S!           ( * * )
          0
536               *
537               * BOTH VARIABLE LC AND VARIABLE OBJFILE MUST REFLECT THIS CHANGE
538               *
539 EDBFE 0000          CON(5) =HERE           HERE
          0
540 EDC03 0000          CON(5) =DUP            DUP          ( * ADDR ADDR * )
          0
541 EDC08 0000          CON(5) =aOBJFL         OBJFILE
          0
542 EDC0D 0000          CON(5) =STORE          !
          0
543 EDC12 0000          CON(5) =aLC            LC
          0
544 EDC17 0000          CON(5) =STORE          !            ( * * )
          0
545 EDC1C 0000          CON(5) =SEMI           ;            ( * * )
          0
546               *
547               * BEEN HERE BEFORE, BUT WHICH PASS?
548               *
549 EDC21          %IF149                      ELSE         ( * * )
550 EDC21 44BD          CON(5) =a?1ST          ?1ST TIME    ( * F * )
          E
551 EDC26 0000          CON(5) =ZBRNH          IF           ( * * )
          0
552 EDC2B A500          REL(5) %IF150
          0
553               *
554               * SECOND PASS.  WE WERE HERE ONLY DURING PASS 1
555               *
556               *
557               * CALCULATE NUMBER OF NIBBLES NEEDED IN FORTH DICTIONARY
558               *
559 EDC30 0000          CON(5) =HERE           HERE
          0
560 EDC35 0000          CON(5) =S0             S0
          0
561 EDC3A 0000          CON(5) =LIT            458
          0
```

```
562 EDC3F AC10          CON(5) 458
          0
563 EDC44 0000          CON(5) =MINUS       -           ( * NUM NUM' * )
          0
564 EDC49 0000          CON(5) =aFLSIZ      FILESIZE
          0
565 EDC4E 0000          CON(5) =AT          @
          0
566 EDC53 0000          CON(5) =MINUS       -
          0
567 EDC58 0000          CON(5) =GT          >
          0
568 EDC5D 0000          CON(5) =ZBRNH       IF          ( * * )
          0
569 EDC62 4100          REL(5) %IF111
          0
570               *
571               * NOT ENOUGH IN DICTIONARY
572               *
573 EDC67 0000          CON(5) =LIT         8
          0
574 EDC6C 8000          CON(5) 8            'dictionary full'
          0
575 EDC71 0000          CON(5) =aSHUTD      SHUTDOWN
          0
576               *
577               * ENOUGH.  ALLOT GUARENTEED NOT TO FAIL (TEST JUST MADE)
578               *
579 EDC76         %IF111
580 EDC76 0000          CON(5) =aFLSIZ      FILESIZE
          0
581 EDC7B 0000          CON(5) =AT          @           ( * NUM * )
          0
582 EDC80 0000          CON(5) =ALLOT       NALLOT      ( * * )
          0
583               *
584               * ALL DONE
585               *
586 EDC85         %IF150
587 EDC85 0000          CON(5) =SEMI        ;           ( * * )
          0
588               ********************************************************************
589               ***
590               ***  FILE.IS.LEX
591               ***
592               *** ( -- )
593               *** ( 'LEX' PSEUDO-OP FOUND.  DO NEEDED PREP )
594               ********************************************************************
595 EDC8A 0000 =aFILLX CON(5) =DOCOL       : FILE.IS.LEX
          0
596 EDC8F 0000          CON(5) =aFLTYP      FILETYPE
          0
597 EDC94 0000          CON(5) =AT          @           ( * NUM * )
          0
598 EDC99 0000          CON(5) =ZEQ         0=
```

```
          0
  599 EDC9E 0000        CON(5) =ZBRNH         IF          ( * * )
          0
  600 EDCA3 B400        REL(5) %IF115
          0
  601           *
  602           * FIRST TIME THROUGH, WE'RE A LEX ASSEMBLY
  603           *
  604 EDCA8 0000        CON(5) =TWO           2
          0
  605 EDCAD 0000        CON(5) =aFLTYP        FILETYPE
          0
  606 EDCB2 0000        CON(5) =STORE         !           ( * * )
          0
  607 EDCB7 0000        CON(5) =SEMI          ;           ( * * )
          0
  608           ********************************************************************
  609           ***
  610           ***  FILE.IS.BIN
  611           ***
  612           *** ( -- )
  613           *** ( 'BIN' PSEUDO-OP FOUND.  DO NEEDED PREP )
  614           ********************************************************************
  615 EDCBC 0000 =aFILBN CON(5) =DOCOL        : FILE.IS.BIN
          0
  616 EDCC1 0000        CON(5) =aFLTYP        FILETYPE
          0
  617 EDCC6 0000        CON(5) =AT            @           ( * NUM * )
          0
  618 EDCCB 0000        CON(5) =ZEQ           0=
          0
  619 EDCD0 0000        CON(5) =ZBRNH         IF          ( * * )
          0
  620 EDCD5 9100        REL(5) %IF115
          0
  621           *
  622           * FIRST TIME THROUGH, WE'RE A BIN ASSEMBLY
  623           *
  624 EDCDA 0000        CON(5) =THREE         3
          0
  625 EDCDF 0000        CON(5) =aFLTYP        FILETYPE
          0
  626 EDCE4 0000        CON(5) =STORE         !           ( * * )
          0
  627 EDCE9 0000        CON(5) =SEMI          ;           ( * * )
          0
  628           *
  629           * SECOND TIME THROUGH.  IS IT BECAUSE THE FIRST TIME THROUGH WAS
  630           * PASS 1 ?
  631           *
  632 EDCEE      %IF115                       ELSE
  633 EDCEE 44BD        CON(5) =a?1ST         ?1ST TRY    ( * F * )
          E
  634 EDCF3 0000        CON(5) =ZBRNH         IF          ( * * )
          0
```

```
635 EDCF8 A000          REL(5) %IF156
          0
636               *
637               * YES.  WE NEED TO GROW THE OBJECT FILE TO INCLUDE THE NIBBLES
638               * WE'LL GENERATE
639               *
640 EDCFD 0000          CON(5) =aOBJGR          OBJ.GROW
          0
641               *
642               * DONE PROCESSING BIN OR LEX PSEUDO-OP
643               *
644 EDD02         %IF156                        THEN        ( * * )
645 EDD02 FEAD          CON(5) =aWRUOL          WRAPUPOLD   ( * * )
          E
646 EDD07 0000          CON(5) =SEMI            ;           ( * * )
          0
647               ********************************************************************
648               ***
649               ***  FILE.TEST
650               ***
651               *** ( NUM -- )
652               *** ( ENSURE FILE TYPE MATCHES 'NUM' )
653               ********************************************************************
654 EDD0C 0000 =aFLTST CON(5) =DOCOL           : FILE.TEST
          0
655 EDD11 0000          CON(5) =aFLTYP          FILETYPE
          0
656 EDD16 0000          CON(5) =AT              @           ( * NUM NUM' * )
          0
657 EDD1B 0000          CON(5) =EQUAL           =
          0
658 EDD20 0000          CON(5) =ZEQ             0=          ( * F * )
          0
659 EDD25 0000          CON(5) =ZBRNH           IF          ( * * )
          0
660 EDD2A 4100          REL(5) %IF112
          0
661               *
662               * PSEUDO-OP IN WRONG FILE (I.E. WORDI IN A BIN FILE)
663               *
664 EDD2F 0000          CON(5) =LIT             51
          0
665 EDD34 3300          CON(5) 51               'missing/multiple filetype'
          0
666 EDD39 0000          CON(5) =aERROR          ERROR       ( * * )
          0
667 EDD3E         %IF112                        THEN
668 EDD3E 0000          CON(5) =SEMI            ;           ( * * )
          0
669               ********************************************************************
670               ***
671               ***  ENSURE.FORTH
672               ***
673               *** ( -- )
674               *** ( A FORTH SUBHEADER PSEUDO-OP FOUND )
```

```
675                ****************************************************************
676 EDD43 0000 =aENS4T CON(5) =DOCOL          : ENSURE.FORTH
          0
677 EDD48 0000         CON(5) =ONE            1           ( * NUM * )
          0
678 EDD4D C0DD         CON(5) =aFLTST         FILE.TEST
          E
679 EDD52 0000         CON(5) =SEMI           ;           ( * * )
          0
680                ****************************************************************
681                ***
682                ***  ENSURE.LEX
683                ***
684                *** ( -- )
685                *** ( A LEX SUBHEADER PSEUDO-OP FOUND )
686                ****************************************************************
687 EDD57 0000 =aENSLX CON(5) =DOCOL          : ENSURE.LEX
          0
688 EDD5C 0000         CON(5) =TWO            2
          0
689 EDD61 C0DD         CON(5) =aFLTST         FILE.TEST
          E
690 EDD66 0000         CON(5) =SEMI           ;           ( * * )
          0
691                ****************************************************************
692                ***
693                ***  ENSURE.BIN
694                ***
695                *** ( -- )
696                ****************************************************************
697 EDD6B 0000 =aENSBN CON(5) =DOCOL          : ENSURE.BIN
          0
698 EDD70 0000         CON(5) =THREE          3
          0
699 EDD75 C0DD         CON(5) =aFLTST         FILE.TEST
          E
700 EDD7A 0000         CON(5) =SEMI           ;           ( * * )
          0
701                ****************************************************************
702                ***
703                ***  CALCLENWORD
704                ***
705                *** ( -- NUM )
706                *** ( CALCULATE THE LENGTH OF THE WORD EXPANSION )
707                ****************************************************************
708 EDD7F 0000 =aCLCWD CON(5) =DOCOL          : CALCLENWORD
          0
709                *
710                * GET WORD
711                *
712 EDD84 0000         CON(5) =aEXP.F         EXPR        ( * STR * )
          0
713 EDD89 0000         CON(5) =aQ"STR         ".STRING    ( * STR * )
          0
714 EDD8E 0000         CON(5) =aTRIM          TRIM.BLANKS ( * STR * )
```

```
          0
715            *
716            * TRIM TO MAXIMUM LENGTH
717            *
718 EDD93 0000         CON(5) =WIDTH          WIDTH
          0
719 EDD98 0000         CON(5) =AT             @
          0
720 EDD9D 0000         CON(5) =MIN            MIN          ( * STR * )
          0
721 EDDA2 0000         CON(5) =SWAP           SWAP
          0
722 EDDA7 0000         CON(5) =DROP           DROP         ( * LEN * )
          0
723            *
724            * CHECK FOR NULL WORD
725            *
726 EDDAC 0000         CON(5) =DUP            DUP          ( * NUM NUM * )
          0
727 EDDB1 0000         CON(5) =ZEQ            0=           ( * NUM F * )
          0
728 EDDB6 0000         CON(5) =ZBRNH          IF           ( * NUM * )
          0
729 EDDBB 4100         REL(5) %IF106
          0
730 EDDC0 0000         CON(5) =LIT            11
          0
731 EDDC5 B000         CON(5) 11              'attempted to redefine null'
          0
732 EDDCA 0000         CON(5) =aSHUTD         SHUTDOWN
          0
733            *
734            * CALCULATE LENGTH & ADD IN LINK FIELD (5), LENGTH BYTE (2),
735            * AND CODE FIELD (5)
736            *
737 EDDCF       %IF106                        THEN         ( * NUM * )
738 EDDCF 0000         CON(5) =TWO*           2*
          0
739 EDDD4 0000         CON(5) =LIT            12
          0
740 EDDD9 C000         CON(5) 5+2+5
          0
741 EDDDE 0000         CON(5) =ADD            +
          0
742 EDDE3 0000         CON(5) =SEMI           ;            ( * NUM * )
          0
743            ***************************************************************
744            ***
745            ***  UPTOLFA
746            ***
747            *** ( -- )
748            *** ( GENERATE CODE THROUGH THE LINK FIELD )
749            ***************************************************************
750 EDDE8 0000 =aUTLFA CON(5) =DOCOL          : UPTOLFA
          0
```

```
751 EDDED FEAD          CON(5) =aWRUOL          WRAPUPOLD    ( * * )
          E
752 EDDF2 0000          CON(5) =QUOTC           "    CON(5) #"
          0
753 EDDF7 A0            CON(2) 10
754 EDDF9 A0            CON(2) 10
755 EDDFB 0202          NIBASC \  \
756 EDDFF 34F4          NIBASC \CON(5) #\
          E482
          5392
          0232
757 EDE0F 0000          CON(5) =a>PAD           >PAD         ( * STR * )
          0
758               *
759               * FORTH VARIABLE LATEST HAS LINK TO LAST WORD
760               *
761 EDE14 0000          CON(5) =LATE            LATEST
          0
762 EDE19 0000          CON(5) =HEX             HEX
          0
763 EDE1E 0000          CON(5) =aNUM#5          #5           ( * STR STR' * )
          0
764 EDE23 0000          CON(5) =DEC             DECIMAL
          0
765 EDE28 0000          CON(5) =S<&             S<&          ( * STR * )
          0
766               *
767               * SIMULATE LINK FIELD LINE
768               *
769 EDE2D 1DAD          CON(5) =aSIMLN          SIM.LINE     ( * * )
          E
770 EDE32 0000          CON(5) =SEMI            ;            ( * * )
          0
771               ********************************************************************
772               ***
773               ***  BREAKUP8
774               ***
775               *** ( STR -- STR1 ... STRN N )
776               *** ( BREAK UP THE STRING INTO N STRINGS OF LENGTH <= 8 )
777               ********************************************************************
778 EDE37 0000 =aBRK8  CON(5) =DOCOL          : BREAKUP8
          0
779               *
780               * INITIALIZE STRING COUNT TO ONE (1)
781               *
782 EDE3C 0000          CON(5) =ONE             1
          0
783               *
784               * repeat
785               *
786 EDE41          %BG14                        BEGIN        ( * STR N * )
787 EDE41 0000          CON(5) =OVER            OVER
          0
788 EDE46 0000          CON(5) =LIT             9
          0
```

```
789 EDE4B 9000          CON(5) 9
          0
790 EDE50 0000          CON(5) =LT              <
          0
791 EDE55 0000          CON(5) =ZBRNH           IF
          0
792 EDE5A 4100          REL(5) %IF117
          0
793               *
794               * MOST CURRENT STRING HAS LENGTH < 9.  WE'RE DONE.
795               *
796 EDE5F 0000          CON(5) =aNEG1           -1          ( * STR1 ... STRn n TF
          0
797 EDE64 0000          CON(5) =BRNCH
          0
798 EDE69 2800          REL(5) %TH117
          0
799 EDE6E        %IF117                         ELSE        ( * STR N * )
800               *
801               * ONE MORE STRING TO COUNT
802               *
803 EDE6E 0000          CON(5) =ONE+            1+
          0
804 EDE73 0000          CON(5) =>R              >R          ( * STR * )
          0
805               *
806               * CALCULATE LENGTH OF THIS STRING
807               *
808 EDE78 0000          CON(5) =DUP             DUP
          0
809 EDE7D 0000          CON(5) =LIT             8
          0
810 EDE82 8000          CON(5) 8
          0
811 EDE87 0000          CON(5) =MOD             MOD
          0
812 EDE8C 0000          CON(5) =DUP             DUP
          0
813 EDE91 0000          CON(5) =ZEQ             0=
          0
814 EDE96 0000          CON(5) =ZBRNH           IF          ( * STR NUM * )
          0
815 EDE9B 4100          REL(5) %IF118
          0
816               *
817               * WORKING STRING HAS LENGTH DIVISIBLE BY 8.  SUBSTITUTE 8 FOR 0
818               *
819 EDEA0 0000          CON(5) =DROP            DROP
          0
820 EDEA5 0000          CON(5) =LIT             8
          0
821 EDEAA 8000          CON(5) 8
          0
822 EDEAF        %IF118                         THEN        ( * STR NUM * )
823               *
```

```
824            * CALCULATE LENGTH AND SAVE ON RETURN STACK
825            *
826 EDEAF 0000         CON(5) =SWAP          SWAP
          0
827 EDEB4 0000         CON(5) =OVER          OVER
          0
828 EDEB9 0000         CON(5) =MINUS         -
          0
829 EDEBE 0000         CON(5) =SWAP          SWAP
          0
830 EDEC3 0000         CON(5) =>R            >R          ( * STR * )
          0
831            *
832            * CALCULATE ADDRESS OF NEW STRING
833            *
834 EDEC8 0000         CON(5) =2DUP          2DUP
          0
835 EDECD 0000         CON(5) =TWO*          2*
          0
836 EDED2 0000         CON(5) =ADD           +
          0
837 EDED7 0000         CON(5) =R>            R>          ( * STR1 STR2 * )
          0
838 EDEDC 0000         CON(5) =SWAP2         2SWAP
          0
839 EDEE1 0000         CON(5) =R>            R>
          0
840            *
841            * WORKING STRING STILL NEEDS TO BE CHOPPED
842            *
843 EDEE6 0000         CON(5) =ZERO          0           ( * STR1 STR2 n FF * )
          0
844            *
845            * until <REMAINING STRING BROKEN UP>
846            *
847 EDEEB       %TH117                       THEN
848 EDEEB 0000         CON(5) =ZBRNH         UNTIL
          0
849 EDEF0 15FF         REL(5) %BG14
          F
850            *
851            * ALL DONE.
852            *
853 EDEF5 0000         CON(5) =SEMI          ;           ( * STR1 ... STRn n * )
          0
854            ****************************************************************
855            ***
856            ***  ENDQUOTE
857            ***
858            *** ( STR -- STR )
859            *** ( PUT A FINAL ' ON THE STRING )
860            ****************************************************************
861 EDEFA 0000 =aENDQ  CON(5) =DOCOL         : ENDQUOTE
          0
862 EDEFF 0000         CON(5) =QUOTC         "
```

```
          0
    863 EDF04 10          CON(2) 1
    864 EDF06 10          CON(2) 1
    865 EDF08 72          NIBASC \'\
    866 EDF0A 0000        CON(5) =S<&          S<&
          0
    867 EDF0F 0000        CON(5) =SEMI         ;            ( * STR * )
          0
    868           ********************************************************************
    869           ***
    870           ***  SIM.ASC
    871           ***
    872           *** ( STR -- )
    873           *** ( PUT STR IN A NIBASC STATEMENT AND ASSEMBLE IT )
    874           ********************************************************************
    875 EDF14 0000 =aSIMFF CON(5) =DOCOL        : SIM.ASC
          0
    876           *
    877           * CLEAR SCRATCH SPACE
    878           *
    879 EDF19 0000        CON(5) =a&CLR        &CLEAR
          0
    880 EDF1E 0000        CON(5) =aLLINE       LLINE       ( * STR STR' * )
          0
    881           *
    882           * BUILD FIRST PART (  NIBASC ')
    883           *
    884 EDF23 0000        CON(5) =QUOTC        "   NIBASC '"
          0
    885 EDF28 A0          CON(2) 10
    886 EDF2A A0          CON(2) 10
    887 EDF2C 0202        NIBASC \  \
    888 EDF30 E494        NIBASC \NIBASC '\
          2414
          3534
          0272
    889           *
    890           * APPEND FIRST PART TO SCRATCH SPACE
    891           *
    892 EDF40 0000        CON(5) =S<&          S<&         ( * STR STR' * )
          0
    893           *
    894           * APPEND STRING ON STACK TO SCRATCH SPACE
    895           *
    896 EDF45 0000        CON(5) =SWAP2        2SWAP
          0
    897 EDF4A 0000        CON(5) =S<&          S<&         ( * STR * )
          0
    898           *
    899           * ADD A TRAILING SINGLE QUOTE (')
    900           *
    901 EDF4F AFED        CON(5) =aENDQ        ENDQUOTE
          E
    902           *
    903           * SIMULATE LINE, I.E. PASS TO DOLINE
```

```
904                *
905 EDF54 1DAD             CON(5) =aSIMLN          SIM.LINE
          E
906 EDF59 0000             CON(5) =SEMI            ;           ( * * )
          0
907                ********************************************************************
908                ***
909                ***  UPTONFA
910                ***
911                *** ( STR -- )
912                *** ( GENERATE CODE THROUGH NAME FIELD )
913                ********************************************************************
914 EDF5E 0000 =aUTNFA CON(5) =DOCOL          : UPTONFA
          0
915                *
916                * SAVE NORMAL/IMMEDIATE EXPANSION LINE
917                *
918 EDF63 0000             CON(5) =aSLINE          SLINE
          0
919 EDF68 0000             CON(5) =S!              S!          ( * * )
          0
920                *
921                * GENERATE CORRECT WORD
922                *
923 EDF6D 0000             CON(5) =aOLDEX          OLDEXPR     ( * STR * )
          0
924 EDF72 0000             CON(5) =aQ"STR          ".STRING    ( * STR * )
          0
925 EDF77 0000             CON(5) =aTRIM           TRIM.BLANKS ( * STR * )
          0
926 EDF7C 0000             CON(5) =WIDTH           WIDTH
          0
927 EDF81 0000             CON(5) =AT              @
          0
928 EDF86 0000             CON(5) =MIN             MIN         ( * STR * )
          0
929 EDF8B 0000             CON(5) =aOLDEX          OLDEXPR
          0
930 EDF90 0000             CON(5) =S!              S!          ( * STR * )
          0
931                *
932                * UPDATE CURRENT TO THIS WORD
933                *
934 EDF95 0000             CON(5) =aFLTYP          FILETYPE
          0
935 EDF9A 0000             CON(5) =AT              @
          0
936 EDF9F 0000             CON(5) =ONE             1
          0
937 EDFA4 0000             CON(5) =EQUAL           =
          0
938 EDFA9 0000             CON(5) =ZBRNH           IF          ( * * )
          0
939 EDFAE 2300             REL(5) %IF119
          0
```

```
940                *
941                * SET CONTEXT TO PREVIOUS WORD
942                *
943 EDFB3 0000         CON(5) =CURR          CURRENT
          0
944 EDFB8 0000         CON(5) =AT            @
          0
945 EDFBD 0000         CON(5) =CONTX         CONTEXT
          0
946 EDFC2 0000         CON(5) =STORE         !           ( * * )
          0
947                *
948                * SET CURRENT TO THIS WORD
949                *
950 EDFC7 0000         CON(5) =aLC           LC
          0
951 EDFCC 0000         CON(5) =AT            @
          0
952 EDFD1 0000         CON(5) =CURR          CURRENT
          0
953 EDFD6 0000         CON(5) =AT            @
          0
954 EDFDB 0000         CON(5) =STORE         !           ( * * )
          0
955 EDFE0       %IF119                       THEN
956                *
957                * CHECK IF WORD UNIQUE
958                *
959 EDFE0 0000         CON(5) =aOLDEX        OLDEXPR     ( * STR * )
          0
960 EDFE5 0000         CON(5) =DROP          DROP        ( * ADDR * )
          0
961 EDFEA 0000         CON(5) =TWO-          2-
          0
962 EDFEF 0000         CON(5) =CONTX         CONTEXT
          0
963 EDFF4 0000         CON(5) =AT            @
          0
964 EDFF9 0000         CON(5) =AT            @           ( * ADDR ADDR' * )
          0
965 EDFFE 0000         CON(5) =FIND>         <FIND>
          0
966 EE003 0000         CON(5) =ZBRNH         IF          ( * [CFA B] * )
          0
967 EE008 9100         REL(5) %IF121
          0
968 EE00D 0000         CON(5) =2DROP         2DROP
          0
969 EE012 0000         CON(5) =LIT           25
          0
970 EE017 9100         CON(5) 25             'warning: word not unique'
          0
971 EE01C 0000         CON(5) =aERROR        ERROR
          0
972 EE021       %IF121                       THEN        ( * * )
```

```
 973                *
 974                * GENERATE LENGTH LINE
 975                *
 976 EE021 00000          CON(5) =aSLINE        SLINE       ( * STR * )
           0
 977 EE026 00000          CON(5) =aOLDEX        OLDEXPR
           0
 978 EE02B 00000          CON(5) =SWAP          SWAP
           0
 979 EE030 00000          CON(5) =DROP          DROP        ( * STR LEN * )
           0
 980 EE035 00000          CON(5) =aNUM#3        #3
           0
 981 EE03A 00000          CON(5) =S<&           S<&         ( * STR * )
           0
 982 EE03F 1DADE          CON(5) =aSIMLN        SIM.LINE    ( * * )
 983                *
 984                * GENERATE WORD TEXT IN NIBASC STATEMENTS
 985                *
 986 EE044 00000          CON(5) =aOLDEX        OLDEXPR     ( * STR * )
           0
 987 EE049 73EDE          CON(5) =aBRK8         BREAKUP8    ( * STR1 ... STRn N * )
 988 EE04E 00000          CON(5) =ONE-          1-
           0
 989 EE053 00000          CON(5) =?DUP          ?DUP
           0
 990 EE058 00000          CON(5) =ZBRNH         IF
           0
 991 EE05D E1000          REL(5) %IF122                     ( * STR1 ... STRn [N] *
           0
 992 EE062 00000          CON(5) =ZERO          0
           0
 993 EE067 00000          CON(5) =XDO           DO
           0
 994 EE06C       %DO13
 995 EE06C 41FDE          CON(5) =aSIMFF        SIM.ASC     ( * STR * )
 996 EE071 00000          CON(5) =XLOOP         LOOP
           0
 997 EE076 6FFFF          REL(5) %DO13
 998 EE07B       %IF122                         THEN        ( * STR * )
 999                *
1000                * GENERATE LAST NIBASC
1001                *
1002 EE07B 00000          CON(5) =aLSTCH        LASTCHR
           0
1003 EE080 00000          CON(5) =>R            >R          ( * STR * )
           0
1004 EE085 00000          CON(5) =DUP           DUP
           0
1005 EE08A 00000          CON(5) =ONE-          1-
           0
```

```
1006 EE08F 0000          CON(5) =ZBRNH          IF          ( * STR * )
           0
1007 EE094 9100          REL(5) %IF123
           0
1008 EE099 0000          CON(5) =ONE-           1-
           0
1009 EE09E 41FD          CON(5) =aSIMFF         SIM.ASC     ( * * )
           E
1010 EE0A3 0000          CON(5) =BRNCH          ELSE
           0
1011 EE0A8 A000          REL(5) %TH123
           0
1012 EE0AD       %IF123
1013 EE0AD 0000          CON(5) =2DROP          2DROP       ( * * )
           0
1014 EE0B2       %TH123                         THEN
1015                    *
1016                    * GENERATE LAST CHARACTER (WITH HIGH BIT SET)
1017                    *
1018 EE0B2 0000          CON(5) =aLLINE         LLINE       ( * STR * )
           0
1019 EE0B7 0000          CON(5) =QUOTC          "   CON(2) #80+'"
           0
1020 EE0BC E0            CON(2) 14
1021 EE0BE E0            CON(2) 14
1022 EE0C0 0202          NIBASC \  CON(2)\
           34F4
           E482
           2392
1023 EE0D0 0232          NIBASC \ #80+'\
           8303
           B272
1024 EE0DC 0000          CON(5) =S<&            S<&         ( * STR * )
           0
1025 EE0E1 0000          CON(5) =R>             R>
           0
1026 EE0E6 0000          CON(5) =CHR$           CHR$
           0
1027 EE0EB 0000          CON(5) =S<&            S<&         ( * STR * )
           0
1028 EE0F0 AFED          CON(5) =aENDQ          ENDQUOTE
           E
1029 EE0F5 1DAD          CON(5) =aSIMLN         SIM.LINE
           E
1030 EE0FA 0000          CON(5) =SEMI           ;           ( * * )
           0
1031                    ********************************************************************
1032                    ***
1033                    ***  UPTOCFA
1034                    ***
1035                    *** ( -- )
1036                    *** ( GENERATE CODE THROUGH CODE FIELD ADDRESS )
1037                    ********************************************************************
1038 EE0FF 0000 =aUTOCFA CON(5) =DOCOL          : UPTOCFA
           0
```

```
1039 EE104 0000         CON(5) =QUOTC           "    CON(5) *+5"
           0
1040 EE109 C0           CON(2) 12
1041 EE10B C0           CON(2) 12
1042 EE10D 0202         NIBASC \  \
1043 EE111 34F4         NIBASC \CON(5) *\
           E482
           5392
           02A2
1044 EE121 B253         NIBASC \+5\                     ( * STR * )
1045 EE125 62BD         CON(5) =aSTUNW          STARTUPNEW
           E
1046 EE12A 0000         CON(5) =SEMI            ;       ( * * )
           0
1047                 ****************************************************************
1048                 ***
1049                 ***  FORTHN
1050                 ***
1051                 *** ( -- [NUM] )
1052                 *** ( FORTH PRIMITIVES DEFINED IN THIS FILE )
1053                 ****************************************************************
1054 EE12F 0000 =aFORTH CON(5) =DOCOL          : FORTHN
           0
1055 EE134 3ABD         CON(5) =aFIL4T         FILE.IS.FORTH
           E
1056 EE139 0000         CON(5) =a?PAS1         ?PASS=1      ( * F * )
           0
1057 EE13E 0000         CON(5) =ZBRNH          IF           ( * * )
           0
1058 EE143 A000         REL(5) %IF124
           0
1059 EE148 0000         CON(5) =ZERO           0            ( * NUM * )
           0
1060 EE14D       %IF124                        ELSE
1061 EE14D 0000         CON(5) =SEMI           ;            ( * [NUM] * )
           0
1062                 ****************************************************************
1063                 ***
1064                 ***  WORDN
1065                 ***
1066                 *** ( -- [NUM] )
1067                 *** ( CREATE A FORTH PRIMITIVE IN THE FORTH DICTIONARY )
1068                 ****************************************************************
1069 EE152 0000 =aWORDN CON(5) =DOCOL          : WORDN
           0
1070 EE157 0000         CON(5) =a?PAS1         ?PASS=1
           0
1071 EE15C 0000         CON(5) =ZBRNH          IF
           0
1072 EE161 F000         REL(5) %IF125
           0
1073                 *
1074                 * PASS 1 PROCESSING
1075                 *
1076 EE166 F7DD         CON(5) =aCLCWD         CALCLENWORD ( * NUM * )
```

```
          E
1077 EE16B 0000         CON(5) =SEMI            ;           ( * NUM * )
          0
1078               *
1079               * PASS 2 PROCESSING
1080               *
1081 EE170          %IF125                       ELSE        ( * * )
1082 EE170 34DD         CON(5) =aENS4T          ENS.FORTH   ( * * )
          E
1083               *
1084               * GENERATE LINK FIELD
1085               *
1086 EE175 8EDD         CON(5) =aUTLFA          UPTOLFA     ( * * )
          E
1087               *
1088               * GENERATE THROUGH NAME FIELD (NON-IMMEDIATE)
1089               *
1090 EE17A 0000         CON(5) =QUOTC           "   CON(2) #80+"
          0
1091 EE17F D0           CON(2) 13
1092 EE181 D0           CON(2) 13
1093 EE183 0202         NIBASC \  CON(2)\
          34F4
          E482
          2392
1094 EE193 0232         NIBASC \ #80+\
          8303
          B2
1095 EE19D E5FD         CON(5) =aUTNFA          UPTONFA     ( * * )
          E
1096               *
1097               * GENERATE CODE FIELD
1098               *
1099 EE1A2 FF0E         CON(5) =aUTCFA          UPTOCFA
          E
1100 EE1A7 0000         CON(5) =SEMI            ;           ( * * )
          0
1101               ********************************************************************
1102               ***
1103               ***  WORDI
1104               ***
1105               *** ( -- [NUM] )
1106               *** ( CREATE A FORTH IMMEDIATE PRIMITIVE IN THE FORTH )
1107               *** ( DICTIONARY )
1108               ********************************************************************
1109 EE1AC 0000 =aWORDI CON(5) =DOCOL           : WORDI
          0
1110 EE1B1 0000         CON(5) =a?PAS1          ?PASS=1
          0
1111 EE1B6 0000         CON(5) =ZBRNH           IF          ( * * )
          0
1112 EE1BB F000         REL(5) %IF126
          0
1113               *
1114               * PASS 1 PROCESSING
```

```
1115                *
1116 EE1C0 F7DD             CON(5) =aCLCWD          CALCLENWORD ( * NUM * )
           E
1117 EE1C5 0000             CON(5) =SEMI            ;           ( * NUM * )
           0
1118                *
1119                * PASS 2 PROCESSING
1120                *
1121 EE1CA                  %IF126                  ELSE        ( * * )
1122 EE1CA 34DD             CON(5) =aENS4T          ENS.FORTH   ( * * )
           E
1123                *
1124                * GENERATE LINK FIELD
1125                *
1126 EE1CF 8EDD             CON(5) =aUTLFA          UPTOLFA     ( * * )
           E
1127                *
1128                * GENERATE THROUGH NAME FIELD (IMMEDIATE)
1129                *
1130 EE1D4 0000             CON(5) =QUOTC           "   CON(2) #C0+"
           0
1131 EE1D9 D0               CON(2) 13
1132 EE1DB D0               CON(2) 13
1133 EE1DD 0202             NIBASC \  CON(2)\
           34F4
           E482
           2392
1134 EE1ED 0232             NIBASC \ #C0+\
           3403
           B2
1135 EE1F7 E5FD             CON(5) =aUTNFA          UPTONFA     ( * * )
           E
1136                *
1137                * GENERATE CODE FIELD
1138                *
1139 EE1FC FF0E             CON(5) =aUTCFA          UPTOCFA     ( * * )
           E
1140 EE201 0000             CON(5) =SEMI            ;           ( * * )
           0
1141                ****************************************************************
1142                ***
1143                ***  VALID.NAME
1144                ***
1145                *** ( STR -- STR )
1146                *** ( ENSURE NAME FIELD IS VALID )
1147                ****************************************************************
1148 EE206 0000 =aVALID CON(5) =DOCOL          : VALID.NAME
           0
1149                *
1150                * GET A STRING FROM EXPRESSION FIELD
1151                *
1152 EE20B 0000             CON(5) =aQ"STR          ".STRING    ( * STR * )
           0
1153 EE210 0000             CON(5) =aTRIM           TRIM.BLANKS ( * STR * )
           0
```

```
1154 EE215 0000         CON(5) =aENS8L          ENSURE8LONG ( * STR * )
           0
1155              *
1156              * CHECK FOR VALID SYNTAX
1157              *
1158 EE21A 0000         CON(5) =2DUP            2DUP
           0
1159 EE21F 0000         CON(5) =FSTX            FSYNTAX
           0
1160 EE224 0000         CON(5) =ZEQ             0=
           0
1161 EE229 0000         CON(5) =ZBRNH           IF          ( * STR * )
           0
1162 EE22E 4100         REL(5) %IF127
           0
1163              *
1164              * NAME ISN'T VALID HP-71 FILE NAME
1165              *
1166 EE233 0000         CON(5) =LIT             26
           0
1167 EE238 A100         CON(5) 26               'invalid filename specifier'
           0
1168 EE23D 0000         CON(5) =aSHUTD          SHUTDOWN    ( * * )
           0
1169 EE242       %IF127                         THEN        ( * STR * )
1170 EE242 0000         CON(5) =SEMI            ;           ( * STR * )
           0
1171              ****************************************************************
1172              ***
1173              ***  NAMEFIELD
1174              ***
1175              *** ( STR -- )
1176              *** ( GENERATE THE NAME FIELD OF A FILE HEADER )
1177              ****************************************************************
1178 EE247 0000 =aNAMEF CON(5) =DOCOL          : NAMEFIELD
           0
1179              *
1180              * SAVE OBJECT FILE NAME
1181              *
1182 EE24C 0000         CON(5) =2DUP            2DUP
           0
1183 EE251 0000         CON(5) =aOFILE          OFILE
           0
1184 EE256 0000         CON(5) =S!              S!
           0
1185              *
1186              * GENERATE NAME FIELD LINE
1187              *
1188 EE25B 0000         CON(5) =QUOTC           "   NIBASC '"
           0
1189 EE260 A0           CON(2) 10
1190 EE262 A0           CON(2) 10
1191 EE264 0202         NIBASC \  \
1192 EE268 E494         NIBASC \NIBASC '\
           2414
```

```
            3534
            0272
1193 EE278  0000        CON(5) =a>PAD          >PAD        ( * STR STR' * )
            0
1194 EE27D  0000        CON(5) =SWAP2          2SWAP
            0
1195 EE282  0000        CON(5) =S<&            S<&         ( * STR * )
            0
1196 EE287  AFED        CON(5) =aENDQ          ENDQUOTE
            E
1197            *
1198            * SIMULATE FILE NAME LINE
1199            *
1200 EE28C  1DAD        CON(5) =aSIMLN         SIM.LINE
            E
1201 EE291  0000        CON(5) =SEMI           ;           ( * * )
            0
1202            ****************************************************************
1203            ***
1204            ***  TIME$
1205            ***
1206            *** ( NUM -- STR )
1207            *** ( RETURN A STRING OF LENGTH TWO, BEGINNING AT 'NUM' )
1208            *** ( FROM THE BASIC STRING FUNCTION TIME$ )
1209            ****************************************************************
1210 EE296  0000 =aTIME$ CON(5) =DOCOL          : TIME$
            0
1211 EE29B  0000        CON(5) =QUOTC          " TIME$
            0
1212 EE2A0  50          CON(2) 5
1213 EE2A2  50          CON(2) 5
1214 EE2A4  4594        NIBASC \TIME$\
            D454
            42
1215 EE2AE  0000        CON(5) =BRNCH          GOTO
            0
1216 EE2B3  D100        REL(5) %GOGET
            0
1217            ****************************************************************
1218            ***
1219            ***  DATE$
1220            ***
1221            *** ( NUM -- STR )
1222            *** ( RETURN A STRING OF LENGTH TWO, BEGINNING AT 'NUM' )
1223            *** ( FROM THE BASIC STRING FUNCTION DATE$ )
1224            ****************************************************************
1225 EE2B8  0000 =aDATE$ CON(5) =DOCOL          : DATE$
            0
1226 EE2BD  0000        CON(5) =QUOTC          " DATE$"
            0
1227 EE2C2  50          CON(2) 5
1228 EE2C4  50          CON(2) 5
1229 EE2C6  4414        NIBASC \DATE$\
            4554
            42
```

```
1230 EE2D0 0000  %GOGET CON(5) =aBAS$          BASIC$      ( * NUM STR * )
           0
1231 EE2D5 0000         CON(5) =ROT           ROT         ( * STR NUM * )
           0
1232 EE2DA 0000         CON(5) =END$          END$
           0
1233 EE2DF 0000         CON(5) =DROP          DROP
           0
1234 EE2E4 0000         CON(5) =TWO           2
           0
1235 EE2E9 0000         CON(5) =SEMI          ;           ( * STR * )
           0
1236            ****************************************************************
1237            ***
1238            ***  TIME/DATE
1239            ***
1240            *** ( -- )
1241            *** ( GENERATE THE TIME AND DATE FIELD OF A FILE HEADER )
1242            ****************************************************************
1243 EE2EE 0000 =aTI/DA CON(5) =DOCOL          : TIME/DATE
           0
1244            *
1245            * MINUTES FIELD
1246            *
1247 EE2F3 0000         CON(5) =aLLINE        LLINE       ( * STR * )
           0
1248 EE2F8 0000         CON(5) =QUOTC         "   CON(2) #"
           0
1249 EE2FD A0           CON(2) 10
1250 EE2FF A0           CON(2) 10
1251 EE301 0202         NIBASC \  \
1252 EE305 34F4         NIBASC \CON(2) #\
           E482
           2392
           0232
1253 EE315 0000         CON(5) =S<&           S<&         ( * STR * )
           0
1254 EE31A 0000         CON(5) =LIT           4
           0
1255 EE31F 4000         CON(5) 4
           0
1256 EE324 692E         CON(5) =aTIME$        TIME$
           E
1257 EE329 0000         CON(5) =S<&           S<&
           0
1258 EE32E 1DAD         CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
1259            *
1260            * HOUR FIELD
1261            *
1262 EE333 0000         CON(5) =aLLINE        LLINE       ( * STR * )
           0
1263 EE338 0000         CON(5) =QUOTC         "   CON(2) #"
           0
1264 EE33D A0           CON(2) 10
```

```
1265 EE33F A0          CON(2) 10
1266 EE341 0202        NIBASC \  \
1267 EE345 34F4        NIBASC \CON(2) #\
           E482
           2392
           0232
1268 EE355 0000        CON(5) =S<&          S<&         ( * STR * )
           0
1269 EE35A 0000        CON(5) =ONE          1
           0
1270 EE35F 692E        CON(5) =aTIME$       TIME$
           E
1271 EE364 0000        CON(5) =S<&          S<&
           0
1272 EE369 1DAD        CON(5) =aSIMLN       SIM.LINE    ( * * )
           E
1273            *
1274            * DAY FIELD
1275            *
1276 EE36E 0000        CON(5) =aLLINE       LLINE       ( * STR * )
           0
1277 EE373 0000        CON(5) =QUOTC        "   CON(2) #"
           0
1278 EE378 A0          CON(2) 10
1279 EE37A A0          CON(2) 10
1280 EE37C 0202        NIBASC \  \
1281 EE380 34F4        NIBASC \CON(2) #\
           E482
           2392
           0232
1282 EE390 0000        CON(5) =S<&          S<&         ( * STR * )
           0
1283 EE395 0000        CON(5) =LIT          7
           0
1284 EE39A 7000        CON(5) 7
           0
1285 EE39F 8B2E        CON(5) =aDATE$       DATE$
           E
1286 EE3A4 0000        CON(5) =S<&          S<&
           0
1287 EE3A9 1DAD        CON(5) =aSIMLN       SIM.LINE    ( * * )
           E
1288            *
1289            * MONTH FIELD
1290            *
1291 EE3AE 0000        CON(5) =aLLINE       LLINE       ( * STR * )
           0
1292 EE3B3 0000        CON(5) =QUOTC        "   CON(2) #"
           0
1293 EE3B8 A0          CON(2) 10
1294 EE3BA A0          CON(2) 10
1295 EE3BC 0202        NIBASC \  \
1296 EE3C0 34F4        NIBASC \CON(2) #\
           E482
           2392
```

```
            0232
1297 EE3D0  0000        CON(5) =S<&          S<&         ( * STR * )
            0
1298 EE3D5  0000        CON(5) =LIT          4
            0
1299 EE3DA  4000        CON(5) 4
            0
1300 EE3DF  8B2E        CON(5) =aDATE$       DATE$
            E
1301 EE3E4  0000        CON(5) =S<&          S<&
            0
1302 EE3E9  1DAD        CON(5) =aSIMLN       SIM.LINE    ( * * )
            E
1303            *
1304            * YEAR FIELD
1305            *
1306 EE3EE  0000        CON(5) =aLLINE       LLINE       ( * STR * )
            0
1307 EE3F3  0000        CON(5) =QUOTC        "   CON(2) #"
            0
1308 EE3F8  A0          CON(2) 10
1309 EE3FA  A0          CON(2) 10
1310 EE3FC  0202        NIBASC \  \
1311 EE400  34F4        NIBASC \CON(2) #\
            E482
            2392
            0232
1312 EE410  0000        CON(5) =S<&          S<&         ( * STR * )
            0
1313 EE415  0000        CON(5) =ONE          1
            0
1314 EE41A  8B2E        CON(5) =aDATE$       DATE$
            E
1315 EE41F  0000        CON(5) =S<&          S<&
            0
1316 EE424  1DAD        CON(5) =aSIMLN       SIM.LINE
            E
1317 EE429  0000        CON(5) =SEMI         ;           ( * * )
            0
1318            ********************************************************************
1319            ***
1320            ***  LEX
1321            ***
1322            *** ( -- [NUM] )
1323            *** ( CREATE A LEX FILE HEADER )
1324            ********************************************************************
1325 EE42E  0000 =aLEX   CON(5) =DOCOL        : LEX
            0
1326            *
1327            * CHECK FOR FILETYPE & MULTIPLE LEX PSEUDO-OPS
1328            *
1329 EE433  A8CD        CON(5) =aFILLX       FILE.IS.LEX ( * * )
            E
1330 EE438  0000        CON(5) =a?PAS1       ?PASS=1
            0
```

```
1331 EE43D 0000         CON(5) =ZBRNH          IF          ( * * )
           0
1332 EE442 A500         REL(5) %IF128
           0
1333            *
1334            * PASS 1
1335            *
1336            *
1337            * ENSURE FILE NAME VALID & REMOVE OLD LEX FILE
1338            *
1339 EE447 0000         CON(5) =aEXP.F         EXPRESSION.FIELD
           0
1340 EE44C 602E         CON(5) =aVALID         VALID.NAME  ( * STR * )
           E
1341 EE451 0000         CON(5) =LIT            lex file type
           0
1342 EE456 802E         CON(5) #E208
           0
1343 EE45B 0000         CON(5) =aPURGE         PURGE
           0
1344 EE460 0000         CON(5) =DROP           DROP        ( * * )
           0
1345            *
1346            * RESET PROGRESS VARIABLE BECAUSE PURGING A LEX FILE WIPES OUT TH
1347            * DISPLAY BUFFER
1348            *
1349 EE465 0000         CON(5) =ZERO           0
           0
1350 EE46A 0000         CON(5) =aLINEC         LINECOUNT
           0
1351 EE46F 0000         CON(5) =STORE          !
           0
1352            *
1353            * UPDATE POINTERS TO REFLECT MEMORY MOVE
1354            *
1355 EE474 0000         CON(5) =aMEMOV         MEMORY MOVED
           0
1356 EE479 0000         CON(5) =aOBJFL         OBJ.FILE
           0
1357 EE47E 0000         CON(5) =AT             @
           0
1358 EE483 0000         CON(5) =aLC            LC
           0
1359 EE488 0000         CON(5) =STORE          !
           0
1360            *
1361            * RETURN LENGTH
1362            *
1363 EE48D 0000         CON(5) =LIT            37          ( * NUM * )
           0
1364 EE492 5200         CON(5) 37
           0
1365 EE497 0000         CON(5) =SEMI           ;           ( * NUM * )
           0
1366 EE49C       %IF128                        ELSE        ( * * )
```

```
1367                *
1368                * PASS 2
1369                *
1370                *
1371                * CHECK VALID NAME & OUTPUT NAME FIELD
1372                *
1373 EE49C 0000              CON(5) =aOLDEX          OLD.EXPR
           0
1374 EE4A1 602E              CON(5) =aVALID          VALID.NAME  ( * STR * )
           E
1375 EE4A6 742E              CON(5) =aNAMEF          NAMEFIELD   ( * * )
           E
1376                *
1377                * OUTPUT FILE TYPE LINE
1378                *
1379 EE4AB 0000              CON(5) =QUOTC           "   NIBHEX 802E"
           0
1380 EE4B0 D0                CON(2) 13
1381 EE4B2 D0                CON(2) 13
1382 EE4B4 0202              NIBASC \  \
1383 EE4B8 E494              NIBASC \NIBHEX 8\
           2484
           5485
           0283
1384 EE4C8 0323              NIBASC \02E\
           54
1385 EE4CE 1DAD              CON(5) =aSIMLN          SIM.LINE    ( * * )
           E
1386                *
1387                * OUTPUT FLAGS LINE
1388                *
1389 EE4D3 0000              CON(5) =QUOTC           "   CON(2) 0"
           0
1390 EE4D8 A0                CON(2) 10
1391 EE4DA A0                CON(2) 10
1392 EE4DC 0202              NIBASC \  \
1393 EE4E0 34F4              NIBASC \CON(2) 0\
           E482
           2392
           0203
1394 EE4F0 1DAD              CON(5) =aSIMLN          SIM.LINE    ( * * )
           E
1395                *
1396                * OUTPUT TIME AND DATE LINES
1397                *
1398 EE4F5 EE2E              CON(5) =aTI/DA          TIME/DATE   ( * * )
           E
1399                *
1400                * OUTPUT FILE CHAIN LINK LINE
1401                *
1402 EE4FA 0000              CON(5) =QUOTC           "   REL(5) FiLeNd"
           0
1403 EE4FF F0                CON(2) 15
1404 EE501 F0                CON(2) 15
1405 EE503 0202              NIBASC \  \
```

```
1406 EE507 2554          NIBASC \REL(5) F\
           C482
           5392
           0264
1407 EE517 96C4          NIBASC \iLeNd\
           56E4
           46
1408 EE521 62BD          CON(5) =aSTUNW        STARTUPNEW  ( * * )
           E
1409 EE526 0000          CON(5) =SEMI          ;           ( * * )
           0
1410               ********************************************************************
1411               ***
1412               ***  ID
1413               ***
1414               *** ( -- [NUM] )
1415               *** ( APPEND LEX FILE ID TO HEADER )
1416               ********************************************************************
1417 EE52B 0000 =aIDN    CON(5) =DOCOL         : ID
           0
1418 EE530 0000          CON(5) =a?PAS1        ?PASS=1
           0
1419 EE535 0000          CON(5) =ZBRNH         IF
           0
1420 EE53A 4100          REL(5) %IF129
           0
1421 EE53F 0000          CON(5) =LIT           16          ( * NUM * )
           0
1422               *
1423               * PASS 1 PROCESSING
1424               *
1425 EE544 0100          CON(5) 16
           0
1426 EE549 0000          CON(5) =SEMI          ;           ( * NUM * )
           0
1427               *
1428               * PASS 2 PROCESSING
1429               *
1430 EE54E        %IF129                       ELSE        ( * * )
1431 EE54E 75DD          CON(5) =aENSLX        ENSURE.LEX  ( * * )
           E
1432 EE553 FEAD          CON(5) =aWRUOL        WRAPUPOLD   ( * * )
           E
1433               *
1434               * GENERATE ID FIELD
1435               *
1436 EE558 0000          CON(5) =QUOTC         "   CON(2) "
           0
1437 EE55D 90            CON(2) 9
1438 EE55F 90            CON(2) 9
1439 EE561 0202          NIBASC \  \
1440 EE565 34F4          NIBASC \CON(2) \
           E482
           2392
           02
```

```
1441 EE573 0000          CON(5) =a>PAD          >PAD         ( * STR * )
           0
1442 EE578 0000          CON(5) =aOLDEX         OLDEXPR
           0
1443 EE57D 0000          CON(5) =S<&            S<&          ( * STR * )
           0
1444 EE582 1DAD          CON(5) =aSIMLN         SIM.LINE     ( * * )
           E
1445             *
1446             * GENERATE LOW TOKEN FIELD
1447             *
1448 EE587 0000          CON(5) =QUOTC          "   CON(2) 0"
           0
1449 EE58C A0            CON(2) 10
1450 EE58E A0            CON(2) 10
1451 EE590 0202          NIBASC \  \
1452 EE594 34F4          NIBASC \CON(2) 0\                   ( * STR * )
           E482
           2392
           0203
1453 EE5A4 0000          CON(5) =LIT            16
           0
1454 EE5A9 0100          CON(5) 16
           0
1455 EE5AE 0000          CON(5) =aTESTF         TEST.FLAG    ( * STR F * )
           0
1456 EE5B3 0000          CON(5) =ZBRNH          IF           ( * STR * )
           0
1457 EE5B8 E100          REL(5) %IF152
           0
1458 EE5BD 0000          CON(5) =a>PAD          >PAD
           0
1459 EE5C2 0000          CON(5) =aLOTOK         LOTOK
           0
1460 EE5C7 0000          CON(5) =AT             @
           0
1461 EE5CC 0000          CON(5) =aNUM#3         #3           ( * STR STR' * )
           0
1462 EE5D1 0000          CON(5) =S<&            S<&
           0
1463 EE5D6       %IF152                         THEN         ( * STR * )
1464 EE5D6 1DAD          CON(5) =aSIMLN         SIM.LINE     ( * * )
           E
1465             *
1466             * GENERATE HIGH TOKEN FIELD
1467             *
1468 EE5DB 0000          CON(5) =QUOTC          "   CON(2) 0"
           0
1469 EE5E0 A0            CON(2) 10
1470 EE5E2 A0            CON(2) 10
1471 EE5E4 0202          NIBASC \  \
1472 EE5E8 34F4          NIBASC \CON(2) 0\
           E482
           2392
           0203
```

```
1473 EE5F8 0000          CON(5) =LIT           16
           0
1474 EE5FD 0100          CON(5) 16
           0
1475 EE602 0000          CON(5) =aTESTF        TEST.FLAG   ( * STR F * )
           0
1476 EE607 0000          CON(5) =ZBRNH         IF          ( * STR * )
           0
1477 EE60C E100          REL(5) %IF153
           0
1478 EE611 0000          CON(5) =a>PAD         >PAD
           0
1479 EE616 0000          CON(5) =aHITOK        HITOK
           0
1480 EE61B 0000          CON(5) =AT            @
           0
1481 EE620 0000          CON(5) =aNUM#3        #3
           0
1482 EE625 0000          CON(5) =S<&           S<&
           0
1483 EE62A       %IF153                        THEN        ( * STR * )
1484 EE62A 1DAD          CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
1485               *
1486               * NULL LEX TABLE LINK
1487               *
1488 EE62F 0000          CON(5) =QUOTC         "   CON(5) 0"
           0
1489 EE634 A0            CON(2) 10
1490 EE636 A0            CON(2) 10
1491 EE638 0202          NIBASC \  \
1492 EE63C 34F4          NIBASC \CON(5) 0\
           E482
           5392
           0203
1493 EE64C 1DAD          CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
1494               *
1495               * NO SPEED TABLE
1496               *
1497 EE651 0000          CON(5) =QUOTC         "   NIBHEX F"
           0
1498 EE656 A0            CON(2) 10
1499 EE658 A0            CON(2) 10
1500 EE65A 0202          NIBASC \  \
1501 EE65E E494          NIBASC \NIBHEX F\
           2484
           5485
           0264
1502 EE66E 1DAD          CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
1503               *
1504               * OFFSET TO TEXT TABLE
1505               *
1506 EE673 0000          CON(5) =QUOTC         " REL(4) 1+TxTbSt"
```

```
           0
1507 EE678 11          CON(2) 17
1508 EE67A 11          CON(2) 17
1509 EE67C 0202        NIBASC \  \
1510 EE680 2554        NIBASC \REL(4) 1\
           C482
           4392
           0213
1511 EE690 B245        NIBASC \+TxTbSt\
           8745
           2635
           47
1512 EE69E 62BD        CON(5) =aSTUNW        STARTUPNEW  ( * * )
           E
1513 EE6A3 0000        CON(5) =SEMI          ;           ( * * )
           0
1514           ********************************************************************
1515           ***
1516           ***  MSG
1517           ***
1518           *** ( -- )
1519           *** ( APPEND MESSAGE TABLE OFFSET TO HEADER )
1520           ********************************************************************
1521 EE6A8 0000 =aMSG   CON(5) =DOCOL         : MSG
           0
1522 EE6AD 75DD        CON(5) =aENSLX        ENSURE.LEX  ( * * )
           E
1523 EE6B2 FEAD        CON(5) =aWRUOL        WRAPUPOLD   ( * * )
           E
1524 EE6B7 0000        CON(5) =aEXPR         EXPR
           0
1525 EE6BC 0000        CON(5) =ZBRNH         IF          ( * * )
           0
1526 EE6C1 9300        REL(5) %IF130
           0
1527           *
1528           * USER SPECIFIED A VALID LABEL
1529           *
1530 EE6C6 0000        CON(5) =QUOTC         "   REL(4) "
           0
1531 EE6CB 90          CON(2) 9
1532 EE6CD 90          CON(2) 9
1533 EE6CF 0202        NIBASC \  \
1534 EE6D3 2554        NIBASC \REL(4) \
           C482
           4392
           02
1535 EE6E1 0000        CON(5) =a>PAD         >PAD        ( * STR * )
           0
1536 EE6E6 0000        CON(5) =aOLDEX        OLDEXPR
           0
1537 EE6EB 0000        CON(5) =S<&           S<&         ( * STR * )
           0
1538 EE6F0 0000        CON(5) =BRNCH
           0
```

```
1539 EE6F5 2200          REL(5) %TH130
           0
1540 EE6FA        %IF130                        ELSE        ( * * )
1541              *
1542              * USER SPECIFIED AN INVALID LABEL, OR ZERO
1543              *
1544 EE6FA 0000          CON(5) =QUOTC          "   CON(4) 0"
           0
1545 EE6FF A0            CON(2) 10
1546 EE701 A0            CON(2) 10
1547 EE703 0202          NIBASC \  \
1548 EE707 34F4          NIBASC \CON(4) 0\      ( * STR * )
           E482
           4392
           0203
1549              *
1550              * SIMULATE THIS LINE
1551              *
1552 EE717        %TH130                        THEN
1553 EE717 62BD          CON(5) =aSTUNW         STARTUPNEW  ( * * )
           E
1554 EE71C 0000          CON(5) =SEMI           ;           ( * * )
           0
1555              ********************************************************************
1556              ***
1557              ***  POLL
1558              ***
1559              *** ( -- )
1560              *** ( APPEND POLL TABLE OFFSET TO HEADER )
1561              ********************************************************************
1562 EE721 0000 =aPOLL  CON(5) =DOCOL          : POLL
           0
1563 EE726 75DD          CON(5) =aENSLX         ENSURE.LEX  ( * * )
           E
1564 EE72B FEAD          CON(5) =aWRUOL         WRAPUPOLD   ( * * )
           E
1565 EE730 0000          CON(5) =aEXPR          EXPR
           0
1566 EE735 0000          CON(5) =ZBRNH          IF          ( * * )
           0
1567 EE73A 9300          REL(5) %IF131
           0
1568              *
1569              * USER SPECIFIED A VALID LABEL
1570              *
1571 EE73F 0000          CON(5) =QUOTC          "   REL(5) "
           0
1572 EE744 90            CON(2) 9
1573 EE746 90            CON(2) 9
1574 EE748 0202          NIBASC \  \
1575 EE74C 2554          NIBASC \REL(5) \
           C482
           5392
           02
1576 EE75A 0000          CON(5) =a>PAD          >PAD        ( * STR * )
```

```
          0
1577 EE75F 0000         CON(5) =aOLDEX          OLDEXPR
          0
1578 EE764 0000         CON(5) =S<&             S<&         ( * STR * )
          0
1579 EE769 0000         CON(5) =BRNCH
          0
1580 EE76E 2200         REL(5) %TH131
          0
1581              *
1582              * USER SPECIFIED AN INVALID LABEL OR ZERO
1583              *
1584 EE773         %IF131                       ELSE        ( * * )
1585 EE773 0000         CON(5) =QUOTC           "   CON(5) 0"
          0
1586 EE778 A0           CON(2) 10
1587 EE77A A0           CON(2) 10
1588 EE77C 0202         NIBASC \  \
1589 EE780 34F4         NIBASC \CON(5) 0\           ( * STR * )
          E482
          5392
          0203
1590              *
1591              * SIMULATE THIS LINE
1592              *
1593 EE790         %TH131                       THEN        ( * STR * )
1594 EE790 62BD         CON(5) =aSTUNW          STAKTUPNEW  ( * * )
          E
1595 EE795 0000         CON(5) =SEMI            ;           ( * * )
          0
1596              ********************************************************************
1597              ***
1598              ***  ENTRY
1599              ***
1600              *** ( -- )
1601              *** ( ENTRY POINT INTO HEADER )
1602              ********************************************************************
1603 EE79A 0000 =aENTRY CON(5) =DOCOL          : ENTRY
          0
1604 EE79F 75DD         CON(5) =aENSLX          ENSURE.LEX  ( * * )
          E
1605 EE7A4 FEAD         CON(5) =aWRUOL          WRAPUPOLD   ( * * )
          E
1606              *
1607              * HAVE WE GENERATED THE MAIN TABLE YET?
1608              *
1609 EE7A9 0000         CON(5) =aTENT           TENT
          0
1610 EE7AE 0000         CON(5) =AT              @
          0
1611 EE7B3 0000         CON(5) =ZEQ             0=
          0
1612 EE7B8 0000         CON(5) =ZBRNH           IF          ( * * )
          0
1613 EE7BD 5500         REL(5) %IF132
```

```
           0
1614            *
1615            * NO.  LET'S DO SO NOW.
1616            *
1617 EE7C2 0000         CON(5) =QUOTC          "   * * * M A I N   T A B L E * * *
           0
1618 EE7C7 12           CON(2) 33
1619 EE7C9 12           CON(2) 33
1620 EE7CB 0202         NIBASC \  \
1621 EE7CF A202         NIBASC \* * * M \
           A202
           A202
           D402
1622 EE7DF 1402         NIBASC \A I N   \
           9402
           E402
           0202
1623 EE7EF 4502         NIBASC \T A B L \
           1402
           2402
           C402
1624 EE7FF 5402         NIBASC \E * * *\                ( * STR * )
           A202
           A202
           A2
1625 EE80D !DAD         CON(5) =aSIMLN         SIM.LINE
           E
1626            *
1627            * ONE MORE ENTRY TO THE MAIN TABLE
1628            *
1629 EE812       %IF132                        THEN      ( * * )
1630 EE812 0000         CON(5) =ONE            1
           0
1631 EE817 0000         CON(5) =aTENT          TENT
           0
1632 EE81C 0000         CON(5) =PSTOR          +!
           0
1633            *
1634            * GENERATE THREE NIBBLE OFFSET TO CORRECT ENTRY IN TEXT TABLE
1635            *
1636 EE821 0000         CON(5) =QUOTC          "   CON(3) (TxEn"
           0
1637 EE826 E0           CON(2) 14
1638 EE828 E0           CON(2) 14
1639 EE82A 0202         NIBASC \  \
1640 EE82E 34F4         NIBASC \CON(3) (\
           E482
           3392
           0282
1641 EE83E 4587         NIBASC \TxEn\
           54E6
1642 EE846 0000         CON(5) =a>PAD          >PAD      ( * STR * )
           0
1643 EE84B 0000         CON(5) =aTENT          TENT
           0
```

```
1644 EE850 0000          CON(5) =AT            @
           0
1645 EE855 0000          CON(5) =aNUM#2        #2
           0
1646 EE85A 0000          CON(5) =S<&           S<&         ( * STR * )
           0
1647 EE85F 0000          CON(5) =QUOTC         " )-(TxTbSt)"
           0
1648 EE864 A0            CON(2) 10
1649 EE866 A0            CON(2) 10
1650 EE868 92D2          NIBASC \)-(TxTbS\
           8245
           8745
           2635
1651 EE878 4792          NIBASC \t)\
1652 EE87C 0000          CON(5) =S<&           S<&         ( * STR * )
           0
1653 EE881 1DAD          CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
1654               *
1655               * GENERATE FIVE NIBBLE OFFSET TO ROUTINE TO HANDLE THIS WORD
1656               *
1657 EE886 0000          CON(5) =QUOTC         "
           0
1658 EE88B 90            CON(2) 9
1659 EE88D 90            CON(2) 9
1660 EE88F 0202          NIBASC \  \
1661 EE893 2554          NIBASC \REL(5) \
           C482
           5392
           02
1662 EE8A1 0000          CON(5) =a>PAD         >PAD        ( * STR * )
           0
1663 EE8A6 0000          CON(5) =aOLDEX        OLDEXPR
           0
1664 EE8AB 0000          CON(5) =S<&           S<&         ( * STR * )
           0
1665 EE8B0 62BD          CON(5) =aSTUNW        STARTUPNEW
           E
1666 EE8B5 0000          CON(5) =SEMI          ;           ( * * )
           0
1667               ********************************************************************
1668               ***
1669               ***  CHAR
1670               ***
1671               *** ( -- )
1672               *** ( APPEND CHARACTERISTIC NIBBLE TO HEADER )
1673               ********************************************************************
1674 EE8BA 0000 =aCHAR  CON(5) =DOCOL         : CHAR
           0
1675 EE8BF 75DD          CON(5) =aENSLX        ENSURE.LEX  ( * * )
           E
1676 EE8C4 FEAD          CON(5) =aWRUOL        WRAPUPOLD   ( * * )
           E
1677               *
```

```
1678                    * GENERATE ONE NIBBLE CONSTANT WITH CHARACTERISTIC NIBBLE
1679                    *
1680 EE8C9 0000                CON(5) =QUOTC           "   CON(1) "
           0
1681 EE8CE 90                  CON(2) 9
1682 EE8D0 90                  CON(2) 9
1683 EE8D2 0202                NIBASC \  \
1684 EE8D6 34F4                NIBASC \CON(1) \
           E482
           1392
           02
1685 EE8E4 0000                CON(5) =a>PAD           >PAD        ( * STR * )
           0
1686 EE8E9 0000                CON(5) =aOLDEX          OLDEXPR
           0
1687 EE8EE 0000                CON(5) =S<&             S<&         ( * STR * )
           0
1688                    *
1689                    * SIMULATE THIS LINE
1690                    *
1691 EE8F3 62BD                CON(5) =aSTUNW          STARTUPNEW
           E
1692 EE8F8 0000                CON(5) =SEMI            ;           ( * * )
           0
1693                    ********************************************************************
1694                    ***
1695                    ***  GENTxEnxx
1696                    ***
1697                    *** ( -- STR )
1698                    *** ( GENERATE A STRING "TxEn01" OR WHATEVER IS IN KENT )
1699                    ********************************************************************
1700 EE8FD 0000 =aGENTx CON(5) =DOCOL           : GENTxEnxx
           0
1701                    *
1702                    * PUT TxEn ONTO PAD
1703                    *
1704 EE902 0000                CON(5) =QUOTC           " TxEn"
           0
1705 EE907 40                  CON(2) 4
1706 EE909 40                  CON(2) 4
1707 EE90B 4587                NIBASC \TxEn\
           54E6
1708 EE913 0000                CON(5) =a>PAD           >PAD        ( * STR * )
           0
1709                    *
1710                    * APPEND TWO DIGIT STRING ONTO PAD
1711                    *
1712 EE918 0000                CON(5) =aKENT           KENT
           0
1713 EE91D 0000                CON(5) =AT              @
           0
1714 EE922 0000                CON(5) =aNUM#2          #2
           0
1715 EE927 0000                CON(5) =S<&             S<&
           0
```

```
1716 EE92C 0000         CON(5) =SEMI            ;           ( * STR * )
           0
1717                ***************************************************************
1718                ***
1719                ***  TXTBST
1720                ***
1721                *** ( -- STR )
1722                *** ( GENERATE THE STRING 'TxTbSt' )
1723                ***************************************************************
1724 EE931 0000 =TxTbSt CON(5) =DOCOL           : TXTBST
           0
1725 EE936 0000         CON(5) =QUOTC           " TxTbSt"
           0
1726 EE93B 60           CON(2) 6
1727 EE93D 60           CON(2) 6
1728 EE93F 4587         NIBASC \TxTbSt\
           4526
           3547
1729 EE94B 0000         CON(5) =SEMI            ;           ( * STR * )
           0
1730                ***************************************************************
1731                ***
1732                ***  KEYP
1733                ***
1734                *** ( -- [NUM] )
1735                *** ( APPEND KEYWORD TEXT TO HEADER )
1736                ***************************************************************
1737 EE950 0000 =aKEYP  CON(5) =DOCOL           : KEYP
           0
1738 EE955 0000         CON(5) =a?PAS1          ?PASS=1
           0
1739 EE95A 0000         CON(5) =ZBRNH           IF          ( * * )
           0
1740 EE95F D700         REL(5) %IF133
           0
1741                *
1742                * PASS 1 PROCESSING
1743                *
1744 EE964 0000         CON(5) =aKENT           KENT
           0
1745 EE969 0000         CON(5) =AT              @
           0
1746 EE96E 0000         CON(5) =ZEQ             0=
           0
1747 EE973 0000         CON(5) =ZBRNH           IF          ( * * )
           0
1748 EE978 9100         REL(5) %IF134
           0
1749                *
1750                * FIRST KEY PSEUDO-OP, PUT TEXT TABLE START ON SYMBOL TABLE
1751                *
1752 EE97D 0000         CON(5) =aLC             LC
           0
1753 EE982 0000         CON(5) =AT              @
           0
```

```
1754 EE987 139E          CON(5) =TxTbSt        TXTBST      ( * NUM STR * )
           E
1755 EE98C 0000          CON(5) =a>SYT         >SYT
           0
1756              *
1757              * ONE MORE KEY PSUEDO-OP
1758              *
1759 EE991         %IF134                      THEN        ( * * )
1760 EE991 0000          CON(5) =ONE           1
           0
1761 EE996 0000          CON(5) =aKENT         KENT
           0
1762 EE99B 0000          CON(5) =PSTOR         +!          ( * * )
           0
1763              *
1764              * GENERATE TXENXX LABEL IN SYMBOL TABLE
1765              *
1766 EE9A0 0000          CON(5) =aLC           LC
           0
1767 EE9A5 0000          CON(5) =AT            @
           0
1768 EE9AA DF8E          CON(5) =aGENTx        GENTxEnxx
           E
1769 EE9AF 0000          CON(5) =a>SYT         >SYT        ( * * )
           0
1770              *
1771              * CALCULATE LENGTH OF KEY PSEUDO-OP
1772              *
1773 EE9B4 0000          CON(5) =aEXP.F        EXPRESSION.FIELD
           0
1774 EE9B9 0000          CON(5) =aQ"STR        QUOTED.STRING
           0
1775 EE9BE 0000          CON(5) =aTRIM         TRIM.BLANKS
           0
1776 EE9C3 0000          CON(5) =SWAP          SWAP
           0
1777 EE9C8 0000          CON(5) =DROP          DROP        ( * NUM * )
           0
1778 EE9CD 0000          CON(5) =TWO*          2*          ( * NUM * )
           0
1779 EE9D2 0000          CON(5) =ONE+          1+          ( * NUM * )
           0
1780 EE9D7 0000          CON(5) =SEMI          ;           ( * NUM * )
           0
1781              *
1782              * PASS 2 PROCESSING
1783              *
1784 EE9DC         %IF133                      ELSE        ( * * )
1785 EE9DC 75DD          CON(5) =aENSLX        ENSURE.LEX  ( * * )
           E
1786 EE9E1 FEAD          CON(5) =aWRUOL        WRAPUPOLD   ( * * )
           E
1787 EE9E6 0000          CON(5) =aKENT         KENT
           0
1788 EE9EB 0000          CON(5) =AT            @
```

```
            0
   1789 EE9F0 0000          CON(5) =ZEQ             0=
            0
   1790 EE9F5 0000          CON(5) =ZBRNH           IF          ( * * )
            0
   1791 EE9FA F500          REL(5) %IF135
            0
   1792              *
   1793              * FIRST KEY PSEUDO-OP (PASS2), GENERATE START OF TEXT TABLE
   1794              *
   1795 EE9FF 0000          CON(5) =QUOTC           "   * * * T E X T   T A B L E * * *
            0
   1796 EEA04 12            CON(2) 33
   1797 EEA06 12            CON(2) 33
   1798 EEA08 0202          NIBASC \  \
   1799 EEA0C A202          NIBASC \* * * T \
            A202
            A202
            4502
   1800 EEA1C 5402          NIBASC \E X T   \
            8502
            4502
            0202
   1801 EEA2C 4502          NIBASC \T A B L \
            1402
            2402
            C402
   1802 EEA3C 5402          NIBASC \E * * *\
            A202
            A202
            A2
   1803 EEA4A 1DAD          CON(5) =aSIMLN          SIM.LINE    ( * * )
            E
   1804 EEA4F 139E          CON(5) =TxTbSt          TXTBST      ( * STR * )
            E
   1805 EEA54 1DAD          CON(5) =aSIMLN          SIM.LINE    ( * * )
            E
   1806              *
   1807              * ONE MORE KEY PSEUDO-OP
   1808              *
   1809 EEA59         %IF135                        THEN        ( * * )
   1810 EEA59 0000          CON(5) =ONE             1
            0
   1811 EEA5E 0000          CON(5) =aKENT           KENT
            0
   1812 EEA63 0000          CON(5) =PSTOR           +!          ( * * )
            0
   1813              *
   1814              * GENERATE LINE FOR LABEL (LABEL IN DURING 1ST PASS)
   1815              *
   1816 EEA68 DF8E          CON(5) =aGENTx          GENTxEnxx   ( * STR * )
            E
   1817 EEA6D 1DAD          CON(5) =aSIMLN          SIM.LINE    ( * * )
            E
   1818              *
```

```
1819            * GENERATE ONE NIBBLE CONSTANT OF LENGTH - 1
1820            *
1821 EEA72 0000         CON(5) =QUOTC          "   CON(1) "
           0
1822 EEA77 90           CON(2) 9
1823 EEA79 90           CON(2) 9
1824 EEA7B 0202         NIBASC \  \
1825 EEA7F 34F4         NIBASC \CON(1) \
           E482
           1392
           02
1826 EEA8D 0000         CON(5) =a>PAD          >PAD        ( * STR * )
           0
1827 EEA92 0000         CON(5) =aOLDEX         OLDEXPR
           0
1828 EEA97 0000         CON(5) =aQ"STR         QUOTED.STRING
           0
1829 EEA9C 0000         CON(5) =aTRIM          TRIM.BLANKS
           0
1830            *
1831            * RESAVE THE OLD EXPRESSION WITHOUT QUOTES OR BLANKS
1832            *
1833 EEAA1 0000         CON(5) =2DUP           2DUP
           0
1834 EEAA6 0000         CON(5) =aOLDEX         OLDEXPR
           0
1835 EEAAB 0000         CON(5) =S!             S!          ( * STR * )
           0
1836 EEAB0 0000         CON(5) =SWAP           SWAP
           0
1837 EEAB5 0000         CON(5) =DROP           DROP        ( * STR LEN * )
           0
1838 EEABA 0000         CON(5) =TWO*           2*
           0
1839 EEABF 0000         CON(5) =ONE-           1-
           0
1840 EEAC4 0000         CON(5) =aNUM#2         #2
           0
1841 EEAC9 0000         CON(5) =S<&            S<&         ( * STR * )
           0
1842 EEACE 1DAD         CON(5) =aSIMLN         SIM.LINE    ( * * )
           E
1843            *
1844            * GENERATE ASCII FOR KEY PSEUDO-OP
1845            *
1846 EEAD3 0000         CON(5) =QUOTC          "   NIBASC '"
           0
1847 EEAD8 A0           CON(2) 10
1848 EEADA A0           CON(2) 10
1849 EEADC 0202         NIBASC \  NIBASC\
           E494
           2414
           3534
1850 EEAEC 0272         NIBASC \ '\
1851 EEAF0 0000         CON(5) =a>PAD          >PAD        ( * STR * )
```

```
          0
1852 EEAF5 0000          CON(5) =aOLDEX         OLDEXPR
          0
1853 EEAFA 0000          CON(5) =S<&            S<&          ( * STR * )
          0
1854 EEAFF AFED          CON(5) =aENDQ          END.QUOTE
          E
1855                *
1856                * SIMULATE THIS LINE
1857                *
1858 EEB04 62BD          CON(5) =aSTUNW         STARTUPNEW   ( * * )
          E
1859 EEB09 0000          CON(5) =SEMI           ;            ( * * )
          0
1860                ****************************************************************
1861                ***
1862                ***  TOKENP
1863                ***
1864                *** ( -- [NUM] )
1865                *** ( APPEND TOKEN TO HEADER )
1866                ****************************************************************
1867 EEB0E 0000 =aTOKNP CON(5) =DOCOL          : TOKENP
          0
1868 EEB13 0000          CON(5) =a?PAS1         ?PASS=1
          0
1869 EEB18 0000          CON(5) =ZBRNH          IF           ( * * )
          0
1870 EEB1D A500          REL(5) %IF136
          0
1871                *
1872                * PASS 1 PROCESSING
1873                *
1874                *
1875                * INDICATE THAT TOKENS ARE PRESENT IN THIS FILE.  PSEUDO-OP ID HA
1876                * TO KNOW.
1877                *
1878 EEB22 0000          CON(5) =LIT            16
          0
1879 EEB27 0100          CON(5) 16
          0
1880 EEB2C 0000          CON(5) =aSETF          SET.FLAG     ( * * )
          0
1881                *
1882                * SAVE LOWEST KNOWN TOKEN
1883                *
1884 EEB31 0000          CON(5) =aEXPR          EXPR
          0
1885 EEB36 0000          CON(5) =DUP            DUP          ( * NUM NUM * )
          0
1886 EEB3B 0000          CON(5) =aLOTOK         LOTOK
          0
1887 EEB40 0000          CON(5) =AT             @
          0
1888 EEB45 0000          CON(5) =MIN            MIN          ( * NUM MIN * )
          0
```

```
1889 EEB4A 00000        CON(5) =aLOTOK        LOTOK
           0
1890 EEB4F 00000        CON(5) =STORE         !           ( * NUM * )
           0
1891            *
1892            * SAVE HIGHEST KNOWN TOKEN
1893            *
1894 EEB54 00000        CON(5) =aHITOK        HITOK
           0
1895 EEB59 00000        CON(5) =AT            @
           0
1896 EEB5E 00000        CON(5) =MAX           MAX         ( * MAX * )
           0
1897 EEB63 00000        CON(5) =aHITOK        HITOK
           0
1898 EEB68 00000        CON(5) =STORE         !
           0
1899            *
1900            * RETURN LENGTH
1901            *
1902 EEB6D 00000        CON(5) =TWO           2           ( * NUM * )
           0
1903 EEB72 00000        CON(5) =SEMI          ;           ( * NUM * )
           0
1904            *
1905            * PASS 2 PROCESSING
1906            *
1907 EEB77       %IF136                       ELSE        ( * * )
1908 EEB77 75DD         CON(5) =aENSLX        ENSURE.LEX  ( * * )
           E
1909 EEB7C FEAD         CON(5) =aWRUOL        WRAPUPOLD   ( * * )
           E
1910            *
1911            * GENERATE TWO NIBBLE CONSTANT OF TOKEN NUMBER
1912            *
1913 EEB81 00000        CON(5) =QUOTC         "   CON(2) "
           0
1914 EEB86 90           CON(2) 9
1915 EEB88 90           CON(2) 9
1916 EEB8A 0202         NIBASC \  \
1917 EEB8E 34F4         NIBASC \CON(2) \
           E482
           2392
           02
1918 EEB9C 00000        CON(5) =a>PAD         >PAD        ( * STR * )
           0
1919 EEBA1 00000        CON(5) =aOLDEX        OLDEXPR
           0
1920 EEBA6 00000        CON(5) =S<&           S<&         ( * STR * )
           0
1921            *
1922            * SIMULATE THIS LINE
1923            *
1924 EEBAB 62BD         CON(5) =aSTUNW        STARTUPNEW  ( * * )
           E
```

```
EEBB0 0000          CON(5) =SEMI          ;           ( * * )
      0
            ****************************************************************
            ***
            ***  END.TEXT
            ***
            *** ( -- [NUM] )
            *** ( MARK THE END OF THE TEXT TABLE )
            ****************************************************************
EEBB5 0000 =aENDTX CON(5) =DOCOL          : END.TEXT
      0
EEBBA 0000          CON(5) =a?PAS1        ?PASS=1
      0
EEBBF 0000          CON(5) =ZBRNH         IF
      0
EEBC4 C300          REL(5) %IF157
      0
            *
            * PASS 1 PROCESSING
            *
EEBC9 0000          CON(5) =aKENT         KENT
      0
EEBCE 0000          CON(5) =AT            @
      0
EEBD3 0000          CON(5) =ZEQ           0=
      0
EEBD8 0000          CON(5) =ZBRNH         IF          ( * * )
      0
EEBDD 9100          REL(5) %IF158
      0
            *
            * TEXT TABLE NOT PRESENT, WE MUST MAKE ONE (SINCE NO KEY PSEUDO-O
            * REACHED)
            *
EEBE2 0000          CON(5) =aLC           LC
      0
EEBE7 0000          CON(5) =AT            @           ( * NUM * )
      0
EEBEC 139E          CON(5) =TxTbSt        TXTBST      ( * NUM STR * )
      E
EEBF1 0000          CON(5) =a>SYT         >SYT        ( * * )
      0
            *
            * RETURN LENGTH
            *
EEBF6        %IF158                       THEN        ( * * )
EEBF6 0000          CON(5) =THREE         3           ( * NUM * )
      0
EEBFB 0000          CON(5) =SEMI          ;           ( * NUM * )
      0
            *
            * PASS 2 PROCESSING
            *
EEC00        %IF157                       ELSE        ( * * )
EEC00 FEAD          CON(5) =aWRUOL        WRAPUPOLD   ( * * )
```

```
           E
1964 EEC05 0000          CON(5) =aKENT          KENT
           0
1965 EEC0A 0000          CON(5) =AT             @
           0
1966 EEC0F 0000          CON(5) =ZEQ            0=
           0
1967 EEC14 0000          CON(5) =ZBRNH          IF
           0
1968 EEC19 F000          REL(5) %IF159
           0
1969               *
1970               * GENERATE START OF TEXT TABLE
1971               *
1972 EEC1E 139E          CON(5) =TxTbSt         TXTBST      ( * STR * )
           E
1973 EEC23 1DAD          CON(5) =aSIMLN         SIM.LINE    ( * * )
           E
1974               *
1975               * GENERATE END OF TEXT TABLE
1976               *
1977 EEC28                %IF159                THEN        ( * * )
1978 EEC28 0000          CON(5) =QUOTC          "   NIBHEX 1FF"
           0
1979 EEC2D C0            CON(2) 12
1980 EEC2F C0            CON(2) 12
1981 EEC31 0202          NIBASC \  NIBHEX\
           E494
           2484
           5485
1982 EEC41 0213          NIBASC \ 1FF\
           6464
1983               *
1984               * SIMULATE THIS LINE
1985               *
1986 EEC49 62BD          CON(5) =aSTUNW         STARTUPNEW  ( * * )
           E
1987 EEC4E 0000          CON(5) =SEMI           ;           ( * * )
           0
1988               ****************************************************************
1989               ***
1990               ***  BIN
1991               ***
1992               *** ( -- [NUM] )
1993               *** ( CREATE A BIN FILE HEADER )
1994               ****************************************************************
1995 EEC53 0000 =aBIN   CON(5) =DOCOL          : BIN
           0
1996               *
1997               * CHECK FOR FILETYPE & MULTIPLE BIN PSEUDO-OPS
1998               *
1999 EEC58 CBCD          CON(5) =aFILBN         FILE.IS.BIN
           E
2000 EEC5D 0000          CON(5) =a?PAS1         ?PASS=1
           0
```

```
2001 EEC62 0000         CON(5) =ZBRNH         IF
           0
2002 EEC67 B400         REL(5) %IF137
           0
2003            *
2004            * PASS 1
2005            *
2006            *
2007            * CHECK FOR VALID FILENAME & PURGE PREVIOUS BIN FILE
2008            *
2009 EEC6C 0000         CON(5) =aEXP.F        EXPRESSION.FIELD
           0
2010 EEC71 602E         CON(5) =aVALID        VALID.NAME  ( * STR * )
           E
2011 EEC76 0000         CON(5) =LIT           bin file type
           0
2012 EEC7B 402E         CON(5) #E204
           0
2013 EEC80 0000         CON(5) =aPURGE        PURGE       ( * F * )
           0
2014 EEC85 0000         CON(5) =DROP          DROP        ( * * )
           0
2015            *
2016            * UPDATE POINTERS TO REFLECT MEMORY MOVE
2017            *
2018 EEC8A 0000         CON(5) =aMEMOV        MEMORY MOVED
           0
2019 EEC8F 0000         CON(5) =aOBJFL        OBJ.FILE
           0
2020 EEC94 0000         CON(5) =AT            @
           0
2021 EEC99 0000         CON(5) =aLC           LC
           0
2022 EEC9E 0000         CON(5) =STORE         !
           0
2023            *
2024            * RETURN LENGTH
2025            *
2026 EECA3 0000         CON(5) =LIT           37          ( * NUM * )
           0
2027 EECA8 5200         CON(5) 37
           0
2028 EECAD 0000         CON(5) =SEMI          ;           ( * NUM * )
           0
2029 EECB2       %IF137
2030            *
2031            * PASS 2
2032            *
2033            *
2034            * CHECK FOR VALID NAME & OUTPUT NAME LINE
2035            *
2036 EECB2 0000         CON(5) =aOLDEX        OLD.EXPR
           0
2037 EECB7 602E         CON(5) =aVALID        VALID.NAME  ( * STR * )
           E
```

```
2038 EECBC 742E          CON(5) =aNAMEF        NAMEFIELD   ( * * )
           E
2039              *
2040              * OUTPUT FILE TYPE LINE
2041              *
2042 EECC1 0000          CON(5) =QUOTC         "   NIBHEX 402E"
           0
2043 EECC6 D0            CON(2) 13
2044 EECC8 D0            CON(2) 13
2045 EECCA 0202          NIBASC \  \
2046 EECCE E494          NIBASC \NIBHEX 4\
           2484
           5485
           0243
2047 EECDE 0323          NIBASC \02E\
           54
2048 EECE4 1DAD          CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
2049              *
2050              * OUTPUT FLAGS LINE
2051              *
2052 EECE9 0000          CON(5) =QUOTC         "   CON(2) 0"
           0
2053 EECEE A0            CON(2) 10
2054 EECF0 A0            CON(2) 10
2055 EECF2 0202          NIBASC \  \
2056 EECF6 34F4          NIBASC \CON(2) 0\
           E482
           2392
           0203
2057 EED06 1DAD          CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
2058              *
2059              * OUTPUT TIME AND DATE LINES
2060              *
2061 EED0B EE2E          CON(5) =aTI/DA        TIME/DATE   ( * * )
           E
2062              *
2063              * OUTPUT FILE CHAIN LINK LINE
2064              *
2065 EED10 0000          CON(5) =QUOTC         "   REL(5) FiLeNd"
           0
2066 EED15 F0            CON(2) 15
2067 EED17 F0            CON(2) 15
2068 EED19 0202          NIBASC \  \
2069 EED1D 2554          NIBASC \REL(5) F\
           C482
           5392
           0264
2070 EED2D 96C4          NIBASC \iLeNd\
           56E4
           46
2071 EED37 62BD          CON(5) =aSTUNW        STARTUPNEW  ( * * )
           E
2072 EED3C 0000          CON(5) =SEMI          ;           ( * * )
```

```
           0
2073            ********************************************************************
2074            ***
2075            ***  CHAIN
2076            ***
2077            *** ( -- )
2078            *** ( APPEND BINARY SUBHEADER TO HEADER )
2079            ********************************************************************
2080 EED41 0000 =aCHAIN CON(5) =DOCOL          : CHAIN
           0
2081 EED46 B6DD         CON(5) =aENSBN         ENSURE.BIN  ( * * )
           E
2082 EED4B FEAD         CON(5) =aWRUOL         WRAPUPOLD   ( * * )
           E
2083 EED50 0000         CON(5) =aEXPR          EXPR
           0
2084 EED55 0000         CON(5) =aNEG1          -1
           0
2085 EED5A 0000         CON(5) =EQUAL          =
           0
2086 EED5F 0000         CON(5) =ZBRNH          IF          ( * * )
           0
2087 EED64 A200         REL(5) %IF138
           0
2088            *
2089            * USER INDICATED NO CHAIN (-1).
2090            *
2091 EED69 0000         CON(5) =QUOTC          "   CON(5) "
           0
2092 EED6E 90           CON(2) 9
2093 EED70 90           CON(2) 9
2094 EED72 0202         NIBASC \  \
2095 EED76 34F4         NIBASC \CON(5) \
           E482
           5392
           02
2096 EED84 0000         CON(5) =BRNCH
           0
2097 EED89 0200         REL(5) %TH138
           0
2098            *
2099            * USER INDICATED A LABEL FOR SUB PROGRAM CHAIN
2100            *
2101 EED8E       %IF138                        ELSE        ( * * )
2102 EED8E 0000         CON(5) =QUOTC          "   REL(5) "
           0
2103 EED93 90           CON(2) 9
2104 EED95 90           CON(2) 9
2105 EED97 0202         NIBASC \  \
2106 EED9B 2554         NIBASC \REL(5) \
           C482
           5392
           02
2107            *
2108            * SIMULATE THIS LINE
```

```
2109           *
2110 EEDA9       %TH138                        THEN        ( * STR * )
2111 EEDA9 0000          CON(5) =a>PAD         >PAD
           0
2112 EEDAE 0000          CON(5) =aOLDEX        OLDEXPR
           0
2113 EEDB3 0000          CON(5) =S<&           S<&         ( * STR * )
           0
2114 EEDB8 1DAD          CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
2115           *
2116           * GENERATE NO LABEL CHAIN IN THIS FILE
2117           *
2118 EEDBD 0000          CON(5) =QUOTC         "   CON(5) -1"
           0
2119 EEDC2 B0            CON(2) 11
2120 EEDC4 B0            CON(2) 11
2121 EEDC6 0202          NIBASC \  \
2122 EEDCA 34F4          NIBASC \CON(5) -\
           E482
           5392
           02D2
2123 EEDDA 13            NIBASC \1\                        ( * STR * )
2124 EEDDC 1DAD          CON(5) =aSIMLN        SIM.LINE    ( * * )
           E
2125           *
2126           * GENERATE TWO NIBBLE FILLER
2127           *
2128 EEDE1 0000          CON(5) =QUOTC         "   NIBHEX 20"
           0
2129 EEDE6 B0            CON(2) 11
2130 EEDE8 B0            CON(2) 11
2131 EEDEA 0202          NIBASC \  \
2132 EEDEE E494          NIBASC \NIBHEX 2\
           2484
           5485
           0223
2133 EEDFE 03            NIBASC \0\                        ( * STR * )
2134           *
2135           * SIMULATE THIS LINE
2136           *
2137 EEE00 62BD          CON(5) =aSTUNW        STARTUPNEW  ( * * )
           E
2138 EEE05 0000          CON(5) =SEMI          ;           ( * * )
           0
```

```
2139                    STITLE FIT STATS
2140            zSIZE   EQU    (*)-zTHIS
2141            zLEFT   EQU    (zNEXT)-*
2142 EEE0A              BSS    zLEFT
2143 EEF00              END
```

%BG13	Abs	973376	#EDA40 -	329	341	
%BG14	Abs	974401	#EDE41 -	786	849	
%DO12	Abs	972669	#ED77D -	65	72	
%DO13	Abs	974956	#EE06C -	994	997	
%GOGET	Abs	975568	#EE2D0 -	1230	1216	
%IF104	Abs	972579	#ED723 -	36	27	
%IF105	Abs	972734	#ED7BE -	95	87	
%IF106	Abs	974287	#EDDCF -	737	729	
%IF107	Abs	973162	#ED96A -	244	235	
%IF108	Abs	973212	#ED99C -	262	251	
%IF109	Abs	973456	#EDA90 -	350	320	
%IF111	Abs	973942	#EDC76 -	579	569	
%IF112	Abs	974142	#EDD3E -	667	660	
%IF115	Abs	974062	#EDCEE -	632	600	620
%IF117	Abs	974446	#EDE6E -	799	792	
%IF118	Abs	974511	#EDEAF -	822	815	
%IF119	Abs	974816	#EDFE0 -	955	939	
%IF121	Abs	974881	#EE021 -	972	967	
%IF122	Abs	974971	#EE07B -	998	991	
%IF123	Abs	975021	#EE0AD -	1012	1007	
%IF124	Abs	975181	#EE14D -	1060	1058	
%IF125	Abs	975216	#EE170 -	1081	1072	
%IF126	Abs	975306	#EE1CA -	1121	1112	
%IF127	Abs	975426	#EE242 -	1169	1162	
%IF128	Abs	976028	#EE49C -	1366	1332	
%IF129	Abs	976206	#EE54E -	1430	1420	
%IF130	Abs	976634	#EE6FA -	1540	1526	
%IF131	Abs	976755	#EE773 -	1584	1567	
%IF132	Abs	976914	#EE812 -	1629	1613	
%IF133	Abs	977372	#EE9DC -	1784	1740	
%IF134	Abs	977297	#EE991 -	1759	1748	
%IF135	Abs	977497	#EEA59 -	1809	1791	
%IF136	Abs	977783	#EEB77 -	1907	1870	
%IF137	Abs	978098	#EECB2 -	2029	2002	
%IF138	Abs	978318	#EED8E -	2101	2087	
%IF142	Abs	973049	#ED8F9 -	201	121	
%IF143	Abs	973089	#ED921 -	217	137	190
%IF144	Abs	972904	#ED868 -	158	129	
%IF145	Abs	972969	#ED8A9 -	178	166	
%IF146	Abs	973074	#ED912 -	210	204	
%IF147	Abs	973706	#EDB8A -	490	479	
%IF148	Abs	973721	#EDB99 -	497	471	
%IF149	Abs	973857	#EDC21 -	549	514	
%IF150	Abs	973957	#EDC85 -	586	552	
%IF151	Abs	972619	#ED74B -	51	40	
%IF152	Abs	976342	#EE5D6 -	1463	1457	
%IF153	Abs	976426	#EE62A -	1483	1477	
%IF156	Abs	974082	#EDD02 -	644	635	
%IF157	Abs	977920	#EEC00 -	1962	1936	
%IF158	Abs	977910	#EEBF6 -	1956	1944	
%IF159	Abs	977960	#EEC28 -	1977	1968	
%RP13	Abs	973436	#EDA7C -	342	337	
%TH117	Abs	974571	#EDEEB -	847	798	
%TH123	Abs	975026	#EE0B2 -	1014	1011	
%TH130	Abs	976663	#EE717 -	1552	1539	

```
%TH131  Abs  976784 #EE790 -  1593  1580
%TH138  Abs  978345 #EEDA9 -  2110  2097
2DROP   Ext                -   170   239   968  1013
2DUP    Ext                -   228   834  1158  1182  1833
>R      Ext                -   287   804   830  1003
?DUP    Ext                -   318   989
ABS     Ext                -    31    44
ADD     Ext                -   152   162   184   289   741   836
ALLOT   Ext                -   582
AND     Ext                -   119
AT      Ext                -   185   511   565   581   597   617   656   719
                              927   935   944   951   953   963   964  1357
                             1460  1480  1610  1644  1713  1745  1753  1767
                             1788  1887  1895  1941  1950  1965  2020
BL      Ext                -   332
BRNCH   Ext                -   340   797  1010  1215  1538  1579  2096
C@+     Ext                -   338
CAT     Ext                -   331
CHR$    Ext                -  1026
CONTX   Ext                -   945   962
CURR    Ext                -   943   952
DEC     Ext                -   764
DOCOL   Ext                -    23    84   110   226   275   304   360   373
                              385   407   448   467   509   595   615   654
                              676   687   697   708   750   778   861   875
                              914  1038  1054  1069  1109  1148  1178  1210
                             1225  1243  1325  1417  1521  1562  1603  1674
                             1700  1724  1737  1867  1933  1995  2080
DROP    Ext                -   116   282   339   722   819   960   979  1233
                             1344  1777  1837  2014
DUP     Ext                -    37    52   159   163   286   540   726   808
                              812  1004  1885
END$    Ext                -   325  1232
EQUAL   Ext                -   187   333   657   937  2085
F.AND   Ext                -   335
FIND>   Ext                -   965
FIVE+   Ext                -   321
FSTX    Ext                -  1159
GT      Ext                -   567
HERE    Ext                -   539   559
HEX     Ext                -   762
LATE    Ext                -   761
LIT     Ext                -    45    58   150   160   171   182   194   211
                              263   346   491   561   573   664   730   739
                              788   809   820   969  1166  1254  1283  1298
                             1341  1363  1421  1453  1473  1878  2011  2026
LT      Ext                -   790
LTZ     Ext                -    38
MAX     Ext                -    62  1896
MIN     Ext                -    60   348   720   928  1888
MINUS   Ext                -   295   563   566   828
MOD     Ext                -   811
N!      Ext                -   153   181
N@      Ext                -   164
NULL$   Ext                -   533
```

ONE	Ext		-	61	518	677	782	936	1269	1313	1630
				1760	1810						
ONE+	Ext		-	68	803	1779					
ONE-	Ext		-	988	1005	1008	1839				
OVER	Ext		-	330	334	787	827				
POS	Ext		-	314							
PSTOR	Ext		-	1632	1762	1812					
QUOTC	Ext		-	229	245	308	524	752	862	884	1019
				1039	1090	1130	1188	1211	1226	1248	1263
				1277	1292	1307	1379	1389	1402	1436	1448
				1468	1488	1497	1506	1530	1544	1571	1585
				1617	1636	1647	1657	1680	1704	1725	1795
				1821	1846	1913	1978	2042	2052	2065	2091
				2102	2118	2128					
R>	Ext		-	294	837	839	1025				
R@	Ext		-	67							
ROT	Ext		-	324	1231						
S!	Ext		-	363	376	390	427	456	535	919	930
				1184	1835						
S0	Ext		-	560							
S<&	Ext		-	765	866	892	897	981	1024	1027	1195
				1253	1257	1268	1271	1282	1286	1297	1301
				1312	1315	1443	1462	1482	1537	1578	1646
				1652	1664	1687	1715	1841	1853	1920	2113
S=	Ext		-	233	249						
SEMI	Ext		-	32	76	102	154	174	197	206	218
				243	258	266	296	349	352	365	377
				399	440	459	486	499	545	587	607
				627	646	668	679	690	700	742	770
				853	867	906	1030	1046	1061	1077	1100
				1117	1140	1170	1201	1235	1317	1365	1409
				1426	1513	1554	1595	1666	1692	1716	1729
				1780	1859	1903	1925	1958	1987	2028	2072
				2138							
STORE	Ext		-	54	70	101	242	257	421	520	542
				544	606	626	946	954	1351	1359	1890
				1898	2022						
SWAP	Ext		-	115	134	180	279	281	290	721	826
				829	978	1776	1836				
SWAP2	Ext		-	838	896	1194					
THREE	Ext		-	624	698	1957					
TWO	Ext		-	179	475	483	604	688	1234	1902	
TWO*	Ext		-	288	738	835	1778	1838			
TWO-	Ext		-	961							
=TxTbSt	Abs	977201	#EE931 -	1724	1754	1804	1951	1972			
WIDTH	Ext		-	718	926						
XDO	Ext		-	64	993						
XLOOP	Ext		-	71	996						
ZBRNH	Ext		-	26	39	86	120	128	136	165	189
				203	234	250	319	336	470	478	513
				551	568	599	619	634	659	728	791
				814	848	938	966	990	1006	1057	1071
				1111	1161	1331	1419	1456	1476	1525	1566
				1612	1739	1747	1790	1869	1935	1943	1967
				2001	2086						

```
 ZEQ      Ext                    -   135   188   469   477   512   598   618   658
                                     727   813  1160  1611  1746  1789  1942  1966
 ZERO     Ext                    -    63    66    91   133   147   205   255   419
                                     498   843   992  1059  1349
 a&CLR    Ext                    -   398   439   879
=a+LAB    Abs  973232 #ED9B0     -   275   313   323
 a>OPx    Ext                    -    69
 a>PAD    Ext                    -   757  1193  1441  1458  1478  1535  1576  1642
                                    1662  1685  1708  1826  1851  1918  2111
 a>SYT    Ext                    -   143  1755  1769  1952
=a?1ST    Abs  973636 #EDB44     -   467   550   633
 a?PAS1   Ext                    -    25    85   127   202   468  1056  1070  1110
                                    1330  1418  1738  1868  1934  2000
 aBAS$    Ext                    -  1230
=aBIN     Abs  978003 #EEC53     -  1995
 aBLNK1   Ext                    -   351
=aBRK8    Abs  974391 #EDE37     -   778   987
=aBSS     Abs  972544 #ED700     -    23
=aCHAIN   Abs  978241 #EED41     -  2080
=aCHAR    Abs  977082 #EE8BA     -  1674
=aCLCWD   Abs  974207 #EDD7F     -   708  1076  1116
=aDATE$   Abs  975544 #EE2B8     -  1225  1285  1300  1314
 aDOLIN   Ext                    -   394
 aDONE    Ext                    -   100
 aEJECT   Ext                    -   364
=aEND     Abs  972709 #ED7A5     -    84
=aENDQ    Abs  974586 #EDEFA     -   861   901  1028  1196  1854
=aENDTX   Abs  977845 #EEBB5     -  1933
=aENS4T   Abs  974147 #EDD43     -   676  1082  1122
 aENS8L   Ext                    -  1154
=aENSBN   Abs  974187 #EDD6B     -   697  2081
=aENSLX   Abs  974167 #EDD57     -   687  1431  1522  1563  1604  1675  1785  1908
=aENTRY   Abs  976794 #EE79A     -  1603
=aEQU     Abs  972754 #ED7D2     -   110
 aERROR   Ext                    -    47   173   196   213   265   493   666   971
 aEXP.F   Ext                    -   227   425   712  1339  1773  2009
 aEXPR    Ext                    -    24   141   186  1524  1565  1884  2083
=aFIL4T   Abs  973731 #EDBA3     -   509  1055
=aFILBN   Abs  974012 #EDCBC     -   615  1999
=aFILLX   Abs  973962 #EDC8A     -   595  1329
 aFLSIZ   Ext                    -   564   580
=aFLTST   Abs  974092 #EDD0C     -   654   678   689   699
 aFLTYP   Ext                    -   510   519   596   605   616   625   655   934
=aFORTH   Abs  975151 #EE12F     -  1054
=aGENTx   Abs  977149 #EE8FD     -  1700  1768  1816
 aHITOK   Ext                    -  1479  1894  1897
=aIDN     Abs  976171 #EE52B     -  1417
 aKENT    Ext                    -  1712  1744  1761  1787  1811  1940  1964
=aKEYP    Abs  977232 #EE950     -  1737
 aKILL    Ext                    -   528
 aLAB.F   Ext                    -   114   117   125   142   148   280
 aLABOK   Ext                    -   118
 aLC      Ext                    -   543   950  1358  1752  1766  1949  2021
 aLC+     Ext                    -   435
=aLEX     Abs  975918 #EE42E     -  1325
```

```
 aLINEC  Ext                    -  1350
=aLIST   Abs  973094 #ED926    -   226
 aLLINE  Ext                    -   880  1018  1247  1262  1276  1291  1306
 aLOTOK  Ext                    -  1459  1886  1889
 aLSTCH  Ext                    -  1002
 aLUKUP  Ext                    -   126   149
 aMEMOV  Ext                    -   529  1355  2018
=aMSG    Abs  976552 #EE6A8    -  1521
=aNAMEF  Abs  975431 #EE247    -  1178  1375  2038
 aNEG1   Ext                    -    99   240   485   796  2084
 aNUM#2  Ext                    -  1645  1714  1840
 aNUM#3  Ext                    -   980  1461  1481
 aNUM#5  Ext                    -   763
 aOBJFL  Ext                    -   541  1356  2019
 aOBJGR  Ext                    -   640
 aOFILE  Ext                    -   534  1183
 aOLDEX  Ext                    -   426   923   929   959   977   986  1373  1442
                                    1536  1577  1663  1686  1827  1834  1852  1919
                                    2036  2112
 aOPLEN  Ext                    -    53   420
 aPARSE  Ext                    -   457
=aPOLL   Abs  976673 #EE721    -  1562
 aPROCS  Ext                    -   458
 aPURGE  Ext                    -  1343  2013
 aQ"STR  Ext                    -   713   924  1152  1774  1828
 aSETF   Ext                    -   484  1880
 aSHUTD  Ext                    -   575   732  1168
=aSIMFF  Abs  974612 #EDF14    -   875   995  1009
=aSIMLN  Abs  973521 #EDAD1    -   385   769   905   982  1029  1200  1258  1272
                                    1287  1302  1316  1385  1394  1444  1464  1484
                                    1493  1502  1625  1653  1803  1805  1817  1842
                                    1973  2048  2057  2114  2124
 aSLINE  Ext                    -   312   322   389   455   918   976
 aSPIT   Ext                    -   431
 aSTIT   Ext                    -   362
=aSTITL  Abs  973466 #EDA9A    -   360
=aSTUNW  Abs  973606 #EDB26    -   448  1045  1408  1512  1553  1594  1665  1691
                                    1858  1924  1986  2071  2137
 aTENT   Ext                    -  1609  1631  1643
 aTESTF  Ext                    -   476  1455  1475
=aTI/DA  Abs  975598 #EE2EE    -  1243  1398  2061
=aTIME$  Abs  975510 #EE296    -  1210  1256  1270
 aTIT    Ext                    -   375
=aTITLE  Abs  973496 #EDAB8    -   373
=aTOKNP  Abs  977678 #EEB0E    -  1867
 aTOLST  Ext                    -   241   256
 aTRIM   Ext                    -   714   925  1153  1775  1829
=aUTCFA  Abs  975103 #EE0FF    -  1038  1099  1139
=aUTLFA  Abs  974312 #EDDE8    -   750  1086  1126
=aUTNFA  Abs  974686 #EDF5E    -   914  1095  1135
=aVALID  Abs  975366 #EE206    -  1148  1340  1374  2010  2037
=aWORDI  Abs  975276 #EE1AC    -  1109
=aWORDN  Abs  975186 #EE152    -  1069
=aWRUOL  Abs  973551 #EDAEF    -   407   645   751  1432  1523  1564  1605  1676
                                    1786  1909  1963  2082
```

```
=aXTRCT  Abs  973297 #ED9F1 -   304   361   374
 zLEFT   Abs     246 #000F6 -  2141  2142
 zNEXT   Abs  978688 #EEF00 -     5  2141
 zSIZE   Abs    5898 #0170A -  2140
 zTHIS   Abs  972544 #ED700 -     4  2140
```

Input Parameters

Source file name is GN&AS6

Listing file name is GN/AS6

Object file name is GN%AS6::65

```
                    111111
          0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
 1                      TITLE  AS7:_FORTH_ASSEMBLER_PARSING
 2                      RDSYMB MR%GTO
 3 EEF00                ABS    #EEF00
 4              zTHIS   EQU    *
 5              zNEXT   EQU    #EF600
 6
 7              ********************************************************
 8              ***
 9              *** MR&AS7     <840504.1037>
10              ***
11              ***
12              ***  FORTH ASSEMBLER
13              ***  PARSING OF SOURCE LINES
14              ***
15              ********************************************************
16              ********************************************************************
17              ***
18              ***  HASH
19              ***
20              *** ( STR -- NUM )
21              ********************************************************************
22 EEF00 0000 =aHASH  CON(5) =DOCOL          : HASH
          0
23              *
24              * SET UP COUNT
25              *
26 EEF05 0000         CON(5) =ZERO           0
          0
27 EEF0A 0000         CON(5) =LIT            6
          0
28 EEF0F 6000         CON(5) 6
          0
29 EEF14 0000         CON(5) =ZERO           0
          0
30 EEF19 0000         CON(5) =XDO            DO          ( * STR NUM * )
          0
31              *
32              * GO THROUGH EACH CHARACTER & EXTRACT LOW ORDER THREE BITS
33              *
34 EEF1E       %DO14
35 EEF1E 0000         CON(5) =>R             >R
          0
36 EEF23 0000         CON(5) =C@+            C@+
          0
37 EEF28 0000         CON(5) =LIT            7
          0
38 EEF2D 7000         CON(5) 7
          0
39 EEF32 0000         CON(5) =AND            AND         ( * STR C * )
          0
40 EEF37 0000         CON(5) =R>             R>
          0
41              *
42              * SHIFT COUNT THREE BITS AND ADD IN BITS FROM CHARACTER
43              *
```

```
44 EEF3C 0000         CON(5) =LIT           8
         0
45 EEF41 8000         CON(5) 8
         0
46 EEF46 0000         CON(5) =MULT          *
         0
47 EEF4B 0000         CON(5) =ADD           +           ( * STR NUM * )
         0
48 EEF50 0000         CON(5) =XLOOP         LOOP        ( * STR NUM * )
         0
49 EEF55 9CFF         REL(5) %DO14
         F
50            *
51            * DROP THE STRING
52            *
53 EEF5A 0000         CON(5) =>R            >R
         0
54 EEF5F 0000         CON(5) =2DROP         2DROP
         0
55 EEF64 0000         CON(5) =R>            R>
         0
56            *
57            * MOD THE RESULT BY 43
58            *
59 EEF69 0000         CON(5) =LIT           43
         0
60 EEF6E B200         CON(5) 43
         0
61 EEF73 0000         CON(5) =MOD           MOD
         0
62 EEF78 0000         CON(5) =SEMI          ;           ( * NUM * )
         0
63            ********************************************************************
64            ***
65            ***  JUMP
66            ***
67            *** ( NUM -- PTR )
68            ********************************************************************
69 EEF7D 0000 =aJUMP  CON(5) =DOCOL         : JUMP
         0
70            *
71            * GET TO APPROPRIATE PLACE IN OPCODE TABLE (PART OF AS0)
72            *
73 EEF82 0000         CON(5) =LIT           5
         0
74 EEF87 5000         CON(5) 5
         0
75 EEF8C 0000         CON(5) =MULT          *
         0
76 EEF91 0000         CON(5) =LIT           OPCODE TABLE
         0
77 EEF96 0000         CON(5) =OPTABL
         0
78 EEF9B 0000         CON(5) =ADD           +
         0
```

```
 79 EEFA0 0000         CON(5) =AT            @
          0
 80 EEFA5 0000         CON(5) =SEMI          ;           ( * PTR * )
          0
 81              ********************************************************************
 82              ***
 83              ***  SEARCH
 84              ***
 85              *** ( STR PTR -- PTR TF )
 86              *** ( STR PTR -- FF )
 87              ********************************************************************
 88 EEFAA 0000 =aSRCH  CON(5) =DOCOL         : SEARCH
          0
 89              *
 90              * SAVE TOP OF THIS OPCODE GROUP & INITIALIZE WHICH ENTRY IN GROUP
 91              *
 92 EEFAF 0000         CON(5) =aOPCTO        OPCTOP
          0
 93 EEFB4 0000         CON(5) =STORE         !
          0
 94 EEFB9 0000         CON(5) =ONE           1
          0
 95 EEFBE 0000         CON(5) =aOPCPO        OPCPOS
          0
 96 EEFC3 0000         CON(5) =STORE         !           ( * STR * )
          0
 97 EEFC8       %BG15                        BEGIN       ( * STR * )
 98              *
 99              * STORE NEXT OPCODE POSITION
100              *
101 EEFC8 0000         CON(5) =aOPCPO        OPCPOS
          0
102 EEFCD 0000         CON(5) =AT            @
          0
103 EEFD2 0000         CON(5) =DUP           DUP         ( * STR POS POS * )
          0
104 EEFD7 0000         CON(5) =TWO*          2*
          0
105 EEFDC 0000         CON(5) =aOPCPO        OPCPOS
          0
106 EEFE1 0000         CON(5) =STORE         !           ( * STR POS * )
          0
107              *
108              * CALCULATE ADDRESS OF THIS OPCODE POSITION
109              *
110 EEFE6 0000         CON(5) =ONE-          1-
          0
111 EEFEB 0000         CON(5) =LIT           25
          0
112 EEFF0 9100         CON(5) 25
          0
113 EEFF5 0000         CON(5) =MULT          *           ( * STR POS * )
          0
114 EEFFA 0000         CON(5) =aOPCTO        OPCTOP
          0
```

```
115 EEFFF 0000          CON(5) =AT              @
          0
116 EF004 0000          CON(5) =ADD             +           ( * STR POS * )
          0
117               *
118               * SAVE CURRENT POSITION
119               *
120 EF009 0000          CON(5) =DUP             DUP
          0
121 EF00E 0000          CON(5) =aOPCPT          OPCPTR
          0
122 EF013 0000          CON(5) =STORE           !           ( * STR PTR * )
          0
123               *
124               * GET OPCODE TEXT
125               *
126 EF018 0000          CON(5) =THREE           3
          0
127 EF01D 0000          CON(5) =ADD             +
          0
128 EF022 0000          CON(5) =DUP             DUP
          0
129 EF027 0000          CON(5) =ONE-            1-
          0
130 EF02C 0000          CON(5) =N@              N@          ( * STR STR' * )
          0
131               *
132               * CHECK IF WE'VE FOUND OUR OPCODE
133               *
134 EF031 0000          CON(5) =aDUP4           4DUP
          0
135 EF036 0000          CON(5) =S=              S=
          0
136 EF03B 0000          CON(5) =ZBRNH           IF          ( * STR STR' * )
          0
137 EF040 E100          REL(5) %IF139
          0
138 EF045 0000          CON(5) =aDROP4          4DROP
          0
139 EF04A 0000          CON(5) =aNEG1           -1
          0
140 EF04F 0000          CON(5) =aNEG1           -1          ( * TF TF * )
          0
141 EF054 0000          CON(5) =BRNCH           ELSE        ( * STR STR' * )
          0
142 EF059 D700          REL(5) %TH139
          0
143 EF05E       %IF139
144               *
145               * CHECK IF END OF TREE
146               *
147 EF05E 0000          CON(5) =aOPCPT          OPCPTR
          0
148 EF063 0000          CON(5) =AT              @
          0
```

```
149 EF068 0000          CON(5) =LIT             15
          0
150 EF06D F000          CON(5) 15
          0
151 EF072 0000          CON(5) =ADD             +
          0
152 EF077 0000          CON(5) =CAT             C@          ( * STR STR' FLGS * )
          0
153 EF07C 0000          CON(5) =LIT             4
          0
154 EF081 4000          CON(5) 4
          0
155 EF086 0000          CON(5) =AND             AND
          0
156 EF08B 0000          CON(5) =ZBRNH           IF          ( * STR STR' * )
          0
157 EF090 E100          REL(5) %IF140
          0
158                *
159                * WE'VE REACHED THE END OF THE TREE & HAVE NOT FOUND OUR OPCODE
160                *
161 EF095 0000          CON(5) =aDROP4          4DROP
          0
162 EF09A 0000          CON(5) =ZERO            0
          0
163 EF09F 0000          CON(5) =aNEG1           -1          ( * FF TF * )
          0
164 EF0A4 0000          CON(5) =BRNCH           ELSE        ( * STR STR' * )
          0
165 EF0A9 D200          REL(5) %TH140
          0
166 EF0AE        %IF140
167                *
168                * TREE STILL HAS ENTRIES, SHOULD WE GO LEFT OR RIGHT ?
169                *
170 EF0AE 0000          CON(5) =OVER2           2OVER
          0
171 EF0B3 0000          CON(5) =S<              S<
          0
172 EF0B8 0000          CON(5) =ZBRNH           IF          ( * STR * )
          0
173 EF0BD 4100          REL(5) %IF141
          0
174                *
175                * RIGHT
176                *
177 EF0C2 0000          CON(5) =ONE             1
          0
178 EF0C7 0000          CON(5) =aOPCPO          OPCPOS
          0
179 EF0CC 0000          CON(5) =PSTOR           +!          ( * STR * )
          0
180 EF0D1        %IF141                         THEN
181 EF0D1 0000          CON(5) =ZERO            0           ( * STR FF * )
          0
```

```
182 EF0D6        %TH140                      THEN
183 EF0D6        %TH139                      THEN        ( * STR FF / F TF * )
184 EF0D6 0000          CON(5) =ZBRNH        UNTIL
          0
185 EF0DB DEEF          REL(5) %BG15
          F
186              *
187              * HAVE WE FOUND OURS ?
188              *
189 EF0E0 0000          CON(5) =DUP          DUP
          0
190 EF0E5 0000          CON(5) =ZBRNH        IF          ( * F * )
          0
191 EF0EA 4100          REL(5) %IF142
          0
192              *
193              * RETURN ADDRESS OF WHAT WE FOUND
194              *
195 EF0EF 0000          CON(5) =aOPCPT       OPCPTR
          0
196 EF0F4 0000          CON(5) =AT           @
          0
197 EF0F9 0000          CON(5) =SWAP         SWAP
          0
198 EF0FE        %IF142                      THEN
199 EF0FE 0000          CON(5) =SEMI         ;           ( * [PTR] F * )
          0
200              ********************************************************************
201              ***
202              ***  OPC.LOOKUP
203              ***
204              *** ( STR -- PTR TF )
205              *** ( STR -- FF )
206              *** ( LOOKUP THE OPCODE IN STR IN THE OPCODE TABLES )
207              *** ( RETURN A POINTER TO THE ENTRY IF FOUND )
208              ********************************************************************
209 EF103 0000 =aOPLUK CON(5) =DOCOL          : OPC.LOOKUP
          0
210              *
211              * DOES THE HOOK ADDRESS FOR THE PARSE ROUTINE HAVE AN ADDRESS IN
212              *
213 EF108 0000          CON(5) =LIT          PARSE RT
          0
214 EF10D 97CF          CON(5) =oPARRT
          2
215 EF112 0000          CON(5) =AT           @           ( * STR PTR * )
          0
216 EF117 0000          CON(5) =?DUP         ?DUP
          0
217 EF11C 0000          CON(5) =ZBRNH        IF          ( * STR [PTR] * )
          0
218 EF121 3200          REL(5) %IF303
          0
219              *
220              * YES IT DOES, LET IT HAVE A CHANCE AT THIS OPCODE
```

```
221           *
222 EF126 0000        CON(5) =EXEC          EXECUTE     ( * [PTR] F * )
          0
223 EF12B 0000        CON(5) =ZBRNH         IF
          0
224 EF130 F000        REL(5) %IF150
          0
225           *
226           * IT HANDLED IT !
227           *
228 EF135 0000        CON(5) =aNEG1         -1          ( * PTR TF * )
          0
229 EF13A 0000        CON(5) =SEMI          ;           ( * PTR TF * )
          0
230 EF13F      %IF150                       ELSE        ( * * )
231           *
232           * WE'VE GOT TO LOOK FOR THIS OPCODE
233           *
234 EF13F 0000        CON(5) =aOPC.F        OPCODE.FIELD
          0
235 EF144      %IF303                                   ( * STR * )
236 EF144 0000        CON(5) =2DUP          2DUP        ( * STR STR * )
          0
237 EF149 00FE        CON(5) =aHASH         HASH        ( * STR NUM * )
          E
238 EF14E D7FE        CON(5) =aJUMP         JUMP        ( * STR PTR * )
          E
239 EF153 AAFE        CON(5) =aSRCH         SEARCH      ( * [PTR] F * )
          E
240 EF158 0000        CON(5) =SEMI          ;           ( * [PTR] F * )
          0
241           ****************************************************************
242           ***
243           ***  SET.OP.VARS
244           ***
245           *** ( PTR -- )
246           *** ( TAKE THE POINTER FROM OPC.LOOKUP AND FILL IN )
247           *** ( THE VARIABLES ASSOCIATED WITH A OPCODE LOOKUP )
248           ****************************************************************
249 EF15D 0000 =aSTVAR CON(5) =DOCOL         : SET.OP.VARS
          0
250 EF162 0000        CON(5) =DUP           DUP
          0
251           *
252           * GET OPCODE CLASS
253           *
254 EF167 0000        CON(5) =CAT           C@
          0
255 EF16C 0000        CON(5) =aOPTYP        OPTYPE
          0
256 EF171 0000        CON(5) =STORE         !
          0
257           *
258           * GET OPCODE FLAGS
259           *
```

```
260 EF176 0000          CON(5) =LIT             15
          0
261 EF17B F000          CON(5) 15
          0
262 EF180 0000          CON(5) =ADD             +           ( * PTR * )
          0
263 EF185 0000          CON(5) =DUP             DUP
          0
264 EF18A 0000          CON(5) =CAT             C@
          0
265 EF18F 0000          CON(5) =aOPFLG          OPFLAGS
          0
266 EF194 0000          CON(5) =STORE           !
          0
267             *
268             * GET OPCODE LENGTH
269             *
270 EF199 0000          CON(5) =THREE           3
          0
271 EF19E 0000          CON(5) =ADD             +           ( * PTR * )
          0
272 EF1A3 0000          CON(5) =DUP             DUP
          0
273 EF1A8 0000          CON(5) =ONE-            1-
          0
274 EF1AD 0000          CON(5) =N@              N@
          0
275 EF1B2 0000          CON(5) =DUP             DUP
          0
276 EF1B7 0000          CON(5) =aOPLEN          OPLEN
          0
277 EF1BC 0000          CON(5) =STORE           !           ( * PTR CNT * )
          0
278             *
279             * GET OPCODE ITSELF
280             *
281 EF1C1 0000          CON(5) =?DUP            ?DUP
          0
282 EF1C6 0000          CON(5) =ZBRNH           IF
          0
283 EF1CB 4600          REL(5) %IF306
          0
284 EF1D0 0000          CON(5) =LIT             5           ( * PTR CNT 5 * )
          0
285 EF1D5 5000          CON(5) 5
          0
286 EF1DA 0000          CON(5) =MIN             MIN
          0
287 EF1DF 0000          CON(5) =DUP             DUP
          0
288 EF1E4 0000          CON(5) =ZERO            0
          0
289 EF1E9 0000          CON(5) =XDO             DO          ( * PTR LIM * )
          0
290 EF1EE       %DO15
```

```
291                *
292                * GET EACH OPCODE SEPARATELY
293                *
294 EF1EE 00000         CON(5) =2DUP          2DUP
295 EF1F3 00000         CON(5) =ADD           +
296 EF1F8 00000         CON(5) =R@            I
297 EF1FD 00000         CON(5) =MINUS         -
298 EF202 00000         CON(5) =ONE-          1-
299 EF207 00000         CON(5) =N@            N@          ( * PTR LIMIT OP * )
300                *
301                * AND STORE IN APPROPRIATE OPx
302                *
303 EF20C 00000         CON(5) =R@            I
304 EF211 00000         CON(5) =ONE+          1+
305 EF216 00000         CON(5) =a>OPx         >OPx
306 EF21B 00000         CON(5) =STORE         !           ( * PTR LIMIT * )
307 EF220 00000         CON(5) =XLOOP         LOOP
308 EF225 9CFFF         REL(5) %DO15
309 EF22A 00000         CON(5) =DROP          DROP
310 EF22F       %IF306                        THEN        ( * PTR * )
311                *
312                * GET VARIABLES
313                *
314 EF22F 00000         CON(5) =FIVE+         5+          ( * PTR * )
315 EF234 00000         CON(5) =DUP           DUP
316 EF239 00000         CON(5) =N@            N@
317 EF23E 00000         CON(5) =aFILMK        FILL.MARK
318 EF243 00000         CON(5) =STORE         !
319 EF248 00000         CON(5) =ONE+          1+          ( * PTR * )
320 EF24D 00000         CON(5) =N@            N@
321 EF252 00000         CON(5) =aFILEN        FILL.LENGTH
322 EF257 00000         CON(5) =STORE         !
323 EF25C 00000         CON(5) =SEMI          ;           ( * * )
```

```
          0
    324           ********************************************************************
    325           ***
    326           ***  GETSTR
    327           ***
    328           *** ( ADDR FIR LST TAIL -- ADDR' STR )
    329           *** ( TAKE THE DATA FROM 'ENCLOSE' AND MASSAGE IT AROUND )
    330           *** ( TO CREATE THE NEXT ADDRESS AND THE STRING THAT ENCLOSE )
    331           *** ( GOT. )
    332           ********************************************************************
    333 EF261 0000 =aGTSTR CON(5) =DOCOL         : GETSTR
          0
    334           *
    335           * GET ADDRESS OF BEGINNING OF STRING
    336           *
    337 EF266 0000        CON(5) =LIT           4
          0
    338 EF26B 4000        CON(5) 4
          0
    339 EF270 0000        CON(5) =PICK          PICK
          0
    340 EF275 0000        CON(5) =ADD           +
          0
    341 EF27A 0000        CON(5) =>R            >R          ( * ADDR FIR LST * )
          0
    342           *
    343           * GET LENGTH OF STRING
    344           *
    345 EF27F 0000        CON(5) =OVER          OVER
          0
    346 EF284 0000        CON(5) =MINUS         -
          0
    347 EF289 0000        CON(5) =TWO/          2/
          0
    348 EF28E 0000        CON(5) =>R            >R          ( * ADDR FIR * )
          0
    349           *
    350           * GET NEW ADDRESS
    351           *
    352 EF293 0000        CON(5) =ADD           +
          0
    353           *
    354           * MASSAGE IT AROUND TO CORRECT ORDER
    355           *
    356 EF298 0000        CON(5) =R>            R>
          0
    357 EF29D 0000        CON(5) =R>            R>
          0
    358 EF2A2 0000        CON(5) =ROT           ROT
          0
    359 EF2A7 0000        CON(5) =ROT           ROT         ( * ADDR' ADDR" LEN" *
          0
    360           *
    361           * REMOVE CHARACTER 0 IF IT IS THE LAST CHARACTER
    362           *
```

```
363 EF2AC 0000          CON(5) =OVER          OVER
          0
364 EF2B1 0000          CON(5) =CAT           C@
          0
365 EF2B6 0000          CON(5) =ZEQ           0=
          0
366 EF2BB 0000          CON(5) =ZBRNH         IF
          0
367 EF2C0 A000          REL(5) %IF143
          0
368 EF2C5 0000          CON(5) =ONE-          1-
          0
369 EF2CA        %IF143                       THEN
370 EF2CA 0000          CON(5) =SEMI          ;           ( * ADDR' ADDR" LEN" *
          0
371               ********************************************************************
372               ***
373               ***  PARSE
374               ***
375               *** ( -- )
376               *** ( PARSE SOURCE LINE INTO COMPONENT FIELDS )
377               *** ( AND LOOK THE OPCODE UP IN THE ROM TABLES )
378               ********************************************************************
379 EF2CF 0000 =aPARSE CON(5) =DOCOL          : PARSE
          0
380               *
381               * APPEND A CHARACTER 0 TO END OF SOURCE LINE
382               *
383 EF2D4 0000          CON(5) =aSLINE        SLINE
          0
384 EF2D9 0000          CON(5) =ZERO          0
          0
385 EF2DE 0000          CON(5) =CHR$          CHR$
          0
386 EF2E3 0000          CON(5) =S<&           S<&         ( * STR * )
          0
387               *
388               * GET FIRST FIELD
389               *
390 EF2E8 0000          CON(5) =DROP          DROP
          0
391 EF2ED 0000          CON(5) =BL            SPACE
          0
392 EF2F2 0000          CON(5) =ENCL          ENCLOSE     ( * ADDR FIR LST TAIL *
          0
393               *
394               * CHECK FOR FIRST CHARACTER BEING '*'
395               *
396 EF2F7 0000          CON(5) =OVER2         2OVER
          0
397 EF2FC 0000          CON(5) =ADD           +
          0
398 EF301 0000          CON(5) =CAT           C@
          0
399 EF306 0000          CON(5) =LIT           42
```

```
          0
400 EF30B A200          CON(5) \*\
          0
401 EF310 0000          CON(5) =EQUAL           =
          0
402 EF315 0000          CON(5) =ZBRNH           IF          ( * ADDR FIR LST TAIL *
          0
403 EF31A B400          REL(5) %IF144
          0
404             *
405             * IT IS, SO TREAT LINE AS A COMMENT
406             *
407 EF31F 0000          CON(5) =aDROP4          4DROP
          0
408 EF324 0000          CON(5) =NULL$           NULL$
          0
409 EF329 0000          CON(5) =2DUP            2DUP
          0
410 EF32E 0000          CON(5) =2DUP            2DUP        ( * STR STR STR * )
          0
411 EF333 0000          CON(5) =aLAB.F          LABEL.FIELD
          0
412 EF338 0000          CON(5) =S!              S!          ( * STR STR * )
          0
413 EF33D 0000          CON(5) =aOPC.F          OPCODE.FIELD
          0
414 EF342 0000          CON(5) =S!              S!          ( * STR * )
          0
415 EF347 0000          CON(5) =aEXP.F          EXPRESSION.FIELD
          0
416 EF34C 0000          CON(5) =S!              S!          ( * * )
          0
417 EF351 0000          CON(5) =LIT             NULL ENTRY
          0
418 EF356 0000          CON(5) =NULENT
          0
419 EF35B D51F          CON(5) =aSTVAR          SET.OP.VARS ( * * )
          E
420 EF360 0000          CON(5) =SEMI            ;           ( * * )
          0
421 EF365       %IF144                          ELSE        ( * ADDR FIR LST TAIL *
422             *
423             * CHECK IF FIRST FIELD BEGINS IN COLUMNS 1 OR 2
424             *
425 EF365 0000          CON(5) =THREE           3
          0
426 EF36A 0000          CON(5) =PICK            PICK
          0
427 EF36F 0000          CON(5) =THREE           3
          0
428 EF374 0000          CON(5) =LT              <
          0
429 EF379 0000          CON(5) =ZBRNH           IF          ( * ADDR FIR LST TAIL *
          0
430 EF37E 7300          REL(5) %IF145
```

```
          0
431             *
432             * IT DOES, SO IT IS A LABEL FIELD
433             *
434 EF383 162F          CON(5) =aGTSTR          GETSTR
          E
435 EF388 0000          CON(5) =LIT             10
          0
436 EF38D A000          CON(5) 10
          0
437 EF392 0000          CON(5) =MIN             MIN         ( * ADDR STR * )
          0
438 EF397 0000          CON(5) =aLAB.F          LABEL.FIELD
          0
439 EF39C 0000          CON(5) =S!              S!          ( * ADDR * )
          0
440             *
441             * GET NEXT FIELD
442             *
443 EF3A1 0000          CON(5) =BL              SPACE
          0
444 EF3A6 0000          CON(5) =ENCL            ENCLOSE     ( * ADDR FIR LST TAIL *
          0
445 EF3AB 0000          CON(5) =BRNCH           ELSE        ( * ADDR FIR LST TAIL *
          0
446 EF3B0 4100          REL(5) %TH145
          0
447 EF3B5        %IF145
448             *
449             * NO LABEL FIELD
450             *
451 EF3B5 0000          CON(5) =NULL$           NULL$       ( * ADDR FIR LST TAIL S
          0
452 EF3BA 0000          CON(5) =aLAB.F          LABEL.FIELD
          0
453 EF3BF 0000          CON(5) =S!              S!          ( * ADDR FIR LST TAIL *
          0
454 EF3C4        %TH145                         THEN        ( * ADDR FIR LST TAIL *
455             *
456             * SAVE OPCODE FIELD
457             *
458 EF3C4 162F          CON(5) =aGTSTR          GETSTR
          E
459 EF3C9 0000          CON(5) =LIT             10
          0
460 EF3CE A000          CON(5) 10
          0
461 EF3D3 0000          CON(5) =MIN             MIN         ( * ADDR STR * )
          0
462 EF3D8 0000          CON(5) =2DUP            2DUP
          0
463 EF3DD 0000          CON(5) =aOPC.F          OPCODE.FIELD
          0
464 EF3E2 0000          CON(5) =S!              S!          ( * ADDR STR * )
          0
```

```
                *
                * LOOKUP THE OPCODE IN THE TABLES (ALSO USE HOOKS)
                *
EF3E7 301FE             CON(5) =aOPLUK          OPC.LOOKUP
EF3EC 00000             CON(5) =ZEQ             0=
EF3F1 00000             CON(5) =ZBRNH           IF          ( * ADDR [PTR] * )
EF3F6 E1000             REL(5) %IF146
                *
                * COULDN'T FIND IT, SUBSTITUTE A NULL OPCODE ENTRY
                *
EF3FB 00000             CON(5) =LIT             20
EF400 41000             CON(5) 20               'unknown opcode'
EF405 00000             CON(5) =aP2ERR          PASS2 ERROR ( * ADDR * )
EF40A 00000             CON(5) =LIT             NULL ENTRY  ( * ADDR PTR * )
EF40F 00000             CON(5) =NULENT
EF414          %IF146                           THEN
                *
                * STORE VARIABLES ASSOCIATED WITH OPCODE
                *
EF414 D51FE             CON(5) =aSTVAR          SET.OP.VARS ( * ADDR * )
                *
                * LOOK FOR THE EXPRESSION FIELD
                *
EF419 00000             CON(5) =BL              SPACE
EF41E 00000             CON(5) =ENCL            ENCLOSE     ( * ADDR FIR LST TAIL *
                *
                * COULD THE EXPRESSION FIELD HAVE A QUOTED SPACE ?
                *
EF423 00000             CON(5) =aOPFLG          OPFLAGS
EF428 00000             CON(5) =AT              @
EF42D 00000             CON(5) =LIT             32
EF432 02000             CON(5) 32
EF437 00000             CON(5) =AND             AND
EF43C 00000             CON(5) =ZBRNH           IF          ( * ADDR FIR LST TAIL *
EF441 8C000             REL(5) %IF148
                *
```

```
501            * YES, THEN WE HAVE TO GO THROUGH THE EXPRESSION FIELD OURSELVES
502            *
503 EF446 0000          CON(5) =2DROP          2DROP
          0
504 EF44B 0000          CON(5) =ADD            +           ( * ADDR * )
          0
505 EF450 0000          CON(5) =ZERO           0
          0
506 EF455 0000          CON(5) =OVER           OVER        ( * ADDR F ADDR * )
          0
507            *
508            * LOOP THROUGH EACH CHARACTER UNTIL A SPACE IS REACHED THAT ISN'T
509            *
510 EF45A        %BG16                         BEGIN       ( * ADDR F ADDR' * )
511 EF45A 0000          CON(5) =TWO+           2+
          0
512 EF45F 0000          CON(5) =DUP            DUP
          0
513 EF464 0000          CON(5) =TWO-           2-
          0
514 EF469 0000          CON(5) =CAT            C@          ( * ADDR F ADDR' C * )
          0
515 EF46E 0000          CON(5) =DUP            DUP
          0
516 EF473 0000          CON(5) =BL             SPACE
          0
517 EF478 0000          CON(5) =EQUAL          =
          0
518 EF47D 0000          CON(5) =ZEQ            0=          ( * ADDR F ADDR' C F' *
          0
519 EF482 0000          CON(5) =LIT            4
          0
520 EF487 4000          CON(5) 4
          0
521 EF48C 0000          CON(5) =PICK           PICK
          0
522 EF491 0000          CON(5) =OR             OR          ( * ADDR F ADDR' C F' *
          0
523 EF496 0000          CON(5) =OVER           OVER
          0
524 EF49B 0000          CON(5) =AND            AND         ( * ADDR F ADDR' C F' *
          0
525 EF4A0 0000          CON(5) =ZBRNH          WHILE       ( * ADDR F ADDR' C * )
          0
526 EF4A5 7300          REL(5) %RP16
          0
527 EF4AA 0000          CON(5) =LIT            39
          0
528 EF4AF 7200          CON(5) \'\
          0
529 EF4B4 0000          CON(5) =EQUAL          =
          0
530 EF4B9 0000          CON(5) =ZBRNH          IF          ( * ADDR F ADDR' * )
          0
531 EF4BE 4100          REL(5) %IF149
```

```
          0
    532           *
    533           * WE'VE REACHED A QUOTE ('), SO REVERSE OUR FLAG
    534           *
    535 EF4C3 0000        CON(5) =SWAP          SWAP
          0
    536 EF4C8 0000        CON(5) =NOT           NOT
          0
    537 EF4CD 0000        CON(5) =SWAP          SWAP        ( * ADDR F ADDR' * )
          0
    538 EF4D2      %IF149                       THEN        ( * ADDR F ADDR' * )
    539 EF4D2 0000        CON(5) =BRNCH         REPEAT      ( * ADDR F ADDR' C * )
          0
    540 EF4D7 38FF        REL(5) %BG16
          F
    541           *
    542           * EXPRESSION FIELD NOW MARKED, LET'S MAKE IT A STRING
    543           *
    544 EF4DC      %RP16
    545 EF4DC 0000        CON(5) =DROP          DROP
          0
    546 EF4E1 0000        CON(5) =SWAP          SWAP
          0
    547 EF4E6 0000        CON(5) =DROP          DROP        ( * ADDR ADDR' * )
          0
    548 EF4EB 0000        CON(5) =OVER          OVER
          0
    549 EF4F0 0000        CON(5) =MINUS         -
          0
    550 EF4F5 0000        CON(5) =TWO-          2-
          0
    551 EF4FA 0000        CON(5) =TWO/          2/          ( * STR * )
          0
    552 EF4FF 0000        CON(5) =BRNCH         ELSE        ( * ADDR FIR LST TAIL *
          0
    553 EF504 4100        REL(5) %TH148
          0
    554 EF509      %IF148                       ELSE        ( * ADDR FIR LST TAIL *
    555           *
    556           * EXPRESSION CANNOT HAVE QUOTED SPACES
    557           *
    558 EF509 162F        CON(5) =aGTSTR        GETSTR
          E
    559 EF50E 0000        CON(5) =ROT           ROT
          0
    560 EF513 0000        CON(5) =DROP          DROP        ( * STR * )
          0
    561 EF518      %TH148                       THEN
    562           *
    563           * ENSURE STRING UNDER 51 CHARACTERS
    564
    565 EF518 0000        CON(5) =DUP           DUP         ( * STR LEN * )
          0
    566 EF51D 0000        CON(5) =LIT           50
          0
```

```
567 EF522 2300          CON(5) 50
          0
568 EF527 0000          CON(5) =GT              >           ( * STR F * )
          0
569 EF52C 0000          CON(5) =ZBRNH           IF          ( * STR * )
          0
570 EF531 3200          REL(5) %IF138
          0
571               *
572               * EXPRESSION FIELD TOO LONG
573               *
574 EF536 0000          CON(5) =LIT             40
          0
575 EF53B 8200          CON(5) 40               'excess characters in expression'
          0
576 EF540 0000          CON(5) =aP2ERR          PASS2 ERROR ( * STR * )
          0
577 EF545 0000          CON(5) =DROP            DROP        ( * ADDR * )
          0
578 EF54A 0000          CON(5) =LIT             50
          0
579 EF54F 2300          CON(5) 50                           ( * STR * )
          0
580 EF554       %IF138                          THEN        ( * STR * )
581               *
582               * SAVE EXPRESSION FIELD IN VARIABLE
583               *
584 EF554 0000          CON(5) =aEXP.F          EXPRESSION.FIELD
          0
585 EF559 0000          CON(5) =S!              S!          ( * * )
          0
586 EF55E 0000          CON(5) =SEMI            ;           ( * * )
          0
```

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
587                     STITLE FIT STATS
588             zSIZE   EQU     (*)-zTHIS
589             zLEFT   EQU     (zNEXT)-*
590 EF563               BSS     zLEFT
591 EF600               END
```

```
%BG15   Abs  978888 #EEFC8 -    97   185
%BG16   Abs  980058 #EF45A -   510   540
%DO14   Abs  978718 #EEF1E -    34    49
%DO15   Abs  979438 #EF1EE -   290   308
%IF138  Abs  980308 #EF554 -   580   570
%IF139  Abs  979038 #EF05E -   143   137
%IF140  Abs  979118 #EF0AE -   166   157
%IF141  Abs  979153 #EF0D1 -   180   173
%IF142  Abs  979198 #EF0FE -   198   191
%IF143  Abs  979058 #EF2CA -   369   367
%IF144  Abs  979813 #EF365 -   421   403
%IF145  Abs  979893 #EF3B5 -   447   430
%IF146  Abs  979988 #EF414 -   480   471
%IF148  Abs  980233 #EF509 -   554   499
%IF149  Abs  980178 #EF4D2 -   538   531
%IF150  Abs  979263 #EF13F -   230   224
%IF303  Abs  979268 #EF144 -   235   218
%IF306  Abs  979503 #EF22F -   310   283
%RP16   Abs  980188 #EF4DC -   544   526
%TH139  Abs  979158 #EF0D6 -   183   142
%TH140  Abs  979158 #EF0D6 -   182   165
%TH145  Abs  979908 #EF3C4 -   454   446
%TH148  Abs  980248 #EF518 -   561   553
2DROP   Ext                -    54   503
2DUP    Ext                -   236   294   409   410   462
>R      Ext                -    35    53   341   348
?DUP    Ext                -   216   281
ADD     Ext                -    47    78   116   127   151   262   271   295
                            340   352   397   504
AND     Ext                -    39   155   497   524
AT      Ext                -    79   102   115   148   196   215   494
BL      Ext                -   391   443   488   516
BRNCH   Ext                -   141   164   445   539   552
C@+     Ext                -    36
CAT     Ext                -   152   254   264   364   398   514
CHR$    Ext                -   385
DOCOL   Ext                -    22    69    88   209   249   333   379
DROP    Ext                -   309   390   545   547   560   577
DUP     Ext                -   103   120   128   189   250   263   272   275
                            287   315   512   515   565
ENCL    Ext                -   392   444   489
EQUAL   Ext                -   401   517   529
EXEC    Ext                -   222
FIVE+   Ext                -   314
GT      Ext                -   568
LIT     Ext                -    27    37    44    59    73    76   111   149
                            153   213   260   284   337   399   417   435
                            459   475   478   495   519   527   566   574
                            578
LT      Ext                -   428
MIN     Ext                -   286   437   461
MINUS   Ext                -   297   346   549
MOD     Ext                -    61
MULT    Ext                -    46    75   113
N@      Ext                -   130   274   299   316   320
```

NOT	Ext		-	536							
NULENT	Ext		-	418	479						
NULL$	Ext		-	408	451						
ONE	Ext		-	94	177						
ONE+	Ext		-	304	319						
ONE-	Ext		-	110	129	273	298	368			
OPTABL	Ext		-	77							
OR	Ext		-	522							
OVER	Ext		-	345	363	506	523	548			
OVER2	Ext		-	170	396						
PICK	Ext		-	339	426	521					
PSTOR	Ext		-	179							
R>	Ext		-	40	55	356	357				
R@	Ext		-	296	303						
ROT	Ext		-	358	359	559					
S!	Ext		-	412	414	416	439	453	464	585	
S<	Ext		-	171							
S<&	Ext		-	386							
S=	Ext		-	135							
SEMI	Ext		-	62	80	199	229	240	323	370	420
				586							
STORE	Ext		-	93	96	106	122	256	266	277	306
				318	322						
SWAP	Ext		-	197	535	537	546				
THREE	Ext		-	126	270	425	427				
TWO*	Ext		-	104							
TWO+	Ext		-	511							
TWO-	Ext		-	513	550						
TWO/	Ext		-	347	551						
XDO	Ext		-	30	289						
XLOOP	Ext		-	48	307						
ZBRNH	Ext		-	136	156	172	184	190	217	223	282
				366	402	429	470	498	525	530	569
ZEQ	Ext		-	365	469	518					
ZERO	Ext		-	26	29	162	181	288	384	505	
a>OPx	Ext		-	305							
aDROP4	Ext		-	138	161	407					
aDUP4	Ext		-	134							
aEXP.F	Ext		-	415	584						
aFILEN	Ext		-	321							
aFILMK	Ext		-	317							
=aGTSTR	Abs	979553 #EF261	-	333	434	458	558				
=aHASH	Abs	978688 #EEF00	-	22	237						
=aJUMP	Abs	978813 #EEF7D	-	69	238						
aLAB.F	Ext		-	411	438	452					
aNEG1	Ext		-	139	140	163	228				
aOPC.F	Ext		-	234	413	463					
aOPCPO	Ext		-	95	101	105	178				
aOPCPT	Ext		-	121	147	195					
aOPCTO	Ext		-	92	114						
aOPFLG	Ext		-	265	493						
aOPLEN	Ext		-	276							
=aOPLUK	Abs	979203 #EF103	-	209	468						
aOPTYP	Ext		-	255							
aP2ERR	Ext		-	477	576						

```
=aPARSE  Abs  979663 #EF2CF -   379
 aSLINE  Ext          -   383
=aSRCH   Abs  978858 #EEFAA -    88   239
=aSTVAR  Abs  979293 #EF15D -   249   419   484
 zLEFT   Abs     157 #0009D -   589   590
 zNEXT   Abs  980480 #EF600 -     5   589
 zSIZE   Abs    1635 #00663 -   588
 zTHIS   Abs  978688 #EEF00 -     4   588
```

Input Parameters

  Source file name is GN&AS7

  Listing file name is GN/AS7::65

  Object file name is GN%AS7::65

                                  111111
                        0123456789012345
  Initial flag settings are

Errors

  None

Saturn Assembler News

```
 1                    TITLE  AS8:_FORTH_ASSEMBLER_MAIN
 2                    RDSYMB MR%GTO
 3 EF600              ABS    #EF600
 4             zTHIS  EQU    *
 5             zNEXT  EQU    #EFF00
 6
 7             ******************************************************
 8             ***
 9             *** MR&AS8     <840504.1037>
10             ***
11             ***
12             ***  FORTH ASSEMBLER
13             ***  ONLY THE LAST WORD, 'ASSEMBLE' HAS A HEADER
14             ***
15             ******************************************************
16             ********************************************************************
17             ***
18             ***  MONITOR.ATTN
19             ***
20             *** ( -- )
21             *** ( WATCH THE INPUT BUFFER FOR THE ATTN KEY )
22             ********************************************************************
23 EF600 0000 =aMONAT CON(5) =DOCOL          : MONITOR.ATTN
       0
24                  *
25                  * while <KEYS HIT> do
26                  *
27 EF605             %BG17                   BEGIN       ( * * )
28 EF605 0000               CON(5) =?TERM    ?TERMINAL   ( * F * )
       0
29 EF60A 0000               CON(5) =ZBRNH    WHILE       ( * * )
       0
30 EF60F BC00               REL(5) %RP17
       0
31                  *
32                  * IS KEY THE ATTN KEY?
33                  *
34 EF614 0000               CON(5) =KEY      KEY         ( * NUM * )
       0
35 EF619 0000               CON(5) =LIT      14          ( * NUM NUM' * )
       0
36 EF61E E000               CON(5) 14
       0
37 EF623 0000               CON(5) =EQUAL    =           ( * F * )
       0
38 EF628 0000               CON(5) =ZBRNH    IF          ( * * )
       0
39 EF62D 3A00               REL(5) %IF150
       0
40                  *
41                  * YES.  DISPLAY ABORT MESSAGE
42                  *
43 EF632 0000               CON(5) =CR       CR          ( * * )
       0
44 EF637 0000               CON(5) =PDOTQ    ." ABORT [Y/N] ?"
```

```
          0
     45 EF63C D0           CON(2) 13
     46 EF63E 1424         NIBASC \ABORT [Y\
          F425
          4502
          B595
     47 EF64E F2E4         NIBASC \/N] ?\
          D502
          F3
     48              *
     49              * while <KEYS HIT> do
     50              *
     51 EF658         %BG19                          BEGIN       ( * * )
     52 EF658 0000         CON(5) =?TERM             ?TERMINAL   ( * F * )
          0
     53 EF65D 0000         CON(5) =ZBRNH             WHILE       ( * * )
          0
     54 EF662 9100         REL(5) %RP19
          0
     55              *
     56              * DROP KEY
     57              *
     58 EF667 0000         CON(5) =KEY               KEY         ( * NUM * )
          0
     59 EF66C 0000         CON(5) =DROP              DROP        ( * * )
          0
     60 EF671 0000         CON(5) =BRNCH             REPEAT      ( * * )
          0
     61 EF676 2EFF         REL(5) %BG19
          F
     62              *
     63              * end while
     64              *
     65 EF67B         %RP19
     66              *
     67              * ASK FOR A KEY
     68              *
     69 EF67B 0000         CON(5) =KEY               KEY         ( * NUM * )
          0
     70 EF680 0000         CON(5) =DUP               DUP
          0
     71 EF685 0000         CON(5) =EMIT              EMIT        ( * NUM * )
          0
     72 EF68A 0000         CON(5) =LIT               89
          0
     73 EF68F 9500         CON(5) 89
          0
     74 EF694 0000         CON(5) =DUP               DUP         ( * NUM 89 89 * )
          0
     75 EF699 0000         CON(5) =ROT               ROT         ( * 89 89 NUM * )
          0
     76 EF69E 0000         CON(5) =AND               AND         ( * 89 NUM * )
          0
     77 EF6A3 0000         CON(5) =EQUAL             =           ( * F * )
          0
```

```
 78 EF6A8 0000         CON(5) =ZBRNH          IF          ( * * )
          0
 79 EF6AD 4100         REL(5) %IF152
          0
 80            *
 81            * USER HIT Y OR y.  SHUT DOWN
 82            *
 83 EF6B2 0000         CON(5) =LIT            56
          0
 84 EF6B7 8300         CON(5) 56              'assembler aborted'
          0
 85 EF6BC 0000         CON(5) =aSHUTD         SHUTDOWN
          0
 86            *
 87            * USER HIT A DIFFERENT KEY.
 88            *
 89 EF6C1       %IF152                        THEN        ( * * )
 90            *
 91            * DISPLAY OF PROGRESS MUFFED.  RESET DOT COUNT.
 92            *
 93 EF6C1 0000         CON(5) =ZERO           0
          0
 94 EF6C6 0000         CON(5) =aLINEC         LINECOUNT
          0
 95 EF6CB 0000         CON(5) =STORE          !           ( * * )
          0
 96 EF6D0       %IF150                        THEN        ( * * )
 97 EF6D0 0000         CON(5) =BRNCH          REPEAT
          0
 98 EF6D5 03FF         REL(5) %BG17
          F
 99            *
100            * end while
101            *
102 EF6DA       %RP17
103 EF6DA 0000         CON(5) =SEMI           ;
          0
104           ****************************************************************
105           ***
106           ***  SHOW.PROGRESS
107           ***
108           *** ( -- )
109           *** ( INDICATE ON THE DISPLAY THAT ACTIONS OCCURS )
110           ****************************************************************
111 EF6DF 0000 =aSHOWP CON(5) =DOCOL          : SHOW.PROGRESS
          0
112           *
113           * SHOULD WE DISPLAY A NEW LINE?
114           *
115 EF6E4 0000         CON(5) =aLINEC         LINECNT
          0
116 EF6E9 0000         CON(5) =AT             @
          0
117 EF6EE 0000         CON(5) =LIT            14
          0
```

```
118 EF6F3 E000          CON(5) 14
          0
119 EF6F8 0000          CON(5) =MOD             MOD
          0
120 EF6FD 0000          CON(5) =ZEQ             0=
          0
121 EF702 0000          CON(5) =ZBRNH           IF          ( * * )
          0
122 EF707 B300          REL(5) %IF153
          0
123               *
124               * YES, NUMBER OF DOTS FILLS SCREEN
125               *
126 EF70C 0000          CON(5) =CR              CR
          0
127               *
128               * DISPLAY PASS
129               *
130 EF711 0000          CON(5) =QUOTC           '
          0
131 EF716 50            CON(2) 5
132 EF718 50            CON(2) 5
133 EF71A 0514          NIBASC \PASS \
          3535
          02
134 EF724 0000          CON(5) =TYPE            TYPE        ( * * )
          0
135 EF729 0000          CON(5) =aPASS           PASS
          0
136 EF72E 0000          CON(5) =AT              @
          0
137 EF733 0000          CON(5) =aNUM#1          #1
          0
138 EF738 0000          CON(5) =TYPE            TYPE        ( * * )
          0
139 EF73D 0000          CON(5) =SPACE           SPACE       ( * * )
          0
140               *
141               * ADD ANOTHER DOT TO SCREEN
142               *
143 EF742          %IF153                       THEN
144 EF742 0000          CON(5) =LIT             46
          0
145 EF747 E200          CON(5) 46
          0
146 EF74C 0000          CON(5) =EMIT            EMIT        ( * * )
          0
147 EF751 0000          CON(5) =ONE             1
          0
148 EF756 0000          CON(5) =aLINEC          LINECNT
          0
149 EF75B 0000          CON(5) =PSTOR           +!
          0
150 EF760 0000          CON(5) =SEMI            ;           ( * * )
          0
```

```
151                ***************************************************************
152                ***
153                ***  NOTHING
154                ***
155                ***************************************************************
156 EF765 0000 =aBLANK CON(5) =DOCOL          : NOTHING
          0
157 EF76A 0000         CON(5) =SEMI           ;
          0
158                ***  ( -- )
159                ***  ( DO NOTHING AT ALL, ACTUALLY JUST A PLACE HOLDER )
160                ***  ( FOR THE TABLE THAT FOLLOWS )
161                ***************************************************************
162                ***
163                ***  TABLE
164                ***
165                ***  ( -- )
166                ***  ( THIS IS NEVER EXECUTED, BUT DOES PROVIDE )
167                ***  ( A TABLE OF ADDRESS FOR PROCESS )
168                ***  ( 00-04 )
169                ***************************************************************
170 EF76F       =aTABLE                       : TABLE
171 EF76F 567F          CON(5) =aBLANK        NOTHING
          E
172 EF774 0000          CON(5) =aREGTE        REGTEST
          0
173 EF779 0000          CON(5) =aREGAR        REGARITH
          0
174 EF77E 0000          CON(5) =aREGLO        REGLOGIC
          0
175 EF783 0000          CON(5) =aBRANC        BRANCHES
          0
176                ***  ( 05-09 )
177 EF788 567F          CON(5) =aBLANK        NOTHING
          E
178 EF78D 567F          CON(5) =aBLANK        NOTHING
          E
179 EF792 0000          CON(5) =aRTNYS        RTNYES
          0
180 EF797 0000          CON(5) =aPTRTE        PTRTEST
          0
181 EF79C 0000          CON(5) =aSTATT        STATTEST
          0
182                ***  ( 10-14 )
183 EF7A1 0000          CON(5) =aSETPT        SETPTR
          0
184 EF7A6 0000          CON(5) =aSETST        SETSTAT
          0
185 EF7AB 0000          CON(5) =aDPARI        DPARITH
          0
186 EF7B0 0000          CON(5) =aDATAT        DATATRANS
          0
187 EF7B5 0000          CON(5) =aNIBHX        NIBHEX
          0
188                ***  ( 15-19 )
```

```
189 EF7BA 0000          CON(5) =aLCHEX          LCHEX
          0
190 EF7BF 0000          CON(5) =Dx=HX           Dx=HEX
          0
191 EF7C4 0000          CON(5) =aNIBFF          NIBASC
          0
192 EF7C9 0000          CON(5) =aLCASC          LCASC
          0
193 EF7CE 0000          CON(5) =aBSS            BSS
          0
194               *** ( 20-24 )
195 EF7D3 0000          CON(5) =aEJECT          EJECT
          0
196 EF7D8 0000          CON(5) =aEND            END
          0
197 EF7DD 0000          CON(5) =aEQU            EQU
          0
198 EF7E2 0000          CON(5) =aLIST           LIST
          0
199 EF7E7 0000          CON(5) =aTITLE          TITLE
          0
200               *** ( 25-29 )
201 EF7EC 0000          CON(5) =aSTITL          STITLE
          0
202 EF7F1 0000          CON(5) =aWORDN          WORDN
          0
203 EF7F6 0000          CON(5) =aWORDI          WORDI
          0
204 EF7FB 0000          CON(5) =aLEX            LEX
          0
205 EF800 0000          CON(5) =aIDN            ID
          0
206               *** ( 30-34 )
207 EF805 0000          CON(5) =aMSG            MSG
          0
208 EF80A 0000          CON(5) =aPOLL           POLL
          0
209 EF80F 0000          CON(5) =aENTRY          ENTRY
          0
210 EF814 0000          CON(5) =aCHAR           CHAR
          0
211 EF819 0000          CON(5) =aKEYP           KEYP
          0
212               *** ( 35-39 )
213 EF81E 0000          CON(5) =aTOKNP          TOKENP
          0
214 EF823 0000          CON(5) =aBIN            BIN
          0
215 EF828 0000          CON(5) =aFORTH          FORTHN
          0
216 EF82D 0000          CON(5) =aCHAIN          CHAIN
          0
217 EF832 0000          CON(5) =aENDTX          END.TEXT
          0
218               ********************************************************************
```

```
219                ***
220                ***  PROCESS
221                ***
222                *** ( -- )
223                *** ( GO TO THE PROPER OPCODE ALGORITHM )
224                *** ( IF AN ALGORITHM RETURNS 'NUM' IT IS PASS 1 )
225                ****************************************************************
226 EF837 0000 =aPROCS CON(5) =DOCOL          : PROCESS
          0
227                *
228                * LOOK UP WHICH PROCESS ROUTINE TO CALL
229                *
230 EF83C 0000          CON(5) =LIT           TABLE       ( * ADDR * )
          0
231 EF841 F67F          CON(5) =aTABLE
          E
232 EF846 0000          CON(5) =aOPTYP        OPTYPE
          0
233 EF84B 0000          CON(5) =AT            @           ( * ADDR NUM * )
          0
234 EF850 0000          CON(5) =DUP           DUP         ( * ADDR NUM NUM * )
          0
235 EF855 0000          CON(5) =LIT           39
          0
236 EF85A 7200          CON(5) 39
          0
237 EF85F 0000          CON(5) =GT            >           ( * ADDR NUM F * )
          0
238 EF864 0000          CON(5) =ZBRNH         IF          ( * ADDR NUM * )
          0
239 EF869 3200          REL(5) %IF304
          0
240                *
241                * THE HOOKS HAVE PROVIDED A PROCESS ROUTINE WITH NUMBER > 39.
242                * SINCE THIS COULDN'T HAPPEN INTERNALLY, WE'LL LET THEM
243                * HANDLE IT.
244                *
245 EF86E 0000          CON(5) =SWAP          SWAP        ( * NUM ADDR * )
          0
246 EF873 0000          CON(5) =DROP          DROP        ( * NUM * )
          0
247 EF878 0000          CON(5) =LIT           PROCESS RT  ( * NUM PTR * )
          0
248 EF87D E7CF          CON(5) =oPRORT
          2
249 EF882 0000          CON(5) =BRNCH         ELSE
          0
250 EF887 9100          REL(5) %TH304
          0
251                *
252                * PULL OUR PROCESS ROUTINE FROM TABLE
253                *
254 EF88C       %IF304
255 EF88C 0000          CON(5) =LIT           5
          0
```

```
256 EF891 5000          CON(5) 5
          0
257 EF896 0000          CON(5) =MULT            *
          0
258 EF89B 0000          CON(5) =ADD             +           ( * PTR * )
          0
259               *
260               * EXECUTE PROCESS ROUTINE
261               *
262 EF8A0          %TH304                       THEN        ( * [NUM] PTR * )
263 EF8A0 0000          CON(5) =AT              @
          0
264 EF8A5 0000          CON(5) =EXEC            EXECUTE     ( * [NUM] * )
          0
265               *
266               * IF PASS 1, IT SHOULD RETURN A LENGTH
267               *
268 EF8AA 0000          CON(5) =aPASS           PASS
          0
269 EF8AF 0000          CON(5) =AT              @
          0
270 EF8B4 0000          CON(5) =ONE             1
          0
271 EF8B9 0000          CON(5) =EQUAL           =
          0
272 EF8BE 0000          CON(5) =ZBRNH           IF          ( * [NUM] * )
          0
273 EF8C3 F000          REL(5) %IF154
          0
274               *
275               * WE'LL STORE THIS LENGTH IN VARIABLE OPLEN
276               *
277 EF8C8 0000          CON(5) =aOPLEN          OPLEN
          0
278 EF8CD 0000          CON(5) =STORE           !           ( * * )
          0
279               *
280               * ALL DONE
281               *
282 EF8D2          %IF154                       THEN
283 EF8D2 0000          CON(5) =SEMI            ;           ( * * )
          0
284               ********************************************************************
285               ***
286               ***  SPIT
287               ***
288               *** ( -- )
289               *** ( SPIT PROCESSED INFORMATION TO OBJECT & LISTING )
290               ********************************************************************
291 EF8D7 0000 =aSPIT  CON(5) =DOCOL          : SPIT
          0
292               *
293               * CHECK FOR TEST INSTRUCTION/RTNYES MATCH
294               *
295 EF8DC 0000          CON(5) =aLSTRQ          LAST.REQ
```

```
          0
296 EF8E1 0000         CON(5) =AT              @
          0
297 EF8E6 0000         CON(5) =ZBRNH           IF          ( * * )
          0
298 EF8EB 7300         REL(5) %IF155
          0
299 EF8F0 0000         CON(5) =aISGYS          IS.GOYES
          0
300 EF8F5 0000         CON(5) =ZEQ             0=          ( * F * )
          0
301              *
302              * BUT ONLY IF THE LINE GENERATES CODE
303              *
304 EF8FA 0000         CON(5) =aOPLEN          OPLEN
          0
305 EF8FF 0000         CON(5) =AT              @
          0
306 EF904 0000         CON(5) =F.AND           F.AND       ( * F * )
          0
307 EF909 0000         CON(5) =ZBRNH           IF
          0
308 EF90E 4100         REL(5) %IF156
          0
309 EF913 0000         CON(5) =LIT             21
          0
310              *
311              * REPORT ERROR
312              *
313 EF918 5100         CON(5) 21               'requires previous GOYES/RTNYES'
          0
314 EF91D 0000         CON(5) =aERROR          ERROR
          0
315 EF922       %IF156                         THEN
316 EF922       %IF155                         THEN        ( * * )
317              *
318              * OUTPUT OBJECT CODE & LISTING LINE
319              *
320 EF922 0000         CON(5) =aOUTOB          OUT.OBJ
          0
321 EF927 0000         CON(5) =aOUTLS          OUT.LIST
          0
322 EF92C 0000         CON(5) =SEMI            ;           ( * * )
          0
323              ***************************************************************
324              ***
325              ***  LC+
326              ***
327              *** ( -- )
328              *** ( SET LAST.REQ AND UPDATE LC )
329              ***************************************************************
330 EF931 0000 =aLC+    CON(5) =DOCOL           : LC+
          0
331 EF936 0000         CON(5) =aOPLEN          OPLEN
          0
```

```
332 EF93B 0000          CON(5) =AT              @
          0
333 EF940 0000          CON(5) =ZBRNH           IF          ( * * )
          0
334 EF945 8200          REL(5) %IF158
          0
335               *
336               * THIS LINE DID GENERATE CODE.  SET VARIABLE LAST.REQ
337               *
338 EF94A 0000          CON(5) =aRQYES          REQ.YES
          0
339 EF94F 0000          CON(5) =aLSTRQ          LAST.REQ
          0
340 EF954 0000          CON(5) =STORE           !           ( * * )
          0
341               *
342               * UPDATE VARIABLE LC
343               *
344 EF959 0000          CON(5) =aOPLEN          OPLEN
          0
345 EF95E 0000          CON(5) =AT              @
          0
346 EF963 0000          CON(5) =aLC             LC
          0
347 EF968 0000          CON(5) =PSTOR           +!
          0
348               *
349               * ALL DONE
350               *
351 EF96D          %IF158                       THEN
352 EF96D 0000          CON(5) =SEMI            ;           ( * * )
          0
353               ********************************************************************
354               ***
355               ***  LABELS
356               ***
357               *** ( -- )
358               *** ( PUT LABELS INTO THE SYMBOL TABLE )
359               ********************************************************************
360 EF972 0000 =aLABLS CON(5) =DOCOL           : LABELS
          0
361               *
362               * DOES LABEL EXIST?
363               *
364 EF977 0000          CON(5) =aLAB.F          LABEL.FIELD ( * STR * )
          0
365 EF97C 0000          CON(5) =SWAP            SWAP        ( * LEN ADDR * )
          0
366 EF981 0000          CON(5) =DROP            DROP        ( * LEN * )
          0
367 EF986 0000          CON(5) =ZBRNH           IF          ( * * )
          0
368 EF98B 7800          REL(5) %IF160
          0
369               *
```

```
370            * YES.  GET VALUE FOR LABEL AND LABEL FIELD
371            *
372 EF990 0000          CON(5) =aLC             LC           ( * PTR * )
          0
373 EF995 0000          CON(5) =AT              @            ( * NUM * )
          0
374 EF99A 0000          CON(5) =aLAB.F          LABEL.FIELD  ( * NUM STR * )
          0
375 EF99F 0000          CON(5) =a?PAS1          ?PASS=1      ( * NUM STR F * )
          0
376 EF9A4 0000          CON(5) =ZBRNH           IF           ( * NUM STR * )
          0
377 EF9A9 F000          REL(5) %IF161
          0
378            *
379            * PUT ONTO SYMBOL TABLE IF PASS 1
380            *
381 EF9AE 0000          CON(5) =a>SYT           >SYT         ( * * )
          0
382 EF9B3 0000          CON(5) =SEMI            ;            ( * * )
          0
383            *
384            * CHECK LABEL FOR VALIDITY IF PASS 2
385            *
386 EF9B8       %IF161                                       ( * NUM STR * )
387 EF9B8 0000          CON(5) =2DUP            2DUP         ( * NUM STR STR * )
          0
388 EF9BD 0000          CON(5) =aLABOK          LABEL.OK?    ( * NUM STR F * )
          0
389 EF9C2 0000          CON(5) =ZBRNH           IF           ( * NUM STR * )
          0
390 EF9C7 2300          REL(5) %IF162
          0
391            *
392            * VALID LABEL, BUT HAS IT'S VALUE CHANGED FROM THE FIRST PASS ?
393            *
394 EF9CC 0000          CON(5) =aSYT>           SYT>         ( * NUM NUM' * )
          0
395 EF9D1 0000          CON(5) =EQUAL           =            ( * F * )
          0
396 EF9D6 0000          CON(5) =ZEQ             0=           ( * F * )
          0
397 EF9DB 0000          CON(5) =ZBRNH           IF           ( * * )
          0
398 EF9E0 2300          REL(5) %IF160
          0
399            *
400            * YES.  EITHER CODE SHIFTED (IMPOSSIBLE!  UNLESS HOOKS GENERATED
401            * DIFFERENT LENGTH IN PASS2 THAN REPORTED IN PASS 1!)  OR THERE W
402            * ANOTHER LABEL BY THE SAME NAME.
403            *
404 EF9E5 0000          CON(5) =LIT             41           ( * NUM * )
          0
405 EF9EA 9200          CON(5) 41               'duplicate label'
          0
```

```
406 EF9EF 0000          CON(5) =aERROR          ERROR       ( * * )
          0
407 EF9F4 0000          CON(5) =SEMI            ;           ( * * )
          0
408               *
409               * INVALID LABEL ON PASS 2
410               *
411 EF9F9          %IF162                       ELSE        ( * NUM STR * )
412 EF9F9 0000          CON(5) =2DROP           2DROP       ( * NUM * )
          0
413 EF9FE 0000          CON(5) =DROP            DROP        ( * * )
          0
414 EFA03 0000          CON(5) =LIT             22          ( * NUM * )
          0
415 EFA08 6100          CON(5) 22               'illegal label'
          0
416 EFA0D 0000          CON(5) =aERROR          ERROR       ( * * )
          0
417               *
418               * ALL DONE
419               *
420 EFA12          %IF160                       THEN        ( * * )
421 EFA12 0000          CON(5) =SEMI            ;           ( * * )
          0
422               ********************************************************************
423               ***
424               ***  DO.LINE
425               ***
426               *** ( -- )
427               *** ( TAKE A SOURCE LINE AND PRODUCE CODE )
428               ********************************************************************
429 EFA17 0000 =aDOLIN CON(5) =DOCOL          : DO.LINE
          0
430               *
431               * MONITOR ATTENTION KEY & SHOW NEW LINE PROGRESS
432               *
433 EFA1C 006F          CON(5) =aMONAT          MONIT.ATTN  ( * * )
          E
434 EFA21 FD6F          CON(5) =aSHOWP          PROGRESS    ( * * )
          E
435               *
436               * PARSE SOURCE LINE
437               *
438 EFA26 0000          CON(5) =aPARSE          PARSE       ( * * )
          0
439               *
440               * CHECK LABEL FIELD, UNLESS WE'RE PROCESSING AN 'EQU' STATEMENT.
441               * IF SO, THE PSEUDO-OP WILL PROCESS THE LABEL ITSELF.
442               *
443 EFA2B 0000          CON(5) =aOPTYP          OPTYPE
          0
444 EFA30 0000          CON(5) =AT              @           ( * NUM * )
          0
445 EFA35 0000          CON(5) =LIT             22
          0
```

```
446 EFA3A 6100          CON(5) 22
          0
447 EFA3F 0000          CON(5) =EQUAL           =           ( * F * )
          0
448 EFA44 0000          CON(5) =ZEQ             0=          ( * F * )
          0
449 EFA49 0000          CON(5) =ZBRNH           IF
          0
450 EFA4E A000          REL(5) %IF167
          0
451 EFA53 279F          CON(5) =aLABLS          LABELS
          E
452 EFA58       %IF167                          THEN
453             *
454             * PROCESS LINE
455             *
456 EFA58 0000          CON(5) =a?PAS1          ?PASS=1     ( * F * )
          0
457 EFA5D 0000          CON(5) =ZBRNH           IF          ( * * )
          0
458 EFA62 6400          REL(5) %IF311
          0
459             *
460             * PROCESSING FOR PASS 1 HERE
461             *
462 EFA67 0000          CON(5) =aLENST          LENGTH.SET
          0
463 EFA6C 0000          CON(5) =ZEQ             0=
          0
464 EFA71 0000          CON(5) =ZBRNH           IF          ( * * )
          0
465 EFA76 A000          REL(5) %IF157
          0
466 EFA7B 738F          CON(5) =aPROCS          PROCESS     ( * * )
          E
467             *
468             * CHECK THAT THE FILETYPE HAS BEEN DECLARED
469             *
470 EFA80       %IF157                          THEN        ( * * )
471 EFA80 0000          CON(5) =aFLTYP          FILETYPE
          0
472 EFA85 0000          CON(5) =AT              @           ( * NUM * )
          0
473 EFA8A 0000          CON(5) =ZEQ             0=          ( * F * )
          0
474 EFA8F 0000          CON(5) =ZBRNH           IF          ( * * )
          0
475 EFA94 E100          REL(5) %TH311
          0
476 EFA99 0000          CON(5) =LIT             51
          0
477 EFA9E 3300          CON(5) 51               'missing file type'
          0
478 EFAA3 0000          CON(5) =aSHUTD          SHUTDOWN    ( * * )
          0
```

```
479                *
480                * PROCESSING FOR PASS 2 HERE
481                *
482 EFAA8           %IF311                          ELSE        ( * * )
483 EFAA8 738F              CON(5) =aPROCS          PROCESS     ( * * )
          E
484 EFAAD 7D8F              CON(5) =aSPIT           SPIT        ( * * )
          E
485                *
486                * UPDATE LOCATION COUNTER & RESET ERROR-THIS-LINE FLAG
487                *
488 EFAB2           %TH311                          THEN        ( * * )
489 EFAB2 139F              CON(5) =aLC+            LC+         ( * * )
          E
490 EFAB7 0000              CON(5) =LIT             ~8
          0
491 EFABC 7FFF              CON(5) #FFFF7
          F
492 EFAC1 0000              CON(5) =aTESTF          TEST.FLAG   ( * F * )
          0
493 EFAC6 0000              CON(5) =aOCCUR          OCCUR
          0
494 EFACB 0000              CON(5) =STORE           !           ( * * )
          0
495 EFAD0 0000              CON(5) =SEMI            ;           ( * * )
          0
496                ********************************************************************
497                ***
498                ***  PASS.INIT
499                ***
500                *** ( -- )
501                *** ( INITIALIZE APPROPRIATE VARIABLES AT )
502                *** ( BEGINNING OF PASS )
503                ********************************************************************
504 EFAD5 0000 =aPASIN CON(5) =DOCOL           : PASS.INIT
          0
505 EFADA 0000              CON(5) =a?PAS1          ?PASS=1
          0
506 EFADF 0000              CON(5) =ZBRNH           IF          ( * * )
          0
507 EFAE4 7300              REL(5) %IF163
          0
508                *
509                * LOW TOKEN COUNT TO HIGHEST POSSIBLE VALUE
510                *
511 EFAE9 0000              CON(5) =LIT             255
          0
512 EFAEE FF00              CON(5) 255
          0
513 EFAF3 0000              CON(5) =aLOTOK          LOTOK
          0
514 EFAF8 0000              CON(5) =STORE           !           ( * * )
          0
515                *
516                * HIGH TOKEN COUNT TO LOWEST POSSIBLE VALUE
```

```
                *
EFAFD 0000          CON(5) =LIT          -256
      0
EFB02 00FF          CON(5) 0-256
      F
EFB07 0000          CON(5) =aHITOK       HITOK
      0
EFB0C 0000          CON(5) =STORE        !           ( * * )
      0
EFB11 0000          CON(5) =BRNCH        ELSE
      0
EFB16 4600          REL(5) %TH163
      0
EFB1B        %IF163                                   ( * * )
                *
                * LISTING VARIABLE TRUE
                *
EFB1B 0000          CON(5) =aNEG1        -1
      0
EFB20 0000          CON(5) =aTOLST       TOLIST
      0
EFB25 0000          CON(5) =STORE        !           ( * * )
      0
                *
                * PAGE NUMBER TO ONE
                *
EFB2A 0000          CON(5) =ONE          1
      0
EFB2F 0000          CON(5) =aPAGE#       PAGENO
      0
EFB34 0000          CON(5) =STORE        !           ( * * )
      0
                *
                * LISTING LINE NUMBER TO ONE
                *
EFB39 0000          CON(5) =ONE          1
      0
EFB3E 0000          CON(5) =aLLIN#       LLINE#
      0
EFB43 0000          CON(5) =STORE        !           ( * * )
      0
                *
                * NO TITLE YET
                *
EFB48 0000          CON(5) =NULL$        NULL$
      0
EFB4D 0000          CON(5) =aTIT         TIT
      0
EFB52 0000          CON(5) =S!           S!          ( * * )
      0
                *
                * NO SUBTITLE YET
                *
EFB57 0000          CON(5) =NULL$        NULL$
      0
```

```
553 EFB5C 0000          CON(5) =aSTIT           STIT
          0
554 EFB61 0000          CON(5) =S!              S!          ( * * )
          0
555             *
556             * SET LC TO BEGINNING OF OBJECT FILE
557             *
558 EFB66 0000          CON(5) =aOBJFL          OBJFILE
          0
559 EFB6B 0000          CON(5) =AT              @
          0
560 EFB70 0000          CON(5) =aLC             LC
          0
561 EFB75 0000          CON(5) =STORE           !           ( * * )
          0
562             *
563             * SOURCE LINE TO ONE
564             *
565 EFB7A        %TH163                         THEN
566 EFB7A 0000          CON(5) =ONE             1
          0
567 EFB7F 0000          CON(5) =aSLIN#          SLINE#
          0
568 EFB84 0000          CON(5) =STORE           !           ( * * )
          0
569             *
570             * DOTS ON DISPLAY TO ZERO
571             *
572 EFB89 0000          CON(5) =ZERO            0
          0
573 EFB8E 0000          CON(5) =aLINEC          LINECNT
          0
574 EFB93 0000          CON(5) =STORE           !           ( * * )
          0
575             *
576             * NO INSTRUCTION REQUIRING GOYES/RTNYES
577             *
578 EFB98 0000          CON(5) =ZERO            0
          0
579 EFB9D 0000          CON(5) =aLSTRQ          LAST.REQ
          0
580 EFBA2 0000          CON(5) =STORE           !
          0
581             *
582             * NOT DONE YET
583             *
584 EFBA7 0000          CON(5) =ZERO            0
          0
585 EFBAC 0000          CON(5) =aDONE           DONE
          0
586 EFBB1 0000          CON(5) =STORE           !           ( * * )
          0
587             *
588             * NO ENTRY PSEUDO-OPS
589             *
```

```
590 EFBB6 0000          CON(5) =ZERO          0
          0
591 EFBBB 0000          CON(5) =aTENT         TENT
          0
592 EFBC0 0000          CON(5) =STORE         !           ( * * )
          0
593               *
594               * NO KEYH PSEUDO-OPS
595               *
596 EFBC5 0000          CON(5) =ZERO          0
          0
597 EFBCA 0000          CON(5) =aKENT         KENT
          0
598 EFBCF 0000          CON(5) =STORE         !
          0
599 EFBD4 0000          CON(5) =SEMI          ;           ( * * )
          0
600               ********************************************************************
601               ***
602               ***  PURGE.ALL
603               ***
604               *** ( -- )
605               *** ( ENSURE ALL REQ'D FILES PURGED )
606               ********************************************************************
607 EFBD9 0000 =aPUALL CON(5) =DOCOL         : PURGE.ALL
          0
608               *
609               * PURGE OLD INTERNAL OBJECT FILES
610               *
611 EFBDE 0000          CON(5) =QUOTC         " ASMBOB"
          0
612 EFBE3 60            CON(2) 6
613 EFBE5 60            CON(2) 6
614 EFBE7 1435          NIBASC \ASMBOB\
          D424
          F424
615 EFBF3 0000          CON(5) =aREMOV        REMOVE
          0
616 EFBF8 0000          CON(5) =DROP          DROP        ( * * )
          0
617               *
618               * PURGE OLD INTERNAL SYMBOL TABLES
619               *
620 EFBFD 0000          CON(5) =QUOTC         " ASMBSY"
          0
621 EFC02 60            CON(2) 6
622 EFC04 60            CON(2) 6
623 EFC06 1435          NIBASC \ASMBSY\
          D424
          3595
624 EFC12 0000          CON(5) =aREMOV        REMOVE
          0
625 EFC17 0000          CON(5) =DROP          DROP        ( * * )
          0
626               *
```

```
627            * REMOVE OLD LISTING FILES, IF THEY'RE PRESENT
628            *
629 EFC1C 0000         CON(5) =LISTNG        LISTING
          0
630 EFC21 0000         CON(5) =FSTX          FSYNTAX
          0
631 EFC26 0000         CON(5) =ZBRNH         IF
          0
632 EFC2B C300         REL(5) %IF164
          0
633 EFC30 0000         CON(5) =LISTNG        LISTING
          0
634 EFC35 0000         CON(5) =aREMOV        REMOVE      ( * F * )
          0
635 EFC3A 0000         CON(5) =ZEQ           0=
          0
636 EFC3F 0000         CON(5) =ZBRNH         IF
          0
637 EFC44 3200         REL(5) %IF165
          0
638            *
639            * COULDN'T PURGE LISTING FILE BECAUSE IT WASN'T TEXT
640            *
641 EFC49 0000         CON(5) =LIT           48
          0
642 EFC4E 0300         CON(5) 48             'listing file not TEXT'
          0
643 EFC53 0000         CON(5) =aERMSG        ERROR MESSAGE
          0
644 EFC58 0000         CON(5) =CR            CR
          0
645 EFC5D 0000         CON(5) =TYPE          TYPE
          0
646 EFC62 0000         CON(5) =ABORT         ABORT
          0
647 EFC67       %IF165                       THEN
648 EFC67       %IF164                       THEN
649 EFC67 0000         CON(5) =SEMI          ;           ( * * )
          0
650            ********************************************************************
651            ***
652            ***  INIT
653            ***
654            *** ( STR -- )
655            *** ( INITIALIZE THE ASSEMBLER TO RUN )
656            ********************************************************************
657 EFC6C 0000 =aINIT  CON(5) =DOCOL         : INIT
          0
658            *
659            * ENSURE SOURCE <> LISTING
660            *
661 EFC71 0000         CON(5) =2DUP          2DUP
          0
662 EFC76 0000         CON(5) =LISTNG        LISTING
          0
```

```
    663 EFC7B 0000          CON(5) =S=              S=          ( * STR F * )
              0
    664 EFC80 0000          CON(5) =ZBRNH           IF
              0
    665 EFC85 3200          REL(5) %IF151
              0
    666 EFC8A 0000          CON(5) =LIT             49
              0
    667 EFC8F 1300          CON(5) 49               'invalid listing file'
              0
    668 EFC94 0000          CON(5) =aERMSG          ERROR MESSAGE
              0
    669 EFC99 0000          CON(5) =CR              CR
              0
    670 EFC9E 0000          CON(5) =TYPE            TYPE
              0
    671 EFCA3 0000          CON(5) =ABORT           ABORT
              0
    672 EFCA8       %IF151                          THEN        ( * STR * )
    673             *
    674             * SAVE SOURCE FILE NAME
    675             *
    676 EFCA8 0000          CON(5) =LIT             20
              0
    677 EFCAD 4100          CON(5) 20
              0
    678 EFCB2 0000          CON(5) =MIN             MIN
              0
    679 EFCB7 0000          CON(5) =a>PAD2          >PAD2       ( * * )
              0
    680             *
    681             * PURGE EXISTING FILES
    682             *
    683 EFCBC 9DBF          CON(5) =aPUALL          PURGE.ALL   ( * * )
              E
    684             *
    685             * TURN OFF ATTN KEY
    686             *
    687 EFCC1 0000          CON(5) =LIT             15
              0
    688 EFCC6 F000          CON(5) 15
              0
    689 EFCCB 0000          CON(5) =LIT             193601
              0
    690 EFCD0 144F          CON(5) 193601
              2
    691 EFCD5 0000          CON(5) =N!              N!          ( * * )
              0
    692             *
    693             * INITIALIZE VARIABLES
    694             *
    695 EFCDA 0000          CON(5) =aVARIN          VAR.INIT    ( * * )
              0
    696             *
    697             * SAVE SOURCE FILE
```

```
698                *
699 EFCDF 0000             CON(5) =aPAD2>          PAD2>       ( * STR * )
          0
700 EFCE4 0000             CON(5) =aSFILE          SRC.FILE
          0
701 EFCE9 0000             CON(5) =S!              S!          ( * * )
          0
702                *
703                * INITIALIZE OBJECT FILE
704                *
705 EFCEE 0000             CON(5) =aOBJIN          OBJ.INIT
          0
706                *
707                * INITIALIZE SYMBOL TABLE
708                *
709 EFCF3 0000             CON(5) =aSYTIN          SYT.INIT
          0
710                *
711                * INITIALIZE LISTING FILE
712                *
713 EFCF8 0000             CON(5) =aLSTIN          LIST.INIT
          0
714                *
715                * OPEN SOURCE FILE
716                *
717 EFCFD 0000             CON(5) =aSFILE          SFILE       ( * STR * )
          0
718 EFD02 0000             CON(5) =aOPSRC          OPEN.SOURCE
          0
719 EFD07 0000             CON(5) =SEMI            ;           ( * * )
          0
720                ****************************************************************
721                ***
722                ***  DO.PASS
723                ***
724                *** ( -- )
725                *** ( DO ONE PASS )
726                ****************************************************************
727 EFD0C 0000 =aDOPAS CON(5) =DOCOL          : DO.PASS
          0
728 EFD11 5DAF             CON(5) =aPASIN          PASS.INIT   ( * * )
          E
729                *
730                * while <NOT EOF> and <NOT DONE> do
731                *
732 EFD16                   %BG18                   BEGIN       ( * * )
733 EFD16 0000             CON(5) =aRDSRC          READ.SOURCE
          0
734 EFD1B 0000             CON(5) =aDONE           DONE
          0
735 EFD20 0000             CON(5) =AT              @
          0
736 EFD25 0000             CON(5) =ZEQ             0=
          0
737 EFD2A 0000             CON(5) =AND             AND         ( * F * )
```

```
          0
738 EFD2F 0000          CON(5) =ZBRNH           WHILE
          0
739 EFD34 4100          REL(5) %RP18
          0
740               *
741               * PROCESS A LINE
742               *
743 EFD39 71AF          CON(5) =aDOLIN          DO.LINE     ( * * )
          E
744 EFD3E 0000          CON(5) =BRNCH           REPEAT
          0
745 EFD43 3DFF          REL(5) %BG18
          F
746               *
747               * end while
748               *
749 EFD48          %RP18
750 EFD48 0000          CON(5) =SEMI            ;           ( * * )
          0
751               ****************************************************************
752               ***
753               ***  no more 8 char words
754               ***
755               ****************************************************************
756 EFD4D 0000          CON(5) 0                Link: no more 8 char words
          0
757 EFD52 88    =!ASSEM CON(2) #80+8
758 EFD54 1435          NIBASC \ASSEMBL\
          3554
          D424
          C4
759 EFD62 5C            CON(2) \E\+#80
760 EFD64 0000 =aASSEM  CON(5) =DOCOL           : ASSEMBLE
          0
761               *** ( STR -- )
762               *** ( WORD WHICH EVOKES THE SASM ASSEMBLER )
763               *
764               * ENSURE WE'RE NOT EXECUTING FORTHX
765               *
766 EFD69 0000          CON(5) =BASIC           BASIC
          0
767 EFD6E 0000          CON(5) =AT              @
          0
768 EFD73 0000          CON(5) =ZBRNH           IF          ( * STR * )
          0
769 EFD78 8200          REL(5) %IF5
          0
770 EFD7D 0000          CON(5) =LIT             63
          0
771 EFD82 F300          CON(5) 63               'BASIC not re-entrant'
          0
772 EFD87 0000          CON(5) =aERMSG          ERROR MESSAGE
          0
773 EFD8C 0000          CON(5) =CR              CR
```

```
          0
774 EFD91 0000          CON(5) =TYPE            TYPE
          0
775 EFD96 0000          CON(5) =CR              CR
          0
776 EFD9B 0000          CON(5) =ABORT           ABORT
          0
777 EFDA0       %IF5                            THEN        ( * STR * )
778             *
779             * SAVE CURRENT VALUE OF BASE
780             *
781 EFDA0 0000          CON(5) =BASE            BASE
          0
782 EFDA5 0000          CON(5) =AT              @
          0
783 EFDAA 0000          CON(5) =CSP             CSP
          0
784 EFDAF 0000          CON(5) =STORE           !
          0
785             *
786             * INITIALIZE VARIABLES & FILES
787             *
788 EFDB4 C6CF          CON(5) =aINIT           INIT        ( * * )
          E
789             *
790             * DO PASS 1
791             *
792 EFDB9 0000          CON(5) =ONE             1
          0
793 EFDBE 0000          CON(5) =aPASS           PASS
          0
794 EFDC3 0000          CON(5) =STORE           !
          0
795 EFDC8 C0DF          CON(5) =aDOPAS          DO.PASS     ( * * )
          E
796             *
797             * CHECK IF USER SUPPLIED THE LABEL "FiLeNd"
798             *
799 EFDCD 0000          CON(5) =QUOTC           " FiLeNd"
          0
800 EFDD2 60            CON(2) 6
801 EFDD4 60            CON(2) 6
802 EFDD6 6496          NIBASC \FiLeNd\
          C456
          E446
803 EFDE2 0000          CON(5) =aSYT>           SYT>        ( * NUM * )
          0
804 EFDE7 0000          CON(5) =ZBRNH           IF
          0
805 EFDEC 4100          REL(5) %IF159
          0
806 EFDF1 0000          CON(5) =LIT             61
          0
807 EFDF6 D300          CON(5) 61               'restricted label FiLeNd exists'
          0
```

```
808 EFDFB 0000          CON(5) =aSHUTD          SHUTDOWN
          0
809 EFE00       %IF159                          THEN        ( * * )
810             *
811             * PUT LABEL FiLeNd ONTO THE SYMBOL TABLE
812             *
813 EFE00 0000          CON(5) =aLC             LC
          0
814 EFE05 0000          CON(5) =AT              @
          0
815 EFE0A 0000          CON(5) =DUP             DUP
          0
816 EFE0F 0000          CON(5) =QUOTC           "
          0
817 EFE14 60            CON(2) 6
818 EFE16 60            CON(2) 6
819 EFE18 6496          NIBASC \FiLeNd\
          C456
          E446
820 EFE24 0000          CON(5) =a>SYT           >SYT        ( * LC * )
          0
821             *
822             * CALCULATE & STORE FILE SIZE IN NIBBLES
823             *
824 EFE29 0000          CON(5) =aOBJFL          OBJFILE
          0
825 EFE2E 0000          CON(5) =AT              @
          0
826 EFE33 0000          CON(5) =MINUS           -
          0
827 EFE38 0000          CON(5) =aFLSIZ          FILESIZE
          0
828 EFE3D 0000          CON(5) =STORE           !           ( * * )
          0
829             *
830             * RESET THE SOURCE FILE TO BEGINNING
831             *
832 EFE42 0000          CON(5) =aRSSRC          RESET.SRC   ( * * )
          0
833             *
834             * DO PASS 2
835             *
836 EFE47 0000          CON(5) =TWO             2
          0
837 EFE4C 0000          CON(5) =aPASS           PASS
          0
838 EFE51 0000          CON(5) =STORE           !
          0
839 EFE56 C0DF          CON(5) =aDOPAS          DO.PASS     ( * * )
          E
840             *
841             * OUTPUT THE SYMBOL TABLE
842             *
843 EFE5B 0000          CON(5) =aTOLST          TOLIST
          0
```

```
844 EFE60 0000          CON(5) =AT              @           ( * F * )
          0
845 EFE65 0000          CON(5) =ZBRNH           IF
          0
846 EFE6A A000          REL(5) %IF166
          0
847 EFE6F 0000          CON(5) =aOUTSY          OUT.SYT
          0
848 EFE74       %IF166                          THEN        ( * * )
849             *
850             * PURGE SYMBOL TABLE & CLOSE FILES
851             *
852 EFE74 0000          CON(5) =aCLEAN          CLEANUP
          0
853 EFE79 0000          CON(5) =SEMI            ;           ( * * )
          0
```

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THE READER AGREES NOT TO
CONTACT THE MANUFACTURER

```
854                     STITLE FIT STATS
855           zSIZE     EQU    (*)-zTHIS
856           zLEFT     EQU    (zNEXT)-*
857 EFE7E               BSS    zLEFT
```

```
858                     STITLE HOOK ROUTINE JUMP TABLES
859 EFF00               BSS    #EFF00-*
860 EFF00 0000          CON(5) =a?PAS1        ?PASS=1
          0
861 EFF05 0000          CON(5) =aWRUOL        WRAP.UP.OLD
          0
862 EFF0A 0000          CON(5) =aSIMLN        SIM.LINE
          0
863 EFF0F 0000          CON(5) =aSTUNW        START.UP.NEW
          0
864 EFF14 0000          CON(5) =a>SYT         >SYT
          0
865 EFF19 0000          CON(5) =aSYT>         SYT>
          0
866 EFF1E 0000          CON(5) =aERROR        ERROR
          0
867 EFF23 0000          CON(5) =a>PAD         >PAD
          0
868 EFF28 0000          CON(5) =aEXPRS        EXPRESSION
          0
869 EFF2D               BSS    #EFF80-*
870 EFF80 0000          CON(5) =aLAB.F        LABEL.FIELD
          0
871 EFF85 0000          CON(5) =aOPC.F        OPCODE.FIELD
          0
872 EFF8A 0000          CON(5) =aEXP.F        EXPRESSION.FIELD
          0
873 EFF8F 0000          CON(5) =aFLTYP        FILETYPE
          0
874 EFF94 0000          CON(5) =aKNOWN        KNOWN
          0
875 EFF99 0000          CON(5) =aOLDEX        OLD.EXPRESSION
          0
876 EFF9E               END
```

```
=!ASSEM  Abs  982354 #EFD52 -   757
 %BG17   Abs  980485 #EF605 -    27    98
 %BG18   Abs  982294 #EFD16 -   732   745
 %BG19   Abs  980568 #EF658 -    51    61
 %IF150  Abs  980688 #EF6D0 -    96    39
 %IF151  Abs  982184 #EFCA8 -   672   665
 %IF152  Abs  980673 #EF6C1 -    89    79
 %IF153  Abs  980802 #EF742 -   143   122
 %IF154  Abs  981202 #EF8D2 -   282   273
 %IF155  Abs  981282 #EF922 -   316   298
 %IF156  Abs  981282 #EF922 -   315   308
 %IF157  Abs  981632 #EFA80 -   470   465
 %IF158  Abs  981357 #EF96D -   351   334
 %IF159  Abs  982528 #EFE00 -   809   805
 %IF160  Abs  981522 #EFA12 -   420   368   398
 %IF161  Abs  981432 #EF9B8 -   386   377
 %IF162  Abs  981497 #EF9F9 -   411   390
 %IF163  Abs  981787 #EFB1B -   524   507
 %IF164  Abs  982119 #EFC67 -   648   632
 %IF165  Abs  982119 #EFC67 -   647   637
 %IF166  Abs  982644 #EFE74 -   848   846
 %IF167  Abs  981592 #EFA58 -   452   450
 %IF304  Abs  981132 #EF88C -   254   239
 %IF311  Abs  981672 #EFAA8 -   482   458
 %IF5    Abs  982432 #EFDA0 -   777   769
 %RP17   Abs  980698 #EF6DA -   102    30
 %RP18   Abs  982344 #EFD48 -   749   739
 %RP19   Abs  980603 #EF67B -    65    54
 %TH163  Abs  981882 #EFB7A -   565   523
 %TH304  Abs  981152 #EF8A0 -   262   250
 %TH311  Abs  981682 #EFAB2 -   488   475
 2DROP   Ext                -   412
 2DUP    Ext                -   387   661
 ?TERM   Ext                -    28    52
 ABORT   Ext                -   646   671   776
 ADD     Ext                -   258
 AND     Ext                -    76   737
 AT      Ext                -   116   136   233   263   269   296   305   332
                              345   373   444   472   559   735   767   782
                              814   825   844
 BASE    Ext                -   781
 BASIC   Ext                -   766
 BRNCH   Ext                -    60    97   249   522   744
 CR      Ext                -    43   126   644   669   773   775
 CSP     Ext                -   783
 DOCOL   Ext                -    23   111   156   226   291   330   360   429
                              504   607   657   727   760
 DROP    Ext                -    59   246   366   413   616   625
 DUP     Ext                -    70    74   234   815
 Dx=HX   Ext                -   190
 EMIT    Ext                -    71   146
 EQUAL   Ext                -    37    77   271   395   447
 EXEC    Ext                -   264
 F.AND   Ext                -   306
 FSTX    Ext                -   630
```

```
 GT       Ext                    -  237
 KEY      Ext                    -   34    58    69
 LISTNG   Ext                    -  629   633   662
 LIT      Ext                    -   35    72    83   117   144   230   235   247
                                    255   309   404   414   445   476   490   511
                                    518   641   666   676   687   689   770   806
 MIN      Ext                    -  678
 MINUS    Ext                    -  826
 MOD      Ext                    -  119
 MULT     Ext                    -  257
 N!       Ext                    -  691
 NULL$    Ext                    -  546   552
 ONE      Ext                    -  147   270   534   540   566   792
 PDOTQ    Ext                    -   44
 PSTOR    Ext                    -  149   347
 QUOTC    Ext                    -  130   611   620   799   816
 ROT      Ext                    -   75
 S!       Ext                    -  548   554   701
 S=       Ext                    -  663
 SEMI     Ext                    -  103   150   157   283   322   352   382   407
                                    421   495   599   649   719   750   853
 SPACE    Ext                    -  139
 STORE    Ext                    -   95   278   340   494   514   521   530   536
                                    542   561   568   574   580   586   592   598
                                    784   794   828   838
 SWAP     Ext                    -  245   365
 TWO      Ext                    -  836
 TYPE     Ext                    -  134   138   645   670   774
 ZBRNH    Ext                    -   29    38    53    78   121   238   272   297
                                    307   333   367   376   389   397   449   457
                                    464   474   506   631   636   664   738   768
                                    804   845
 ZEQ      Ext                    -  120   300   396   448   463   473   635   736
 ZERO     Ext                    -   93   572   578   584   590   596
 a>PAD    Ext                    -  867
 a>PAD2   Ext                    -  679
 a>SYT    Ext                    -  381   820   864
 a?PAS1   Ext                    -  375   456   505   860
=aASSEM   Abs  982372 #EFD64     -  760
 aBIN     Ext                    -  214
=aBLANK   Abs  980837 #EF765     -  156   171   177   178
 aBRANC   Ext                    -  175
 aBSS     Ext                    -  193
 aCHAIN   Ext                    -  216
 aCHAR    Ext                    -  210
 aCLEAN   Ext                    -  852
 aDATAT   Ext                    -  186
=aDOLIN   Abs  981527 #EFA17     -  429   743
 aDONE    Ext                    -  585   734
=aDOPAS   Abs  982284 #EFD0C     -  727   795   839
 aDPARI   Ext                    -  185
 aEJECT   Ext                    -  195
 aEND     Ext                    -  196
 aENDTX   Ext                    -  217
 aENTRY   Ext                    -  209
```

```
 aEQU    Ext                  -   197
 aERMSG  Ext                  -   643   668   772
 aERROR  Ext                  -   314   406   416   866
 aEXP.F  Ext                  -   872
 aEXPRS  Ext                  -   868
 aFLSIZ  Ext                  -   827
 aFLTYP  Ext                  -   471   873
 aFORTH  Ext                  -   215
 aHITOK  Ext                  -   520
 aIDN    Ext                  -   205
=aINIT   Abs  982124 #EFC6C  -   657   788
 aISGYS  Ext                  -   299
 aKENT   Ext                  -   597
 aKEYP   Ext                  -   211
 aKNOWN  Ext                  -   874
 aLAB.F  Ext                  -   364   374   870
=aLABLS  Abs  981362 #EF972  -   360   451
 aLABOK  Ext                  -   388
 aLC     Ext                  -   346   372   560   813
=aLC+    Abs  981297 #EF931  -   330   489
 aLCASC  Ext                  -   192
 aLCHEX  Ext                  -   189
 aLENST  Ext                  -   462
 aLEX    Ext                  -   204
 aLINEC  Ext                  -    94   115   148   573
 aLIST   Ext                  -   198
 aLLIN#  Ext                  -   541
 aLOTOK  Ext                  -   513
 aLSTIN  Ext                  -   713
 aLSTRQ  Ext                  -   295   339   579
=aMONAT  Abs  980480 #EF600  -    23   433
 aMSG    Ext                  -   207
 aNEG1   Ext                  -   528
 aNIBFF  Ext                  -   191
 aNIBHX  Ext                  -   187
 aNUM#1  Ext                  -   137
 aOBJFL  Ext                  -   558   824
 aOBJIN  Ext                  -   705
 aOCCUR  Ext                  -   493
 aOLDEX  Ext                  -   875
 aOPC.F  Ext                  -   871
 aOPLEN  Ext                  -   277   304   331   344
 aOPSRC  Ext                  -   718
 aOPTYP  Ext                  -   232   443
 aOUTLS  Ext                  -   321
 aOUTOB  Ext                  -   320
 aOUTSY  Ext                  -   847
 aPAD2>  Ext                  -   699
 aPAGE#  Ext                  -   535
 aPARSE  Ext                  -   438
=aPASIN  Abs  981717 #EFAD5  -   504   728
 aPASS   Ext                  -   135   268   793   837
 aPOLL   Ext                  -   208
=aPROCS  Abs  981047 #EF837  -   226   466   483
 aPTRTE  Ext                  -   180
```

```
=aPUALL  Abs  981977 #EFBD9 -   607   683
 aRDSRC  Ext                -   733
 aREGAR  Ext                -   173
 aREGLO  Ext                -   174
 aREGTE  Ext                -   172
 aREMOV  Ext                -   615   624   634
 aRQYES  Ext                -   338
 aRSSRC  Ext                -   832
 aRTNYS  Ext                -   179
 aSETPT  Ext                -   183
 aSETST  Ext                -   184
 aSFILE  Ext                -   700   717
=aSHOWP  Abs  980703 #EF6DF -   111   434
 aSHUTD  Ext                -    85   478   808
 aSIMLN  Ext                -   862
 aSLIN#  Ext                -   567
=aSPIT   Abs  981207 #EF8D7 -   291   484
 aSTATT  Ext                -   181
 aSTIT   Ext                -   553
 aSTITL  Ext                -   201
 aSTUNW  Ext                -   863
 aSYT>   Ext                -   394   803   865
 aSYTIN  Ext                -   709
=aTABLE  Abs  980847 #EF76F -   170   231
 aTENT   Ext                -   591
 aTESTF  Ext                -   492
 aTIT    Ext                -   547
 aTITLE  Ext                -   199
 aTOKNP  Ext                -   213
 aTOLST  Ext                -   529   843
 aVARIN  Ext                -   695
 aWORDI  Ext                -   203
 aWORDN  Ext                -   202
 aWRUOL  Ext                -   861
 zLEFT   Abs     130 #00082 -   856   857
 zNEXT   Abs  982784 #EFF00 -     5   856
 zSIZE   Abs    2174 #0087E -   855
 zTHIS   Abs  980480 #EF600 -     4   855
```

Input Parameters

Source file name is GN&AS8

Listing file name is GN/AS8::65

Object file name is GN%AS8::65

```
                                  111111
                        0123456789012345
```

Initial flag settings are

Errors

None

Saturn Assembler News

OFFICIALLY UNOFFICIAL

NOMAS

THE READER AGREES NOT TO
CONTACT THE MANUFACTURER