# United States Patent [19]

**Raskin et al.**

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[45] **Date of Patent: Feb. 21, 1989**


[54] **COMPUTER DISPLAY WITH TWO PART CURSOR FOR INDICATING LOCI OF OPERATION**


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[73] Assignee: **Information Appliance, Inc.**, Palo Alto, Calif.



[21] Appl. No.: **937,157**

[22] Filed: **Dec. 2, 1986**

**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 902,339, Aug. 29, 1986, abandoned.

[51] **Int. Cl.**[4] ..... **G09G 3/02**; G06F 3/14

[52] **U.S. Cl.** ..... **340/709**; 364/521; 364/900

[58] **Field of Search** ... 364/200 MS File, 900 MS File, 364/146, 171, 188-190, 521; 340/709, 710, 723, 724; 400/83



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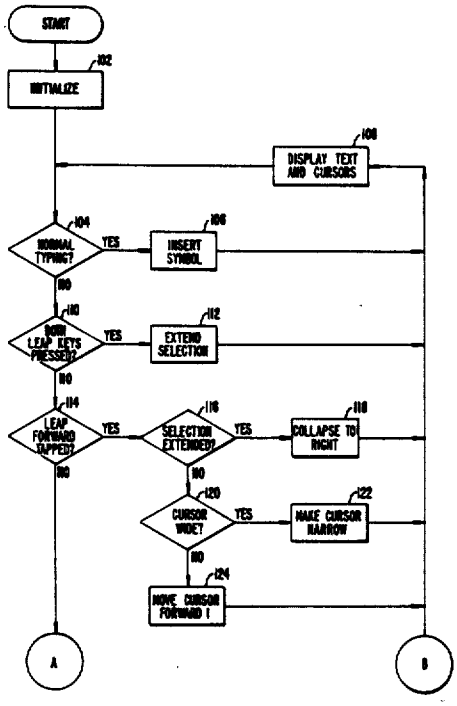
*Assistant Examiner*—Florin Munteanu
*Attorney, Agent, or Firm*—Townsend and Townsend

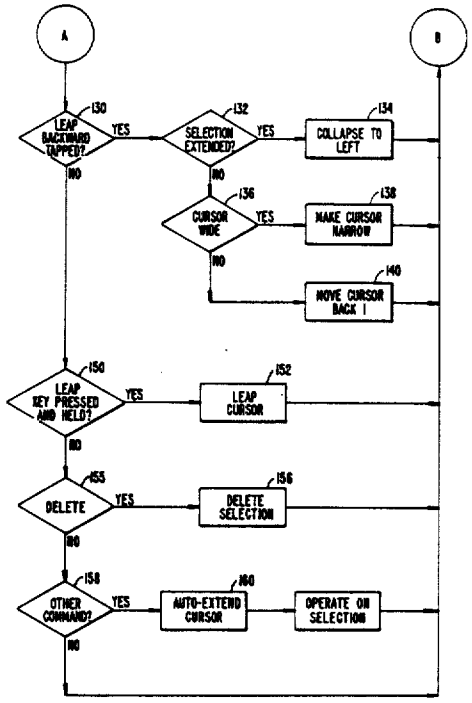


[57] **ABSTRACT**

A system for creating and modifying strings of symbols in a computer storage apparatus includes a two-part cursor for guiding the operator. One cursor part indicates the exact location where entered symbols will be inserted. A second cursor part highlights a selected substring which is the object of certain commands, such as the delete command. Internally, the system provides memory management techniques for inserting and deleting symbols in response to operator commands. The display, including the two-part cursor, is derived from the memory contents with the aid of pointers, tables, and state variables.


**9 Claims, 8 Drawing Sheets**



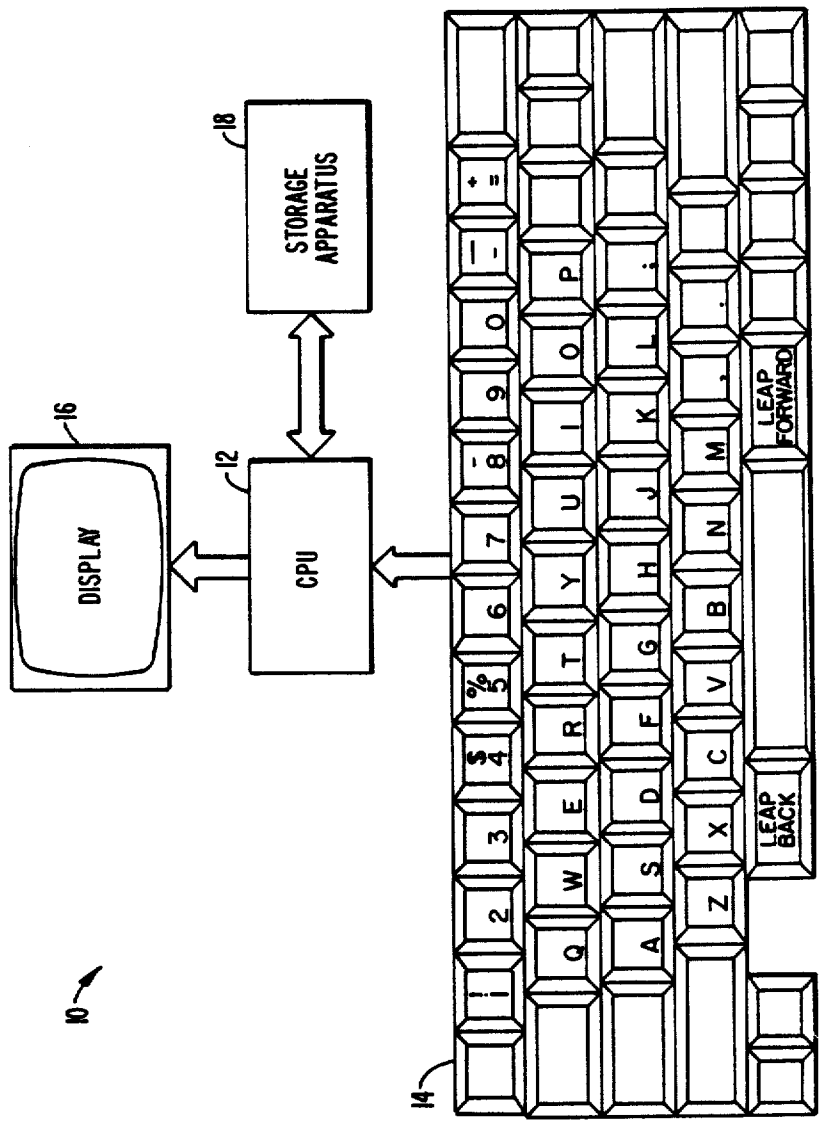

STORAGE APPARATUS
18
DISPLAY
16
CPU
12
10
14
LEAP FORWARD
LEAP BACK

FIG. 1.

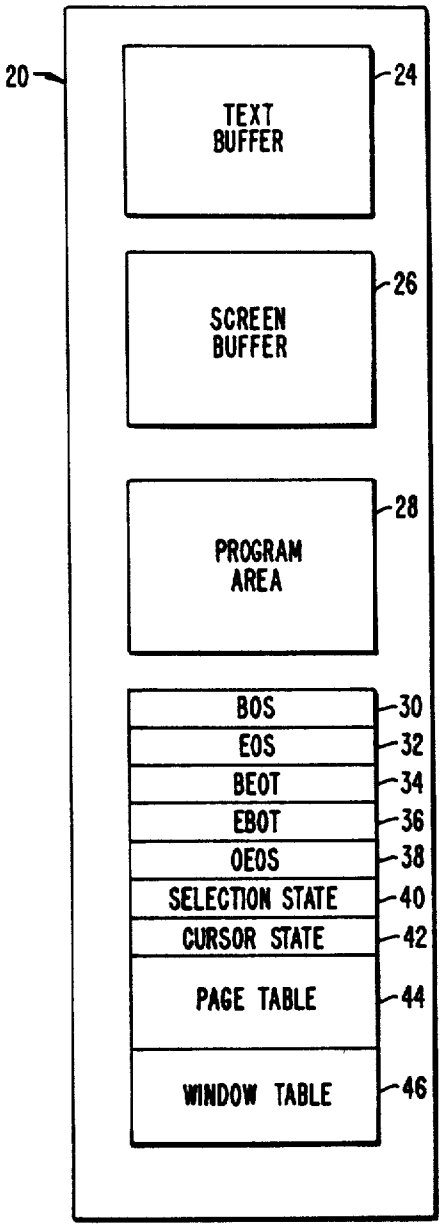

20
TEXT BUFFER
24
SCREEN BUFFER
26
PROGRAM AREA
28
BOS
30
EOS
32
BEOT
34
EBOT
36
OEOS
38
SELECTION STATE
40
CURSOR STATE
42
PAGE TABLE
44
WINDOW TABLE
46

FIG.__2.

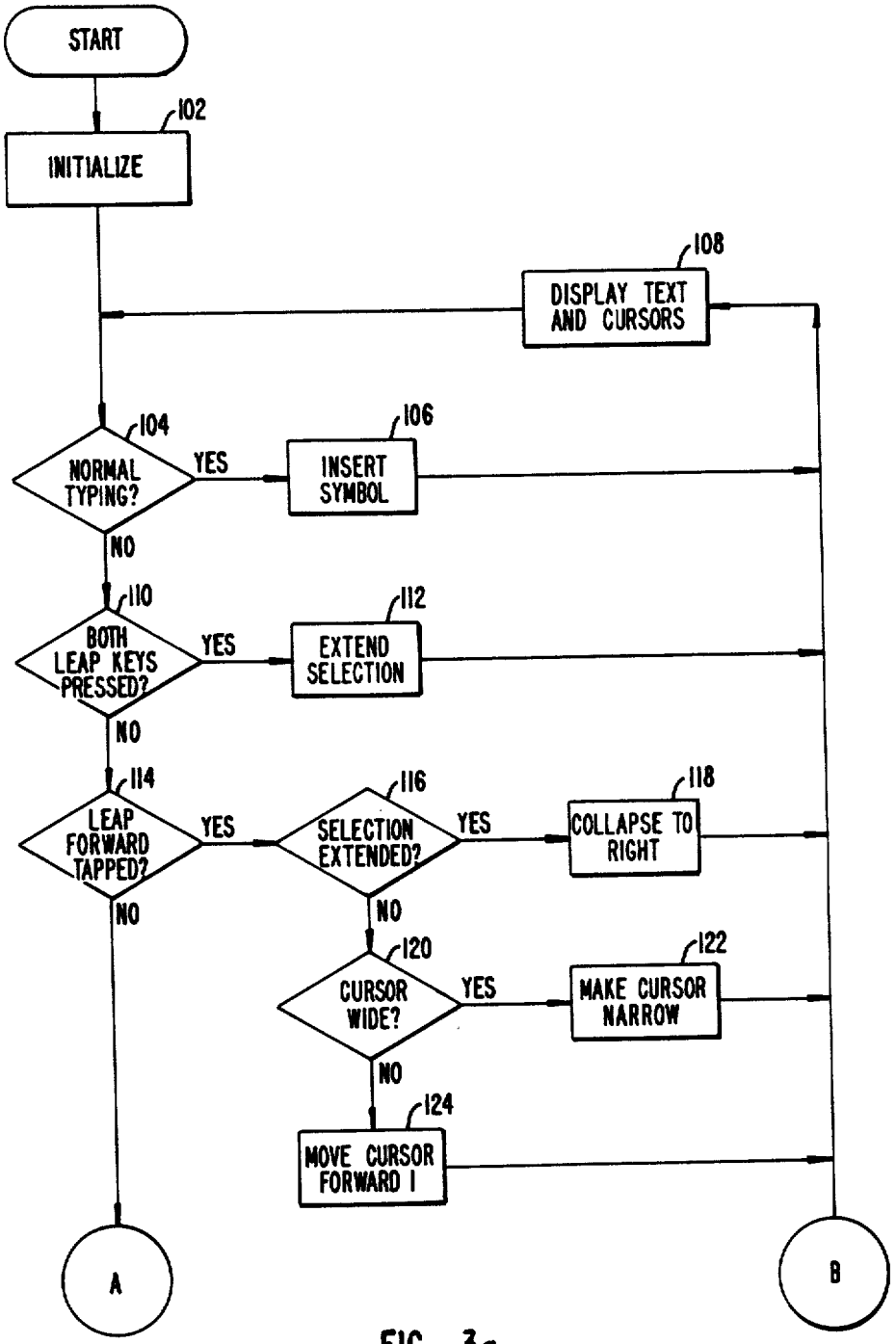



FIG._3a.

FIG._3.

| FIG. 3a. |
| --- |
| FIG. 3b. |

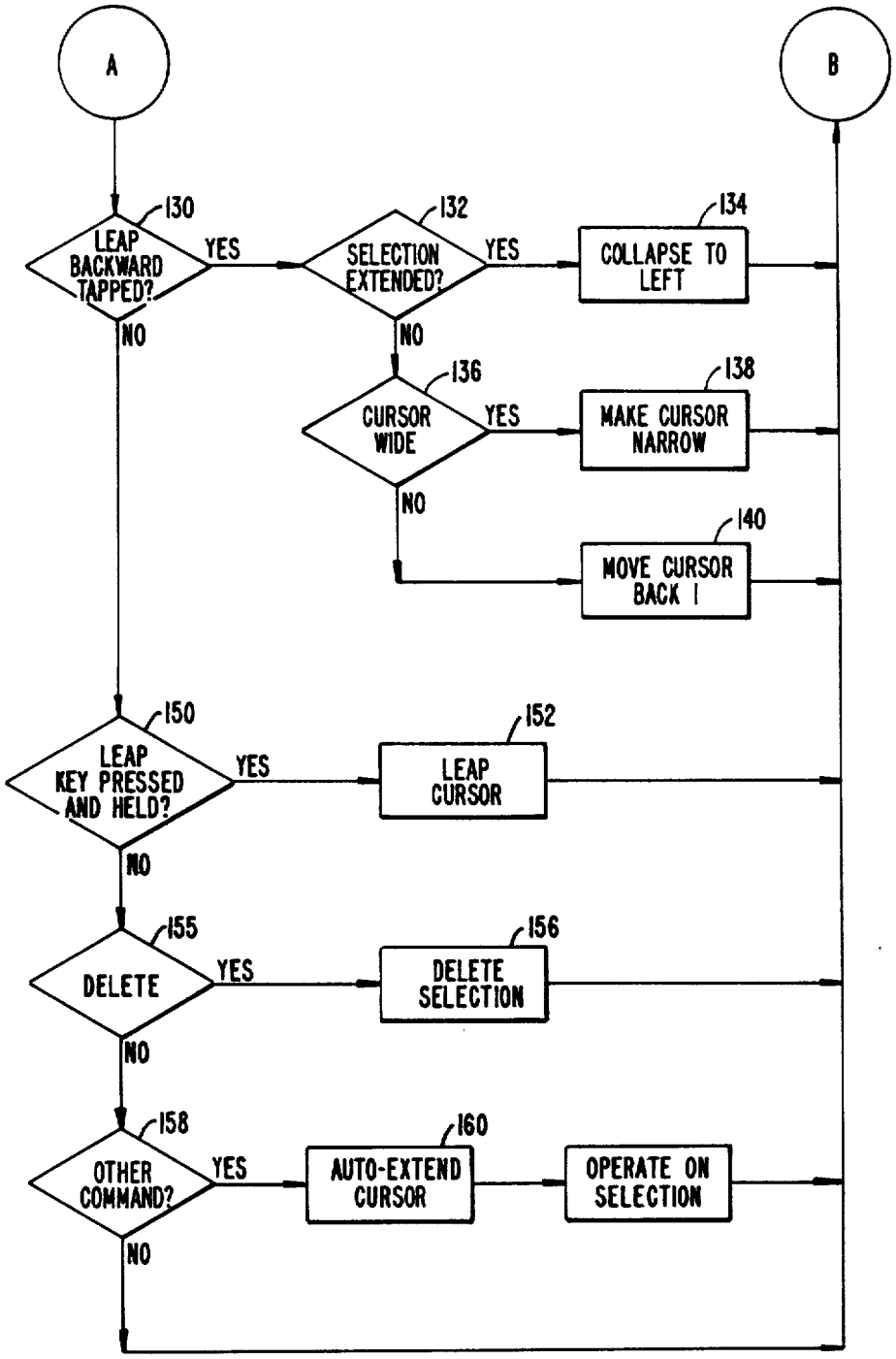

A
B
130
LEAP BACKWARD TAPPED?
YES
NO
132
SELECTION EXTENDED?
YES
NO
134
COLLAPSE TO LEFT
136
CURSOR WIDE
YES
NO
138
MAKE CURSOR NARROW
140
MOVE CURSOR BACK I
150
LEAP KEY PRESSED AND HELD?
YES
NO
152
LEAP CURSOR
155
DELETE
YES
NO
156
DELETE SELECTION
158
OTHER COMMAND?
YES
NO
160
AUTO-EXTEND CURSOR
OPERATE ON SELECTION

FIG._3b.

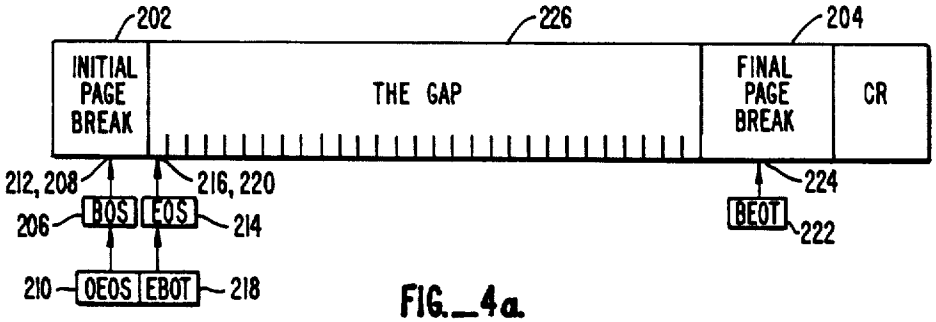



FIG._4a.

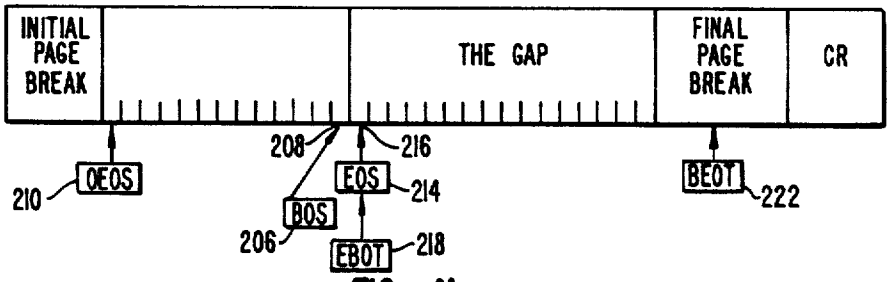



FIG._4b.

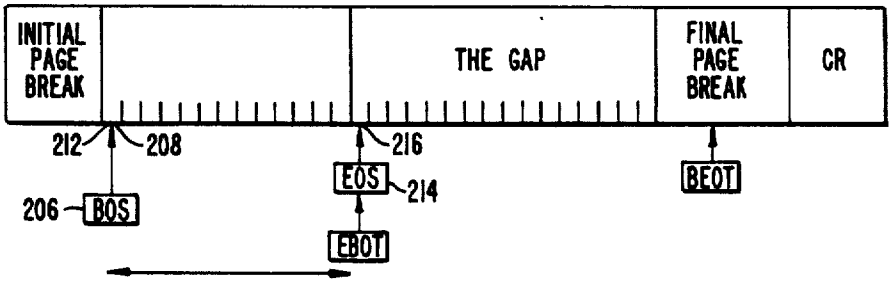



FIG._4c.

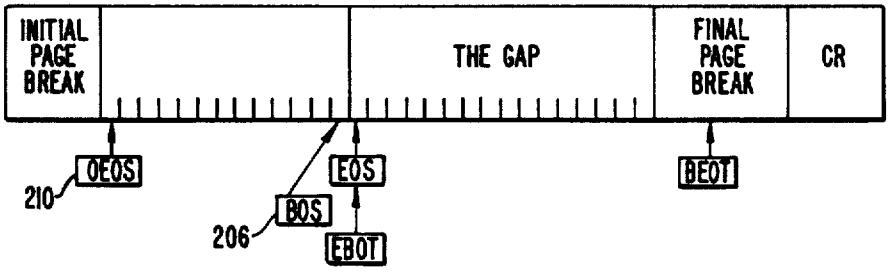



FIG._4d.

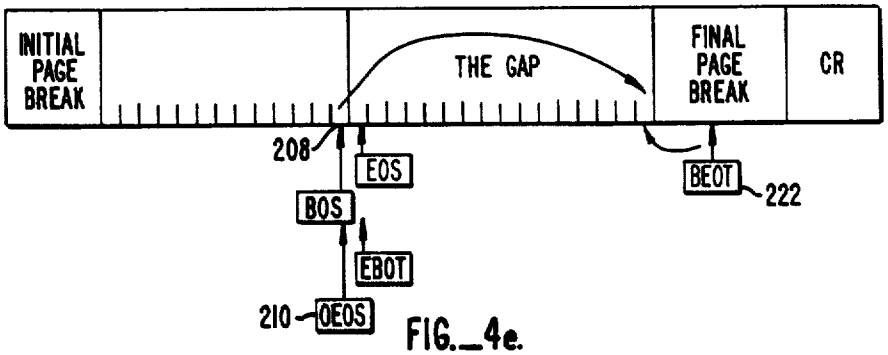



FIG._4e.

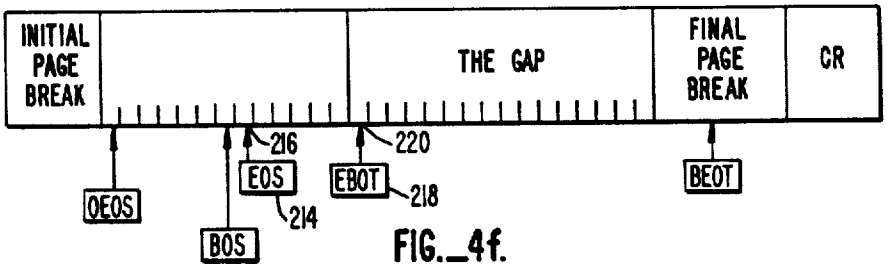



FIG._4f.

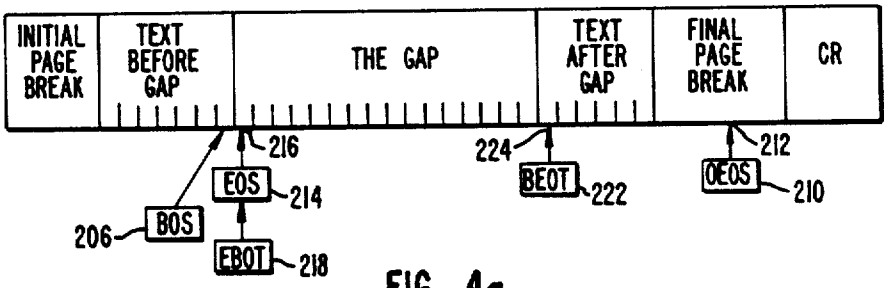



FIG._4g.

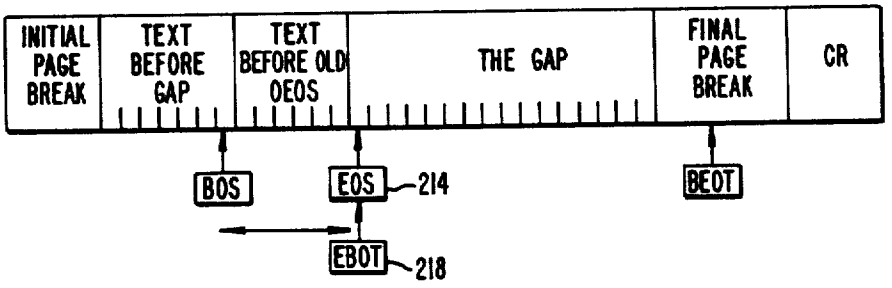



FIG._4h.

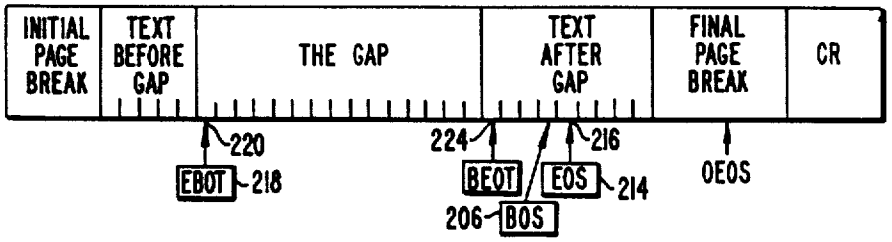



FIG._4i.

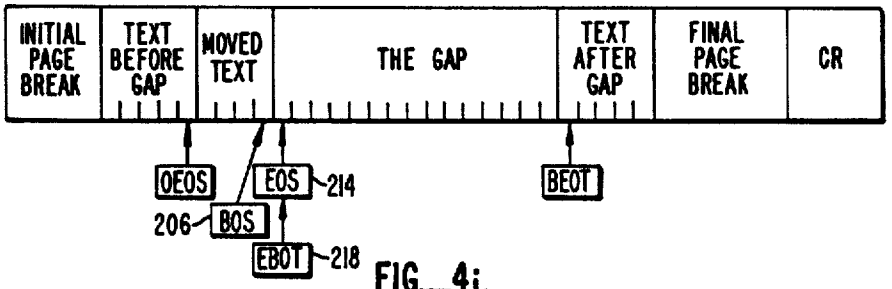



FIG._4j.

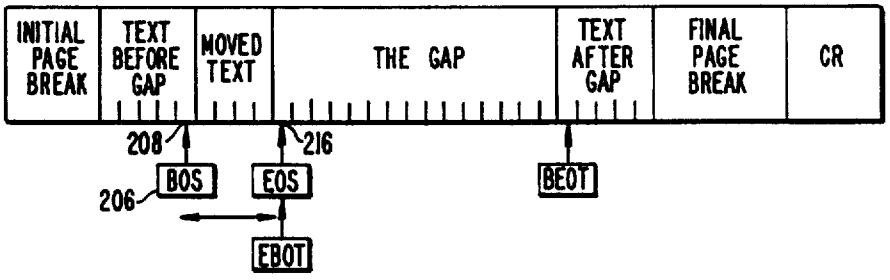



FIG._4k.

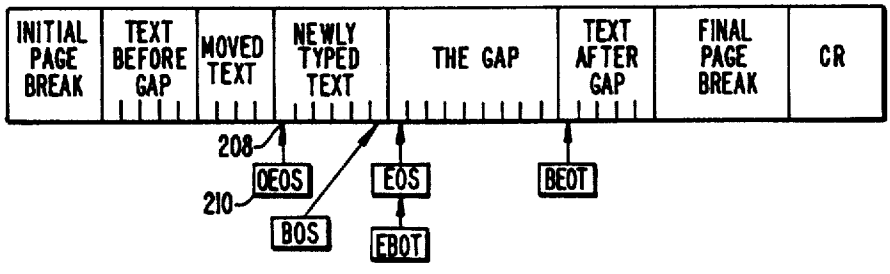



FIG._4l.

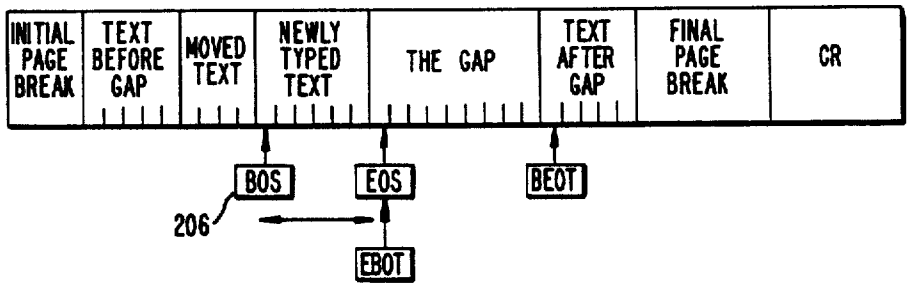

INITIAL PAGE BREAK
TEXT BEFORE GAP
MOVED TEXT
NEWLY TYPED TEXT
THE GAP
TEXT AFTER GAP
FINAL PAGE BREAK
CR
BOS
EOS
BEOT
206
EBOT

FIG._4m.

# COMPUTER DISPLAY WITH AUTO-PART CURSOR FOR INDICATING LOCI OF OPERATION

## CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of U.S. patent application No. 902,339, filed Aug. 29, 1986, now abandoned.

## NOTICE REGARDING COPYRIGHTED MATERIAL



## BACKGROUND OF THE INVENTION

This invention relates generally to a method and apparatus for creating and modifying a string of symbols in computer storage apparatus and, in particular, it relates to a method and apparatus which utilizes a two-part cursor for constantly indicating the effect of certain operations on a string of symbols stored in a computer.

In certain computer applications, such as word processing, an operator enters selected symbols, such as, for example, alphanumeric characters, via a keyboard (or other entry means). The entered symbols are stored in the storage apparatus of the computer system where they become part of a string of symbols. The stored string of symbols defines a document which, through the inclusion of special page break and carriage return symbols, may be subdivided into pages and lines of text. All or part of the stored string of symbols is displayed on a display device as additional symbols are entered and stored. To aid the operator, a cursor is usually displayed to indicate the position in the string where the next entered symbol will be inserted.

In prior art systems the cursor sits on a particular character (typically as: (i) a flashing block surrounding or, (ii) an underline beneath or, (iii) a vertical bar to the right or left of the character being pointed to.). The function of the cursor is to indicate a locus or site where a user action, such as inserting or deleting characters, will take place. However, in certain computer applications, such as word processing, there are usually two such loci, namely (i) that character that will be replaced or displaced when a new character is typed and (ii) that character that will be erased when the backspace or delete key is typed. They are not, in general, the same character. This is based on mimicking the operation of a typewriter.

In prior art systems the user has had to remember a rule such as: the insertion will be to the right of the cursor and deleting will be to the left. Neophytes find having to learn such a rule confusing. Even experienced user have trouble remembering to whence the cursor should be moved in order to insert or delete a character into the midst of text. For example, to remove the letter "x" from "anxd" in most examples of prior art systems, the user has to remember to move the cursor not to the "x", but to the "d;" but on some systems the user would have to remember to move the cursor to the "n". On a very few systems the user would be able to do the obvious and move the cursor to the "x" but on those systems the user has to aim "one off" for insertion rather than deletion so there is no overall benefit.

## SUMMARY OF THE INVENTION

The method and apparatus of this invention provide a two-part cursor display which aids an operator in the creation and modification of a string of symbols. The two-part cursor serves to make explicit the exact loci of action of insert and delete operations. A first cursor part (herein called the "blinker," which is differentiated from the highlight by flashing or through some other visual distinction) marks that position in the string where a newly typed or inserted symbol (or symbols in the case of the insertion of a number of symbols simultaneously) will appear. A second cursor part (herein called the "highlight") marks a symbol (or symbols) that will be the object of certain operations, and particularly of the delete operation.

This relieves the operator from having to remember the confusing rules normally associated with the loci of action for cursor operation.

In a preferred embodiment, when the two-part cursor is moved to a particular character, either by a command, or via some device such as a joystick or mouse, or by some other method, the two parts both visually and functionally can "coalesce" onto a single character which then can either be deleted or can indicate the site where further characters will be inserted. Thus, to use our former example, to delete the "x" from "anxd" with the two-part cursor the user has to move the cursor to the obvious position, namely the "x". But because both parts of the two-part cursor coalesced when the cursor was moved, the user can also insert a character at that location. That is, on neither insertion nor deletion does the user have to move the cursor to a character that is "one off" from the desired location. The operator is able to concentrate on entering and deleting the desired symbols to create a stored string of symbols.

## BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** is a block diagram of an embodiment of a computing system for practicing the invention.

FIG. **2** is a block diagram illustrating the contents of the storage apparatus of the embodiment of FIG. **1**.

FIG. **3** is composite of FIGS. **3***a* and **3***b* which show a flow chart of the method of the preferred embodiment.

FIGS. **4**(*a*)–**4**(*m*) illustrate the contents of the text buffer of FIG. **2** during the operations shown in FIG. **3**.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** is a block diagram illustrating one embodiment of a computer system for practicing the invention. The system **10** includes a central processing unit (CPU) **12** coupled to a keyboard **14**, a display unit **16**, and storage apparatus **18**. Storage apparatus **18** may include external memory (such as a disk subsystem) as well as internal memory. Keyboard **14** is adapted for transmitting various distinguishable types of signals to CPU **12** by means well-known in the art. For example, keyboard **14** includes standard alphanumeric symbol keys for normal typing. Activation of one of these keys causes the transmission to CPU **12** of signals coded by standard means (such as ASCII) to unambiguously identify a particular symbol. Keyboard **14** also includes two special "leap" keys at opposite ends of the space bar. One

leap key is designated the leap backward key; the other is designated the leap forward key. These keys are connected to the CPU in such a way that the states in which either may be at any time (up or down) may be detected independently of the states of the other keys on the keyboard. The signls transmitted by activation (depression) of the leap keys can be differentiated to determine whether either key or both keys are activated, and for how long.

FIG. **2** is a block diagram illustrating the general organization of the internal memory **20** of storage apparatus **18**. It will be understood that the precise storage location of the contents of the illustrated memory contents may vary over time, depending on the operation of the particular computer. Some or all of the contents may be "swapped" to and from an external storage device and/or may occupy different locations in internal memory at different times. For purposes of the invention, it is only important that the memory locations of the contents of these blocks are addressable by CPU **12** at any particular time.

Referring now to FIG. **2**, the contents of memory **20** include a text buffer **24** for storing a string of encoded symbols, a screen buffer **26** for storing encoded symbols for display on the display device, and program area **28** for storing all or part of an applications program. In this embodiment, the method of the invention is implemented by the execution (by the CPU) of application program instructions which control the contents of text buffer **24** and screen buffer **26**. The application program uses certain other addressable memory locations, including at least five pointers **30, 32, 34, 36, 38**, two state variables **40, 42**, and two tables **44, 46**, the function and contents of each of which will be described below.

The preferred embodiment of the method of this invention will now be described in terms of the operation of the application program on text buffer **24** and screen buffer **26**, in response to signals from keyboard **14**. The contents of screen buffer **26** are displayed on the display device in a manner directly corresponding to the organization of the screen buffer. References to the displaying of symbols will therefore be understood to mean moving symbols to appropriate locations in the screen buffer.

FIGS. **3***a* and **3***b* show a flow chart illustrating a preferred embodiment of the method of this invention. FIGS. **4***a*–**4***f* conceptually illustrate the contents of text buffer **24** after the operations shown in FIGS. **3***a* and **3***b*.

Referring to FIG. **3***a*, the method begins at block **102** by initializing the system. As shown in FIG. **4***a*, the text buffer is initialized by inserting a one byte initial page break indicator **202** at the beginning (low-address) part of the text buffer and a one byte final page break indicator **204** at the end of the text buffer. Page breaks serve to divide the text buffer into pages of symbols; no symbols are stored before the initial page break or after the final page break.

Five pointers are shown conceptually in FIGS. **4***a*–**4***m*. These pointers are implemented by storing text buffer addresses in pointer storage locations **30, 32, 34, 36, 38** (FIG. **2**) in memory **20**. Referring to FIG. **4**(*a*), the pointers are shown after initialization. A BOS (beginning of selection) pointer **206** points to BOS location **208**, and an OEOS (old end of selection) pointer **210** points to OEOS location **212**. BOS pointer **206** and OEOS pointer **210** are both initialized to point to initial page break **202**. An EOS (end-of-selection) pointer **214** points to EOS location **216** and an EBOT (end of beginning of text) pointer **218** points to EBOT location **220**. EOS pointer **214** and EBOT pointer **218** are initialized to point to the first storage location after initial page break **202**. A BEOT (beginning of end of text) pointer **222** points to BEOT location **224** and is initialized to point to the final page break **204**.

The region **226** of the text buffer beginning at EOS **216** and ending at the last symbol storage location before BEOT **222** is called the Gap. No active text is stored in the Gap; that is, the symbols which are stored in the Gap are not considered part of the string of symbols being constructed. The region from BOS **208** to EOS **216** is called the Selection. The Selection identifies a substring of symbol which, as will be seen, is used as the object to be operated on by certain commands.

At block **104** of FIG. **3***a*, a test is performed to determine whether the signals received from the keyboard represent normal typing. In this embodiment, normal typing means the activation of one of the alpha-numeric keys. If the signals from the keyboard indicate normal typing, the signals identify a specific symbol (for example, in ASCII) and the identified symbol is stored (block **106**) in the text buffer. FIG. **4**(*b*) shows the text buffer after several symbols have been stored. Each symbol is inserted in the text buffer at EOS **216**, the first location in the Gap. After each symbol is stored at EOS, EOS pointer **214** is incremented by one symbol length to point to the next symbol storage location. In this embodiment, the symbol length is one byte, which is one addressable storage location; adjacent storage locations therefore have consecutive addresses.

In response to normal typing, EBOT pointer **218** is also incremented by one to point to the new first storage location in the Gap. After incrementing EOS pointer **214**, BOS pointer **206** is assigned the address of the symbol storage location **208** preceding EOS.

When normal typing begins after initialization, OEOS pointer **210** is assigned the first value of BOS **208**, and keeps this value as long as normal typing continues. This is the location of the first symbol entered.

The Selection is defined by the region from BOS **208** to EOS **216**. During normal typing, the Selection therefore consists of the last symbol typed (no active symbol being stored at EOS).

On the display device of this embodiment, the symbols are displayed as they are entered from the keyboard and inserted in the text buffer. According to the invention, a two-part cursor is also displayed (block **108**). The two parts of the cursor will be referred to as the blinker and the highlight.

The blinker indicates the position in the substring (corresponding to EOS) where the next typed symbol will be inserted. In some displays (e.g. bit-mapped) the blinker may appear between two symbols to indicate precisely where the insertion will take place; in other displays (e.g. character oriented) the blinker appears over a character (or page break symbol) and the left edge of the blinker indicates the insertion location. The embodiment described herein uses a character-oriented display.

The highlight indicates the Selection. The Selection is made obvious (and distinguished from the blinker) by reverse video, color, or other conventional techniques. During normal typing, the last symbol entered is highlighted and the blinker is on the next character or page break symbol.

At block **110** of the flow chart of FIG. **3***a*, the signals from the keyboard are tested to determine whether both

leap keys are depressed. In this embodiment, the system responds to this action by extending the Selection (block **112**). The Selection is considered to be extended when it consists of more than one character. FIG. **4***c* illustrates the selection extension operation when it is performed after initialization and normal typing. BOS pointer **206** is moved to OEOS location **212**, by copying the address in OEOS pointer **210** to BOS pointer **206**. OEOS pointer **210** becomes undefined. The Selection is thereby extended to the entire region from BOS **208** to EOS **216**, to include all symbols entered since initialization. On the display, the part of the Selection which displayed is highlighted. (As will be seen below, the Selection extension operation always results in the selection of a well-defined, predictable substring; the selection of all symbols entered since initialization is limited to the present example, where only normal typing has been performed since initialization.) When the Selection is extended, one of the aforementioned state variables, Selection state varible **40**, is set to indicate this fact.

Returning to the flow chart of FIG. **3**, at block **114**, the signals from the keyboard are tested to determine whether the leap forward key is tapped. The system responds to this signal in different ways, depending on the state of the two-part cursor. At block **116**, the system tests the Selection state variable **40** to determine whether the Selection is presently extended. If it is, then at block **118** the Selection is "collapsed", i.e., restored to an unextended condition, wherein the Selection is one symbol. In this case, the Selection is collapsed (FIG. **4***d*) to the right end of the Selection by moving BOS pointer **206** to the last location before the Gap (by assigning the address EOS-1 to BOS pointer **206**). OEOS pointer **210** saves the old value of BOS.

If the Selection is not extended when the leap forward key is tapped, then, at block **120**, a test is made to determine whether the cursor is "wide." The two-part cursor of this invention is referred to as wide when the blinker follows the highlight by one character or symbol on the display (i.e., when the insertion location indicated by the left edge of the blinker immediately follows the highlighted character). The cursor is referred to as narrow when the blinker and the highlight are on the same character or symbol on the display (i.e., when the insertion location indicated by the left edge of the blinker immediately precedes the highlight). The second state variable, cursor state variable **42**, is maintained to indicate a wide or narrow cursor.

If the Selection is not extended, and the cursor is wide when the leap forward key is tapped, then the cursor is made narrow (block **122**) by moving the Selection and highlight forward one character and modifying cursor state variable **42**. In the text buffer, if there is a symbol stored at BEOT **224** (other than the final page break symbol), this symbol is moved to EOS **216**, and EOS pointer **214**, EBOT pointer **218**, BOS pointer **206**, and BEOT pointer **222** are all incremented by one.

When the cursor is narrow, the blinker is displayed over the symbol stored at BOS to indicate that insertions will be made before this symbol. When the cursor is not narrow, the blinker is displayed over the symbol, if any, stored at BEOT.

The effect of normal typing when the cursor is narrow is shown in FIG. **4***(e)*. BEOT pointer **222** is decremented by one, the symbol stored at BOS **208** is moved to new BEOT **224**, and the typed symbol is inserted at BOS **208**. OEOS pointer **210** saves the value of BOS location **208**. The cursor is changed to wide and the cursor state variable is updated.

If the leap forward key is tapped and the Selection is not extended and the cursor is already narrow, than, at block **124**, the narrow cursor is moved forward one symbol (unless it is already on the final page break). In the text buffer, if there is a symbol stored at BEOT **224**, it is moved to EOS **216**, and EOS pointer **218**, BOS pointer **206**, and BEOT pointer **222** are all incremented by one.

Referring to FIG. **3***b*, if the signals from the keyboard indicate that the leap backward key is tapped (tested at block **130**), the Selection state variable is tested (at block **132**) to determine whether the Selection is extended. If it is, then at block **134** the Selection is collapsed to the beginning of the Selection. In the text buffer, all symbols stored from BOS+1 to EOS are moved to the new BEOT, effectively moving the Gap. The new BEOT address is calculated as: BEOT=old BEOT−(EBOT−EOS). EOS pointer **214** and EBOT pointer **218** are then modified to point to the location BOS+1, making it the first location of the Gap. The cursor is made narrow and the blinker is at the symbol stored on BOS.

If the Selection is not extended when the leap backward key is tapped, the cursor state variable is tested at block **136** to determine whether the cursor is wide. If the cursor is wide, it is made narrow at block **138** by modifying the second state variable, causing the blinker to be moved to the symbol stored at BOS, effectively moving the blinker over the highlighted Selection.

If the leap backward key is tapped and the Selection is not extended and the cursor is narrow, then, at block **140**, the narrow cursor is moved back one character (unless it is already on the initial page break). Any symbol stored at BOS is moved to after the Gap, and BOS pointer **206**, EOS pointer **214**, EBOT pointer **218** and BEOT pointer **222** are all decremented by one.

If the narrow cursor is on the initial page break after it is collapsed to the beginning of the Selection, it is changed to a wide cursor, because no symbols can be inserted before the initial page break.

If the signals from the keyboard indicate that either leap key is pressed and held (block **150**), this is interpreted as a request to move the two-part cursor to a specific location. The move may be a content-based move in which the user specifies a substring in the text buffer (and possibly not on the display). The substring is located and displayed with a narrow cursor on the first symbol of the substring. A content-based cursor moving function ("leaping") is explained in detail in co-pending U.S. patent application serial No. 605,448, assigned to the assignee of the present application, the disclosure of which is hereby incorporated by reference. While the method of moving the cursor described therein is used in the preferred embodiment of the present invention, it will be understood that other conventional methods, such as cursor control keys, joy sticks, or "find" commands could be used with the present invention.

FIG. **4***(f)* shows the text buffer during a leap backwards, where the text buffer before the leap is as shown in FIG. **4***(d)*. BOS pointer **206** points to the location leaped to, EOS pointer **214** points to the next location, and EBOT pointer **218** temporarily stays at the previous EOS location at the beginning of the Gap. The other pointers are not moved. FIG. **4***(g)* shows the text buffer and pointers after the leap operation is completed. All active text from new EOS **216** to old EBOT **220** is

moved to new BEOT **224**, effectively moving the Gap up to the new EOS. EBOT pointer **218** is then set to the new EOS address **216**, OEOS pointer **210** is set to the old value of BEOT, and BEOT pointer **222** is set to the new start of text after the Gap. The new BEOT address is calculated as BEOT=old BEOT−(old EBOT−new EOS). After leaping, the cursor state variable is set to narrow and the blinker is on the symbol stored at BOS.

In an alternative embodiment, a "dragging" feature is provided. If the Selection is extended when the cursor movement (leap) function is invoked, the Selection is "dragged" to the target location and inserted there.

A second example of extending the Selection will now illustrate the effect of this operation when it is invoked immediately after a leap. The extension operation will result in the Selection being extended to the region bounded by the highlight before the leap and the highlight after the leap. FIG. **4**(*h*) shows the effect of the extension operation when it is performed after the backward leap which results in the text buffer of **4**(*g*). The symbols from BEOT to OEOS-1 are moved to EOS **216**, effectively moving the Gap to where it was in FIG. **4**(*f*). EOS pointer **214** and EBOT pointer **218** are updated to point to the start of the new Gap. BEOT pointer **224** is assigned the value of OEOS. The Selection extends from BOS to EOS and the blinker is at the character stored at BEOT.

FIG. **4**(*i*) shows the text buffer during the leap forward operation. BOS pointer **206** points to the target location of the leap and EOS pointer **214** points to the next location. EBOT pointer **218** temporarily saves the old value of EOS. FIG. **4**(*j*) shows the text buffer after completion of the leap forward. The symbols from old BEOT **224** to new BOS **206** are moved to the Gap at old EBOT **220**; new EBOT pointer **218** and EOS pointer **214** are then set to: old EBOT+(new EOS−old BEOT). BOS pointer **206** is set to EOS minus 1 and OEOS pointer **210** is set to the old value of EBOT minus 1. It is seen that OEOS pointer **210** maintains the address of the location which was highlighted before the leap. The cursor is narrow and the blinker is at BOS.

If the Selection is now extended after the leap forward, the text buffer is as shown in **4**(*k*). BOS pointer **206** is assigned the value of OEOS. The Selection extends from BOS **208** to EOS **216**.

As illustrated in these examples of selection extension, if OEOS is greater than BOS, then the BEOT pointer is moved to OEOS, and the EOS pointer is moved to the beginning of the new Gap (after accounting for text moves). If OEOS is less than BOS, then the BOS pointer is moved to OEOS. Extending the Selection immediately after a leap results in the Selection being bounded by the Selection before the leap and the Selection after the leap. Extending the Selection after normal typing results in a Selection consisting of all symbols typed since the last leap.

FIG. **4**(*l*) shows the text buffer and pointers when normal typing follows the leap operation shown in FIG. **4**(*j*). The cursor is always narrow after a leap. When typing begins, the first symbol is entered at BOS **208** (because the cursor is narrow) and OEOS pointer **210** saves the value of BOS **208**. If both leap keys are pressed, the Selection is extended by assigning the value of OEOS to BOS pointer **206**, resulting in the extended Selection shown in FIG. **4**(*m*), wherein all symbols entered since the last leap are selected.

The Selection may advantageously be used as the object for certain commands, such as print requests and delete requests. Referring to FIG. **3***b*, if the signals from the keyboard indicate a delete request (block **155**) then the Selection is deleted. The delete operation (block **156**) works as follows: When the cursor is wide, and the Selection is not extended, BOS pointer **206**, EBOT pointer **218**, and EOS pointer **214** are all decremented by one, effectively deleting the highlighted symbol by moving the Gap. If the Selection is extended, EOS pointer **214** and EBOT pointer **218** are assigned the address of BOS **208** and BOS pointer **206** is assigned the address of EOS-1. When the cursor is narrow, the symbol stored at BEOT **224** is moved to BOS **208**, and BEOT pointer **222** is incremented by one. It will be noted that, when the cursor is wide (as it is during normal typing), successive deletions work to the left; when the cursor is narrow (as it is after it is moved, or leaped), successive deletions proceed to the right. This is consistent with the usual intentions of the operator.

Other commands that can operate on the Selection include "CALC" and "SEND." The "CALC" command takes the Selection and executes it as a program. It may, for example, send the Selection to the system's BASIC interpreter, where the program is interpreted and executed. The output of the program is then inserted at the gap and the Selection is deleted. The "SEND" command invokes telecommunications features and transmits the Selection to a remote location, such as another computer. A "RECEIVE" function may also be provided, with a message being received via telecommunications and inserted either at EOS (if there has not been any typing since the last leap) or OEOS (if there has been typing since the last leap).

In the preferred embodiment, certain commands which operate on the Selection (block **158**) will automatically extend the Selection (block **160**) if they are invoked when the Selection is not extended. For example, if the print command is received and the Selection is unextended, the system assumes that the user does not intend to print only one symbol. The system therefore extends the Selection in the same manner it would if both leap keys were pressed, and then it prints the extended Selection. Other commands, such as delete, do not cause automatic extension.

The tables **44** and **46** (FIG. **2**) will now be explained so that the display operation may be fully understood. Page table **42** contains one entry for each page of text. Each entry on page table **44** contains a pointer and a line number. The pointer contains an address in the text buffer of the start of each page of text. The line number is the line number of the start of that page, counting from the beginning of the text. Pages can start either because there are enough symbols to fill a page or because the user entered a page break signal. After a leap operation, the page table is recalculated from the text buffer so that all of the pointers refer to the start of each page. This is necessary because the Gap may have been moved by the leap operation. It is not necessary to actually recalculate all page table entries, but only to adjust the pointer values based on how far the Gap has moved. Normal typing can also require updating of the page table from the cursor's page to the final page.

Window table **46** consists of one entry for each line on the display. Each entry contains: a pointer to the text buffer at the location of the beginning of the line; the line number on the page; and the page number in the text.

The content-based leap operation can result in the blinker being moved to a part of text buffer which is not

yet displayed on the display. To display the leaped-to text, the page table is searched to find which page contains the EOS. The address value EOS is compared to the page pointers in the page table until a page pointer having an address greater than EOS is found, identifying the previous page as the page containing EOS. The end of the Selection (EOS) is to be displayed in the middle of the display. Assuming an embodiment with 24 lines per display screen, the page table is traversed backward until a page is located which at least 12 lines before EOS. The start of the 11 lines preceding the line with EOS, the start of the line with EOS, and the 12 lines after EOS are then located. The line start pointers, line numbers, and page numbers of these 24 lines are stored in the window table. The display routine then moves these 24 lines of text to the screen buffer for display on the display screen. When BOS is encountered, all symbols from BOS to EOS are hightlighted.

In the preferred embodiment, the method of this invention is performed on an Apple IIe computer operating under control of the FORTH program attached as Appendix 1 to this application.

The foregoing explanation of the preferred embodiment is intended to illustrate the invention rather than limit it. The scope of the invention may be ascertained from the appended claims.

## APPENDIX 1

```
19
 0 ( DECOMPILER )  HEX
 1
 2 : .NAME  2+ NFA ID. ;
 3
 4 : .N  ( ADDR CFA -- FLAG )  2+ >R
 5  R ' BRANCH = R ' OBRANCH = OR
 6  R ' (+LOOP) = OR R ' (LOOP) = OR
 7  DUP IF CR ENDIF
 8  R ' LIT = 0= R ' CLIT = 0= AND
 9  IF R 2- .NAME ENDIF
10  R ' LIT = OR
11  IF 2+ DUP @ . 0
12  ELSE R ' CLIT =
13   IF 2+ DUP C@ . 1- 0
14   ELSE R ' (.") =
15    IF 2+ COUNT 2DUP TYPE + 2- 0
16     22 EMIT SPACE
17    ELSE R ' ;S =
18  ENDIF ENDIF ENDIF R> DROP ;
19
20 : SEE  [COMPILE] ' 2-
21  BEGIN 2+ DUP @ .N
22  UNTIL DROP CR ;
23
```

```
scr #   20
 0 ( metacompiler load block )
 1
 2 FIRST B/BUF + -4 + DUP ' FIRST ! PREV !
 3
 4 DECIMAL 56 LOAD          ( printer aids )
 5 ( DECIMAL 57 58 THRU     ( listing stuff)
 6 1 PRINTING !             ( begin printer)
 7 DECIMAL 22 54 THRU      ( trans-compiler)
 8 DECIMAL 21 LOAD            ( Edde source)
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
0 Decompiler for Lyon's Forth
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 ( metacompiler load block )
 1
 2 FIRST B/BUF + 4 + DUP ' FIRST ! PREV !
 3
 4 DECIMAL 56 LOAD          ( printer aids )
 5 ( DECIMAL 57 58 THRU     ( listing stuff)
 6 1 PRINTING !             ( begin printer)
 7 DECIMAL 22 54 THRU      ( trans-compiler)
 8 DECIMAL 21 LOAD            ( Edde source)
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
21
 0 ( EDDE source load block )  HEX
 1
 2 LPON? HERE OLDDP ! AIM DP !  ( heading)
 3 CR ." There are " . ." tokens."
 4 CR CR OLDDP @ U. ." top of Lyon's"
 5 CR AIM U. ." beginning of bank 2" CR
 6 AIM 4000 0 FILL ( clean compile space )
 7 0 NAMED !   ( begin table on left )
 8
 9 DECIMAL 60 109 THRU
10
11 TKTABLE DUP  200 + DP !  ' AIM !
12 0 NAMED !
13
14 DECIMAL 110 279 THRU
15
16 HEX CR CR HERE ADR U. ." end of bank 1"
17 OLDDP @ DP !              ( footing )
18
19 DECIMAL 280 LOAD DECIMAL
20
21
22 BELL LPDONE
23
```

```
 0 ( load screen for EDDE )
 1
 2 LPON? HERE OLDDP ! AIM DP !  ( heading)
 3 CR ." There are " . ." tokens."
 4 CR CR OLDDP @ U. ." top of Lyon's"
 5 CR AIM U. ." beginning of bank 2" CR
 6 AIM 4000 0 FILL ( clean compile space )
 7 0 NAMED !   ( begin table on left )
 8
 9 DECIMAL 60 109 THRU ( bank 2 routines )
10
11 TKTABLE DUP  200 + DP !  ' AIM !
12 0 NAMED !
13
14 DECIMAL 110 279 THRU
15
16 HEX CR CR HERE ADR U. ." end of bank 1"
17 OLDDP @ DP !      ( footing )
18
19 DECIMAL 280 LOAD DECIMAL ( set vectors )
20
21 BELL LPDONE
22
23
```

```
scr #   22
 0 ( CONSTANTS NAME VAR ADR ) HEX
 1 : CON   CONSTANT ;      ( for brevity )
 2
 3 5A00 CON AIM       6A00 CON TKTABLE
 4  800 CON RAM       1200 CON LOMEM
 5 15A0 CON HIMEM     15C0 CON RTABLE
 6 1600 CON BOV       B3E0 CON EOV
 7 D000 CON ROM       BC00 CON SCREEN
 8
 9 VARIABLE OLDDP     VARIABLE TOKENS
10 VARIABLE BOUND     VARIABLE RES
11
12 : NAME  HERE TOKENS @ DUP CONSTANT 0 ,
13  ?CR 3 .R 2 SPACES ID. 6 SPACES
14  1 TOKENS +! ;
15 : ADR   AIM - ROM + ;
16 : -ADR  ROM - AIM + ;
17 : VAR   TOKENS @ CONSTANT 2 TOKENS +! ;
18
19 01 CON del         1D CON cr
20 1B CON tab         1C CON ff
21 24 CON CH          FF CON SSAV
22 FB CON ASAV        FC CON PSAV
23 FD CON XSAV        FE CON YSAV
```

```
 0 ( CONSTANTS NAME VAR ADR ) HEX
 1 AKA defined for brevity.
 2 AIM compiled Swyft TKTABLE token table
 3 RAM variables/tables RTABLE ram table
 4 LOMEM,HIMEM basic
 5 BOV begin cut       EOV end of text area
 6 ROM Swyft target    SCREEN
 7 OLDDP old DP        TOKENS next token #
 8 BOUND limits word length to y-reg range
 9 RES used by initialization
10
11 NAME associates a token with a word and
12   reserves space for an address.
13   T: later resolves this address to
14   point to beginning of definition and
15   compiles tokens of resolved words.
16 ADR gives equivalent adr in ROM
17 -ADR gives equivalent adr at AIM
18 VAR associates a token with a word
19
20 key assignments.
21 CH cursor position  SSAV status register
22 ASAV accumulator    PSAV processor reg
23 XSAV x register     YSAV y register
```

```
23
 0 ( PAGE0 VARIABLES ) HEX
 1
 2 ASSEMBLER DEFINITIONS
 3 50 CONSTANT X0     ( TWO BYTE TEMPS )
 4 52 CONSTANT X1
 5 54 CONSTANT X2
 6 56 CONSTANT X3
 7 58 CONSTANT X4
 8 5A CONSTANT X5
 9 5C CONSTANT Y0     ( ONE BYTE TEMPS )
```

```
 0 ( PAGE0 VARIABLES ) HEX
 1 two byte assembler temporaries:
 2 X0,X0+1
 3 X1,X1+1
 4 X2,X2+1
 5 X3,X3+1
 6 X4,X4=1
 7 X5,X5+1
 8 one byte assembler temporaries:
 9 Y0
```

```
 10 5D CONSTANT Y1                                10 Y1
 11 5E CONSTANT Y2                                11 Y2
 12 5F CONSTANT WC     ( WRAP COUNT )             12 other temporaries:
 13 60 CONSTANT WR     ( WRAP ADDRESS )           13 WC,WR wrap address and count of line to
 14 62 CONSTANT VB     ( VARIABLE ADDRESS )       14  wrap. answer left in page table, e.g.
 15 64 CONSTANT TSTAT  ( XMIT STATUS )            15 VB variable address used by TO.
 16 65 CONSTANT RSTAT  ( RCEV STATUS )            16 TSTAT transmit status used by .INTERRUPT
 17 66 CONSTANT XSAVE                             17 RSTAT receive status used by .INTERRUPT
 18 67 CONSTANT YSAVE                             18 XSAVE x-reg temporary storage.
 19 68 CONSTANT SSAVE                             19 YSAVE y-reg temporary storage.
 20 69 CONSTANT IP                                20 SSAVE status reg temporary storage.
 21 6B CONSTANT NEXT                              21 IP forth interpretive pointer.
 22 A0 CONSTANT SP0                               22 NEXT forth next (within word) pointer.
 23 FORTH DEFINITIONS                             23 SP0 forth stack.

scr #   24
  0 ( PASS 1 )                                    0 ( PASS 1 )
  1                                               1
  2 VOCABULARY SOURCE IMMEDIATE                   2 negative tokens prevent tokenization
  3 SOURCE DEFINITIONS                            3  into token table; used for FRAG
  4                                               4  machine code
  5 -99 TOKENS ! ( FRAGs use in code only )       5
  6                                               6 the following are all NAME definitions:
  7 NAME .NEST  ( begins T: words )               7 .NEST  ( begins T: words )
  8 NAME .XLAT  ( keyboard lookup table )         8 .XLAT  ( keyboard lookup table )
  9 NAME .DISP0 ( address of display lines)       9 .DISP0 ( address of display lines)
 10 NAME .DISP1                                  10 .DISP1
 11 NAME .SCR0  ( auxiliary display )            11 .SCR0  ( auxiliary display )
 12 NAME .SCR1                                   12 .SCR1
 13 NAME .MSG0          NAME XYNEXT              13 .MSG0          XYNEXT
 14 NAME .QUE           NAME YNEXT               14 .QUE           YNEXT
 15 NAME .ON            NAME .ON/OFF             15 .ON            .ON/OFF
 16 NAME .SCR           NAME .CURSOR             16 .SCR           .CURSOR
 17 NAME .PRINT         NAME .DEFAULT            17 .PRINT         .DEFAULT
 18 NAME .CH>F          NAME .B>F                18 .CH>F          .B>F
 19 NAME .INTERRUPT     NAME .RECEIVE            19 .INTERRUPT     .RECEIVE
 20 NAME .LTABLE        NAME .USINGLE            20 .LTABLE        .USINGLE
 21 NAME .RESET         NAME .MOVE-VARS          21 .RESET         .MOVE-VARS
 22 NAME .MON           NAME .40COL              22 .MON           .40COL
 23 NAME .STARTU        NAME .ENDU               23 .STARTU        .ENDU
25
  0 ( SOURCE )                                    0 ( SOURCE )
  1                                               1 disk version routines:
  2 NAME .LEMIT2         NAME D.LEMIT2            2  .LEMIT2        D.LEMIT2
  3 NAME .NEWDISK        NAME D.ZPMOVE            3  .NEWDISK       D.ZPMOVE
  4 NAME .CDISK          NAME D.CDISK             4  .CDISK         D.CDISK
  5 NAME .AUX            NAME D.AUX               5  .AUX           D.AUX
  6 NAME .MAIN           NAME D.MAIN              6  .MAIN          D.MAIN
  7 NAME .XNEXT          NAME D.XNEXT             7  .XNEXT        D.XNEXT
  8 NAME .MONITOR        NAME D.MONITOR           8  .MONITOR      D.MONITOR
  9 NAME .B/F            NAME D.B/F               9  .B/F          D.B/F
 10 NAME .D444           NAME D.D444             10  .D444         D.D444
 11 NAME .CH/F           NAME D.CH/F             11  .CH/F         D.CH/F
 12 NAME .XFER           NAME D.XFER             12  .XFER         D.XFER
 13 NAME .RTS            NAME D.RTS              13  .RTS          D.RTS
 14 NAME .LEMIT          NAME D.LEMIT            14  .LEMIT        D.LEMIT
 15 NAME .START          NAME D.START            15  .START        D.START
 16 NAME .BOOT           NAME D.BOOT             16  .BOOT         D.BOOT
 17                                              17 disk operations:
 18 NAME *100US          NAME .SERIAL#           18  *100US         .SERIAL#
 19 NAME ONDL            NAME OFFDL              19  ONDL           OFFDL
 20 NAME DL12            NAME WB30               20  DL12           WB30
```

```
 21 NAME PHSW            NAME PHSW2          21  PHSW          PHSW2
 22 NAME .SWYFT          NAME .SENDSWYFT     22 .SWYFT        .SENDSWYFT
 23 NAME .WRAP           NAME BMP            23 .WRAP         BMP
```

```
scr #   26
  0 ( SOURCE DEFINITIONS )
  1
  2 ( bank2 routines )
  3 NAME BOOT1            NAME MATCH
  4 NAME 2.REVERSE        NAME 2.TOBUFF
  5 NAME 2.ADJUST         NAME 2.?APPLE
  6 NAME 2.SEEK>          NAME 2.?EDDE
  7 NAME 2.SEEK<          NAME 2.CHECKSUM
  8 NAME 2.CMOVE2         NAME 2.?UPDATE
  9 NAME 2.<SEEK>         NAME 2.ENDWRAP
 10 NAME 2.<WRITE>        NAME 2.PRESET
 11 NAME 2.40COL          NAME 2.ABOOT
 12 NAME 2.MON
 13 NAME 2.<READ>         NAME 2.NUDGE
 14 NAME 2.WRITE0         NAME 2.PAGEPRINT
 15 NAME 2.SHOWPAGE       NAME .DECIMATE
 16 NAME 2.SERIAL#        NAME 2.@M
 17 NAME 2.V              NAME 2.@K
 18 NAME 2.?X             NAME 2.QUE
 19 NAME 2.SETMODEM       NAME 2.CONTROL
 20 NAME 2.HARDPAGE       NAME 2.SOFTPAGE
 21 NAME 2.STOP?          NAME 2.INCPAGES
 22 NAME end_of_bank2
 23
```

```
 0 ( SOURCE DEFINITIONS )
 1
 2 bank 2 routines:
 3  BOOT1          MATCH
 4  2.REVERSE      2.TOBUFF
 5  2.ADJUST       2.?APPLE
 6  2.SEEK>        2.?EDDE
 7  2.SEEK<        2.CHECKSUM
 8  2.CMOVE2       2.?UPDATE
 9  2.<SEEK>       2.ENDWRAP
10  2.<WRITE>      2.PRESET
11  2.40COL        2.ABOOT
12  2.MON
13  2.<READ>       2.NUDGE
14  2.WRITE0       2.PAGEPRINT
15  2.SHOWPAGE     .DECIMATE
16  2.SERIAL#      2.@M
17  2.V            2.@K
18  2.?X           2.QUE
19  2.SETMODEM     2.CONTROL
20  2.HARDPAGE     2.SOFTPAGE
21  2.STOP?        2.INCPAGES
22  end_of_bank2
23
```

```
27
  0 ( SOURCE DEFINITIONS )
  1
  2 ( tokenized words called by T: words )
  3
  4 LPON? CR 0 TOKENS !
  5
  6 NAME .BLIT      ( 0 )
  7 NAME .2BYTERS   ( 1, not yet required )
  8 NAME .LIT       ( 2 )
  9 NAME .BRAN      ( 3 )
 10 NAME .0BRAN     ( 4 )
 11 NAME .DO        ( 5 )
 12 NAME .LOOP      ( 6 )
 13 NAME EXIT       ( 7 )
 14 NAME .VARIAB    ( must be token # 8)
 15 NAME .+LOOP     ( 9 )
 16 NAME .LEAVE     ( A )
 17
 18
 19
 20
 21
 22
 23
```

```
 0 ( SOURCE DEFINITIONS )
 1 beginning of tokenization at TKTABLE.
 2   NAME creates token table and saves a
 3     space for an address;
 4   T: later places address in TKTABLE
 5     which points to code for a word's
 6     definition.
 7
 8 TOKEN :     NAME:
 9  0            .BLIT
10  1            .2BYTERS
11  2            .LIT
12  3            .BRAN
13  4            .0BRAN
14  5            .DO
15  6            .LOOP
16  7            EXIT
17  8            .VARIAB must be token 8
18               because 8 is used as the
19               high byte address for
20               variable table ($0800)
21  9            .EXITLOOP
22  A            .+LOOP
23  B            .LEAVE
```

```
scr #   28
  0 ( SOURCE DEFINITIONS )
  1
  2 NAME DUP          NAME 2DUP
  3 NAME ?DUP         NAME DROP
  4 NAME ROT          NAME OVER
```

```
 0 ( SOURCE DEFINITIONS )
 1
 2 tokenization of metacompiled FORTH:
 3  DUP              2DUP
 4  ?DUP             DROP
```

```
 5 NAME SWAP          NAME SWAB
 6 NAME R>            NAME R@
 7 NAME >R            NAME I
 8
 9 NAME @             NAME C@
10 NAME !             NAME C!
11 NAME +!
12
13 NAME NEGATE        NAME ABS
14 NAME AND           NAME OR
15 NAME XOR
16
17
18
19
20
21
22
23
29
 0 ( SOURCE )
 1
 2 NAME -1            NAME 0
 3 NAME 1             NAME 2
 4 NAME +             NAME -
 5
 6 NAME 1+            NAME 1-
 7 NAME 2*            NAME U2/
 8 NAME =             NAME 0=
 9 NAME U<            NAME 0<
10 NAME UM/MOD        NAME UMIN
11 NAME UMAX          NAME OMAX
12
13 NAME CMOVE         NAME CMOVE>
14 NAME FILL
15 NAME NOOP          NAME BEEP
16
17 NAME TO            NAME +TO
18 NAME ADDR
19
20 NAME MS
21
22
23
```

```
 5  ROT               OVER
 6  SWAP              SWAB
 7  R>                R@
 8  >R                I
 9
10  @                 C@
11  !                 C!
12  +!
13
14  NEGATE            ABS
15  AND               OR
16  XOR
17
18
19
20
21
22
23

 0 ( SOURCE )
 1
 2 tokenization of metacompiled FORTH
 3  -1                0
 4  1                 2
 5  +                 -
 6
 7  1+                1-
 8  2*                U2/
 9  =                 0=
10  U<                0<
11  UM/MOD            UMIN
12  UMAX              OMAX
13
14  CMOVE             CMOVE>
15  FILL
16  NOOP              BEEP
17
18  TO                +TO
19  ADDR
20
21  MS
22
23
```

```
scr #   30
 0 ( SOURCE )
 1
 2 NAME WR!           NAME WR@
 3 NAME WC@           NAME ROM?
 4 NAME LEXLEN        NAME TOPLINE
 5
 6 NAME BOW
 7 NAME LOCLIN        NAME LOCCHR
 8 NAME SEL           NAME ?COLLAPSE
 9
10 NAME DOPAGING      NAME NEXTPAGE
11 NAME FIXTABLE      NAME NOTMATCH?
12 NAME PAGEWRAP      NAME SAVEPAGE
13
14 NAME PREALIGN      NAME +ALIGN
15 NAME INCPAGES      NAME LASTPAGE
```

```
 0 ( SOURCE )
 1
 2 tokenization of Swyft:
 3  WR!               WR@
 4  WC@               ROM?
 5  LEXLEN            TOPLINE
 6
 7  BOW
 8  LOCLIN            LOCCHR
 9  SEL               ?COLLAPSE
10
11  DOPAGING          NEXTPAGE
12  FIXTABLE          NOTMATCH?
13  PAGEWRAP          SAVEPAGE
14
15  PREALIGN          +ALIGN
```

```
 16 NAME ENDFORM          NAME <ENDFORM>
 17 NAME ?ONPAGE
 18 NAME ?MORETEXT        NAME FIXEND
 19 NAME STOP?
 20
 21
 22 NAME HARDPAGE
 23 NAME SOFTPAGE
31
  0 ( SOURCE )
  1
  2 NAME WRAP             NAME ENDWRAP
  3 NAME AFTERGAP
  4
  5 NAME SHOWLINE         NAME SETLINE
  6 NAME PRESET           NAME ?UPDATE
  7 NAME ADJUST           NAME TOBUFF
  8 NAME ENDWINDOW        NAME ?SCROLL
  9 NAME ENDSCREEN?       NAME SHOWPAGE
 10 NAME NEWND            NAME REWINDOW
 11
 12 NAME FRESH            NAME REFRESH
 13 NAME REFRESHER        NAME SHOW
 14 NAME SHOWMARK         NAME NEWMARK
 15 NAME RESHOW           NAME OLDSHOW
 16
 17
 18
 19
 20
 21
 22
 23.
```

```
 16  INCPAGES            LASTPAGE
 17  ENDFORM             <ENDFORM>
 18  ?ONPAGE
 19  ?MORETEXT           FIXEND
 20  STOP?
 21
 22  HARDPAGE
 23  SOFTPAGE
  0 ( SOURCE )
  1
  2 tokenization of Swyft:
  3  WRAP                ENDWRAP
  4  AFTERGAP
  5
  6  SHOWLINE            SETLINE
  7  PRESET              ?UPDATE
  8  ADJUST              TOBUFF
  9  ENDWINDOW           ?SCROLL
 10  ENDSCREEN?          SHOWPAGE
 11  NEWND               REWINDOW
 12
 13  FRESH               REFRESH
 14  REFRESHER           SHOW
 15  SHOWMARK            NEWMARK
 16  RESHOW              OLDSHOW
 17
 18
 19
 20
 21
 22
 23
```

```
cr #   32
  0 ( SOURCE ) HEX
  1
  2 NAME SETDISP          NAME SIGNON
  3 NAME MSGO             NAME CLEAR
  4 NAME SCROLL
  5 NAME DISP             NAME AUXIL
  6 NAME ?BLINK           NAME ?LBLINK
  7 NAME ON               NAME OFF
  8
  9 NAME QUE
 10 NAME ?K               NAME @K
 11 NAME ?E               NAME ?A
 12 NAME ?X               NAME ?S
 13 NAME ?D               NAME FLUSH
 14
 15 NAME SETMODEM         NAME MEMIT
 16 NAME ?M               NAME ?LE
 17 NAME CONTROL          NAME MAPPEND
 18 NAME ?SEND            NAME ?RECFULL
 19
 20
 21
 22
 23
```

```
  0 ( SOURCE ) HEX
  1
  2 tokenization of Swyft:
  3  SETDISP             SIGNON
  4  MSGO                CLEAR
  5  SCROLL
  6  DISP                AUXIL
  7  ?BLINK              ?LBLINK
  8  ON                  OFF
  9
 10  QUE
 11  ?K                  @K
 12  ?E                  ?A
 13  ?X                  ?S
 14  ?D                  FLUSH
 15
 16  SETMODEM            MEMIT
 17  ?M                  ?LE
 18  CONTROL             MAPPEND
 19  ?SEND               ?RECFULL
 20
 21
 22
 23
```

```
33
 0 ( SOURCE ) HEX
 1
 2 NAME PRINT            NAME SETPRINTER
 3 NAME LEMIT            NAME LTYPE
 4 NAME LCR              NAME LCRS
 5 NAME PAGEPRINT        NAME ENDPAGE
 6 NAME LMARGIN          NAME ULEMIT
 7 NAME ENDU             NAME STARTU
 8
 9 NAME REVERSE
10 NAME SEEK>            NAME SEEK<
11 NAME FLIP/TRIM        NAME FLIP
12 NAME ?LEXXED
13 NAME RENCUR           NAME LEXCUR
14 NAME DEL              NAME [SEARCH]
15 NAME SEARCH           NAME <SEARCH>
16 NAME REP              NAME EXPAND
17 NAME AUTOEXTEND
18 NAME LEX              NAME REX
19 NAME LXX              NAME RXX
20 NAME PRELEX           NAME POSTLEX
21 NAME LEXREX           NAME OUTLEX
22 NAME MOVE-GAP
23 NAME CREEPSHOW        NAME CREEPER
```

```
 0 ( SOURCE ) HEX
 1 tokenization of Swyft:
 2  PRINT            SETPRINTER
 3  LEMIT            LTYPE
 4  LCR              LCRS
 5  PAGEPRINT        ENDPAGE
 6  LMARGINS         ULEMIT
 7  ENDU             STARTU
 8
 9  REVERSE
10  SEEK>            SEEK<
11  FLIP/TRIM        FLIP
12  ?LEXXED
13  RENCUR           LEXCUR
14  DEL              [SEARCH]
15  SEARCH           <SEARCH>
16  REP              EXPAND
17  AUTOEXTEND
18  LEX              REX
19  LXX              RXX
20  PRELEX           POSTLEX
21  LEXREX           OUTLEX
22  MOVE-GAP
23  CREEPSHOW        CREEPER
```

```
scr #   34
 0 ( SOURCE ) HEX
 1
 2 NAME BASIC
 3
 4 NAME TOBASIC          NAME TOINPUT
 5 NAME APPEND           NAME F>B
 6 NAME VALIDATE         NAME START
 7 NAME INITBASIC
 8 NAME DEFVARS          NAME RESETVARS
 9 NAME BEFORE           NAME AFTER
10 NAME ?MOVETEXT        NAME MOVETEXT
11 NAME WIDTHCHANGE
12 NAME MARGIN-CHANGES   NAME CHECKCHANGES
13 NAME SAVESTRINGS      NAME LOADSTRINGS
14 NAME SAVE$            NAME LOAD$
15 NAME V@               NAME V!
16 NAME V
17 NAME FRAGMENTS
18 NAME ROM-FRAGMENTS    NAME DISK-FRAGMENTS
19
20
21
22
23
```

```
 0 ( SOURCE ) HEX
 1
 2 tokenization of BASIC words:
 3  BASIC
 4
 5  TOBASIC          TOINPUT
 6  APPEND           F>B
 7  VALIDATE         START
 8  INITBASIC
 9  DEFVARS          RESETVARS
10  BEFORE           AFTER
11  MARGIN-CHANGES   CHECKCHANGES
12  SAVESTRINGS      LOADSTRINGS
13  SAVE$            LOAD$
14  V@               V!
15  V
16  FRAGMENTS
17  ROM-FRAGMENTS    DISK-FRAGMENTS
18
19
20
21
22
23
```

```
35
 0 ( SOURCE )
 1
 2 NAME LOAD             NAME SAVE
 3 NAME DRAG             NAME GET
 4 NAME BOOT
 5
 6 NAME DISKON           NAME PROT?
 7 NAME ?EDDE            NAME ?APPLE
 8 NAME ACT              NAME DEACT
 9 NAME CHECKSUM         NAME SERIAL#
```

```
 0 ( SOURCE )
 1
 2 tokenization of disk operations:
 3  LOAD             SAVE
 4  DRAG             GET
 5  BOOT
 6
 7  DISKON           PROT?
 8  ?EDDE            ?APPLE
 9  ACT              DEACT
```

```
 10 NAME RECAL
 11 NAME <SEEK>          NAME SEEK
 12 NAME <READ>          NAME READ
 13 NAME <WRITE>         NAME WRITE
 14 NAME OLDLOAD         NAME <LOAD>
 15 NAME WRITES          NAME WRITE0
 16 NAME APPLEDISK       NAME ABOOT
 17 NAME .40COL          NAME .MON
 18
 19
 20
 21
 22
 23
```

```
 10  CHECKSUM        SERIAL#
 11  RECAL
 12  <SEEK>          SEEK
 13  <READ>          READ
 14  <WRITE>         WRITE
 15  OLDLOAD         <LOAD>
 16  WRITES          WRITE0
 17  APPLEDISK       ABOOT
 18  .40COL          .MON
 19
 20
 21
 22
 23
```

```
scr #   36
  0 ( SOURCE ) HEX
  1
  2 NAME MAIN       NAME LOOKUP
  3 NAME COLD       NAME WARM
  4 NAME INIT       NAME <INIT>
  5 NAME RAMKEYS    NAME ?RAMKEYS
  6
  7 NAME DELETE     NAME CUT
  8 NAME <ENTER>    NAME NEWPAGES
  9
 10 NAME BUG        NAME RP!
 11
 12 NAME ENTER      NAME PASTE
 13 NAME TAB        NAME RESET
 14 NAME DISK       NAME SEND
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
  0 ( SOURCE )
  1
  2  MAIN           LOOKUP
  3  COLD           WARM
  4  INIT           <INIT>
  5  RAMKEYS        ?RAMKEYS
  6
  7  DELETE         CUT
  8  <ENTER>        NEWPAGES
  9
 10  BUG            RP!
 11
 12  ENTER          PASTE
 13  TAB            RESET
 14  DISK           SEND
 15
 16 storing a 0 in the lfa of the first
 17  definition of SOURCE vocabulary limits
 18  vocabulary searches to SOURCE
 19
 20 the value in tokens represents the
 21  actual number of tokens placed into
 22  the table
 23
```

```
 37
  0 ( END OF SOURCE DEFINITIONS ) HEX
  1
  2 00 ' .NEST LFA
  3 FORTH DEFINITIONS
  4 !
  5
  6 LPDONE  TOKENS @
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
```

```
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
```

```
21                                          21
22                                          22
23                                          23


scr #   38
  0 ( VARIABLES )                            0 ( VARIABLES )
  1 ASSEMBLER DEFINITIONS    800 TOKENS !    1 beginning of variables at RAM ($0800).
  2 ( 800 ) VAR ORIGIN       808 TOKENS !    2 ORIGIN
  3 ( 808 ) VAR BOT                          3 BOT          beginning of text.
  4 ( 80A ) VAR BEOT                         4 BEOT         beginning of end of text.
  5 ( 80C ) VAR EBOT                         5 EBOT         end of beginning of text.
  6 ( 80E ) VAR EOT                          6 EOT          end of text.
  7 ( 810 ) VAR BOS                          7 BOS          beginning of selection.
  8 ( 812 ) VAR EOS                          8 EOS          end of selection.
  9 ( 814 ) VAR TOP                          9 TOP          top line on screen.
 10 ( 816 ) VAR BOC                         10 BOC          beginning of cut buffer.
 11 ( 818 ) VAR OEOS                        11 OEOS         old end of selection.
 12 ( 81A ) VAR BOTTOM                      12 BOTTOM       bottom of all text area.
 13 ( 81C ) VAR DIRTY                       13 DIRTY        state of text.
 14 ( 81E ) VAR LOCAL1                      14 LOCAL1       (used as flag for creep).
 15 ( 820 ) VAR QIN                         15 QIN          pointer to que input.
 16 ( 822 ) VAR QOUT                        16 QOUT         pointer to que output.
 17 ( 824 ) VAR NARROW                      17 NARROW       state of cursor.
 18 ( 826 ) VAR CHAR                        18 CHAR         character buffer.
 19 ( 828 ) VAR LONG                        19 LONG         lines of text per page.
 20 ( 82A ) VAR WIDE                        20 WIDE         columns on page.
 21 ( 82C ) VAR YWRAP                       21 YWRAP        horizontal wrap.
 22 ( 82E ) VAR XFLAG                       22 XFLAG        state of apple (lex) keys.
 23 ( 830 ) VAR LCTR                        23 LCTR         cumulative line counter.
39
  0 ( VARIABLES ) HEX                        0 ( VARIABLES ) HEX
  1 ( 832 ) VAR PCT                          1 PCT          page count (temporary).
  2 ( 834 ) VAR LCT                          2 LCT          line count (temporary).
  3 ( 836 ) VAR LINES                        3 LINES        total # of lines in text.
  4 ( 838 ) VAR PAGES                        4 PAGES        total # of pages in text.
  5 ( 83A ) VAR CLIN                         5 CLIN         current cursor screen line.
  6 ( 83C ) VAR OLIN                         6 OLIN         old cursor line position.
  7 ( 83E ) VAR GAP                          7 GAP          space remaining (BEOT-EBOT).
  8 ( 840 ) VAR LINE#                        8 LINE#        line number.
  9 ( 842 ) VAR PAGE#                        9 PAGE#        page number.
 10 ( 844 ) VAR CTR                         10 CTR          counter for blink rate.
 11 ( 846 ) VAR LINREL                      11 LINREL       relative line.
 12 ( 848 ) VAR LINADR                      12 LINADR       line address.
 13 ( 84A ) VAR PAGEFLAG                    13 PAGEFLAG     state of page change.
 14 ( 84C ) VAR EFLAG                       14 EFLAG
 15 ( 84E ) VAR EOW                         15 EOW          end of window.
 16 ( 850 ) VAR RETN                        16 RETN         BASIC horizontal position.
 17 ( 852 ) VAR RETNCHR                     17 RETNCHR      character passed from BASIC.
 18 ( 854 ) VAR COL#                        18 COL#         horizontal position.
 19 ( 856 ) VAR .LF                         19 .LF          line feed (see SETPRINTER).
 20 ( 858 ) VAR .BL                         20 .BL          blanks to print for margin.
 21 ( 85A ) VAR LRFLAG                      21 LRFLAG       state of lexxing.
 22 ( 85C ) VAR CT                          22 CT
 23 ( 85E ) VAR PRINTBREAK                  23 PRINTBREAK   state of page break display.


scr #   40
  0 ( VARIABLES ) HEX                        0 ( VARIABLES ) HEX
  1 ( 860 ) VAR E#                           1 E#           line # of EOS.
  2 ( 862 ) VAR B#                           2 B#           line # of BOS.
  3 ( 864 ) VAR VECT                         3 VECT
  4 ( 866 ) VAR OLDE#                        4 OLDE#        previous line # of EOS.
```

```
 5 ( 868 ) VAR OLDB#
 6 ( 86A ) VAR NUFLAG
 7 ( 86C ) VAR LEXXING
 8 ( 86E ) VAR PTR
 9 ( 870 ) VAR W/2
10 ( 872 ) VAR TRACK
11 ( 874 ) VAR XPOS
12 ( 876 ) VAR YPOS
13 ( 878 ) VAR MQIN
14 ( 87A ) VAR MQOUT
15 ( 87C ) VAR BL0
16 ( 87E ) VAR BL1
17 ( 880 ) VAR BANK
18 ( 882 ) VAR SAVECHAR
19 ( 884 ) VAR FIRST
20 ( 886 ) VAR SIZE
21 ( 888 ) VAR ABOVE%
22 ( 88A ) VAR BELOW%
23 ( 88C ) VAR PAGE%
```

```
 5 OLDB#        previous line # of BOS.
 6 NUFLAG       state for new display.
 7 LEXXING      state for lex/rex operation.
 8 PTR
 9 W/2
10 TRACK        desired track number.
11 XPOS         display cursor x position.
12 YPOS         display cursor y position.
13 MQIN         modem que input pointer.
14 MQOUT        modem que output pointer.
15 BL0          used for cursor blinking.
16 BL1          used for cursor blinking.
17 BANK         active display bank.
18 SAVECHAR
19 FIRST
20 SIZE
21 ABOVE%       # of lines on top of page.
22 BELOW%       # of lines at bottom.
23 PAGE%        page number to print.
```

41

```
 0 ( VARIABLES ) HEX
 1 ( 88E ) VAR MARGIN%
 2 ( 890 ) VAR HALF-TRACK#
 3 ( 892 ) VAR LINESCOUNT
 4 ( 894 ) VAR EXTENDED
 5 ( 896 ) VAR LPAGE% ( 898 ) VAR PFLAG%
 6 ( 89A ) VAR THOROUGH?
 7 ( 89C ) VAR LASTC
 8 ( 89E ) VAR PRINT?  ( 8A0 ) VAR OLDPAGE
 9 ( 8A2 ) VAR DISK#   ( 8A4 ) VAR OLDISK#
10 ( 8A6 ) VAR SAVED?
11 ( 8A8 ) VAR FILLED-LEN
12 ( 8AA ) VAR SSC?    ( 8AC ) VAR TEOS
13 ( 8AE ) VAR SPACING ( 8B0 ) VAR LINEND%
14 ( 8B2 ) VAR SEND%   ( 8B4 ) VAR HEAD%
15 ( 8B6 ) VAR PLEN%   ( 8B8 ) VAR LOCAL2
16 ( 8BA ) VAR UFLAG   ( 8BC ) VAR BELL?
17 ( 8BE ) VAR SAVED   ( 8C0 ) VAR RESEEK
18 ( 8C2 ) VAR NEWBOTTOM
19 ( 8C4 ) VAR CUTPAGES
20 ( 8C6 ) VAR WRAPDONE
21
22 8D0 CONSTANT USTART 8D8 CONSTANT UEND
23 8E0 CONSTANT PBUF
```

```
 0 ( VARIABLES ) HEX
 1 MARGIN%      # of spaces for left margin.
 2 HALF-TRACK#
 3 LINESCOUNT
 4 EXTENDED
 5 LPAGE%
 6 PFLAG%
 7 THOROUGH?    wrap without interruption.
 8 LASTC        last command buffer.
 9 PRINT?       state for printing.
10 OLDPAGE
11 DISK#        disk identification #.
12 OLDISK#      old disk identification #.
13 SAVED?               FILLED-LEN  unused.
14 SSC?         flag for super serial card.
15 TEOS         temporary EOS.
16 SPACING              LINEND%
17 SEND%                HEAD%
18 PLEN% page length    LOCAL2  xflag buffer
19 UFLAG backup to u'l  BELL?   sound bell?
20 SAVED tracks saved   RESEEK  find header.
21
22 underlining: USTART, UEND.
23 PBUF         PR$ buffer.
```

scr # 42

```
 0 ( ARRAYS ) HEX
 1
 2 900 CONSTANT PATT   920 CONSTANT KQUE
 3 930 CONSTANT CURR   980 CONSTANT UPDATE
 4 998 CONSTANT WND0   9B0 CONSTANT WND1
 5 9C8 CONSTANT WND2   9E0 CONSTANT WND3
 6 A00 CONSTANT PGS0   B00 CONSTANT PGS1
 7 C00 CONSTANT PGS2   D00 CONSTANT PGS3
 8
 9 E00 CONSTANT <LEMIT2>
10 E10 CONSTANT <NDISK>
11 E70 CONSTANT <CDISK>
12 E80 CONSTANT <ZPMOVE>
13 EE0 CONSTANT <AUX>
14 EF0 CONSTANT <MAIN>
15 F00 CONSTANT <XNEXT>
```

```
 0 ( ARRAYS ) HEX
 1 PATT search pattern KQUE key queue
 2 CURR printer/screen buffer for line.
 3 WND0, WND1 addr for line on display (WR)
 4 WND2 line on page (LCT)
 5 WND3 page number (PCT)
 6 PGS0, PGS1 addr for page (WR)
 7 PGS2, PGS3 cumulative # of lines (LCTR)
 8
 9 <LEMIT2> printer routine.
10 <NDISK> call 3600.
11 <CDISK> clear disk.
12 <ZPMOVE> zero page move.
13 <AUX>
14 <MAIN>
15 <XNEXT> exit from bank 2 routine.
```

```
16 F10 CONSTANT <MON>
17 F20 CONSTANT <B/F>
18 F30 CONSTANT <D444>
19 F40 CONSTANT <CH/F>
20 F50 CONSTANT <XFER>
21 F60 CONSTANT <RTS>
22 F70 CONSTANT <LEMIT>
23 FA0 CONSTANT <START>
```

```
43
 0 ( END OF VARIABLES )
 1
 2 1000 CONSTANT BASIC0
 3 1100 CONSTANT BASIC1
 4 1140 CONSTANT FORTH0
 5 11A0 CONSTANT FORTH1
 6 B400 CONSTANT MQUE
 7 FFF8 CONSTANT ROM?
 8
 9 0 ' A.PLACE  LFA
10 FORTH DEFINITIONS
11 !
12
13
14
15
16
17
18
19
20
21
22
23
```

```
16 <MON> call to Apple monitor.
17 <B/F> basic/forth interface.
18 <D444> call to Apple BASIC.
19 <CH/F> character from basic to forth.
20 <XFER> entry for bank 2 routine.
21 <RTS> return from Apple BASIC.
22 <LEMIT> printer routine.
23 <START> setup before BASIC.
```

```
 0 ( END OF VARIABLES )
 1
 2 BASIC0 BASIC zero page.
 3 BASIC1 BASIC page 1.
 4 FORTH0 forth zero page.
 5 FORTH1 forth page 1.
 6 TIMER  programmable counter
 7 .IVEC  input from modem routine
 8 .OVEC  output to modem routine
 9 .SVEC  initialize modem routine
10 .QVEC  poll modem routine
11 MQUE   modem que - holds input
12 ROM? if the Swyft system is operating
13  from a disk then the value at this
14  location probably will be different
15
16 placing a 0 in the lfa of the first
17  definition stops vocabulary searches
18
19
20
21
22
23
```

```
scr #   44
  0 ( COMPILER DEFINITIONS ) VOCABULARY
  1 COMPILER IMMEDIATE COMPILER DEFINITIONS
  2 : DO SOURCE .DO FORTH C, 3 ;
  3 : IF SOURCE .OBRAN FORTH C,
  4  HERE 0 C, 2 ;
  5 : BEGIN HERE 1 ;  : WHILE IF 2+ ;
  6 : >RESOLVE HERE BOUND @ - SWAP C! ;
  7 : <LOOP>  C, FORTH BEGIN DUP 4 = WHILE
  8  DROP >RESOLVE REPEAT 3 ?PAIRS ;
  9 : LOOP  SOURCE .LOOP  FORTH <LOOP> ;
 10 : +LOOP SOURCE .+LOOP FORTH <LOOP> ;
 11 : <RESOLVE C, 1 ?PAIRS BOUND @ - C, ;
 12 : UNTIL SOURCE .OBRAN FORTH <RESOLVE ;
 13 : AGAIN SOURCE .BRAN  FORTH <RESOLVE ;
 14 : THEN  0 >R FORTH BEGIN DUP 4 =
 15  WHILE >R >R REPEAT 2 ?PAIRS >RESOLVE
 16  BEGIN R> -DUP WHILE R> REPEAT ;
 17 : REPEAT >R >R AGAIN R> R> 2- THEN ;
 18 : ELSE  0 >R FORTH BEGIN DUP 4 = WHILE
 19  >R >R REPEAT 2 ?PAIRS SOURCE .BRAN
 20  FORTH C, 0 C, >RESOLVE HERE 1- 2
 21  BEGIN R> -DUP WHILE R> REPEAT ;
 22 : LEAVE  SOURCE .LEAVE FORTH C, HERE 4
 23  0 C, ;  : ENDIF THEN ;
```

```
 0 ( COMPILER DEFINITIONS ) VOCABULARY
 1 immediate compiler commands
 2 DO ( -- 3) compile .DO token
 3 IF ( -- 2) compile .OBRAN token
 4 BEGIN ( --here 1)
 5 WHILE ( -- 4)
 6 >RESOLVE ( n --) resolve forward ref.
 7 <LOOP>  ( 3 .loop --)  compile .LOOP
 8 LOOP ( 3 --) compile .LOOP
 9 +LOOP ( 3 --) compile .+LOOP
10 UNTIL ( f --) compile .OBRAN
11 AGAIN ( --) compile .BRAN
12 : THEN  0 >R FORTH BEGIN DUP 4 =
13  WHILE >R >R REPEAT 2 ?PAIRS >RESOLVE
14  BEGIN R> -DUP WHILE R> REPEAT ;
15 : REPEAT >R >R AGAIN R> R> 2- THEN ;
16 : ELSE  0 >R FORTH BEGIN DUP 4 = WHILE
17  >R >R REPEAT 2 ?PAIRS SOURCE .BRAN
18  FORTH C, 0 C, >RESOLVE HERE 1- 2
19  BEGIN R> -DUP WHILE R> REPEAT ;
20 LEAVE compile .LEAVE 0 , here 4 0 c,
21 ENDIF then
22
23
```

```
45
 0 ( COMPILER DEFINITIONS )
 1
 2 00 ' DO LFA
 3 FORTH DEFINITIONS
 4 !
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
0 ( COMPILER DEFINITIONS )
1
2 store 0 in lfa of first word in
3  compiler vocabulary to limit searches
4
5 GET#  common to ERRORIS, CALL, and >NUM
6
7 ERRORIS  compile error# phrase
8
9 CALL  compile call and address
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #   46
 0 ( MORE COMPILER ) HEX
 1
 2 : ?COMMAND  ' COMPILER 2+ @ (FIND)
 3  IF DROP CFA EXECUTE 1 ELSE 0 ENDIF ;
 4
 5 : ?VAR  ' ASSEMBLER 2+ @ (FIND) DUP
 6  IF 2DROP @ DUP 8FF U>
 7   IF SOURCE .LIT FORTH C,
 8   ELSE SWAB
 9   ENDIF , 1 ENDIF ;
10
11 : ?COMPILE  ' SOURCE 2+ @ (FIND) DUP
12  IF 2DROP @ DUP 0< ABORT" FRAGment:"
13   C, 1 ENDIF ;    ( all 1 byte tokens )
14
15
16
17
18
19
20
21
22
23
```

```
0 ( MORE COMPILER ) HEX
1
2 : ?COMMAND  ( adr -- flag)
3   true=executed compiler word
4   false=not a compiler word
5
6 : ?VAR  ( adr -- flag)
7   true=compiled either a .lit or
8     .variable and its value
9   false=not an assembler word
10
11 : ?COMPILE  ( adr -- flag)
12   true=compiled a token
13   false=not a source word, abort if
14   token is negative (i.e., a fragment)
15
16
17
18
19
20
21
22
23
```

```
47
 0 ( MORE COMPILER ) HEX
 1
 2 : ?NUM   ( addr -- )
 3  0 OVER DUP C@ 1+ + ROT 1+
 4  DO I C@ 10 DIGIT
 5   IF SWAP 10 * +
 6   ELSE R> R> ." compile error: "
 7    HERE COUNT TYPE ABORT
 8   ENDIF
 9  LOOP DUP 100 U<
```

```
0 ( MORE COMPILER ) HEX
1
2 : ?NUM   ( addr -- )
3   in T: if it is not ?command, ?var or
4   ?compile then try to convert it to a
5   number; if successful, compile as a
6   .blit or .lit (as appropriate), if not
7   then abort with a compile error.
8
9
```

```
10  IF SOURCE .BLIT FORTH C, C,
11  ELSE SOURCE .LIT FORTH C, ,
12  THEN ;
13
14
15
16
17
18
19
20
21
22
23
```

```
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #   48
 0 ( MORE COMPILER ) HEX
 1
 2 : T'  ( -- pfa )
 3  BL WORD ' SOURCE 2+ @ (FIND) 0=
 4  ABORT" not NAMEd " DROP
 5  NAMED @ 1 XOR DUP NAMED !
 6  IF CR 0 OUT !
 7  ELSE 28 OUT @ - SPACES
 8  THEN
 9  BASE @ HERE ADR HEX U. BASE !
10  DUP @ DUP 0<
11  IF DROP 5 SPACES
12  ELSE 3 .R SPACE SPACE
13  THEN HERE COUNT TYPE SPACE ;
14
15 : !FRAG  HERE ADR SWAP 2+ !
16  [COMPILE] ASSEMBLER ;
17
18
19
20
21
22
23
```

```
 0 ( MORE COMPILER ) HEX
 1
 2 : T'  ( -- pfa )
 3   abort if word not defined by NAME,
 4   otherwise print out its address and
 5   its token and then leave pfa on stack
 6
 7 : !FRAG  ( pfa --) resolve NAMEd word
 8   for fragment with ROM+offset
 9   and leave in assembler
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
49
 0 ( MORE COMPILER ) HEX
 1
 2 : FRAG  T' DUP !FRAG @ 0< 0=
 3  IF ." FRAG has a token" ABORT THEN ;
 4
 5 : LABEL  T' DUP !FRAG DUP @ 0<
 6  IF ." LABEL with no token" ABORT THEN
 7  HERE ADR SWAP @ DUP + TKTABLE + ! ;
 8
 9 : T:  LABEL
10  20 C, SOURCE ' .NEST FORTH 2+ @ ,
11  HERE 1- BOUND !
12  BEGIN BL WORD @ 3B01 = 0=
13  WHILE HERE ?COMPILE 0=
14   IF   HERE ?COMMAND 0=
15    IF  HERE ?VAR     0=
16     IF HERE ?NUM
17   ENDIF ENDIF ENDIF
18  REPEAT HERE BOUND @ - FF U>
19  ABORT" definition too large"
20  SOURCE EXIT FORTH C, ;
```

```
 0 ( MORE COMPILER ) HEX
 1 : FRAG  ( --) if it is a fragment then
 2   associate an address with the name
 3   (where the address points to code)
 4   otherwise abort.  the address is not
 5   placed in the token table.
 6   FRAGs are called by JSR and end in RTS
 7
 8 : LABEL  ( --) if it is a label then
 9   associate an address with the token in
10   in the token table.  abort it token is
11   a code fragment (i.e., <0).  LABELs
12   are machine code ending with JMP NEXT.
13
14 : T: ( --) compiles tokenized words.
15 if NAME is found then compile JSR .NEST
16  to execute tokenized words, and compile
17  tokens until ";" found.
18 if BOUND exceeds $FF then the word is
19  too large for Y register incrementation
20  by NEXT so abort.
```

```
 21                                          21 T: definitions end with JMP NEXT.
 22                                          22
 23                                          23


scr #   50                                   0 ( MORE COMPILER )
   0 ( MORE COMPILER )                       1
   1                                         2 : \ ( -- token)
   2 : \  BL WORD ' SOURCE 2+ @ (FIND)       3   find a NAME; if not NAMED or not a
   3   IF DROP 2+ @ DUP 0=                   4    resolved fragment then abort.
   4    IF HERE COUNT TYPE                   5
   5    ." not yet a FRAGment" ABORT ENDIF   6 : TNEXT,
   6   ELSE HERE COUNT TYPE                  7   ending for a T: definition.
   7    ." not NAMEd" ABORT ENDIF ;          8
   8                                         9 : "
   9 : TNEXT, ASSEMBLER NEXT JMP, ;         10   compile a string into the dictionary.
  10                                        11
  11 : " 22 WORD C@ 1+ ALLOT ;              12 : H,
  12                                        13   compile the hi byte only.
  13 : H, SWAB C, ;                         14
  14                                        15
  15 : TARGET  AIM 1000 - 17 4000 >DISK ;   16 : TARGET
  16                                        17   save image of Swyft program on T1.7
  17                                        18    disk.
  18                                        19
  19                                        20
  20                                        21
  21                                        22
  22                                        23
  23
 51                                          0 ( ADDITIONS TO THE METACOMPILER ) HEX
   0 ( ADDITIONS TO THE METACOMPILER ) HEX   1
   1                                         2 : ?FITS  aborts if HERE is
   2 : ?FITS  ( # -- | aborts if HERE is     3   more than # bytes beyond a page
   3  more than # bytes beyond a page )      4
   4  HERE OFF AND SWAP U<                   5
   5  ABORT" Doesn't fit.  Try again" ;      6
   6                                         7 : XFER
   7 : XFER  LABEL                           8 PURPOSE: transfer to machine language
   8  BL WORD ' SOURCE 2+ @ (FIND)           9  routine in bank 2.  return through
   9  0= ABORT" doesn't exist "             10  <xnext>.
  10  DROP DUP @ 0<                         11
  11  0= ABORT" don't transfer to a token "  12   if the next two words are defined then
  12  2+ @ ASSEMBLER DUP                    13    point the first word to the following
  13  YSAVE STY,                            14    code:
  14  OFF AND #B LDY,                       15   save y-reg and (using the resolved
  15  SWAB OFF AND #B LDA,                  16    address in the first word)
  16  <XFER> JMP, ;                         17   lda# hi-byte and ldy# lo-byte
  17                                        18   then JMP <XFER>.
  18                                        19
  19                                        20
  20                                        21
  21                                        22
  22                                        23
  23

scr #   52                                   0 ( PROM BURNER FOR 2764'S ) ;S HEX
   0 ( PROM BURNER FOR 2764'S ) ;S HEX       1
   1                                         2
   2 C0A0    CONSTANT DRA ( DATA A )         3
   3 DRA 2+  CONSTANT DRB ( DATA B )         4
   4 DRA 1+  CONSTANT CRA ( CTLR A )
```

```
 5 DRA 3 + CONSTANT CRB ( CTRL B )
 6 VARIABLE CNT
 7 : MS 0 DO 5 0 DO LOOP LOOP ;
 8 : ?T ?TERMINAL IF QUIT ENDIF ;
 9 : !AND OVER C@ AND SWAP C! ;
10 : !OR  OVER C@  OR SWAP C! ;
11 : PGML  DRB FB !AND ;
12 : PGMH  DRB 04 !OR  ;
13 : CEL   DRB DF !AND ;
14 : CEH   DRB 20 !OR  ;
15 : OEL   DRB EF !AND ;
16 : OEH   DRB 10 !OR  ;
17 : VPPL  DRB 80 !OR  ;
18 : VPPH  DRB 7F !AND ;
19
20 : INA CRA FB !AND  0 DRA C! CRA 4 !OR ;
21 : OTA CRA FB !AND FF DRA C! CRA 4 !OR ;
22 : OTB CRB FB !AND FF DRB C! CRB 4 !OR ;
23
```

```
53
 0 ( PROM PROGRAMMER ) ;S HEX
 1
 2 : CAL CRA C@ 38 OR F7 AND CRA C! ;
 3 : CAH CRA 38 !OR ;
 4 : CBL CRB C@ 38 OR F7 AND CRB C! ;
 5 : CBH CRB 38 !OR ;
 6
 7 : INI OTB INA PGMH CEH OEH
 8  DRB FC !AND
 9  VPPL CEH PGMH OEH ;
10 : RES CBH CBL 0 CNT !
11  DRB FC !AND ;
12 : COU CAL CAH 1 CNT +! ;
13 : INCR ( INCREMENT HIGH BITS )
14  DRB C@ DUP 1+ 3 AND SWAP FC AND OR
15  DRB C! ;
16 : BUMP COU CNT @ OFFF AND 0=
17  IF INCR ENDIF ;
18 : ZAP PGML 35 MS PGMH ;
19 : SETS -DUP IF 0 DO BUMP LOOP THEN ;
20
21
22
23
```

```
 0 ( PROM PROGRAMMER ) ;S HEX
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #   54
 0 ( PROM PROGRAMMER ) ;S HEX
 1
 2 : BURN  CEL VPPH OTA RES SETS
 3  OVER + SWAP
 4  DO I C@ DRA C! ZAP BUMP ?T LOOP INI ;
 5 : READ  INA CEL OEL RES SETS
 6  OVER + SWAP
 7  DO DRA C@ I C! BUMP ?T LOOP INI ;
 8 : GET  30 EOV RAM
 9  DO I OVER 1 R/W 1+ 400 +LOOP DROP ;
10 : SAVE 30 EOV RAM
11  DO I OVER 0 R/W 1+ 400 +LOOP DROP ;
12 : START GET RE ;
13 : ROM0 INI AIM 1000 0 BURN
14  AIM 3000 + 800 1000 BURN ;
15 : ROM1 INI AIM 1000 + 2000 0 BURN ;
```

```
 0 ( PROM PROGRAMMER ) ;S HEX
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
```

```
 16 DECIMAL
 17 : COPIER 141 1 5 BLKCOPY SAVE-IMAGE
 18  SAVE ;
 19
 20
 21
 22
 23
55
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 16
 17
 18
 19
 20
 21
 22
 23
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
cr #   56
  0 ( writing a target image to disk ) HEX
  1
  2 VARIABLE NAMED      0 NAMED !
  3 VARIABLE PRINTING   1 PRINTING !
  4
  5 : ?CR  ( -- ) NAMED @ 1 XOR DUP NAMED !
  6  IF CR 0 OUT !
  7  ELSE 28 OUT @ - SPACES THEN ;
  8
  9 : LPON?  PRINTING @ IF LON THEN ;
 10 : LPDONE PRINTING @ IF FORM LOFF THEN ;
 11
 12 : >DISK   ( a n # ->  | copy # bytes
 13             from address a to block n )
 14   400 /MOD SWAP >R
 15   OVER + DUP >R   SWAP DO
 16     DUP I BLOCK 400 CMOVE
 17     UPDATE FLUSH  400 +
 18   LOOP   R> BLOCK  R> CMOVE
 19   UPDATE FLUSH ;
 20
 21
 22
 23
```

```
  0 ( writing a target image to disk ) HEX
  1
  2 NAMED is used to determine which half of
  3  the page to print listing; a toggle
  4
  5 PRINTING is a flag to determine if a
  6  listing is to be printed.
  7
  8 ?CR  ( -- )
  9   formatting word for printing listing
 10    during compilation.
 11
 12 : LPON?  PRINTING @ IF LON THEN ;
 13 : LPDONE PRINTING @ IF FORM LOFF THEN ;
 14
 15 >DISK   ( a n # --)
 16  copy # bytes from address a to block n.
 17
 18
 19
 20
 21
 22
 23
```

```
57
 0 ( LISTIT, INDEXIT )
 1
 2 : PRINIT
 3   LON 27 EMIT 77 EMIT 27 EMIT 61 EMIT ;
 4 : PLIST BASE @ ROT ROT DECIMAL PRINIT
 5   1+ SWAP DO I 2+ I DO
 6      I BLOCK I 140 + BLOCK
 7      ."       SCR # " I 0 3 D.R
 8      ."
 9       SCR # " I 140 + 0 3 D.R CR
10      25 0 DO ."       "
11      I 0 3 D.R ."  " 40 0 DO
12        OVER J 40 * I + + C@ EMIT LOOP
13      ."     "
14      I 0 3 D.R ."  " 40 0 DO
15        DUP J 40 * I + + C@ EMIT LOOP CR
16      LOOP CR CR CR CR DROP DROP
17   LOOP FORM 2 +LOOP LOFF BASE ! ;
18 : PINDEX DECIMAL PRINIT 1+ SWAP DO
19   I 60 + 281 MIN I DO I BLOCK I 0 4 D.R
20   ."  " 40 0 DO DUP I + C@ EMIT LOOP CR
21   DROP LOOP FORM 60 +LOOP LOFF ;
22
23
```

```
 0 ( LISTIT, INDEXIT ) DECIMAL
 1
 2 : PRINIT
 3 printer initialization string.
 4
 5 : PLIST
 6
 7
 8 : PINDEX
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #   58
 0 ( LISTIT, INDEXIT & LOAD CONTROL )
 1
 2 : LISTIT BASE @ ROT ROT DECIMAL PRINIT
 3   1+ SWAP DO I 4 + I DO
 4      I BLOCK I 1+ BLOCK
 5      ."       SCR # " I 0 3 D.R
 6      ."
 7       SCR # " I 1+ 0 3 D.R CR
 8      25 0 DO ."       "
 9      I 0 3 D.R ."  " 40 0 DO
10        OVER J 40 * I + + C@ EMIT LOOP
11      ."     "
12      I 0 3 D.R ."  " 40 0 DO
13        DUP J 40 * I + + C@ EMIT LOOP CR
14      LOOP CR CR CR CR DROP DROP
15   2 +LOOP FORM 4 +LOOP LOFF BASE ! ;
16 : INDEXIT DECIMAL PRINIT 1+ SWAP DO
17   I 48 + 281 MIN I DO I BLOCK I 0 4 D.R
18   ."  " 40 0 DO DUP I + C@ EMIT LOOP CR
19   DROP LOOP FORM 48 +LOOP LOFF ;
20
21
22
23
59
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
```

```
 0 ( LISTIT, INDEXIT & LOAD CONTROL )
 1
 2 : LISTIT
 3
 4 : INDEXIT
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
```

```
10                                          10
11                                          11
12                                          12
13                                          13
14                                          14
15                                          15
16                                          16
17                                          17
18                                          18
19                                          19
20                                          20
21                                          21
22                                          22
23                                          23
```

```
scr #   60
  0 ( BOOT1 copy EDDE to ramcard ) HEX
  1
  2 FRAG BOOT1    SEI, 00 #B LDA,
  3  67F8 STA, 67F9 STA,          ( disk id )
  4  3C STA, 42 STA,
  5  20 #B LDA, 3D STA, 43 STA,
  6  2F #B LDA, 3F STA, FF #B LDA, 3E STA,
  7  SEC, C311 JSR,  ( auxmove )
  8  C009 STA, C083 LDA, C083 LDA,
  9  00 #B LDA, 3C STA, 42 STA,
 10  20 #B LDA, 3D STA, D0 #B LDA, 43 STA,
 11  2F #B LDA, 3F STA, FF #B LDA, 3E STA,
 12  SEC, C311 JSR,  ( auxmove )
 13  C08F LDA, C08F LDA,
 14  00 #B LDA, 3C STA, 42 STA,
 15  38 #B LDA, 3D STA, D0 #B LDA, 43 STA,
 16  67 #B LDA, 3F STA, FF #B LDA, 3E STA,
 17  SEC, C311 JSR,  ( auxmove )
 18  C005 STA, C003 STA,
 19  0 #B LDA, 39E STA, ( force cold start)
 20  D200 JMP,
 21
 22
 23
61
  0 ( 2.REVERSE ) HEX
  1
  2 ( START  LENGTH --- )
  3 FRAG 2.REVERSE
  4  0 SP) LDA, X0 STA,
  5  1 SP) LDA, X0 1+ STA,
  6  2 SP) LDA, X1 STA,
  7  3 SP) LDA, X1 1+ STA,
  8  INX, INX, INX, INX, XSAVE STX,
  9  0 #B LDX,
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
```

```
 0 FRAG BOOT1
 1 PURPOSE: move EDDE image to romcard.
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 FRAG 2.REVERSE ( start length -- )
 1 PURPOSE: reverse the order of bytes,
 2  e.g., first byte is placed at the end,
 3  last byte is placed at the beginning.
 4 REASON: to move a section of a length
 5  from 1 end to the other in place (ie,
 6  without a buffer of equal length) can
 7  be done with a reverse of the entire
 8  section then reversal of 2 subsets of
 9  the length.
10
11 store the length in X0, the starting
12  address in X1.
13 set X-reg to 0 to defeat addressing
14  mode (eg, LDA($z-page-adr,X)).
15 while the length is greater than 2,
16  decrement the number of pages (X0),
17  set X2 to be equal to X0+X1 minus
18  1 page and decrement X0+1.
19  swap 1 page of bytes betw X0,Y (Y=FF)
20   and (X2,X) (X=0).
```

```
 21                                    21  exchange the last bytes.
 22                                    22 ...
 23                                    23
```

```
scr #   62                             0 ( 2.REVERSE... ) HEX
  0 ( 2.REVERSE ... ) HEX              1
  1                                    2 BEGIN, X0 1+ LDA, 2 #B CMP, CS
  2 BEGIN, X0 1+ LDA, 2 #B CMP, CS     3 WHILE, X0 1+ DEC, CLC,
  3 WHILE, X0 1+ DEC, CLC,             4  X1 LDA, X0 ADC, X2 STA,
  4  X1 LDA, X0 ADC, X2 STA,           5  X1 1+ LDA, X0 1+ ADC, X2 1+ STA,
  5  X1 1+ LDA, X0 1+ ADC, X2 1+ STA,  6  X0 1+ DEC, OFF #B LDY,
  6  X0 1+ DEC, OFF #B LDY,            7  BEGIN,  X1 )Y LDA, X3 STA,
  7  BEGIN,  X1 )Y LDA, X3 STA,        8   X2 X) LDA, X1 )Y STA, X3 LDA,
  8   X2 X) LDA, X1 )Y STA, X3 LDA,    9   X2 X) STA, DEY, X2 INC, EQ
  9   X2 X) STA, DEY, X2 INC, EQ      10  UNTIL,  X2 1+ INC, OFF #B CPY, NE
 10  UNTIL,  X2 1+ INC, OFF #B CPY, NE 11  IF, 0 #B CPY, NE
 11  IF, 0 #B CPY, NE                 12   IF,
 12   IF,                             13    BEGIN,
 13    BEGIN,                         14     X1 )Y LDA, X3 STA, X2 X) LDA,
 14     X1 )Y LDA, X3 STA, X2 X) LDA, 15     X1 )Y STA, X3 LDA, X2 X) STA,
 15     X1 )Y STA, X3 LDA, X2 X) STA, 16     X2 INC, DEY, EQ
 16     X2 INC, DEY, EQ               17    UNTIL,
 17    UNTIL,                         18   ENDIF,
 18   ENDIF,                          19   X1 )Y LDA, X3 STA, X2 X) LDA,
 19   X1 )Y LDA, X3 STA, X2 X) LDA,   20   X1 )Y STA, X1 )Y STA, X3 LDA,
 20   X1 )Y STA, X1 )Y STA, X3 LDA,   21   X2 X) STA,
 21   X2 X) STA,                      22  ENDIF,  X1 1+ INC,
 22  ENDIF,  X1 1+ INC,               23 REPEAT,
 23 REPEAT,
63                                    0 ( 2.REVERSE... ) HEX
  0 ( 2.REVERSE ... ) HEX             1
  1                                   2 X0 LDA, .A LSR, CLC,
  2 X0 LDA, .A LSR, CLC,              3 X0 1+ LDY, NE IF, 80 #B ADC, ENDIF,
  3 X0 1+ LDY, NE IF, 80 #B ADC, ENDIF, 4 TAY,
  4 TAY,                              5 X1 ADC, X2 STA, 0 #B LDA,
  5 X1 ADC, X2 STA, 0 #B LDA,         6 X1 1+ ADC, X2 1+ STA,
  6 X1 1+ ADC, X2 1+ STA,             7 X0 LSR, CS
  7 X0 LSR, CS                        8 IF, X2 INC, EQ IF, X2 1+ INC, ENDIF,
  8 IF, X2 INC, EQ IF, X2 1+ INC, ENDIF, 9 ENDIF,
  9 ENDIF,                           10 BEGIN, DEY, OFF #B CPY, NE
 10 BEGIN, DEY, OFF #B CPY, NE       11 WHILE,
 11 WHILE,                           12  X1 )Y LDA, X3 STA,
 12  X1 )Y LDA, X3 STA,              13  X2 X) LDA, X1 )Y STA,
 13  X2 X) LDA, X1 )Y STA,           14  X3 LDA, X2 X) STA,
 14  X3 LDA, X2 X) STA,              15  X2 INC, EQ IF, X2 1+ INC, ENDIF,
 15  X2 INC, EQ IF, X2 1+ INC, ENDIF, 16 REPEAT,
 16 REPEAT,                          17 XSAVE LDX, <XNEXT> JMP,
 17 XSAVE LDX, <XNEXT> JMP,          18
 18                                  19
 19                                  20
 20                                  21
 21                                  22
 22                                  23
 23
```

```
scr #   64                             0 FRAG 2.QUE ( --)
  0 ( 2.QUE ) HEX                      1 PURPOSE: add a character to key queue
  1                                    2  during pattern search.
  2 FRAG 2.QUE  C010 STA,              3
  3  FF #B CMP, 0 #B ADC,              4 clear keyboard buffer.
  4  7F #B AND, 20 #B CMP, NC
```

```
 5  IF, TAY, HIMEM ,Y LDA, ENDIF,
 6  CHAR LDY, PL
 7  IF, 80 #B ORA, CHAR STA,
 8  ELSE, QIN LDY, KQUE ,Y STA, DEY, MI
 9   IF, 4 #B LDY, ENDIF, QIN STY,
10  ENDIF,  RTS,
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 5 decode key.
 6 if a regular character then add
 7  to key queue.
 8
 9
10 NOTE: A-reg holds C000 value before
11  calling this routine.
12
13
14
15
16
17
18
19
20
21
22
23
```

```
65
 0 ( MATCH ) HEX
 1
 2 FRAG MATCH
 3  X3 STY,  TYA, CLC,
 4  PATT ADC, TAY, PATT LDX,
 5  BEGIN,  DEY, DEX, PL
 6  WHILE,
 7   PATT 1+ ,X LDA, 61 #B CMP, CS
 8   IF, 7B #B CMP, CS
 9    IF, X0 )Y CMP, NE
10     IF, X3 LDY, RTS, ENDIF,
11    ELSE, X0 )Y EOR, ODF #B AND, NE
12     IF, X3 LDY, RTS, ENDIF,
13    ENDIF,
14   ELSE, X0 )Y CMP, NE
15    IF, X3 LDY, RTS, ENDIF,
16   ENDIF,
17  REPEAT,
18  PLA, PLA, XSAVE LDX,
19  CLC, X3 LDA, X0 ADC, 0 SP) STA,
20  0 #B LDA, X0 1+ ADC, 1 SP) STA,
21  <XNEXT> JMP,
22
23
```

```
 0 FRAG MATCH  ( 0 -- 0 | addr )
 1 PURPOSE: compare pattern at PATT to text
 2  at X0+Y.
 3
 4  input:
 5   X0       address of text
 6   Y        offset beyond X0     X3
 7   PATT     length of pattern    X
 8   PATT+1   pattern (X chars)
 9
10  store pattern length + offset in Y
11  store pattern length          in X
12  for each character in pattern
13   get the character from PATT
14   if it is lower case (61 thru 7A)
15    ignore case
16    if it doesn't match restore Y-reg.
17   else: if it doesn't match exactly:
18     restore Y register
19  if all characters match:
20  discard return address (to exit from
21   2.SEEK> or 2.SEEK<).
22  restore X register
23  add offset to address, place on stack
```

```
scr #   66
  0 ( 2.SEEK> ) HEX
  1
  2 ( LEFTSIDE RIGHTSIDE -- ADDR | 0 )
  3 FRAG 2.SEEK>
  4  SEC,
  5  2 SP) LDA, X0 STA, 0 SP) SBC, X5 STA,
  6  3 SP) LDA, X0 1+ STA, 1 SP) SBC,
  7  X5 1+ STA, INX, INX, 0 #B LDA,
  8  0 SP) STA, 1 SP) STA, CS
  9  IF, <XNEXT> JMP, ENDIF,
 10
 11  XSAVE STX, SEC,
 12  0 #B LDA, X5 SBC,  X5 STA,
 13  0 #B LDA, X5 1+ SBC, X5 1+ STA,
 14
 15  PATT 1+ LDA, ODF #B AND, X1 STA,
```

```
 0 FRAG 2.SEEK>
 1 ( leftside rightside -- addr | 0 )
 2 PURPOSE: search for pattern among text
 3  characters from leftside to rightside.
 4
 5  store leftside in X0
 6  store negative of length of text to be
 7   searched in X5
 8  store default 0 on stack
 9  return on negative length
10  save X register
11  negate value in X5
12  store first two characters from PATT
13   in X1 and X2, ignoring case
14
15 NOTE1: 2.SEEK> is exitted when 2.MATCH
```

```
16  PATT 2+ LDA, ODF #B AND, X2 STA,
17
18
19
20
21
22
23
67
  0 ( 2.SEEK> ... ) HEX
  1
  2  BEGIN, X5 LDA, 90 #B CMP,
  3   X5 1+ LDA, 0 #B SBC, CS
  4  WHILE, PATT LDY, DEY, EQ
  5   IF, BEGIN, X0 )Y LDA, ODF #B AND,
  6     X1 CMP, EQ IF, \ MATCH JSR, ENDIF,
  7     INY, MI UNTIL,
  8   ELSE, 1 #B LDY,
  9    BEGIN, X0 )Y LDA, ODF #B AND, X2 CMP,
 10     EQ IF, DEY, X0 )Y LDA, ODF #B AND,
 11     X1 CMP, EQ IF, \ MATCH JSR, ENDIF,
 12     INY, X0 )Y LDA, ODF #B AND, ENDIF,
 13     INY, X1 CMP, EQ
 14     IF, X0 )Y LDA, ODF #B AND, X2 CMP,
 15     EQ IF, DEY, \ MATCH JSR, INY, ENDIF,
 16     ENDIF, INY, MI UNTIL,
 17   ENDIF, CLC,
 18   C000 LDA, MI IF, \ 2.QUE JSR, ENDIF,
 19   X0 LDA, 80 #B ADC, X0 STA, CS
 20   IF, X0 1+ INC, ENDIF, SEC,
 21   X5 LDA, 80 #B SBC, X5 STA, NC
 22   IF, X5 1+ DEC, ENDIF,
 23  REPEAT,
```

```
16  discards the return address of 2.SEEK>
17  or if no match is found.
18
19
20
21
22
23
  0
  1  while there are more than 90 characters
  2   to be searched
  3   for a pattern length of one
  4    compare with 80 text characters
  5     ignoring case
  6    for each match: call MATCH
  7   for a pattern length greater than one
  8    for the first 80 text characters
  9     incrementing two at a time
 10     compare first two pattern characters
 11      ignoring case
 12     for each matched pair: call MATCH
 13   check for key press, call .QUE if need
 14    to add character to key queue after
 15    every 80 characters searched.
 16   increment address of text to be
 17    searched by 80
 18   decrement length to be searched by 80
 19
 20
 21
 22
 23
```

```
scr #   68
  0 ( 2.SEEK> ... ) HEX
  1
  2  0 #B LDY,
  3  BEGIN,
  4   X0 )Y LDA, ODF #B AND, X1 CMP, EQ
  5   IF, \ MATCH JSR, ENDIF,
  6   INY, X5 CPY, EQ
  7  UNTIL,
  8  XSAVE LDX, <XNEXT> JMP,
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
  0
  1  for the last hunk of text
  2   for each character match ignoring
  3    case: call MATCH
  4  match failed
  5  restore X register
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
69
 0 ( 2.SEEK< ) HEX
 1
 2 ( LEFTSIDE RIGHTSIDE --- ADDR OR 0 )
 3 FRAG 2.SEEK<
 4  SEC,
 5  0 SP) LDA, X0 STA, 2 SP) SBC, X5 STA,
 6  1 SP) LDA, X0 1+ STA, 3 SP) SBC,
 7  X5 1+ STA,
 8  INX, INX, 0 #B LDY, 0 SP) STY,
 9  1 SP) STY, NC
10  IF, <XNEXT> JMP, ENDIF,
11  X5 ORA, EQ IF, <XNEXT> JMP, ENDIF,
12  XSAVE STX,
13
14  PATT 1+ LDA, ODF #B AND, X1 STA,
15  PATT 2+ LDA, ODF #B AND, X2 STA,
16
17
18
19
20
21
22
23
```

```
 0 FRAG 2.SEEK<
 1 ( leftside rightside -- addr | 0 )
 2 PURPOSE: search for pattern among text
 3 characters from rightside to leftside.
 4
 5  store rightside in X0
 6  store length of text to be searched
 7   in X5
 8  store default 0 on stack
 9  return on negative or zero length
10  save X register
11  store first two characters from PATT
12   in X1 and X2, ignoring case
13
14
15 NOTE1: 2.SEEK< is exitted when 2.MATCH
16  discards the return address of 2.SEEK<
17  or if no match is found.
18
19
20
21
22
23
```

```
scr #   70
 0 ( 2.SEEK< ... ) HEX
 1
 2  BEGIN, X5 LDA, 90 #B CMP,
 3   X5 1+ LDA, 0 #B SBC, CS
 4  WHILE, X0 LDA, 80 #B SBC, X0 STA, NC
 5   IF, X0 1+ DEC, SEC, ENDIF,
 6   X5 LDA, 80 #B SBC, X5 STA, NC
 7   IF, X5 1+ DEC, ENDIF,
 8   7F #B LDY, PATT LDX, DEX, EQ
 9   IF,
10    BEGIN, X0 )Y LDA, ODF #B AND,
11     X1 CMP, EQ IF, \ MATCH JSR, ENDIF,
12     DEY, MI UNTIL,
13   ELSE, BEGIN, X0 )Y LDA, ODF #B AND,
14     X1 CMP, EQ IF, INY, X0 )Y LDA,
15      ODF #B AND, DEY, X2 CMP, EQ
16      IF, \ MATCH JSR, ENDIF, X0 )Y LDA,
17      ODF #B AND, ENDIF, DEY, X2 CMP, EQ
18     IF, X0 )Y LDA, ODF #B AND, X1 CMP,
19      EQ IF, \ MATCH JSR, ENDIF,
20     ENDIF, DEY, MI UNTIL,
21   ENDIF,
22   C000 LDA, MI IF, \ 2.QUE JSR, ENDIF,
23  REPEAT,
```

```
 0
 1  while there are more than 90
 2   characters to be searched
 3   decrement address of text to be
 4    searched by 80
 5   decrement length to be searched by 80
 6   for a pattern length of one
 7    compare with 80 text characters
 8     ignoring case
 9    for each match: call MATCH
10   for a pattern length greater than one
11    for the first 80 text characters
12     decrementing two at a time
13     compare first two pattern characters
14      ignoring case
15     for each matched pair: call MATCH
16   check for key press and add characters
17    to key queue as necessary after
18    searching every 80 characters.
19
20
21
22
23
```

```
71
 0 ( 2.SEEK< ... ) HEX
 1
 2  X0 LDA, X5 SBC, X0 STA, NC
 3  IF, X0 1+ DEC, ENDIF, X5 LDY,
 4
 5  BEGIN,
 6   X0 )Y LDA, ODF #B AND, X1 CMP, EQ
 7   IF, \ MATCH JSR, ENDIF,
 8   DEY, EQ
 9  UNTIL,
```

```
 0
 1  for less than 90 characters to be
 2   searched
 3   for each character match, ignoring
 4    case: call MATCH
 5  match failed
 6  restore X register
 7
 8
 9
```

```
10
11  XSAVE LDX, <XNEXT> JMP,
12
13
14
15
16
17
18
19
20
21
22
23
```

```
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #   72
  0 ( 2.ADJUST ) HEX
  1 FRAG 2.ADJUST
  2  0 #B LDY, Y1 STY, Y2 STY,
  3  WR    LDA, EOS    CMP,
  4  WR 1+ LDA, EOS 1+ SBC,
  5  WC LDA, Y0 STA, CS
  6  IF, <XNEXT> JMP, ENDIF,
  7  WR ADC, X1 STA, TYA,
  8  WR 1+ ADC, X1 1+ STA, ( X1=LINE END )
  9  BOS LDA, X1 CMP,
 10  BOS 1+ LDA, X1 1+ SBC, CS
 11  IF, ( BOS>=LINE END )
 12   X1 LDA, EBOT SBC, X0 STA,
 13   X1 1+ LDA, EBOT 1+ SBC, NC
 14   IF, <XNEXT> JMP, ENDIF,
 15   X1    LDA, BEOT    CMP,
 16   X1 1+ LDA, BEOT 1+ SBC, CS
 17   IF, <XNEXT> JMP, ENDIF, SEC,
 18   BOS LDA, BEOT SBC, X2 STA,
 19   BOS 1+ LDA, BEOT 1+ SBC, X2 1+ STA,
 20   X2 LDA, X0 SBC,
 21   X2 1+ LDA, 0 #B SBC, CS
 22   IF, <XNEXT> JMP, ENDIF,
 23  ENDIF,
```

```
 0 FRAG 2.ADJUST
 1 PURPOSE: calculates offsets to normal
 2  and inverse fields during display
 3  of a line.
 4
 5 clear Y-reg, Y1 and Y2.
 6 subtract EOS from WR (setting carry).
 7 store wrap count in Y0.
 8 if wrap address >= to EOS then exit.
 9 otherwise add wrap count to wrap address
10  and store answer in X1 (line end).
11 if BOS >= line end (X1) and
12  if EBOT > line end (X1) then exit
13   else store line end (X1) - EBOT in X0.
14  otherwise (BOS still >= line end and)
15  if line end (X1) >= BEOT then exit.
16  otherwise store BOS - BEOT in X2.
17  if (BOS-BEOT) >= (line end-EBOT)
18   then exit.
19
20
21
22
23
```

```
73
  0 ( 2.ADJUST ... ) HEX
  1
  2 BOS LDA, X2 STA,
  3 BOS 1+ LDA, X2 1+ STA,
  4 EOS LDA, X3 STA,
  5 EOS 1+ LDA, X3 1+ STA,
  6 BEOT LDA, X1 CMP,
  7 BEOT 1+ LDA, X1 1+ SBC, CS
  8 IF, X2 LDA, BEOT CMP,
  9  X2 1+ LDA, BEOT 1+ SBC, CS
 10  IF, X2 LDA, GAP SBC, X2 STA,
 11   X2 1+ LDA, GAP 1+ SBC, X2 1+ STA,
 12  ENDIF,
 13  X3 LDA, BEOT CMP,
 14  X3 1+ LDA, BEOT 1+ SBC, CS
 15  IF, X3 LDA, GAP SBC, X3 STA,
 16   X3 1+ LDA, GAP 1+ SBC, X3 1+ STA,
 17  ENDIF,
 18 ENDIF,
 19
```

```
 0
 1 otherwise store BOS in X2 and EOS
 2  in X3.
 3 if BEOT >= line end (X1) and
 4  if BOS (X2) >= BEOT then store BOS -
 5   GAP in X2.
 6 if EOS (X3) >= BEOT then store EOS -
 7   GAP in X3.
 8
 9
10
11
12
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14
15
16
17
18
19
```

```
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23


scr #   74
  0 ( 2.ADJUST ... ) HEX                             0
  1                                                  1 if wrap address >= BOS and
  2 WR LDA, X2 CMP,  ( WRAP>=BOS )                   2  if EOS (X3) >= line end (X1)
  3 WR 1+ LDA, X2 1+ SBC, CS                         3  then store Y0 in Y1
  4 IF, X3 LDA, X1 CMP, ( EOS>=ENDLINE )             4  else store EOS (X1) - wrap address
  5  X3 1+ LDA, X1 1+ SBC, CS                        5   in Y1, Y2.
  6  IF, Y0 LDA, Y1 STA,                             6  store Y-reg in Y0.
  7  ELSE, SEC, X3 LDA, WR SBC, Y1 STA,              7 else (WRAP<BOS)
  8   SEC, X1 LDA, X3 SBC, Y2 STA,                   8  store BOS (X2) - wrap address in Y0,
  9  ENDIF,  Y0 STY,                                 9  if EOS >= line end then
 10 ELSE, SEC, ( WRAP<BOS )                         10   store Y1 with line end (X1) - BOS (X2)
 11  X2 LDA, WR SBC, Y0 STA,                        11 exit
 12  X3 LDA, X1 CMP, ( EOS>=ENDLINE )               12
 13  X3 1+ LDA, X1 1+ SBC, CS                       13
 14  IF, X1 LDA, X2 SBC, Y1 STA,                    14
 15  ELSE, SEC,                                     15
 16   X3 LDA, X2 SBC, Y1 STA, SEC,                  16
 17   X1 LDA, X3 SBC, Y2 STA,                       17
 18  ENDIF,                                         18
 19 ENDIF,                                          19
 20 <XNEXT> JMP,                                    20
 21                                                 21
 22                                                 22
 23                                                 23
75
  0 ( 2.TOBUFF ) HEX                                0 FRAG 2.TOBUFF
  1                                                 1 PURPOSE: convert/move text to display
  2 FRAG 2.TOBUFF                                   2  buffer highlighting selected text.
  3  XSAVE STX,                                     3    CAPS = 0 thru 1F
  4  50 #B LDY, WC CPY, NE                          4    cr = 7F
  5  IF, A0 #B LDA,                                 5   normal text with high bit on
  6   BEGIN, DEY, CURR ,Y STA, WC CPY, EQ           6    cr = A0
  7   UNTIL,                                        7
  8  ENDIF, DEY,                                    8  input:
  9  Y2 LDX, NE                                     9   WC      count of characters from text
 10  IF, WR )Y LDA, 1D #B CMP, EQ                  10   WR      address of text
 11   IF, A0 #B LDA, CURR ,Y STA, DEY, DEX,        11   Y2      count of trailing blanks
 12   ENDIF, NE                                    12   Y1      count of selected text
 13   IF,                                          13   PRINT? flag   true if printing
 14    BEGIN, WR )Y LDA, 80 #B ORA,                14                 false if displaying
 15     CURR ,Y STA, DEY, DEX, EQ                  15   Y0      count of leading normal text
 16    UNTIL,                                      16
 17  ENDIF, ENDIF,                                 17  output:
 18                                                18   CURR display buffer holds converted
 19                                                19    text
 20                                                20
 21                                                21
 22                                                22
 23                                                23


scr #   76
  0 ( 2.TOBUFF ... ) HEX                            0
  1                                                 1
  2 Y1 LDX, NE                                      2
  3 IF, WR )Y LDA, 1D #B CMP, EQ                    3
```

```
 4  IF, 7F #B LDA, CURR ,Y STA, DEY, DEX,
 5  ENDIF, NE
 6  IF,
 7   BEGIN, PRINT? LDA, EQ
 8    IF, WR )Y LDA, 40 #B CMP, CS
 9     IF, 60 #B CMP, NC
10      IF, 1F #B AND, ENDIF,
11     ENDIF,
12    ELSE, WR )Y LDA,
13    ENDIF, CURR ,Y STA,
14    DEY, DEX, EQ
15   UNTIL,
16 ENDIF, ENDIF,
17
18
19
20
21
22
23
```

```
77
 0 ( 2.TOBUFF ... ) HEX
 1
 2 YO LDX, NE
 3 IF, WR )Y LDA, 1D #B CMP, EQ
 4  IF, AO #B LDA, CURR ,Y STA, DEY, DEX,
 5  ENDIF, NE
 6  IF,
 7   BEGIN, WR )Y LDA, 80 #B ORA,
 8    CURR ,Y STA, DEY, MI
 9   UNTIL,
10 ENDIF, ENDIF,
11 XSAVE LDX, <XNEXT> JMP,
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #   78
 0 ( 2.PRESET ) HEX
 1
 2 FRAG 2.PRESET
 3  OLIN LDY, WND2 ,Y LDA, EQ
 4  IF, DEY, ( 1ST LINE ON PAGE) ENDIF,
 5  DEY, MI IF, 0 #B LDY, ENDIF,
 6  CLIN STY, CLC,
 7  CLIN LDA, TOP ADC, LCTR STA,
 8  0 #B LDA, TOP 1+ ADC, LCTR 1+ STA,
 9  WND0 ,Y LDA, WR STA,
10  WND1 ,Y LDA, WR 1+ STA,
11  WND2 ,Y LDA, LCT STA,
12  WND3 ,Y LDA, PCT STA,
13  EBOT    LDA, XO STA,
14  EBOT 1+ LDA, XO 1+ STA,
```

```
 0 2.PRESET
 1 PURPOSE: Decides what line to refresh,
 2  gets variables from window arrays,
 3  moves 82 bytes at BEOT to EBOT to wrap
 4
 5  input: OLIN WND0-3
 6  output: CLIN LCTR WR LCT PCT GAP
 7
 8  OLIN is line# of the last event.
 9  WND2 is page relative line count.
10  If the old line is at the top of a pag
11   wrap beginning with the last line in
12   the preceding page,
13  else wrap beginning with the line abov
14   ie:
```

```
 15  BEOT    LDA, X1 STA,                    15  CLIN = OLIN - 1 (not first line)
 16  BEOT 1+ LDA, X1 1+ STA,  51 #B LDY,     16  CLIN = OLIN - 2 (first line on page)
 17  BEGIN, X1 )Y LDA, X0 )Y STA, DEY, MI    17  CLIN = 0 (first line in text)
 18  UNTIL, SEC,                             18  LCTR = TOP + CLIN
 19  BEOT LDA, EBOT SBC, GAP STA,            19  WR   = CLINth element in WND0 and WND1
 20  BEOT 1+ LDA, EBOT 1+ SBC, GAP 1+ STA,   20  LCT  = "                  WND2
 21  <XNEXT> JMP,                            21  PCT  = "                  WND3
 22                                          22  Move 82 bytes at BEOT to EBOT.
 23                                          23  GAP = BEOT - EBOT
79
  0 ( 2.40COL 2.MON 2.ABOOT ) HEX            0 FRAG 2.40COL
  1                                          1 PURPOSE: set 40 column display.
  2 FRAG 2.40COL                             2
  3  C051 LDA, C00E STA,                     3 FRAG 2.ABOOT
  4  C056 LDA, C00C STA,                     4 PURPOSE: boot apple disk.
  5  C054 LDA, C000 STA,                     5
  6  F0 #B LDA,  36 STA,                     6 FRAG 2.MON
  7  FD #B LDA,  37 STA,                     7 PURPOSE: go to monitor from SWYFTCARD.
  8  FF #B LDA,  32 STA,                     8
  9  0 #B LDA, 24 STA, 25 STA, RTS,          9
 10                                         10
 11 FRAG 2.ABOOT   \ 2.40COL JSR,           11
 12  0 #B LDA, 3F4 STA, 39E STA, 3E0 JMP,   12
 13                                         13
 14 ( copy text & variables to main ram )   14
 15 FRAG 2.MON    \ 2.40COL JSR, FFF8 LDA,  15
 16  EQ IF,  3C STA, 3D STA, 42 STA, 43 STA, 16
 17   EBOT LDA, 3E STA,                     17
 18   EBOT 1+ LDA, 3F STA,  CLC, C311 JSR,  18
 19   BEOT LDA, 3C STA, 42 STA,             19
 20   BEOT 1+ LDA, 3D STA, 43 STA,          20
 21   FF LDA, 3E STA,                       21
 22   BF #B LDA, 3F STA,   CLC, C311 JSR,   22
 23  ENDIF, <MON> JMP,                      23
```

```
scr #   80
  0 ( 2.<READ> )   HEX                       0 2.<READ>  ( -- )
  1                                          1 PURPOSE: read a track (located by SEEK)
  2 FRAG 2.<READ>                            2   to ram (B3F0 through BFFF)
  3  XSAVE STX, F0 #B LDY,                   3   including a 16 byte preface
  4  0 #B LDA, X0 STA, B3 #B LDX,            4
  5  X0 1+ STX, C0 #B LDA, X5 STA, CLV,      5
  6  SEI,                                    6
  7  BEGIN,                                  7
  8   BEGIN, C0EC LDA, MI UNTIL,             8
  9   BEGIN, SWAP                            9
 10    BEGIN, SWAP ED #B CMP, EQ UNTIL,     10
 11    BEGIN, C0EC LDA, MI UNTIL,           11
 12    DE #B CMP, EQ                        12
 13   UNTIL, BEGIN, C0EC LDA, MI UNTIL,     13
 14   DA #B CMP, EQ                         14
 15  UNTIL,                                 15
 16  BEGIN,                                 16
 17   BEGIN, C0EC LDA, MI UNTIL,            17
 18   SEC, .A ROL, X2 STA, 0FF #B CPY, EQ   18
 19   IF, INX, X5 CPX, -1 DP +! ELSE,       19
 20   X5 HERE 3 - C! CLC, ENDIF,            20
 21   BEGIN, C0EC LDA, MI UNTIL,            21
 22   X2 AND, X0 )Y STA, INY, X0 1+ STX, CS 22
 23  UNTIL, XSAVE LDX, CLI, <XNEXT> JMP,    23
```

```
81
  0 ( *100US PHSW PHSW2 ONDL OFFDL ) HEX
  1
  2 FRAG *100US
  3  BEGIN, 11 #B LDX,
  4   BEGIN, DEX, EQ UNTIL,
  5   NOP, NOP, NOP, NOP, SEC, 1 #B SBC, EQ
  6  UNTIL,  RTS,
  7
  8 FRAG PHSW  TRACK LDA,
  9 FRAG PHSW2 3 #B AND, .A ROL, TAX,
 10  C0E0 ,X LDA, RTS,
 11
 12 FRAG ONDL
 13  3001 , 2428 , 1E20 , 1C1D , 1C1C ,
 14  1C1C ,
 15
 16 FRAG OFFDL
 17  2C70 , 2226 , 1E1F , 1C1D , 1C1C ,
 18  1C1C ,
 19
 20 FRAG DL12  RTS,
 21
 22 FRAG WB30 NOP, PHA, PLA, C0ED ,X STA,
 23  C0EC ,X CMP, RTS,
```

```
 0 FRAG *100US ( A-reg --)
 1 PURPOSE: delay by value in A-reg times
 2  100us.
 3
 4 FRAG PHSW  TRACK LDA,
 5 LABEL PHSW2 3 #B AND, .A ROL, TAX,
 6  C0E0 ,X LDA, RTS,
 7
 8 FRAG ONDL
 9  3001 , 2428 , 1E20 , 1C1D , 1C1C ,
10  1C1C ,
11
12 FRAG OFFDL
13  2C70 , 2226 , 1E1F , 1C1D , 1C1C ,
14  1C1C ,
15
16 FRAG DL12  ( -- )
17   delay 12 machine cycles
18
19 FRAG WB30  ( -- )
20   write a byte in 30 machine cycles
21
22
23
```

```
scr #   82
  0 ( 2.<WRITE> ) HEX
  1
  2 FRAG 2.<WRITE> XSAVE STX, 0D #B LDA,
  3  X5 STA, B3 #B LDY, X0 1+ STY, CLV,
  4  0 #B LDX, X0 STX,
  5  0F0 #B LDY, TYA, PHA,
  6  SEI,
  7  C0ED ,X LDA, C0EE ,X LDA, 0 #B LDY,
  8  0FF #B LDA, C0EF ,X STA, C0EC ,X CMP,
  9  PHA, PLA,
 10  BEGIN, \ DL12 JSR, \ DL12 JSR,
 11   C0ED ,X STA, C0EC ,X CMP, NOP, DEY, EQ
 12  UNTIL, ED #B LDA, \ WB30 JSR,
 13  DE #B LDA, \ WB30 JSR, \ DL12 JSR,
 14   X0 LDA,
 15  DA #B LDA, C0ED ,X STA, C0EC ,X CMP,
 16  PLA, TAY,
 17
 18
 19
 20
 21
 22
 23
```

```
 0 FRAG 2.<WRITE>  ( -- )
 1  write a track (32 cycles per byte)
 2  from ram (B3F0 through BFFF)
 3  including:
 4   256 self-sync (40 cycle) bytes
 5   an EDDE header (ED DE DA)
 6   a 16 byte preface
 7   a 3K track image
 8
 9  soft switches:
10   C0ED, C0EC write a byte
11   C0ED, C0EE sense write protect
12   C0EF set mode to write
13
14  start code at a page boundary
15
16
17
18
19
20
21
22
23
```

```
83
  0 ( 2.<WRITE> ... ) HEX
  1
  2  BEGIN, X0 LDA, X0 )Y LDA, PHA, .A LSR,
  3   AA #B ORA, NOP, C0ED ,X STA,
  4   C0EC ,X CMP, INY, EQ
  5   IF, X0 1+ INC, X5 DEC,
  6   -1 DP +! ELSE,
  7   X5 HERE 3 - C! \ DL12 JSR,
  8   ENDIF,
  9   PLA, AA #B ORA, C0ED ,X STA,
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
```

```
10   COEC ,X CMP, X5 LDA, EQ
11  UNTIL,
12  NOP, NOP, \ DL12 JSR,
13  DA #B LDA, COED ,X STA, COEC ,X CMP,
14  NOP, NOP, NOP,
15  DE #B LDA, \ WB30 JSR,
16  FF #B LDA, \ WB30 JSR, X0 LDA, NOP,
17  \ DL12 JSR, COEE ,X LDA,
18  XSAVE LDX,
19  CLI, <XNEXT> JMP,
20
21 A0 ?FITS
22
23
```

```
scr #   84
  0 ( 2.<SEEK> ) HEX
  1
  2 FRAG 2.<SEEK> 0 SP) LDA, X2 STA,
  3  INX, INX, XSAVE STX, TRACK CMP, EQ
  4  IF, <XNEXT> JMP, ENDIF,
  5  0 #B LDA, X0 STA,
  6  SEI,
  7  BEGIN, TRACK LDA, X1 STA, SEC,
  8   X2 SBC, NE
  9  WHILE, NC
 10   IF, OFF #B EOR, TRACK INC,
 11   ELSE, OFE #B ADC, TRACK DEC,
 12   ENDIF,
 13   X0 CMP, CS IF, X0 LDA, ENDIF,
 14   0C #B CMP, NC IF, TAY, ENDIF, SEC,
 15   \ PHSW JSR, NOP, \ ONDL ,Y LDA, NOP,
 16   \ *100US JSR, X1 LDA, CLC,
 17   \ PHSW2 JSR, \ OFFDL ,Y LDA,
 18   \ *100US JSR, X0 INC, EQ
 19  UNTIL, HERE OVER - 1- SWAP C!
 20  \ *100US JSR, CLC, \ PHSW JSR,
 21  CLI,
 22  XSAVE LDX, <XNEXT> JMP,
 23
```

```
85
  0 ( 2.?EDDE ) HEX
  1
  2 FRAG 2.?EDDE 0 #B LDY, DEX, DEX,
  3  XSAVE STX, 0 SP) STY, 1 SP) STY,
  4  20 #B LDX, SEI,
  5  BEGIN,
  6   BEGIN,
  7    BEGIN, DEY, EQ
  8     IF, DEX, EQ
  9      IF, XSAVE LDX, CLI, <XNEXT> JMP,
 10      ENDIF,
 11     ENDIF,
 12     BEGIN, COEC LDA, MI UNTIL,
 13     0ED #B CMP, EQ UNTIL,
 14    BEGIN, COEC LDA, MI UNTIL,
 15    DE #B CMP, EQ UNTIL,
 16   BEGIN, COEC LDA, MI UNTIL,
 17   DA #B CMP, EQ UNTIL,
 18  XSAVE LDX, 0 SP) INC,
 19  CLI, <XNEXT> JMP,
```

```
 0 FRAG 2.<SEEK> ( t --)
 1 PURPOSE: seek to track t.
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 FRAG 2.?EDDE  ( -- flag )
 1 PURPOSE: checks disk for EDDE header.
 2 true means the disk was written by
 3  EDDE, which means that on that track
 4  can be found the bytes: ED DE DA.
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
```

```
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23


scr #   86
  0 ( 2.?APPLE )  HEX                                0 FRAG 2.?APPLE  ( -- flag )
  1                                                  1 PURPOSE: check disk for Apple header.
  2 FRAG 2.?APPLE  DEX, DEX, XSAVE STX,              2 true means initialized by Apple DOS
  3  0 #B LDY, 0 SP) STY, 1 SP) STY,                 3  (see ?EDDE).
  4  7C #B LDX, 20 #B LDA, Y0 STA,                   4
  5  SEI,                                            5
  6  BEGIN, DEY, EQ                                  6
  7   IF, Y0 DEC, EQ                                 7
  8    IF, XSAVE LDX, CLI, <XNEXT> JMP,              8
  9    ENDIF,                                        9
 10   ENDIF,                                         10
 11   BEGIN, C070 ,X LDA, MI UNTIL,                  11
 12   BEGIN, SWAP                                    12
 13    BEGIN, SWAP D5 #B CMP, EQ UNTIL,              13
 14    BEGIN, C070 ,X LDA, MI UNTIL,                 14
 15    AA #B CMP, EQ UNTIL,                          15
 16   BEGIN, C070 ,X LDA, MI UNTIL,                  16
 17   96 #B CMP, EQ UNTIL,                           17
 18  XSAVE LDX, 0 SP) INC,                           18
 19  CLI, <XNEXT> JMP,                               19
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23
87
  0 ( 2.CMOVE2 from bank2 to B400 )                  0 FRAG 2.CMOVE2  ( a(hi) -- )  cmove from
  1                                                  1  bank to B400
  2 FRAG 2.CMOVE2                                    2
  3  0 #B LDA, X0 STA, X1 STA, TAY,                  3
  4  1 SP) LDA, X0 1+ STA,                           4
  5  B4 #B LDA, X1 1+ STA,                           5
  6  INX, INX, XSAVE STX, 0C #B LDX,                 6
  7  BEGIN,                                          7
  8  BEGIN, X0 )Y LDA, X1 )Y STA, INY, EQ            8
  9  UNTIL, X0 1+ INC, X1 1+ INC, DEX, EQ            9
 10  UNTIL,                                          10
 11  XSAVE LDX, <XNEXT> JMP,                         11
 12                                                  12
 13 FRAG 2.CHECKSUM ( -- # )                        13 2.CHECKSUM ( -- # )
 14  F0 #B LDY, B3 #B LDA, X0 1+ STA,               14   calculate the EXCLUSIVE-OR checksum
 15  0 #B LDA, X0 STA,                              15   for the ram buffer (B3F0 through BFFF)
 16  PHA, BEGIN, PLA,                               16
 17   BEGIN, X0 )Y EOR, INY, EQ UNTIL,              17 NOTE: if the checksum byte is zero,
 18   PHA, X0 1+ INC, X0 1+ LDA,                    18   and the checsum is placed there,
 19   C0 #B CMP, EQ UNTIL,                          19   the new checksum will be zero
 20  DEX, DEX, PLA, 0 SP) STA,                      20
 21  0 #B LDA, 1 SP) STA, <XNEXT> JMP,              21
 22                                                  22
 23                                                  23


scr #   88
  0 ( 2.?UPDATE )  HEX                               0 FRAG 2.?UPDATE ( line# -- flag )
  1                                                  1 PURPOSE: update line in window array.
  2 FRAG 2.?UPDATE   0 SP) LDY,                      2  true means changed.
```

```
 3  WR LDA, WND0 ,Y CMP, EQ
 4  IF, WR 1+ LDA, WND1 ,Y CMP, EQ
 5   IF, LCT LDA, WND2 ,Y CMP, EQ
 6    IF, PCT LDA, WND3 ,Y CMP, EQ
 7     IF, 0 #B LDA, 0 SP) STA, 1 SP) STA,
 8      <XNEXT> JMP,
 9  ENDIF, ENDIF, ENDIF, ENDIF,
10  WR    LDA, WND0 ,Y STA,
11  WR 1+ LDA, WND1 ,Y STA,
12  LCT LDA, WND2 ,Y STA,
13  PCT LDA, WND3 ,Y STA,
14  OFF #B LDA, 0 SP) STA, 1 SP) STA,
15  <XNEXT> JMP,
16
17
18
19
20
21
22
23
89
 0 ( 2.WRITE0 image ) HEX
 1
 2 FRAG 2.WRITE0  XSAVE STX,
 3  SEI, 60 #B LDX, C08D ,X LDA,
 4  C08E ,X LDA, 0 #B LDA,
 5  TAY, X0 STA, X1 STA, C #B LDA, X2 STA,
 6  FF #B LDA, C08F ,X STA, C08C ,X CMP,
 7  DE #B LDA, X0 1+ STA, X0 1+ STA,
 8  DF #B LDA, X1 1+ STA,
 9  BEGIN,
10   BEGIN, NOP, X0 )Y LDA, PL          ( 7)
11    IF, PHA, PLA, FF #B LDA,       ( 3/11)
12    ENDIF, C08D ,X STA, C08C ,X ORA, ( 9)
13    X0 LDA, X0 LDA, NOP, INY, EQ     ( 10)
14   UNTIL,                           ( 2/3)
15   BEGIN, X0 LDA, X1 )Y LDA, PL       ( 8)
16    IF, PHA, PLA, FF #B LDA,       ( 3/11)
17    ENDIF, C08D ,X STA, C08C ,X ORA, ( 9)
18    PHA, PLA, INY, EQ                ( 9)
19   UNTIL, NOP, X2 DEC, EQ           ( 7/3)
20  UNTIL,                            ( 2/3)
21  C08E ,X LDA,
22  XSAVE LDX, CLI, <XNEXT> JMP,
23 62 ?FITS
```

```
 3
 4 Y-reg holds the line#.
 5 if the address of the line, the line on
 6  the page and the current page have not
 7  changed then put a 0 on the stack and
 8  exit.
 9 otherwise (the address, line or page
10  have changed) update that element in
11  the window array and put a -1 on the
12  stack.
13
14
15
16
17
18
19
20
21
22
23
 0 FRAG 2.WRITE0
 1 PURPOSE: write boot 0 track to disk.
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #   90
 0 ( 2.NUDGE ) HEX ;S
 1
 2 FRAG 2.NUDGE -
 3  0 #B LDY, 0 SP) LDA, X0 STA,
 4  1 SP) LDA, X0 1+ STA, INX, INX,
 5  BEGIN,  EBOT LDA, PGS0 ,Y CMP,
 6   EBOT 1+ LDA, PGS1 ,Y SBC, CS
 7   IF, CLC,
 8    PGS0 ,Y LDA, X0 ADC, PGS0 ,Y STA,
 9    PGS1 ,Y LDA, X0 1+ ADC, PGS1 ,Y STA,
10    SEC,
11   ENDIF, INY, NC
12  UNTIL,
13  WND0 LDA, X0 ADC, WND0 STA,
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
```

```
 14  WND1 LDA, X0 1+ ADC, WND1 STA, CLC,
 15  BOS LDA, X0 ADC, BOS STA,
 16  BOS 1+ LDA, X0 1+ ADC, BOS 1+ STA, CLC,
 17  EOS LDA, X0 ADC, EOS STA,
 18  EOS 1+ LDA, X0 1+ ADC, EOS 1+ STA, CLC,
 19  BOT LDA, X0 ADC, BOT STA,
 20  BOT 1+ LDA, X0 1+ ADC, BOT 1+ STA, CLC,
 21  EBOT LDA, X0 ADC, EBOT STA,
 22  EBOT 1+ LDA, X0 1+ ADC, EBOT 1+ STA,
 23  <XNEXT> JMP,
91
  0 ( 2.SERIAL# ) HEX
  1
  2 FRAG .SERIAL#   0 #B LDY,
  3  BEGIN, DEY, NE
  4  WHILE, X0 )Y LDA,
  5   CLC, X2 ADC, X2 STA, CS
  6   IF, X2 1+ INC, ENDIF,
  7   X2 1+ LDA, .A ROL,
  8   X2 LDA,     .A ROL, X2 STA,
  9   X2 1+ LDA, .A ROL, X2 1+ STA,
 10  REPEAT, RTS,
 11
 12 FRAG 2.SERIAL#  ( -- # )
 13  0 #B LDA, X2 STA, X2 1+ STA,
 14  EBOT LDA, EBOT 1+ LDY,
 15  X0 STA, X0 1+ STY,
 16  \ .SERIAL# JSR,
 17  X0 1+ INC,
 18  \ .SERIAL# JSR,
 19  DEX, DEX, X2 LDA, 0 SP) STA,
 20  X2 1+ LDA, 1 SP) STA,
 21  <XNEXT> JMP,
 22
 23
```

```
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23

  0 FRAG .SERIAL#
  1 PURPOSE: calculate a unique number.
  2
  3
  4
  5
  6
  7
  8 LABEL 2.SERIAL#  ( -- # )
  9 PURPOSE: calculate a unique number to
 10  place on a disk.
 11
 12  start with a seed of 0
 13  start with 100 hex bytes below cursor
 14   modify the seed with those bytes
 15  end with 100 hex bytes above cursor
 16   modify the seed with those bytes
 17  store the result on the stack
 18
 19
 20
 21
 22
 23
```

```
scr #   92
  0 ( .DECIMATE ) HEX ( later: y0,1 -> x1-5)
  1
  2 FRAG .DECIMATE
  3  0 #B LDA, PHA,
  4  PCT LDA,  CLC, PAGE% ADC, X1 STA,
  5  PCT 1+ LDA, PAGE% 1+ ADC, X2 STA,
  6  80 #B AND, NE
  7  IF, PLA, FF #B LDA, PHA,
  8   X1 EOR,        CLC, 1 #B ADC, X1 STA,
  9   X2 LDA, FF #B EOR, 0 #B ADC, X2 STA,
 10  ENDIF,
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
  0 FRAG .DECIMATE  ( -- )
  1 PURPOSE: subroutine convert hex number
  2  in register to ascii characters
  3  in place.
  4
  5  Y    high order byte   X1
  6  A    low               X2
  7
  8  X3   ten thousands
  9  X4   thousands
 10  X5   hundreds
 11  Y0   tens
 12  Y1   ones
 13  X1   -1 is negative, 0 is positive
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
93
 0 ( .DECIMATE ... )   HEX                    0
 1                                            1
 2  SEC, OFF #B LDY,                          2
 3  BEGIN, INY, X1 LDA, 10 #B SBC, X1 STA,    3
 4  X2 LDA, 27 #B SBC, X2 STA, NC UNTIL,      4
 5  X1 LDA, 10 #B ADC, X1 STA,                5
 6  X2 LDA, 27 #B ADC, X2 STA, TYA,           6
 7  30 #B ORA, X3 STA, SEC, OFF #B LDY,       7
 8  BEGIN, INY, X1 LDA, E8 #B SBC, X1 STA,    8
 9  X2 LDA, 03 #B SBC, X2 STA, NC UNTIL,      9
10  X1 LDA, E8 #B ADC, X1 STA,               10
11  X2 LDA, 03 #B ADC, X2 STA, TYA,          11
12  30 #B ORA, X4 STA, SEC, OFF #B LDY,      12
13  BEGIN, INY, X1 LDA, 64 #B SBC, X1 STA,   13
14  X2 LDA, 00 #B SBC, X2 STA, NC UNTIL,     14
15  X1 LDA, 64 #B ADC, PHA,                  15
16  TYA, 30 #B ORA, X5 STA,                  16
17  SEC, OFF #B LDY, PLA,                    17
18  BEGIN, INY, 0A #B SBC, NC UNTIL,         18
19  0A #B ADC, 30 #B ORA, Y1 STA,            19
20  TYA, 30 #B ORA, Y0 STA,                  20
21  PLA, X1 STA, RTS,                        21
22                                           22
23                                           23
```

```
scr #   94
 0 ( 2.PAGEPRINT ) HEX                       0 FRAG 2.PAGEPRINT  ( -- )
 1 FRAG 2.PAGEPRINT   XSAVE STX,             1 PURPOSE: print number at bottom of page.
 2  W/2 LDA, MARGIN% ADC, .BL ADC, X2 STA,   2
 3  X2 DEC,                                  3  input: W/2 MARGIN% PCT PAGE%
 4  BEGIN, 20 #B LDX, <LEMIT2> JSR, X2 DEC,  4
 5  EQ UNTIL, \ .DECIMATE JSR, X1 LDX, NE    5  add MARGIN% to W/2
 6  IF, 2D #B LDX, <LEMIT2> JSR, ENDIF,      6  add PCT to PAGE%, all 16 bits
 7  X3 LDX, 30 #B CPX, NE                    7  convert to decimal ascii characters
 8  IF, <LEMIT2> JSR, X4 LDX, <LEMIT2> JSR,  8  replace Apple output vector
 9    X5 LDX, <LEMIT2> JSR,                  9   with printer driver
10    Y0 LDX, <LEMIT2> JSR,                 10  print half a line of blanks
11  ELSE, X4 LDX, 30 #B CPX, NE             11  print page number ascii characters
12   IF, <LEMIT2> JSR,                      12  restore output vector
13    X5 LDX, <LEMIT2> JSR,                 13
14    Y0 LDX, <LEMIT2> JSR,                 14
15   ELSE, X5 LDX, 30 #B CPX, NE            15
16    IF, <LEMIT2> JSR,                     16
17     Y0 LDX, <LEMIT2> JSR,                17
18    ELSE, Y0 LDX, 30 #B CPX, NE           18
19     IF, <LEMIT2> JSR,                    19
20  ENDIF, ENDIF, ENDIF, ENDIF,             20
21  Y1 LDX, <LEMIT2> JSR,                   21
22  0D #B LDX, <LEMIT2> JSR,                22
23  XSAVE LDX, <XNEXT> JMP,                 23
```

```
95
 0 ( 2.SHOWPAGE ) HEX                        0 FRAG 2.SHOWPAGE  ( -- )
 1                                           1 PURPOSE: display page break symbols and
 2 FRAG 2.SHOWPAGE  WR LDA, EOT CMP, EQ      2  page number.
 3  IF,  WR 1+ LDA, EOT 1+ CMP, EQ           3
 4   IF, ( 4F #B LDY, A0 #B LDA,     scroll  4  if WRAP got to end of text,
 5    BEGIN, CURR ,Y STA, DEY, MI   problem? 5   issue a line of spaces
 6    UNTIL, ) <XNEXT> JMP,                  6  Y register holds pagebreak symbol
 7  ENDIF, ENDIF,                            7  if wrap count is zero,
 8  0BD #B LDY, WC LDA, EQ                   8   use  implicit symbol: "-" (ascii AD),
 9  IF, AD #B LDY, ENDIF, SEC,               9   else explicit symbol: "=" (ascii BD)
```

```
10  WR LDA, BOS SBC, X2 STA,
11  WR 1+ LDA, BOS 1+ SBC, X2 1+ STA, CS
12  IF, WR LDA, EOS CMP,
13   WR 1+ LDA, EOS 1+ SBC, NC
14   IF, TYA, 80 #B EOR, TAY, ENDIF,
15  ENDIF,
16  X2 LDA, X2 1+ ORA, EQ
17  IF, WC LDA, EQ IF, AD #B LDY, ENDIF,
18  ENDIF,
19  TYA, 4F #B LDY, CLC,
20  BEGIN, CURR ,Y STA, DEY, MI UNTIL,
21  80 #B AND, X0 STA,
22
23
```

```
10  if WR is equal to or greater than BOS
11   if WR less than EOS
12    toggle high bit (80) of symbol
13     (make highlighted)
14  if WR is equal to BOS,
15   if wrap count zero,
16    use implicit symbol: "-" (ascii AD)
17  fill CURR with symbol
18  strip high bit (80) of symbol
19   (highlighting bit: false=highlight)
20   and store it in X0
21  place decimal page number in center
22   with a space on either side
23
```

```
scr #   96
 0 ( 2.SHOWPAGE ... ) HEX
 1
 2  \ .DECIMATE JSR,   25 #B LDY,
 3  20 #B LDA, X0 ORA, CURR ,Y STA, INY,
 4  X1 LDA, NE IF,
 5   2D #B LDA, X0 ORA, CURR ,Y STA, INY,
 6  ENDIF, X3 LDA, 30 #B CMP, NE
 7  IF,       X0 ORA, CURR ,Y STA, INY,
 8   X4 LDA, X0 ORA, CURR ,Y STA, INY,
 9   X5 LDA, X0 ORA, CURR ,Y STA, INY,
10   Y0 LDA, X0 ORA, CURR ,Y STA, INY,
11  ELSE, X4 LDA, 30 #B CMP, NE
12   IF,       X0 ORA, CURR ,Y STA, INY,
13    X5 LDA, X0 ORA, CURR ,Y STA, INY,
14    Y0 LDA, X0 ORA, CURR ,Y STA, INY,
15   ELSE, X5 LDA, 30 #B CMP, NE
16    IF,       X0 ORA, CURR ,Y STA, INY,
17     Y0 LDA, X0 ORA, CURR ,Y STA, INY,
18    ELSE, Y0 LDA, 30 #B CMP, NE
19     IF, X0 ORA, CURR ,Y STA, INY,
20  ENDIF, ENDIF, ENDIF, ENDIF,
21  Y1 LDA, X0 ORA, CURR ,Y STA, INY,
22  20 #B LDA, X0 ORA, CURR ,Y STA,
23  <XNEXT> JMP,
97
 0 ( 2.@K 2.?X ) HEX
 1
 2 FRAG 2.@K  DEX, DEX,
 3  0 #B LDY, 1 SP) STY,
 4  CHAR LDA, 7F #B AND,
 5  0 SP) STA, CHAR STA,
 6  QOUT LDY, QIN CPY, NE
 7  IF, KQUE ,Y LDA, DEY, MI
 8   IF, 4 #B LDY, ENDIF, QOUT STY,
 9   80 #B ORA, CHAR STA,
10  ENDIF, <XNEXT> JMP,
11
12 FRAG 2.?X ( LEX OR REX? )
13  DEX, DEX, 0 #B LDY, 1 #B LDA,
14  C061 BIT, MI
15  IF, DEY, C062 BIT, MI
16   IF, XFLAG LDA, 3 #B ORA, ENDIF,
17  ELSE, C062 BIT, MI
18   IF, DEY, 2 #B LDA, ENDIF,
19  ENDIF,
20  XFLAG STA, 0 SP) STY, 1 SP) STY,
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 FRAG 2.@K  ( -- char )
 1 PURPOSE: process keyboard character.
 2 inputs: CHAR KQUE QIN QOUT LASTC
 3 outputs: CHAR SAVED? QOUT
 4
 5  place contents of CHAR on stack
 6  with its high bit clear
 7  compare it to the last char, LASTC
 8  if the same
 9   is it a control W?
10   if it is, set SAVED?
11  else, clear SAVED?
12  clear the high bit in CHAR
13  check if the key queue is empty
14  if it isn't
15   grab one character,
16   set its high bit
17   store it in CHAR
18   decrement queue index
19
20 LABEL 2.?X ( -- mask | lex or rex? )
```

```
 21  <XNEXT> JMP,
 22
 23
```

```
 21 PURPOSE: process lex/rex keys.
 22  bit 0 = C061
 23  bit 1 = C062
```

```
scr #   98
  0 ( 2.V ) HEX
  1
  2 FRAG 2.V   1 SP) LDA, X0 STA,
  3  0 SP) LDA, X0 1+ STA,
  4  BASIC0 69 + LDA, X1 STA,
  5  BASIC0 6A + LDA, X1 1+ STA,
  6  BASIC0 6B + LDA, X2 STA,
  7  BASIC0 6C + LDA, X2 1+ STA,
  8  0 #B LDY,
  9  BEGIN, X1 )Y LDA, X0 CMP, EQ
 10   IF, INY, X1 )Y LDA, X0 1+ CMP, EQ
 11    IF, CLC, X1 LDA, 2 #B ADC,
 12     0 SP) STA, X1 1+ LDA, 0 #B ADC,
 13     1 SP) STA, <XNEXT> JMP,
 14   ENDIF, DEY, ENDIF,
 15   CLC, X1 LDA, 7 #B ADC, X1 STA, CS
 16   IF, X1 1+ INC, ENDIF,
 17   CLC, X1 LDA, X2 CMP, CS
 18   IF, X1 1+ LDA, X2 1+ CMP, ENDIF, CS
 19  UNTIL, 0 #B LDA, 0 SP) STA, 1 SP) STA,
 20  <XNEXT> JMP,
 21
 22
 23
```

```
 0 FRAG 2.V  ( char-pair -- addr | 0 )
 1 PURPOSE: locate the BASIC variable
 2  identified by its unique character
 3  pair.
 4
 5  set each high bit, reverse byte order
 6  find area BASIC placed them in
 7  look for that byte pattern
 8   found: return address
 9   not: return 0
10  both integers and string pointers
11   are 7 bytes long,
12   so skip 7 bytes for each test
13
14
15
16
17
18
19
20
21
22
23
```

```
99
  0 ( 2.@M ) ;S
  1
  2 ( -- char |   remove one character from
  3 the modem queue to the stack.  If the
  4 buffer was full, RSTAT=FF, then send a
  5 control-S when it is half empty )
  6
  7 FRAG 2.@M  DEX, DEX, MQOUT LDY,
  8  MQUE ,Y LDA, 0 SP) STA,
  9  INY, MQOUT STY,
 10  RSTAT LDA, NE
 11  IF, SEC, MQOUT LDA, MQIN SBC, PL
 12   IF, 11 #B LDY,   ( send control Q )
 13    BEGIN, C0A9 LDA, 10 #B AND, NE
 14    UNTIL, C0A8 STY,
 15    0 #B LDA, RSTAT STA,
 16  ENDIF, ENDIF,
 17  0 #B LDA, 1 SP) STA,
 18  <XNEXT> JMP,
 19
 20
 21
 22
 23
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
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17
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```

```
scr #  100
  0 ( 2.ENDWRAP ) HEX
  1
  2 FRAG 2.ENDWRAP   DEX, DEX, 0FF #B LDY,
  3  WR LDA, WC ADC, WR STA, CS
  4  IF, WR 1+ INC, ENDIF,  EBOT CMP,
```

```
 0 FRAG 2.ENDWRAP  ( -- flag )
 1 PURPOSE: point wrap address (WR) to the
 2  beginning of the next line.
 3 update PCT LCT LCTR CLIN.
 4
```

```
 5  WR 1+ LDA, EBOT 1+ SBC, CS
 6  IF, INY,
 7   WR LDA, BEOT CMP,
 8   WR 1+ LDA, BEOT 1+ SBC, NC
 9   IF, WR LDA, GAP ADC, WR STA,
10    WR 1+ LDA, GAP 1+ ADC, WR 1+ STA,
11  ENDIF, ENDIF,
12  WR    LDA, EOT CMP,
13  WR 1+ LDA, EOT 1+ SBC, CS
14  IF, EOT LDA, WR STA,
15      EOT 1+ LDA, WR 1+ STA,
16  ENDIF, 0 SP) STY, 1 SP) STY,
17  PAGEFLAG LDY, EQ
18  IF, PCT INC, LCT STY,
19  ELSE, LCT INC,
20  ENDIF, CLIN INC,
21  LCTR INC, EQ IF, LCTR 1+ INC, ENDIF,
22  <XNEXT> JMP,
23
```

```
 5  add WC to WR
 6  if WR is past EBOT set false and
 7   if WR is not past BEOT then
 8    add GAP ...
 9    set WR that much past BEOT
10    (ie, EBOT < WR < BEOT)
11  if WR goes past text
12   set WR to end of text
13  if PAGEFLAG is false (was set by WRAP)
14   then: increment PCT, set LCT to zero
15   else: increment LCT
16  increment CLIN, LCTR
17
18
19 NOTE1: WRAP sets PAGEFLAG
20  true=PAGEFLAG=no page break generated.
21 NOTE2: WC set by WRAP, SHOWPAGE.
22
23
```

```
101
 0 ( 2.SETMODEM ) HEX
 1
 2 FRAG 2.SETMODEM
 3  0 #B LDA, SSC? STA, SSC? 1+ STA,
 4  C205 LDA, 38 #B CMP, NE
 5  IF, <XNEXT> JMP, ENDIF,
 6  C20C LDA, 31 #B CMP, NE
 7  IF, <XNEXT> JMP, ENDIF,
 8  FF #B LDA, SSC? STA, SSC? 1+ STA,
 9  0  #B LDA, C0A9 STA,
10  SEND% LDA, C0AA STA,
11  SEND% 1+ LDA, C0AB STA,
12  0  #B LDA, TSTAT STA, RSTAT STA,  CLI,
13  <XNEXT> JMP,
14
15
16
17
18
19
20
21
22
23
```

```
 0 FRAG 2.SETMODEM  ( -- )
 1 PURPOSE: initialize 6551 on super serial
 2  card for use with modem.
 3
 4  if a super serial card isn't in slot 2
 5   (C205 = 38 and C20C = 31) then set
 6   SSC? to 0 and exit.
 7  else, set SSC? to -1.
 8   clear transmit (C0A9).
 9   place the two bytes in SE% (BASIC)
10    in status (C0AA) and control (C0AB).
11   clear RSTAT and TSTAT.
12   enable interrupts.
13
14
15
16
17
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19
20
21
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23
```

```
scr #  102
 0 ( 2.HARDPAGE 2.SOFTPAGE ) HEX
 1
 2 FRAG 2.HARDPAGE ( addr -- )
 3  PAGE# LDY, INY,
 4  0 SP) LDA, PGS0 ,Y STA,
 5  1 SP) LDA, PGS1 ,Y STA,
 6  INX, INX, <XNEXT> JMP,
 7
 8 FRAG 2.SOFTPAGE  ( flag -- )
 9  0 SP) LDA, NE
10  IF, LOCAL2 LDA, 1 #B CMP, EQ
11   IF,
12    YPOS LDY, WND3 2 + ,Y LDA, TAY, CLC,
13    PGS0 ,Y LDA, GAP    ADC, PGS0 ,Y STA,
14    PGS1 ,Y LDA, GAP 1+ ADC, PGS1 ,Y STA,
15   ELSE,
```

```
 0
 1
 2 FRAG 2.HARDPAGE ( address -- )
 3 PURPOSE: update page table for cursor
 4  creeper crossing a hard page break.
 5
 6 store the address of the current page in
 7  the page table.
 8  the variable LOCAL1 is cleared, so that
 9  CREEPER will work right.
10
11
12
13
14
15
```

```
 16    YPOS LDY, WND3 ,Y LDA, TAY, SEC,
 17    PGS0 ,Y LDA, GAP    SBC, PGS0 ,Y STA,
 18    PGS1 ,Y LDA, GAP 1+ SBC, PGS1 ,Y STA,
 19   ENDIF,
 20  ENDIF,
 21  INX, INX, <XNEXT> JMP,
 22
 23
```

```
scr # 103
  0 ( <WRAP> ) HEX ;S
  1
  2 FRAG <WRAP>  SEC,
  3  WR LDA, YWRAP SBC, X5 STA,
  4  WR 1+ LDA, 0 #B SBC, X5 1+ STA,
  5  YWRAP LDY, cr #B LDA,
  6  BEGIN, X5 )Y CMP, CS
  7   IF, EQ IF, INY, ENDIF,
  8    TYA, YWRAP SBC, WC STA, EQ
  9    IF, WC INC, ENDIF, RTS,
 10   ENDIF, INY, MI UNTIL,
 11  20 #B LDA, WIDE LDY, DEY, WR )Y CMP, NE
 12  IF, INY,  BEGIN, DEY, MI
 13   IF, WIDE LDA, WC STA, RTS, ENDIF,
 14   WR )Y CMP, EQ
 15   UNTIL, INY, WC STY, RTS, ENDIF,
 16  DEY, WR )Y CMP, EQ
 17  IF, WIDE LDA, WC STA, RTS, ENDIF,
 18  WIDE LDY, WR )Y CMP, EQ
 19  IF, DEY, DEY, BEGIN, DEY, MI IF, WIDE
 20   LDA, WC STA, RTS, ENDIF, WR )Y CMP,
 21   EQ UNTIL, INY, WC STY, RTS, ENDIF,
 22  WIDE LDA, WC STA, RTS,
 23
```

```
scr #  104
  0 ( 2.WRAP BMP ) HEX ;S
  1
  2 FRAG 2.WRAP  \ <WRAP> JSR, <XNEXT> JMP,
  3
  4 FRAG BMP  CLC,
  5  WC LDA, WR ADC, WR STA, CS
  6  IF, WR 1+ INC, ENDIF,
  7  EBOT CMP, WR 1+ LDA, EBOT 1+ SBC, NC
  8  IF, RTS, ENDIF,
  9  WR LDA, BEOT CMP,
 10  WR 1+ LDA, BEOT 1+ SBC, NC
 11  IF, WR LDA, GAP ADC, WR STA,
 12   WR 1+ LDA, GAP 1+ ADC, WR 1+ STA,
 13  ENDIF,
 14  RTS,
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0
 1
 2 FRAG 2.SOFTPAGE ( oldNARROW -- )
 3 PURPOSE: update page table for cursor
 4  creeper crossing a soft page break.
 5
 6  use vert cursor position on the screen
 7  (store YPOS in Y register)
 8 if creep was going left then
 9  if cursor was wide (stack element = 0)
10   if cursor was on a page boundary
11    (window table - BEOT = 0)
12    get page # from window table
13    add gap
14    and store in that page of page table
15 else (creep was going right)
16  if cursor is at left margin (XPOS = 0)
17   get page # from window table
18   subtract gap
19   and store in that page of page table
20 discard element from stack
21
22
23
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
105
  0 ( 2.STOP? ) HEX
  1
  2 FRAG 2.STOP?
  3  DEX, DEX, 0 #B LDA,
  4  0 SP) STA, 1 SP) STA,
  5  C061 LDA, C062 ORA, MI
  6  IF, <XNEXT> JMP, ENDIF,
  7  0 SP) DEC, 1 SP) DEC,
  8  TEOS 1+ LDA, WR 1+ CMP,
  9  TEOS LDA, WR SBC, NC
 10  IF, <XNEXT> JMP, ENDIF,
 11  MQIN LDA, MQOUT CMP, NE
 12  IF, <XNEXT> JMP, ENDIF,
 13  CHAR LDA, del 80 OR #B CMP, EQ
 14  IF, <XNEXT> JMP, ENDIF,
 15  CHAR LDA, tab 80 OR #B CMP, CS
 16  IF, LEXXING LDA, EQ
 17   IF, <XNEXT> JMP, ENDIF,
 18  ENDIF,
 19  0 SP) INC, 1 SP) INC,
 20  <XNEXT> JMP,
 21
 22
 23
```

```
 0 FRAG 2.STOP? ( -- flag )
 1 PURPOSE: true flag means interrupt
 2  wrapping to add a cr, ff, tab, delete
 3  or any printable character wrapped
 4  past TEOS. also process a modem
 5  character.
 6
 7 put 0 flag on stack.
 8 if a lex key then exit.
 9 put -1 flag on stack.
10 if wrapped past TEOS, or something in
11  modem queue, or a cr, ff, tab, delete
12  or any other printed character,
13  then exit.
14 put 0 flag on stack and exit.
15
16
17
18
19
20
21
22
23
```

```
scr #  106
  0 ( 2.INCPAGES ) HEX
  1
  2  ( endaddress increase startpage -- )
  3 FRAG 2.INCPAGES   0 SP) LDY,
  4  INX, INX,
  5  BEGIN, INY, 2 SP) LDA, PGS0 ,Y CMP,
  6   3 SP) LDA, PGS1 ,Y SBC, NC
  7   IF, DEY, PCT STY, 0 #B LDA, LCT STA,
  8    PGS2 ,Y LDA, LCTR STA,
  9    PGS3 ,Y LDA, LCTR 1+ STA,
 10    INX, INX, INX, INX,
 11    <XNEXT> JMP,
 12   ENDIF, CLC, 0 SP) LDA, PGS0 ,Y ADC,
 13   PGS0 ,Y STA, WR STA,
 14   1 SP) LDA, PGS1 ,Y ADC,
 15   PGS1 ,Y STA, WR 1+ STA,
 16  AGAIN,
 17
 18
 19
 20
 21
 22
 23
```

```
 0 FRAG 2.INCPAGES ( endaddress increase
 1   startpage -- )
 2 PURPOSE: update the page table by
 3  adding the increase from startpage to
 4  endaddress.
 5
 6 start examining the page table by
 7  setting Y-reg equal to startpage.
 8 while the end address is less than the
 9  address for each page (PGS0,1) add
10  the increase to that page (PGS0,1)
11  and update the wrap address (WR).
12 when the end address is larger than the
13  address for a page (PGS0,1) store
14  the last updated page in PCT, clear
15  LCT, store PGS2,3 into LCTR, and exit.
16
17
18
19
20
21
22
23
```

```
107
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
```

```
 0 LABEL UM/MOD
 1 ( double-number
 2 unsigned-divisor -- remainder quotient )
 3 PURPOSE: return the remainder and
 4  quotient of the unsigned mixed number
 5  division.
 6
 7 NOTE: this has been used in a number of
 8  places to determine the maximum that a
 9  number can be divided by plus one.
```

```
 10                                    10  e.g.,   ( n1 0 n2 -- n3 )
 11                                    11  UM/MOD SWAP IF 1+ ENDIF
 12                                    12  see, for example, MARGIN-CHANGES.
 13                                    13
 14                                    14
 15                                    15
 16                                    16
 17                                    17
 18                                    18
 19                                    19
 20                                    20
 21                                    21
 22                                    22
 23                                    23

scr #  108                             0
   0                                   1 2.CMOVE>
   1                                   2
   2                                   3
   3                                   4
   4                                   5
   5                                   6
   6                                   7
   7                                   8
   8                                   9
   9                                  10
  10                                  11
  11                                  12
  12                                  13
  13                                  14
  14                                  15
  15                                  16
  16                                  17
  17                                  18
  18                                  19
  19                                  20
  20                                  21
  21                                  22
  22                                  23
  23
109                                    0
   0 CR 0 NAMED !                      1 return printing to left half of page
   1 FRAG end_of_bank2                 2
   2                                   3 FRAG end_of_bank2   affords printout of
   3                                   4   the last available byte in bank 2
   4                                   5
   5                                   6
   6                                   7
   7                                   8
   8                                   9
   9                                  10
  10                                  11
  11                                  12
  12                                  13
  13                                  14
  14                                  15
  15                                  16
  16                                  17
  17                                  18
  18                                  19
  19                                  20
  20
```

```
 21
 22
 23
```

```
 21
 22
 23
```

```
scr #  110
  0 ( INITIALIZATION CODE ) HEX
  1
  2 ASSEMBLER
  3  0A #B LDX, MI
  4  IF, 0B #B LDX, ENDIF,
  5  SEI, CLD, MI
  6  IF, SOURCE RESET C, WARM C, ASSEMBLER
  7   HERE RES !
  8   IP )Y LDA, INY, .A ASL, NC
  9   IF, HERE RES @ - 3 + NEXT + STA,
 10    ROM )JMP,
 11   ENDIF, HERE RES @ - 4 + NEXT + STA,
 12   CLC, ROM 100 + )JMP,
 13   ROM 200 + )JMP,
 14  ENDIF, 0 #B LDY,
 15  BEGIN,  ROM 20C + ,Y LDA, NEXT ,Y STA,
 16   INY, 12 #B CPY, EQ
 17  UNTIL,  IP STX,
 18  ROM 200 + SWAB OFF AND #B LDX,
 19  IP 1+ STX,
 20  08 #B LDX, VB 1+ STX,
 21  04F #B LDX, TXS,
 22  SP0 #B LDX, C010 LDA,
 23  0 #B LDY, TNEXT,
```

```
scr #  110
  0 initialization code at D200
  1
  2 D200: 0A to X register, for IP = COLD
  3 D204: 0B to X register, for IP = WARM
  4 D206: SEI, CLD,
  5 D208: always branch to D022
  6 D20A: RESET C,
  7 D20B: WARM C,
  8 D20C: rom copy of Forth NEXT (at 006B)
  9
 10 YNEXT: YSAVE LDY,
 11 NEXT: IP )Y LDA, INY, .A ASL, NC
 12       IF, HERE RES @ - 3 + NEXT + STA,
 13        ROM )JMP,
 14       ENDIF, HERE RES @ - 4 + NEXT +
 15       STA, CLC, ROM 100 + )JMP,
 16
 17 D222: copy code at D00C to NEXT.
 18       point IP to $D20A (COLD) or to
 19        $D20B (WARM).
 20       4F to return stack register.
 21       data stack pointer to X register.
 22       clear the keyboard strobe.
 23
```

```
111
  0 ( listing header, copyright msg )
  1
  2 CR CR CR      ." EDDE   Apple Version 104
  3 3  1985 September 27  Friday"
  4 CR CR CR AIM U. ." beginning of bank 1"
  5 CR
  6
  7 FRAG .MSG0                 " SwyftCard 104
  8 3 //e  Copyright 1985  Information Appli
  9 ance Inc."
 10
 11
 12 ( NOTE: if you change the version #,
 13  you must ALSO update the screen that
 14  .SWYFT is on - 216 )
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 ( listing header, copyright msg )
 1
 2 message for compilation printout.
 3
 4
 5
 6
 7 LABEL .MSG0
 8 PURPOSE: message for SwyftCard bootup.
 9
10
11 NOTE1:  the position of the version
12  number within .MSG0 must remain the
13  same.  it is used to correctly load
14  the key and command tables with the
15  right values.
16
17
18
19
20
21
22
23
```

```
scr #  112
  0 ( NEST VARIABLE ) HEX
  1
  2 FRAG .NEST
  3  PLA, X0 STA, PLA, X0 1+ STA,
  4  TYA, PHA, 0 #B LDA, PHA,
```

```
 0 ( NEST VARIABLE ) HEX
 1
 2 FRAG .NEST
 3 save current IP and Y-reg on stack,
 4  put return address (from JSR .NEST)
```

```
 5  IP LDA, PHA, IP 1+ LDA, PHA,
 6  XO LDA, IP STA, XO 1+ LDA, IP 1+ STA,
 7  1 #B LDY, TNEXT,
 8
 9 LABEL .VARIAB
10  IP )Y LDA, INY, YSAVE STY, 0 #B LDY,
11  VB STA, DEX, DEX,
12  VB )Y LDA, 0 SP) STA, INY,
13  VB )Y LDA, 1 SP) STA,
14  YSAVE LDY, TNEXT,
15
16
17
18
19
20
21
22
23
```

```
 5  into IP, initialize Y-reg = 1,
 6  then JMP NEXT.
 7
 8 LABEL .VARIAB
 9 store page number ($08) and offset (next
10  number) in VB; get value pointed to in
11  variable table and put on stack.
12
13 remember that IP and Y-reg point to
14  current token (controlled by NEXT)
15  and that the token for .variab is $08
16  which is also the page for variables.
17 note that y-reg incremented, saved and
18  restored.
19
20 LABEL .CALL
21 PURPOSE: jump to the address in the two
22  bytes compiled following this token
23
```

113

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

scr # 114

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
```

```
 13                                                  13
 14                                                  14
 15                                                  15
 16                                                  16
 17                                                  17
 18                                                  18
 19                                                  19
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23
115
  0 ( CHAR. TRANSLATION TABLE ) HEX                  0 ( CHAR. TRANSLATION TABLE ) HEX
  1                                                  1
  2 FRAG .XLAT                                       2 FRAG .XLAT
  3 del C, ( DELETE :: RUBOUT )                      3 PURPOSE: used to translate a control
  4  7  C, ( 01,^A ::  PASTE )                       4  character into an index.  The index
  5 00  C, ( 02,^B :: was PRINT )                    5  is an offset into .LTABLE (the command
  6 00  C, ( 03,^C :: was SEND )                     6  table) which contains addresses for
  7  5  C, ( 04,^D :: SEND )                         7  executable functions.  Since .XLAT
  8 00  C, ( 05,^E )                                 8  is downloaded into ram the functions
  9 00  C, ( 06,^F )                                 9  can be reassigned (see ?RAMKEYS and
 10  8  C, ( 07,^G :: BASIC )                       10  RAMKEYS).
 11 00  C, ( 08,^H )                                11
 12 tab C, ( 09,^I :: TAB )                         12
 13 00  C, ( 0A,^J :: was PRINT)                    13
 14 00  C, ( 0B,^k,UP-ARROW )                       14
 15  4  C, ( 0C,^L :: DISK ) .                      15
 16 cr  C, ( 0D,^m,CARRIAGE RETURN )                16
 17  2  C, ( 0E,^N :: PRINT )                       17
 18 00  C, ( 0F,^O :: NOOP - was GET )              18
 19 00  C, ( 10,^P :: was BASIC )                   19
 20 00  C, ( 11,^Q )                                20
 21 00  C, ( 12,^R :: was 6 - GET, CUT )            21
 22 00  C, ( 13,^S )                                22
 23                                                 23

scr #  116
  0 ( CHARACTER TRANSLATION TABLE ) HEX             0
  1                                                 1
  2 00  C, ( 14,^T )                                2
  3 00  C, ( 15,^U )                                3
  4 00  C, ( 16,^V )                                4
  5 00  C, ( 17,^W :: was DISK )                    5
  6 00  C, ( 18,^X )                                6
  7 00  C, ( 19,^Y :: was PASTE )                   7
  8  C  C, ( 1A,^Z )                                8
  9 ff  C, ( 1B,ESCAPE :: PAGE )                    9
 10 00  C, ( 1C,^\ )                               10
 11  9  C, ( 1D,^] :: MON )                        11
 12  3  C, ( 1E,^6 :: SORT, was OLDLOAD )          12
 13  B  C, ( 1F,^- )                               13
 14                                                14
 15                                                15
 16                                                16
 17                                                17
 18                                                18
 19                                                19
 20                                                20
 21                                                21
 22                                                22
 23                                                23
```

```
117
  0 ( DISPLAY ARRAY ) HEX                    0 FRAG .DISP0
  1                                          1
  2 FRAG .DISP0                              2
  3                                          3
  4 400 C, 480 C, 500 C, 580 C,              4
  5 600 C, 680 C, 700 C, 780 C,              5
  6 428 C, 4A8 C, 528 C, 5A8 C,              6
  7 628 C, 6A8 C, 728 C, 7A8 C,              7
  8 450 C, 4D0 C, 550 C, 5D0 C,              8
  9 650 C, 6D0 C, 750 C, 7D0 C,              9 FRAG .DISP1
 10                                         10
 11 FRAG .DISP1                             11
 12                                         12
 13 400 H, 480 H, 500 H, 580 H,             13
 14 600 H, 680 H, 700 H, 780 H,             14
 15 428 H, 4A8 H, 528 H, 5A8 H,             15
 16 628 H, 6A8 H, 728 H, 7A8 H,             16
 17 450 H, 4D0 H, 550 H, 5D0 H,             17
 18 650 H, 6D0 H, 750 H, 7D0 H,             18
 19                                         19
 20                                         20
 21                                         21
 22                                         22
 23                                         23

scr #  118
  0 ( BUFFER FOR ALT SCREEN ) HEX            0 FRAG .SCR1
  1                                          1 PURPOSE: buffer for alternate screen.
  2 FRAG .SCR1    -                          2
  3  SCREEN       H, SCREEN  28 + H,         3
  4  SCREEN 050 + H, SCREEN  78 + H,         4
  5  SCREEN 0A0 + H, SCREEN 0C8 + H,         5
  6  SCREEN 0F0 + H, SCREEN 118 + H,         6
  7  SCREEN 140 + H, SCREEN 168 + H,         7
  8  SCREEN 190 + H, SCREEN 1B8 + H,         8
  9  SCREEN 1E0 + H, SCREEN 208 + H,         9
 10  SCREEN 230 + H, SCREEN 258 + H,        10
 11  SCREEN 280 + H, SCREEN 2A8 + H,        11
 12  SCREEN 2D0 + H, SCREEN 2F8 + H,        12
 13  SCREEN 320 + H, SCREEN 348 + H,        13
 14  SCREEN 370 + H, SCREEN 398 + H,        14
 15                                         15
 16                                         16
 17                                         17
 18                                         18
 19                                         19
 20                                         20
 21                                         21
 22                                         22
 23                                         23
119
  0 ( BUFFER FOR ALT SCREEN ) HEX            0 FRAG .SCR0
  1                                          1 PURPOSE: buffer for alternate screen.
  2 FRAG .SCR0                               2
  3  SCREEN       C, SCREEN  28 + C,         3
  4  SCREEN 050 + C, SCREEN  78 + C,         4
  5  SCREEN 0A0 + C, SCREEN 0C8 + C,         5
  6  SCREEN 0F0 + C, SCREEN 118 + C,         6
  7  SCREEN 140 + C, SCREEN 168 + C,         7
  8  SCREEN 190 + C, SCREEN 1B8 + C,         8
  9  SCREEN 1E0 + C, SCREEN 208 + C,         9
```

```
 10  SCREEN 230 + C, SCREEN 258 + C,
 11  SCREEN 280 + C, SCREEN 2A8 + C,
 12  SCREEN 2D0 + C, SCREEN 2F8 + C,
 13  SCREEN 320 + C, SCREEN 348 + C,
 14  SCREEN 370 + C, SCREEN 398 + C,
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
scr #  120
  0 ( calls to 2nd bank ) HEX
  1
  2 XFER REVERSE -   2.REVERSE
  3 XFER SEEK>       2.SEEK>
  4 XFER SEEK<       2.SEEK<
  5 XFER ADJUST      2.ADJUST
  6 XFER TOBUFF      2.TOBUFF
  7 XFER PRESET      2.PRESET
  8 XFER .40COL      2.40COL
  9 XFER ABOOT       2.ABOOT
 10 XFER .MON        2.MON
 11 XFER <READ>      2.<READ>
 12 XFER <SEEK>      2.<SEEK>
 13 XFER <WRITE>     2.<WRITE>
 14 XFER ?EDDE       2.?EDDE
 15 XFER ?APPLE      2.?APPLE
 16 XFER CHECKSUM    2.CHECKSUM
 17 XFER ENDWRAP     2.ENDWRAP
 18 XFER ?UPDATE     2.?UPDATE
 19 XFER PAGEPRINT   2.PAGEPRINT
 20 XFER SHOWPAGE    2.SHOWPAGE
 21 XFER SERIAL#     2.SERIAL#
 22 XFER V           2.V
 23
121
  0 ( calls to 2nd bank ) HEX
  1
  2 XFER @K          2.@K
  3 XFER ?X          2.?X
  4 XFER SETMODEM    2.SETMODEM
  5 XFER CONTROL     2.CONTROL
  6 XFER WRITE0      2.WRITE0
  7 XFER HARDPAGE    2.HARDPAGE
  8 XFER SOFTPAGE    2.SOFTPAGE
  9 XFER STOP?       2.STOP?
 10 XFER INCPAGES    2.INCPAGES
 11
 12 ;S
 13
 14 XFER @M          2.@M
 15 XFER CMOVE2      2.CMOVE2
 16 XFER WRAP        2.WRAP
 17 XFER LOCLIN      2.LOCLIN
 18 XFER LOCCHR      2.LOCCHR
 19
 20
```

```
 0 XFER creates a 7 byte structure which
 1  will transfer control to the code in
 2  the alternate bank at D000 to DDFF.
 3  All routines in bank 2 return to bank
 4  1 by exiting through <XNEXT>.
 5
 6 For example, XFER will cause any
 7  reference REVERSE to access the
 8  routine 2.REVERSE in bank 2.
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
```

```
 21                                                  21
 22                                                  22
 23                                                  23


scr #  122
  0 ( .QUE ) HEX                                     0 .QUE ( --)
  1                                                  1 PURPOSE: put keyboard character into
  2 FRAG .QUE  C010 STA,                             2  key queue.
  3  FF #B CMP, 0 #B ADC,                            3
  4  7F #B AND, 20 #B CMP, NC                        4 it looks to see if it is
  5  IF, TAY, HIMEM ,Y LDA, ENDIF,                   5  a control or special character, and if
  6  CHAR LDY, PL                                    6  not then puts it in the key queue.
  7  IF, 80 #B ORA, CHAR STA,                        7  the queue offset is pointed to by QIN.
  8  ELSE, QIN LDY, KQUE ,Y STA, DEY, MI             8  the value in TIMER (-1, -2, and -3)
  9   IF, 4 #B LDY, ENDIF, QIN STY,                  9   is initialized, from value in TIMER.
 10  ENDIF,  RTS,                                    10
 11                                                  11 NOTE: A-reg holds byte read from $C000
 12                                                  12  before calling this routine.
 13                                                  13
 14                                                  14
 15                                                  15
 16                                                  16
 17                                                  17
 18                                                  18
 19                                                  19
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23
123
  0 ( EXIT ) HEX                                     0 LABEL EXIT
  1                                                  1 restores previous IP and y-reg for NEXT
  2 LABEL EXIT                                       2
  3  PLA, IP 1+ STA, PLA, IP STA,                    3
  4  PLA, PLA, TAY, TNEXT,                           4 LABEL .2BYTERS
  5                                                  5 this word modifies NEXT
  6 LABEL .2BYTERS  IP )Y LDA, .A ASL, INY,          6
  7  NEXT 11 + STA, NEXT 10 + JMP,                   7
  8                                                  8
  9                                                  9
 10                                                  10
 11                                                  11
 12                                                  12 note that IP for any one word is the
 13                                                  13  address left by JSR next and that the
 14                                                  14  y register is used to increment within
 15                                                  15  that word (see screen 110).
 16                                                  16
 17                                                  17
 18                                                  18
 19                                                  19
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23


scr #  124
  0                                                  0
  1                                                  1
  2                                                  2
  3                                                  3
  4                                                  4
```

```
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
125
 0 ( .LIT ) HEX
 1
 2 LABEL .LIT  DEX, DEX,
 3  IP )Y LDA, 0 SP) STA, INY,
 4  IP )Y LDA, 1 SP) STA, INY, TNEXT,
 5
 6 LABEL .BLIT  DEX, DEX,
 7  IP )Y LDA, 0 SP) STA, INY,
 8  0 #B LDA,  1 SP) STA, TNEXT,
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 LABEL .LIT
 1 PURPOSE: compile a word sized literal.
 2
 3
 4 LABEL .BLIT
 5 PURPOSE: compile a byte sized literal.
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  126
 0 ( .BRAN .OBRAN ) HEX
 1
 2 LABEL .BRAN  -IP )Y LDA, TAY, TNEXT,
 3
 4 LABEL .OBRAN
 5  0 SP) LDA, INX, 0 SP) ORA, NE
 6  IF, INY, INX, TNEXT,
 7  ENDIF, INX,
 8   IP )Y LDA, TAY, TNEXT,
 9
10
11
12
13
14
15
```

```
 0 LABEL .BRAN
 1 PURPOSE: force a branch.  used, e.g., by
 2  ELSE, by REPEAT.
 3
 4 LABEL .OBRAN
 5 PURPOSE: conditional branch. used, e.g.,
 6  by IF, WHILE.
 7
 8
 9
10
11
12
13
14
15
```

```
 16                                                    16
 17                                                    17
 18                                                    18
 19                                                    19
 20                                                    20
 21                                                    21
 22                                                    22
 23                                                    23
127
  0 ( .DO .LOOP ) HEX                                  0 LABEL .DO ( to from -- )
  1                                                    1 PURPOSE: initialize a loop.
  2 LABEL .DO  TYA, PHA, PHA, SEC,                     2
  3  3 SP) LDA, PHA, 2 SP) LDA, PHA,                   3
  4  0 SP) LDA, 2 SP) SBC, X0 STA,                     4 LABEL DROP ( n -- )
  5  1 SP) LDA, 3 SP) SBC, PHA,                        5 PURPOSE: remove element from stack.
  6  X0 LDA, PHA,                                      6
  7  INX, INX, INX, INX, TNEXT,                        7
  8                                                    8 LABEL .LOOP ( -- )
  9 LABEL .LOOP  XSAVE STX, TSX,                       9 PURPOSE: end a loop when the count has
 10  0 RP) INC, EQ IF, 1 RP) INC, ENDIF, EQ           10  been reached.
 11  IF, TXA, 6 #B ADC, TAX, TXS,                     11
 12  ELSE, 4 RP) LDY,                                 12
 13  ENDIF, XSAVE LDX, TNEXT,                         13 LABEL I ( -- i )
 14                                                   14 PURPOSE: place count of do-loop on stack
 15 LABEL .LEAVE                                      15
 16  PLA, PLA, PLA, PLA, PLA, PLA,                    16
 17  IP )Y LDA, TAY, TNEXT,                           17
 18                                                   18
 19 LABEL I  DEX, DEX, XSAVE STX, TSX, CLC,           19
 20  0 RP) LDA, 2 RP) ADC, PHA,                       20
 21  1 RP) LDA, 3 RP) ADC, XSAVE LDX,                 21
 22  1 SP) STA, PLA, 0 SP) STA, TNEXT,                22
 23                                                   23


scr #  128
  0 ( .+LOOP ) HEX                                     0 LABEL .LEAVE
  1                                                    1 PURPOSE: exit a do-loop unconditionally
  2 LABEL .+LOOP -YSAVE STY,                           2
  3  1 SP) LDY,                                        3
  4  0 SP) LDA, INX, INX, XSAVE STX, TSX,              4 LABEL .+LOOP ( n -- )
  5  0 RP) ADC, 0 RP) STA, TYA,                        5 PURPOSE: exit a loop when the count has
  6  1 RP) ADC, 1 RP) STA, TYA, MI                     6  been reached (increment each loop by
  7  IF, CS                                            7  the n).
  8   IF, 4 RP) LDY, XSAVE LDX, TNEXT,                 8
  9   ENDIF,                                           9
 10  ELSE, NC                                         10 FRAG XYNEXT
 11   IF, 4 RP) LDY, XSAVE LDX, TNEXT,                11 PURPOSE: an alternate exit from LABEL
 12   ENDIF,                                          12  definitions: restore X and Y registers
 13  ENDIF, CLC, TXA, 6 #B ADC, TAX, TXS,             13
 14  XSAVE LDX, YSAVE LDY, TNEXT,                     14
 15                                                   15
 16                                                   16
 17                                                   17
 18                                                   18
 19                                                   19
 20                                                   20
 21                                                   21
 22                                                   22
 23                                                   23
```

```
129
  0 ( 0 1 2 -1 NOOP ) HEX
  1
  2 LABEL 0   DEX, DEX, 0 #B LDA,
  3  0 SP) STA, 1 SP) STA,
  4  TNEXT,
  5
  6 LABEL 1   DEX, DEX, 0 #B LDA,
  7  1 SP) STA, 1 #B LDA, 0 SP) STA,
  8  TNEXT,
  9
 10 LABEL 2   DEX, DEX, 0 #B LDA,
 11  1 SP) STA, 2 #B LDA, 0 SP) STA,
 12  TNEXT,
 13
 14 LABEL -1  DEX, DEX, OFF #B LDA,
 15  0 SP) STA, 1 SP) STA,
 16  TNEXT,
 17
 18 LABEL NOOP TNEXT,
 19
 20
 21
 22
 23
```

```
 0 LABEL 0 ( -- 0 )
 1
 2
 3 LABEL 1 ( -- 1 )
 4
 5
 6 LABEL 2 ( -- 2 )
 7
 8
 9 LABEL -1 ( -- -1 )
10
11
12 LABEL NOOP ( -- )
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  130
  0 ( CMOVE ) HEX
  1
  2 LABEL CMOVE  XSAVE STX, YSAVE STY,
  3  5 SP) LDA, X0 1+ STA,
  4  4 SP) LDA, X0    STA,
  5  3 SP) LDA, X1 1+ STA,
  6  2 SP) LDA, X1    STA, 0 #B LDY,
  7  1 SP) LDA, NE
  8  IF, BEGIN,
  9    BEGIN, X0 )Y LDA, X1 )Y STA, INY, EQ
 10    UNTIL, X0 1+ INC, X1 1+ INC,
 11    1 SP) DEC, EQ
 12   UNTIL,
 13  ENDIF,  0 SP) LDA, NE
 14  IF, TAX,
 15   BEGIN, X0 )Y LDA, X1 )Y STA, INY,
 16    DEX, EQ
 17   UNTIL,
 18  ENDIF,  XSAVE LDA, CLC, 6 #B ADC, TAX,
 19  YSAVE LDY, TNEXT,
 20
 21
 22
 23
131
  0 ( CMOVE>  ) HEX
  1
  2 LABEL CMOVE>  YSAVE STY,
  3  1 SP) LDA, X2 STA,
  4  5 SP) ADC, X0 1+ STA, CLC,
  5  3 SP) LDA, X2 ADC, X1 1+ STA,
  6  4 SP) LDA, X0 STA,
  7  2 SP) LDA, X1 STA,
  8  0 SP) LDA, NE
  9  IF, TAY, DEY, NE
```

```
 0 LABEL CMOVE ( from to # -- )
 1 PURPOSE: move # of bytes from to.
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
```

```
 10   IF, BEGIN, X0 )Y LDA, X1 )Y STA,
 11    DEY, EQ UNTIL,
 12   ENDIF, X0 )Y LDA, X1 )Y STA,
 13  ENDIF, X2 LDA, NE
 14  IF, BEGIN, OFF #B LDY,
 15   X0 1+ DEC, X1 1+ DEC,
 16   BEGIN, X0 )Y LDA, X1 )Y STA, DEY, EQ
 17    UNTIL, X0 )Y LDA, X1 )Y STA,
 18    X2 DEC, EQ
 19   UNTIL,
 20  ENDIF, YSAVE LDY,
 21  CLC, TXA, 6 #B ADC, TAX, TNEXT,
 22
 23
```

```
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
scr #  132
  0 ( AND OR XOR ) HEX
  1
  2 LABEL AND     -
  3  0 SP) LDA, 2 SP) AND, 2 SP) STA,
  4  1 SP) LDA, 3 SP) AND, 3 SP) STA,
  5  INX, INX, TNEXT,
  6
  7 LABEL OR
  8  0 SP) LDA, 2 SP) ORA, 2 SP) STA,
  9  1 SP) LDA, 3 SP) ORA, 3 SP) STA,
 10  INX, INX, TNEXT,
 11
 12 LABEL XOR
 13  0 SP) LDA, 2 SP) EOR, 2 SP) STA,
 14  1 SP) LDA, 3 SP) EOR, 3 SP) STA,
 15  INX, INX, TNEXT,
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 LABEL AND ( n1 n2 -- n3 )
 1 PURPOSE: logical AND n1 with n2 leaving
 2  n3.
 3
 4
 5 LABEL OR ( n1 n2 -- n3 )
 6 PURPOSE: logical OR n1 with n2 leaving
 7  n3.
 8
 9
10 LABEL XOR ( n1 n2 -- n3 )
11 PURPOSE: logical exclusive OR n1 with n2
12  leaving n3.
13
14
15
16
17
18
19
20
21
22
23
```

```
133
  0 ( DUP 2DUP DROP ) HEX
  1
  2 LABEL DUP
  3  DEX, DEX,
  4  2 SP) LDA, 0 SP) STA,
  5  3 SP) LDA, 1 SP) STA,
  6  TNEXT,
  7
  8 LABEL 2DUP
  9  DEX, DEX, DEX, DEX,
 10  4 SP) LDA, 0 SP) STA,
 11  5 SP) LDA, 1 SP) STA,
 12  6 SP) LDA, 2 SP) STA,
 13  7 SP) LDA, 3 SP) STA,
 14  TNEXT,
 15
 16 LABEL DROP  INX, INX, TNEXT,
 17
 18
 19
 20
```

```
 0 LABEL DUP ( n -- n n )
 1 PURPOSE: duplicate n.
 2
 3
 4 LABEL 2DUP ( n1 n2 -- n1 n2 n1 n2 )
 5 PURPOSE: duplicate n1 n2.
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
```

```
 21                                          21
 22                                          22
 23                                          23


scr #  134
  0 ( SWAP ROT ) HEX                         0 LABEL SWAP ( n1 n2 -- n2 n1 )
  1                                          1 PURPOSE: switch order of top two
  2 LABEL SWAP    -                          2  elements on stack.
  3  2 SP) LDA, PHA, 0 SP) LDA,              3
  4  2 SP) STA, PLA, 0 SP) STA,              4
  5  3 SP) LDA, PHA, 1 SP) LDA,              5 LABEL ROT ( n1 n2 n3 -- n2 n3 n1 )
  6  3 SP) STA, PLA, 1 SP) STA,              6 PURPOSE: bring third element on stack to
  7  TNEXT,                                  7  the top.
  8                                          8
  9 LABEL ROT                                9
 10  4 SP) LDA, PHA, 2 SP) LDA,             10
 11  4 SP) STA, 0 SP) LDA,                  11
 12  2 SP) STA, PLA, 0 SP) STA,             12
 13  5 SP) LDA, PHA, 3 SP) LDA,             13
 14  5 SP) STA, 1 SP) LDA,                  14
 15  3 SP) STA, PLA, 1 SP) STA,             15
 16  TNEXT,                                 16
 17                                         17
 18                                         18
 19                                         19
 20                                         20
 21                                         21
 22                                         22
 23                                         23
135
  0 ( OVER ?DUP ) HEX                        0 LABEL OVER ( n1 n2 -- n1 n2 n1 )
  1                                          1 PURPOSE: duplicate second element on the
  2 LABEL OVER                               2  stack to the top.
  3  DEX, DEX,                               3
  4  4 SP) LDA, 0 SP) STA,                   4 LABEL ?DUP ( n1 -- 0 | n1 n1 )
  5  5 SP) LDA, 1 SP) STA,                   5 PURPOSE: duplicate element on the stack
  6  TNEXT,                                  6  if not zero.
  7                                          7
  8 LABEL ?DUP                               8
  9  0 SP) LDA, 1 SP) ORA, NE                9
 10  IF,  DEX, DEX,                         10
 11   3 SP) LDA, 1 SP) STA,                 11
 12   2 SP) LDA, 0 SP) STA,                 12
 13  ENDIF,                                 13
 14  TNEXT,                                 14
 15                                         15
 16                                         16
 17                                         17
 18                                         18
 19                                         19
 20                                         20
 21                                         21
 22                                         22
 23                                         23


scr #  136
  0 ( I R> >R R@ ) HEX                       0 LABEL R> ( -- n )
  1                                          1 PURPOSE: remove n from return stack.
  2 LABEL R>  DEX, DEX,                      2
  3  PLA, 0 SP) STA,                         3
  4  PLA, 1 SP) STA,  TNEXT,                 4 LABEL >R ( n -- )
```

```
 5
 6 LABEL >R
 7  1 SP) LDA, PHA,
 8  0 SP) LDA, PHA,
 9  INX, INX,  TNEXT,
10
11 LABEL R@  DEX, DEX,
12  PLA, 0 SP) STA,
13  PLA, 1 SP) STA, PHA,
14  0 SP) LDA, PHA, TNEXT,
15
16
17
18
19
20
21
22
23
137
 0 ( LEAVE ) HEX ;S
 1
 2 LABEL LEAVE
 3  XSAVE STX, TSX,
 4  1 RP) LDY,
 5  0 RP) LDA, 1 #B ADC, 2 RP) STA, EQ
 6  IF, INY, ENDIF, TYA,
 7  3 RP) STA,
 8  XSAVE LDX, TNEXT,
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 5 PURPOSE: place n on return stack.
 6
 7
 8 LABEL R@ ( -- n )
 9 PURPOSE: copy element from return stack.
10
11
12
13
14
15
16
17
18
19
20
21
22
23

 0
 1
 2
 3
 4
 5
 6
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```

```
scr #  138
 0 ( 1+ 1- )
 1
 2 LABEL 1+
 3  0 SP) INC, EQ
 4  IF, 1 SP) INC, ENDIF,
 5  TNEXT,
 6
 7 LABEL 1-
 8  0 SP) LDA, EQ
 9  IF, 1 SP) DEC, ENDIF,
10  0 SP) DEC,
11  TNEXT,
12
13
14
15
```

```
 0 LABEL 1+ ( n -- n+1 )
 1 PURPOSE: add one to element on stack.
 2
 3
 4 LABEL 1- ( n -- n-1 )
 5 PURPOSE: subtract one from element on
 6  stack.
 7
 8
 9
10
11
12
13
14
15
```

```
 16
 17
 18
 19
 20
 21
 22
 23
139
  0 ( @ C@ ) HEX
  1
  2 LABEL @
  3  0 X) LDA, PHA,
  4  0 SP) INC, EQ
  5  IF, 1 SP) INC, ENDIF,
  6  0 X) LDA,
  7  1 SP) STA, PLA,
  8  0 SP) STA,  TNEXT,
  9
 10 LABEL C@
 11  0 X) LDA, 0 SP) STA,
 12  0 #B LDA, 1 SP) STA,
 13  TNEXT,
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 16
 17
 18
 19
 20
 21
 22
 23
 0 LABEL @ ( address -- word-value )
 1 PURPOSE: given address, return the value
 2  residing there.
 3
 4
 5 LABEL C@ ( address -- byte-value )
 6 PURPOSE: given address, return the value
 7  residing there.
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  140
  0 ( ! C! +! )
  1
  2 LABEL !
  3  2 SP) LDA, 0 X) STA,
  4  0 SP) INC, EQ
  5  IF, 1 SP) INC, ENDIF,
  6  3 SP) LDA, 0 X) STA,
  7  INX, INX, INX, INX, TNEXT,
  8
  9 LABEL C!
 10  2 SP) LDA, 0 X) STA,
 11  INX, INX, INX, INX, TNEXT,
 12
 13 LABEL +!
 14  2 SP) LDA, 0 X) ADC, 0 X) STA,
 15  0 SP) INC, EQ
 16  IF, 1 SP) INC, ENDIF,
 17  3 SP) LDA, 0 X) ADC, 0 X) STA,
 18  INX, INX, INX, INX, TNEXT,
 19
 20
 21
 22
 23
```

```
 0 LABEL ! ( n address -- )
 1 PURPOSE: store the value at the address.
 2
 3
 4 LABEL C! ( b address -- )
 5 PURPOSE: store the byte value at the
 6  address.
 7
 8
 9 LABEL +! ( n address -- )
10 PURPOSE: increment the value at the
11  address by the value n.
12
13
14
15
16
17
18
19
20
21
22
23
```

```
41
  0 ( TO ADDR +TO ) HEX
  1
  2 LABEL TO  YSAVE STY, 0 #B LDY,
  3  2 SP) LDA, VB )Y STA, INY,
  4  3 SP) LDA, VB )Y STA, YSAVE LDY,
  5  INX, INX, INX, INX, TNEXT,
  6
  7 LABEL ADDR
  8  VB LDA, 0 SP) STA,
  9  VB 1+ LDA, 1 SP) STA,
 10  TNEXT,
 11
 12 LABEL +TO  YSAVE STY, 0 #B LDY,
 13  VB )Y LDA, 2 SP) ADC, VB )Y STA, INY,
 14  VB )Y LDA, 3 SP) ADC, VB )Y STA,
 15  YSAVE LDY, INX, INX, INX, INX, TNEXT,
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 LABEL TO  ( value constant -- )
 1 PURPOSE: store the value in place of
 2  the value normally returned by the
 3  constant.
 4
 5 LABEL +TO ( value constant -- )
 6 PURPOSE: replace the constant with the
 7  sum of the value and the constant.
 8
 9 LABEL ADDR ( constant -- address )
10 PURPOSE: put the address of the last
11  constant on the stack in place of the
12  value returned by the constant.
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  142
  0 ( + - NEGATE ) HEX
  1
  2 LABEL +       -
  3  0 SP) LDA, 2 SP) ADC, 2 SP) STA,
  4  1 SP) LDA, 3 SP) ADC, 3 SP) STA,
  5  INX, INX, TNEXT,
  6
  7 LABEL -   SEC,
  8  2 SP) LDA, 0 SP) SBC, 2 SP) STA,
  9  3 SP) LDA, 1 SP) SBC, 3 SP) STA,
 10  INX, INX, TNEXT,
 11
 12 LABEL NEGATE  SEC,
 13  0 #B LDA, 0 SP) SBC, 0 SP) STA,
 14  0 #B LDA, 1 SP) SBC, 1 SP) STA,
 15  TNEXT,
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 LABEL + ( n1 n2 -- n3 )
 1 PURPOSE: add n1 to n2 leaving n3.
 2
 3
 4 LABEL - ( n1 n2 -- n3 )
 5 PURPOSE: subtract n2 from n3 leaving n3.
 6
 7
 8 LABEL NEGATE ( n1 -- n2 )
 9 PURPOSE: subtract n1 from zero leaving
10  n2.
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
143
  0 ( BEEP FILL ) HEX
  1
  2 T: BEEP  100 0
  3  DO 1 0 DO LOOP 1 C030 C! LOOP ;
  4
  5 T: FILL  SWAP >R OVER C!
  6  DUP 1+ R> 1- CMOVE ;
  7
  8
  9
```

```
 0 FILL ( address # value -- )
 1 PURPOSE: fill from address for # bytes
 2  with the value.
 3
 4 .ERRORIS  ( -- )
 5 PURPOSE: take next byte from word,
 6  store it in ERROR, and beep.
 7
 8 BEEP ( -- )
 9 PURPOSE: sound the Apple speaker.
```

```
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  144
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0
 1
 2
 3
 4
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 6
 7
 8
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10
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12
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14
15
16
17
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19
20
21
22
23
```

```
145
  0 ( UM/MOD ) HEX
  1
  2 LABEL UM/MOD  YSAVE STY,
  3  0 SP) LDA, X0 STA,
  4  1 SP) LDA, X1 STA,
  5  2 SP) LDA, X4 STA,
  6  3 SP) LDA, X5 STA,
  7  4 SP) LDA, .A ASL, X2 STA,
  8  5 SP) LDA, .A ROL, X3 STA,
  9  XSAVE STX,  10 #B LDX,
 10  BEGIN, X4 ROL, X5 ROL, SEC,
 11   X4 LDA, X0 SBC, TAY,
 12   X5 LDA, X1 SBC, CS
 13   IF, X4 STY, X5 STA, ENDIF,
 14   X2 ROL, X3 ROL, DEX, EQ
 15  UNTIL,  XSAVE LDX,
 16  X5 LDA, 5 SP) STA,
 17  X4 LDA, 4 SP) STA,
 18  X3 LDA, 3 SP) STA,
 19  X2 LDA, 2 SP) STA,
 20  INX, INX, YSAVE LDY, TNEXT,
```

```
 0 LABEL UM/MOD
 1 ( double-number
 2 unsigned-divisor -- remainder quotient )
 3 PURPOSE: return the remainder and
 4  quotient of the unsigned mixed number
 5  division.
 6
 7 NOTE: this has been used in a number of
 8  places to determine the maximum that a
 9  number can be divided by plus one.
10  e.g.,   ( n1 0 n2 -- n3 )
11  UM/MOD SWAP IF 1+ ENDIF
12  see, for example, MARGIN-CHANGES.
13
14
15
16
17
18
19
20
```

```
 21                                                  21
 22                                                  22
 23                                                  23


scr #  146
  0 ( 2* U2/ SWAB )  HEX                             0 LABEL 2* ( n -- n*2 )
  1                                                  1 PURPOSE: multiply n by 2.
  2 LABEL 2*                                         2
  3  0 SP) ASL, 1 SP) ROL, TNEXT,                    3
  4                                                  4 LABEL U2/ ( n -- n/2 )
  5 LABEL U2/                                        5 PURPOSE: unsigned divide n by 2.
  6  1 SP) LSR, 0 SP) ROR, TNEXT,                    6
  7                                                  7
  8 LABEL SWAB  0 SP) LDA, PHA, 1 SP) LDA,           8 LABEL SWAB ( n1 -- n2 )
  9  0 SP) STA, PLA, 1 SP) STA, TNEXT,               9 PURPOSE: swap the upper and lower bytes
 10                                                 10  of n1 to give n2.
 11                                                 11
 12                                                 12
 13                                                 13
 14                                                 14
 15                                                 15
 16                                                 16
 17                                                 17
 18                                                 18
 19                                                 19
 20                                                 20
 21                                                 21
 22                                                 22
 23                                                 23
147
  0 ( = 0= ) HEX                                    0 LABEL = ( n1 n2 -- flag )
  1                                                  1 PURPOSE: leave a true flag if n1 equals
  2 LABEL =  YSAVE STY, 0 #B LDY,                    2  n2.
  3  2 SP) LDA, 0 SP) CMP, EQ                        3
  4  IF, 3 SP) LDA, 1 SP) CMP, ENDIF, EQ             4 FRAG .Y@
  5  IF, DEY, ENDIF,                                 5 PURPOSE:  an alternate exit from
  6  INX, INX, 1 SP) STY, 0 SP) STY,                 6  LABEL definitions:  stores Y register
  7  YSAVE LDY, TNEXT,                               7  onto stack, jumps to YNEXT
  8                                                  8
  9                                                  9 LABEL 0= ( n -- flag )
 10 LABEL 0=  YSAVE STY, 0 #B LDY,                  10 PURPOSE: leave a true flag if n equals
 11  0 SP) LDA, 1 SP) ORA, EQ                       11  zero.
 12  IF, DEY, ENDIF,                                12
 13  0 SP) STY, 1 SP) STY,                          13
 14  YSAVE LDY, TNEXT,                              14
 15                                                 15
 16                                                 16
 17                                                 17
 18                                                 18
 19                                                 19
 20                                                 20
 21                                                 21
 22                                                 22
 23                                                 23


scr #  148
  0 ( U< 0< ABS ) HEX                               0 LABEL U< ( n1 n2 -- flag )
  1                                                  1 PURPOSE: leave a true flag if n1 is less
  2 LABEL U<                                         2  than n2.
  3  2 SP) LDA, 0 SP) CMP,                           3
  4  3 SP) LDA, 1 SP) SBC,                           4 LABEL 0< ( n -- flag )
```

```
 5  INX, INX, OFF #B LDA, 0 #B ADC,
 6  0 SP) STA, 1 SP) STA,
 7  TNEXT,
 8
 9 LABEL 0<  YSAVE STY,
10  0 #B LDY, 1 SP) LDA, MI
11  IF, DEY, ENDIF,
12  0 SP) STY, 1 SP) STY,
13  YSAVE LDY, TNEXT,
14
15
16 LABEL ABS  1 SP) LDA, MI
17  IF, SEC,
18   0 #B LDA, 0 SP) SBC, 0 SP) STA,
19   0 #B LDA, 1 SP) SBC, 1 SP) STA,
20  ENDIF, TNEXT,
21
22
23
149
 0 ( UMIN UMAX OMAX ) HEX
 1
 2 LABEL UMIN
 3  2 SP) LDA, 0 SP) CMP,
 4  3 SP) LDA, 1 SP) SBC, CS
 5  IF, 0 SP) LDA, 2 SP) STA,
 6      1 SP) LDA, 3 SP) STA,
 7  ENDIF,  INX, INX,
 8  TNEXT,
 9
10 LABEL UMAX
11  2 SP) LDA, 0 SP) CMP,
12  3 SP) LDA, 1 SP) SBC, NC
13  IF, 0 SP) LDA, 2 SP) STA,
14      1 SP) LDA, 3 SP) STA,
15  ENDIF,  INX, INX,
16  TNEXT,
17
18 LABEL OMAX  1 SP) LDA, MI
19  IF, 0 #B LDA, 0 SP) STA, 1 SP) STA,
20  ENDIF,
21  TNEXT,
22
23
```

```
 5 PURPOSE: leave a true flag if n is less
 6  than zero.
 7
 8 LABEL ABS ( n -- u )
 9 PURPOSE: leave the unsigned (absolute)
10  value of n.
11
12
13
14
15
16
17
18
19
20
21
22
23

 0 LABEL UMIN ( u1 u2 -- umin )
 1 PURPOSE: leave the unsigned minimum of
 2  u1 and u2.
 3
 4 LABEL UMAX ( u1 u2 -- umax )
 5 PURPOSE: leave the unsigned maximum of
 6  u1 and u2.
 7
 8 LABEL OMAX ( n -- 0 | n )
 9 PURPOSE: leave the greater positive
10  integer comparing n with zero.
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  150
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
```

```
 16                                                  16
 17                                                  17
 18                                                  18
 19                                                  19
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23
151
  0 ( ?K QUE ?A ?S ) HEX                             0 LABEL ?K ( -- flag )
  1                                                  1 PURPOSE: detect if a key has been
  2 LABEL ?K  YSAVE STY, DEX, DEX,                   2  pressed.
  3  0 #B LDY, CHAR LDA, MI                          3
  4  IF, DEY, ENDIF, 0 SP) STY,                      4 LABEL ?A  ( -- flag )
  5  1 SP) STY, YSAVE LDY, TNEXT,                    5 PURPOSE: detect if "again" key has been
  6                                                  6  pressed.
  7 LABEL QUE  YSAVE STY, C000 LDA, MI               7 true means "Tab" key pressed.
  8  IF, \ .QUE JSR, ENDIF, YSAVE LDY,               8 this is the EDDE "again" key.
  9  TNEXT,                                          9
 10                                                 10 LABEL ?S  ( -- flag )
 11 LABEL ?A  ( AGAIN? )  YSAVE STY,                11 PURPOSE: valid search for character(?).
 12  DEX, DEX, 0 #B LDY,                            12  true means normal character typed.
 13  CHAR LDA, tab 80 OR #B CMP, EQ                 13
 14  IF, DEY, 07F AND, CHAR STA, ENDIF,             14
 15  0 SP) STY, 1 SP) STY, YSAVE LDY,               15
 16  TNEXT,                                         16
 17                                                 17
 18 LABEL ?S  ( SEARCH FOR CHAR ? )                 18
 19  YSAVE STY, DEX, DEX, 0 #B LDY,                 19
 20  CHAR LDA, ff 80 OR #B CMP, CS                  20
 21  IF, DEY, ENDIF,  0 SP) STY,                    21
 22  1 SP) STY, YSAVE LDY, TNEXT,                   22
 23                                                 23

scr #  152
  0 ( ?E ?D ) HEX                                   0 LABEL ?E  ( -- flag )
  1                                                 1 PURPOSE: return true if both lex keys
  2 LABEL ?E  ( EXPAND SELECTION? )                 2  are being pressed.
  3  YSAVE STY, DEX, DEX, 0 #B LDY,                 3 used to expand selection.
  4  XFLAG LDA, 3 #B CMP, EQ IF, DEY, ENDIF,        4 forth equivalent  : ?E  XFLAG C@ 3 = ;
  5  0 SP) STY, 1 SP) STY, YSAVE LDY,               5
  6  TNEXT,                                         6 LABEL ?D ( -- flag )
  7                                                 7 PURPOSE: return true if delete key has
  8 LABEL ?D ( DELETE FROM PATTERN? )               8  been pressed.
  9  YSAVE STY, DEX, DEX,                           9 used to delete from the search pattern.
 10  0 #B LDY, CHAR LDA,                           10
 11  del 80 OR #B CMP, EQ IF, DEY, ENDIF,          11 LABEL QUE  ( -- )
 12  0 SP) STY, 1 SP) STY, YSAVE LDY,              12 PURPOSE: fetch character from keyboard
 13  TNEXT,                                        13  and place in keyboard queue.
 14                                                14  also jump to the subroutine at .QVEC
 15                                                15  keyboard uses C000 and .QUE.
 16                                                16
 17                                                17
 18                                                18
 19                                                19
 20                                                20
 21                                                21
 22                                                22
 23                                                23
```

```
153
  0 ( MSG ) HEX
  1
  2 LABEL MSGO  YSAVE STY, 0 #B LDA, X1 STA,
  3  \ .MSGO OFF AND #B LDA,
  4  \ .MSGO SWAB OFF AND #B LDY,
  5  X0 STA, X0 1+ STY,
  6  0 #B LDY,
  7  X0 )Y LDA, TAY,
  8  BEGIN, X0 )Y LDA, 80 #B ORA,
  9   CURR 1- ,Y STA, DEY, EQ
 10  UNTIL,
 11  X0 )Y LDA, TAY, A0 #B LDA,
 12  BEGIN, CURR ,Y STA, INY, 50 #B CPY, EQ
 13  UNTIL,
 14  DEX, DEX, X1 LDA, 0 SP) STA,
 15  YSAVE LDY,
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 LABEL MSGO ( -- 0 )
 1 PURPOSE: puts signon message in CURR,
 2  places a zero on the stack, and then
 3  executes DISP (next word in dictionary)
 4
 5 save y-reg, set X1 to zero.
 6 store the address of .MSGO at X0.
 7 put length of .MSGO in y-reg.
 8 set high bit of each element of .MSGO
 9  and store in CURR (excluding count).
10 put blanks after at the end of CURR.
11 leaves a zero on the stack.
12 ...
13
14
15
16
17
18 NOTE: next word (disp) is executed
19  immediately after this word.
20
21
22
23
```

```
scr #  154
  0 ( DISP ) HEX
  1
  2 LABEL DISP  YSAVE STY,
  3  0 SP) LDA, INX, INX, XSAVE STX,
  4  TAY, 1 #B LDA, UPDATE ,Y STA,
  5  \ .DISP0 ,Y LDA, X0    STA,
  6  \ .DISP1 ,Y LDA, X0 1+ STA,
  7  \ .SCR0  ,Y LDA, X1    STA,
  8  \ .SCR1  ,Y LDA, X1 1+ STA,
  9  C001 STA, C055 STA,
 10  4F #B LDX, 27 #B LDY,
 11  BEGIN,
 12   CURR ,X LDA, X1 )Y STA, DEX,
 13   CURR ,X LDA, X0 )Y STA, DEX, DEY,
 14   CURR ,X LDA, X1 )Y STA, DEX,
 15   CURR ,X LDA, X0 )Y STA, DEX, DEY, MI
 16  UNTIL,
 17  CLIN LDA, XSAVE LDX, YSAVE LDY, TNEXT,
 18
 19
 20
 21
 22
 23
```

```
 0 LABEL DISP ( n -- )
 1 PURPOSE: distribute text in CURR for
 2  display.
 3
 4 clear keyboard buffer, set soft switch
 5  (C055).
 6 save x-reg.
 7 put stack element in y-reg.
 8 store 1 in UPDATE array.
 9 put .DISP element into X0.
10 put .SCR0 element into X1.
11 set x-reg for 79 ($4f) columns,
12  set y-reg for 39 ($27) columns.
13 take every other element in CURR and
14  store in position pointed to by .DISP,
15  and the other elements and store into
16  the position pointed to by .SCR0.
17 load a-reg with CLIN.
18 restore x-reg.
19
20
21
22
23
```

```
155
  0 ( AUXIL ) HEX
  1
  2 LABEL AUXIL  YSAVE STY,
  3  XSAVE STX, 0 #B LDX,
  4  BEGIN,  UPDATE ,X LDA, NE
  5   IF, 0 #B LDA, UPDATE ,X STA,
  6    \ .SCR0  ,X LDA, X0 STA,
  7    \ .SCR1  ,X LDA, X0 1+ STA,
  8    \ .DISP0 ,X LDA, X1 STA,
  9    \ .DISP1 ,X LDA, X1 1+ STA,
```

```
 0 LABEL AUXIL ( -- )
 1 PURPOSE: update screen/display elements.
 2
 3 save x-reg, load x-reg with zero.
 4 if an element needs updating (UPDATE
 5  array) then clear UPDATE element,
 6  store .SCR0 element in X0 and .DISP0
 7   element in X1.
 8  attend to modem if necessary.  waiting
 9   for C019 eliminates screen flicker.
```

```
10     BEGIN, C019 LDA, PL
11     UNTIL, ROM? LDA, NE
12     IF, C000 STA,
13     ELSE, C001 LDA,
14     ENDIF, C054 STA, 27 #B LDY,
15     BEGIN,
16      X0 )Y LDA, X1 )Y STA, DEY,
17      X0 )Y LDA, X1 )Y STA, DEY,
18      X0 )Y LDA, X1 )Y STA, DEY,
19      X0 )Y LDA, X1 )Y STA, DEY, MI
20     UNTIL,
21    ENDIF, INX, 18 #B CPX, EQ
22   UNTIL, XSAVE LDX, YSAVE LDY, TNEXT,
23
```

```
10  clear keyboard strobe, set soft
11   switch (C054).
12  set y-reg to 39 ($27).
13  move elements from .SCR0 to .DISP0.
14  attend to modem if necessary. waiting
15   for C019 eliminates screen flicker.
16 restore x-reg.
17
18
19
20
21
22
23
```

```
scr #  156
 0 ( LEXLEN ROM? ) HEX
 1
 2 LABEL LEXLEN  DEX, DEX,
 3  0 #B LDA, 1 SP) STA,
 4  PATT LDA, 0 SP) STA, TNEXT,
 5
 6 LABEL ROM?  DEX, DEX,
 7  ROM? LDA, 0 SP) STA,
 8  ROM? 1+ LDA, 1 SP) STA,
 9  TNEXT,
10
11
12
13
14
15
16
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23
```

```
 0 LABEL LEXLEN ( -- n )
 1 PURPOSE: put length of search pattern
 2  onto the stack.
 3 forth equivalent  : LEXLEN  PATT C@ ;
 4
 5 LABEL ROM? ( -- n )
 6 PURPOSE: the returned value is used to
 7  determine whether the disk version or
 8  the rom version of Swyft is being
 9  used; different FRAGMENTS are used
10  depending on the version.
11 the value is zero if using the disk
12  version.
13 forth equivalent  : ROM?  ROM? C@ ;
14
15
16
17
18
19
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21
22
23
```

```
157
 0 ( SETDISP CLEAR SIGNON FLUSH ) HEX
 1
 2 LABEL SETDISP
 3  C001 STA, C051 LDA, C054 LDA,
 4  C00D STA, C00F STA, TNEXT,
 5
 6 T: CLEAR  CURR 50 A0 FILL
 7  DO I DISP LOOP AUXIL ;
 8
 9 T: SIGNON MSG0 18 1 CLEAR ;
10
11 ( FLUSHES KEYBOARD BUFFER )
12 T: FLUSH
13     0 CHAR TO
14     QIN QOUT TO
15     0 C010 C! ;
16
17
18
19
20
```

```
 0 LABEL SETDISP ( --)
 1 PURPOSE: adjust display switches.
 2
 3  C00D 80 column display on
 4  C00F alternate character set on
 5  C051 text mode on
 6  C054 page 2 off, main memory
 7
 8 T: CLEAR  (a b -- )
 9 PURPOSE: clear screen lines a to b-1.
10
11 T: SIGNON ( --)
12 PURPOSE: clear screen, display message.
13
14 T: FLUSH ( --)
15 PURPOSE: flush Swyft (CHAR, QOUT,
16  QIN) and Apple (C010) keyboard buffers.
17
18
19
20
```

```
 21                                                  21
 22                                                  22
 23                                                  23


scr #  158
  0 ( .40COL .MON ABOOT ) HEX ;S                     0
  1                                                  1
  2 FRAG .40COL  -                                   2
  3  C051 LDA, C00E STA,                             3
  4  C056 LDA, C00C STA,                             4
  5  C054 LDA, C000 STA,                             5
  6  F0 #B LDA,  36 STA,                             6
  7  FD #B LDA,  37 STA,                             7
  8  FF #B LDA,  32 STA,                             8
  9  0 #B LDA, 24 STA, 25 STA, RTS,                  9
 10                                                  10
 11 LABEL ABOOT   \ .40COL JSR,                      11
 12  0 #B LDA, 3F4 STA, 39E STA, 3E0 JMP,            12
 13                                                  13
 14                                                  14
 15                                                  15
 16                                                  16
 17                                                  17
 18                                                  18
 19                                                  19
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23
159
  0 ( .MON ) HEX ;S                                  0
  1                                                  1
  2 ( copy text & variables to main ram )            2
  3 FRAG .MON   \ .40COL JSR, FFF8 LDA, EQ           3
  4  IF,  3C STA, 3D STA, 42 STA, 43 STA,            4
  5   EBOT LDA, 3E STA,                              5
  6   EBOT 1+ LDA, 3F STA,                           6
  7   CLC, C311 JSR,                                 7
  8   BEOT LDA, 3C STA, 42 STA,                      8
  9   BEOT 1+ LDA, 3D STA, 43 STA,                   9
 10   FF LDA, 3E STA,                               10
 11   BF #B LDA, 3F STA,                            11
 12   CLC, C311 JSR,                                12
 13  ENDIF, <MON> JMP,                              13
 14                                                 14
 15                                                 15
 16                                                 16
 17                                                 17
 18                                                 18
 19                                                 19
 20                                                 20
 21                                                 21
 22                                                 22
 23                                                 23


scr #  160
  0                                                  0
  1                                                  1
  2                                                  2
  3                                                  3
  4                                                  4
```

```
 5
 6
 7
 8
 9
10
11
12
13
14
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16
17
18
19
20
21
22
23
```

```
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23
```

```
161
  0 ( <SCR> ) HEX
  1
  2 FRAG .SCR  0 #B LDX,
  3  BEGIN, 27 #B LDY,
  4   \ .DISP0    ,X LDA, X0    STA,
  5   \ .DISP0 1+ ,X LDA, X1    STA,
  6   \ .DISP1    ,X LDA, X0 1+ STA,
  7   \ .DISP1 1+ ,X LDA, X1 1+ STA,
  8   BEGIN, X1 )Y LDA, X0 )Y STA, DEY,
  9    X1 )Y LDA, X0 )Y STA, DEY, MI
 10   UNTIL, INX, 17 #B CPX, EQ
 11  UNTIL,  RTS,
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
  0 FRAG .SCR
  1 PURPOSE: from X1 to X0, move 40 bytes
  2  at a time, for 24 lines of the screen
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
scr #  162
  0 ( SCROLL ) HEX
  1
  2 LABEL SCROLL -YSAVE STY,
  3  XSAVE STX, 0 #B LDY,
  4  CLIN DEC, TOP INC, EQ
  5  IF, TOP 1+ INC, ENDIF,
  6  BEGIN, WND0 1+ ,Y LDA, WND0 ,Y STA,
  7   WND1 1+ ,Y LDA, WND1 ,Y STA,
  8   WND2 1+ ,Y LDA, WND2 ,Y STA,
  9   WND3 1+ ,Y LDA, WND3 ,Y STA,
 10   INY, 17 #B CPY, EQ
 11  UNTIL, C001 STA,
 12  C055 STA, \ .SCR JSR,
 13  BEGIN, C019 LDA, PL UNTIL,
 14  C054 LDA, \ .SCR JSR,
 15  XSAVE LDX, YSAVE LDY, TNEXT,
```

```
  0 LABEL SCROLL
  1 PURPOSE: scroll the text up if you are
  2  on the last character of the display
  3  window.
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
```

```
 16                                                  16
 17                                                  17
 18                                                  18
 19                                                  19
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23
163
  0 ( .ON/OFF .ON ON OFF ) HEX                       0 FRAG .ON/OFF  ( -- )
  1 FRAG .ON/OFF YPOS LDY,                           1 PURPOSE: calculates cursor position.
  2  \ .DISP0 ,Y LDA, X0 STA,                        2
  3  \ .DISP1 ,Y LDA, X0 1+ STA,                     3  X0=address of beginning of display line
  4  BEGIN, C019 LDA, PL                             4  picks up characters from the modem
  5  UNTIL, XPOS LDY, BANK LDA, EQ                   5   placing them into the modem que
  6  IF,    C001 STA, C055 STA,                      6  regY=YPOS
  7  ELSE, ROM? LDA, NE                              7  sets the proper ram video bank
  8   IF, C000 STA, ELSE, C001 LDA, ENDIF,           8
  9   C054 STA, ENDIF, RTS,                          9
 10                                                  10
 11 FRAG .ON YSAVE LDY,                              11
 12 LABEL ON   YSAVE STY, \ .ON/OFF JSR,             12
 13  X0 )Y LDA, OFF #B CMP, NE                       13
 14  IF, SAVECHAR STA, OFF #B LDA,                   14
 15   X0 )Y STA, ENDIF,                              15
 16  ROM? LDA, NE                                    16
 17  IF, C000 STA, ELSE, C001 LDA, ENDIF,            17
 18  C054 STA, YSAVE LDY, TNEXT,                     18
 19                                                  19
 20 LABEL OFF  YSAVE STY, \ .ON/OFF JSR,             20
 21  SAVECHAR LDA, X0 )Y STA, ROM? LDA, NE           21
 22  IF, C000 STA, ELSE, C001 LDA, ENDIF,            22
 23  C054 STA, YSAVE LDY, TNEXT,                     23

scr #  164
  0 ( <CURSOR> ) HEX                                0 FRAG ON ( -- )
  1                                                   1 PURPOSE: save Y-reg before doing .ON
  2 FRAG .CURSOR -X0 STA, X0 1+ STY,                  2
  3  18 #B LDY,                                       3 FRAG .ON  ( -- )
  4  BEGIN, DEY,                                      4 PURPOSE: display cursor on screen.
  5   X0    LDA, WND0 ,Y CMP,                        5
  6   X0 1+ LDA, WND1 ,Y SBC, CS                     6 do the following if the character on
  7  UNTIL,  NE                                       7 the screen is not a del character:
  8  IF, X0 LDA, GAP SBC, SEC,                        8 put del character on screen (into ram)
  9  ELSE, X0 LDA,                                    9 (little checkerboard),
 10  ENDIF,  WND0 ,Y SBC,  YPOS STY,                 10 saving current character in SAVECHAR
 11  .A LSR, XPOS STA, 0 #B LDA, 0 #B ADC,           11 turn regular ram back on.
 12  BANK STA,  BL0 LDA, CTR STA,                    12
 13  BL0 1+ LDA, CTR 1+ STA,  RTS,                   13 FRAG OFF  ( -- )
 14                                                  14 PURPOSE: turn cursor off.
 15                                                  15
 16                                                  16 put character on screen (into ram)
 17                                                  17 turn regular ram back on
 18                                                  18
 19                                                  19
 20                                                  20
 21                                                  21
 22                                                  22
 23                                                  23
```

```
165
  0 ( RENCUR ) HEX
  1 LABEL RENCUR  YSAVE STY, BEOT LDA,
  2  BEOT 1+ LDY, \ .CURSOR JSR, SEC,
  3  WNDO ,Y LDA, BEOT SBC, X2 STA, SEC,
  4  WND1 ,Y LDA, BEOT 1+ SBC, X2 ORA, EQ
  5  IF, EOS 1+ LDA, X1 1+ STA, 0 #B LDY,
  6   EOS LDA, EQ IF, X1 1+ DEC, ENDIF,
  7   1 #B SBC, X1 STA, X1 )Y LDA,
  8   20 #B CMP, CS
  9   IF, YPOS LDY, YPOS DEC, SEC,
 10    EOS LDA, WNDO 1- ,Y SBC,
 11    .A LSR, XPOS STA, 0 #B LDA, 0 #B ADC,
 12    BANK STA,
 13  ENDIF, ENDIF, 0 #B LDA, NARROW 1+ STA,
 14  NARROW STA, XPOS LDY, W/2 CPY, CS
 15  IF, XPOS STA, YPOS INC, ENDIF,
 16  BEOT LDA, YPOS LDY, WNDO ,Y CMP, EQ
 17  IF, BEOT 1+ LDA, WND1 ,Y CMP, EQ
 18   IF, BEGIN, WNDO 1- ,Y LDA,
 19    WNDO ,Y CMP, NE IF, \ .ON JMP, ENDIF,
 20    WND1 ,Y LDA, WND1 1- ,Y CMP, NE
 21    IF, \ .ON JMP, ENDIF, DEY, YPOS DEC,
 22    AGAIN,
 23  ENDIF, ENDIF,  \ .ON JMP,
```

```
0 FRAG .CURSOR  ( -- )
1 PURPOSE:  calculates cursor position
2  given address in regs A,Y.
3
4  output:
5   X0=address
6   YPOS=line number
7   XPOS=column number divided by 2
8   BANK=column number (even or odd)
9   CTR=blinking rate counter value (BL0)
10
11  looks in window table for entry that
12   is less than or equal to that address
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  166
  0 ( LEXCUR ) HEX
  1
  2 LABEL LEXCUR - YSAVE STY,
  3  0 #B LDA, LOCAL1 DUP 1+ STA, STA,
  4  OFF #B LDA, NARROW DUP 1+ STA, STA,
  5  EOS 1+ LDY, EOS LDA, EQ
  6  IF, DEY, ENDIF, 0 #B SBC,
  7  \ .CURSOR JSR,
  8  0 #B LDY, X0 )Y LDA, ff #B CMP, EQ
  9  IF, X0 1+ DEC, DEY, X0 )Y LDA,
 10   X0 1+ INC, 20 #B CMP, CS
 11   IF, SEC, YPOS LDY, NE
 12    IF, WNDO ,Y LDA, DEY, WNDO ,Y SBC,
 13     PHA, SEC,
 14     WND1 1+ ,Y LDA, WND1 ,Y SBC,
 15     OFE #B AND, NE
 16     IF, PLA, CLC, GAP SBC, PHA, ENDIF,
 17     PLA, WIDE CMP, NE
 18     IF, YPOS STY, .A LSR, XPOS STA,
 19      0 #B LDA, 0 #B ADC, BANK STA,
 20  ENDIF, ENDIF, ENDIF, ENDIF,
 21  \ .ON JMP,
 22
 23
167
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
```

```
 0 LABEL RENCUR  ( -- )
 1 PURPOSE: put a "fat" cursor on screen.
 2  "Fat" means a checkerboard on character
 3  and a highlight to the left.
 4
 5  calculates cursor position from BEOT
 6  if cursor is at beginning of line
 7   look at last character in selection
 8   if it isn't a control character
 9    place the blinker on the line above
10    where the next character will go
11   if it is a control character
12    place the blinker at the beginning
13    of the next line
14  set LEXXED to zero: fat cursor
15  if cursor is in last display position
16   place blinker at beginning next line
17   >>>> *** why isn't BANK set? *** <<<<
18  if cursor is at beginning of line
19   and just follows an implicit page brk
20   then: place the blinker at the
21   implicit page break, in the first cell
22
23
```

```
 0 LABEL LEXCUR  ( -- )
 1 PURPOSE: put a "thin" cursor on the
 2  character.  "Thin" means a checkerboard
 3  and a highlight alternate on the same
 4  character.
 5
 6  set LEXXED to -1: thin cursor
 7  calculate cursor position from EOS-1
 8  if character is an explicit page break
 9   and previous character is normal
```

```
 10                                          10  and not first line in display
 11                                          11  and previous line isn't full
 12                                          12   calculate XPOS by subtracting
 13                                          13    low order bytes in window table
 14                                          14    if previous line starts below gap
 15                                          15     (high order difference isn't -2)
 16                                          16    then: subtract GAP from window diff
 17                                          17   (fixes "del" bug: 9Jan85)
 18                                          18  then: place blinker on previous line
 19                                          19
 20                                          20
 21                                          21
 22                                          22
 23                                          23


scr #  168
  0                                          0
  1                                          1
  2                                          2
  3                                          3
  4                                          4
  5                                          5
  6                                          6
  7                                          7
  8                                          8
  9                                          9
 10                                         10
 11                                         11
 12                                         12
 13                                         13
 14                                         14
 15                                         15
 16                                         16
 17                                         17
 18                                         18
 19                                         19
 20                                         20
 21                                         21
 22                                         22
 23                                         23
169
  0 ( FLIP FLIP/TRIM SEL BOW ) HEX          0 T: FLIP ( start len1 len2 -- )
  1                                         1 PURPOSE: from start, swap the bytes so
  2 ( STR  LEN1  LEN2  --- )                2  that the positions of length1 and
  3 T: FLIP                                 3  length2 are swapped.
  4  ROT >R 2DUP + R@ SWAP REVERSE          4
  5  R@ OVER REVERSE                        5 T: FLIP/TRIM ( start len1 len2 len3 -- )
  6  R> + SWAP REVERSE ;                    6 PURPOSE: store cut.
  7                                         7
  8 ( STR  LEN1 LEN2 LEN3 --- )             8 T: SEL  ( -- EOS-BOS )
  9 T: FLIP/TRIM                            9 PURPOSE: returns length of selected
 10  2DUP SWAP >R >R + + OVER >R REVERSE   10  text.
 11  R> DUP R@ REVERSE                     11
 12  R> + R> REVERSE ;                     12 T: BOW  ( -- addr )
 13                                        13 PURPOSE: returns address of beginning of
 14 LABEL SEL  SEC, DEX, DEX,              14  display window.
 15  EOS    LDA, BOS    SBC, 0 SP) STA,    15
 16  EOS 1+ LDA, BOS 1+ SBC, 1 SP) STA,    16
 17  TNEXT,                                17
 18                                        18
 19 LABEL BOW  DEX, DEX,                   19
 20  WNDO LDA, 0 SP) STA,                  20
```

```
 21  WND1 LDA, 1 SP) STA, TNEXT,
 22
 23
```

```
 21
 22
 23
```

```
scr #  170
  0 ( ?BLINK ?LBLINK ?LEXXED ) HEX
  1
  2 T: ?BLINK -1 CTR +TO CTR
  3  IF CTR BL1 DIRTY 0= IF U2/ U2/ ENDIF =
  4   IF OFF ENDIF
  5  ELSE ON
  6   BL0 DIRTY 0= IF U2/ U2/ ENDIF CTR TO
  7  ENDIF ;
  8
  9 T: ?LBLINK SEL 2 U< IF ?BLINK ENDIF ;
 10
 11 T: ?LEXXED  NARROW
 12  IF -1 BEOT +TO  EBOT 1- C@ BEOT C!
 13   -1 EOS +TO -1 EBOT +TO
 14   -1 BOS +TO
 15   0 NARROW TO
 16  ENDIF ;
 17
 18
 19
 20
 21
 22
 23
```

```
 0 T: ?BLINK  ( -- )  blink cursor
 1 PURPOSE: toggle for the cursor to make
 2  it blink.
 3 if the text is not dirty then blink the
 4  cursor at 4 times its normal speed.
 5 decrement CTR.
 6 when it is BL1, turn blinker off.
 7 when it is 0, turn blinker on
 8  and set CTR to BL0.
 9
10 T: ?LBLINK  ( -- )
11 PURPOSE: if less than two characters are
12  selected, blink cursor.
13
14 T: ?LEXXED  ( -- )
15 PURPOSE: if LEXXED is true then move
16  a character from EBOT 1- across gap to
17  new BEOT.
18
19
20
21
22
23
```

```
171
  0 ( .WRAP ) HEX
  1
  2 FRAG .WRAP  SEC, WR LDA, YWRAP SBC,
  3  X5 STA, WR 1+ LDA, 0 #B SBC,
  4  X5 1+ STA, YWRAP LDY, cr #B LDA,
  5  BEGIN, X5 )Y CMP, CS
  6   IF, EQ IF, INY, ENDIF,
  7    TYA, YWRAP SBC, WC STA, EQ
  8    IF, WC INC, ENDIF, RTS,
  9   ENDIF, INY, MI
 10  UNTIL, 20 #B LDA, WIDE LDY,
 11  DEY, WR )Y CMP, NE
 12  IF, INY,
 13   BEGIN, DEY, MI
 14    IF, WIDE LDA, WC STA, RTS,
 15    ENDIF, WR )Y CMP, EQ
 16   UNTIL, INY, WC STY, RTS,
 17  ENDIF, DEY, WR )Y CMP, EQ
 18  IF, WIDE LDA, WC STA, RTS,
 19  ENDIF,
 20
 21
 22
 23
```

```
 0 FRAG .WRAP  ( -- )
 1 PURPOSE: given character at wrap
 2  address (WR) return wrap count (WC)
 3  for line.
 4
 5 X5+YWRAP initially equal to WR.
 6 UNTIL either a cr or ff or end of line
 7  if a cr or ff
 8   if a cr, increment count by one
 9   increment wrap count by count
10   if wrap count is 0, increment to one
11   exit
12  else increment count.
13 if there are 1 or 2 blanks at end of
14  line then wrap the last word by
15  decrementing until a blank is found,
16  increment to first character of word,
17  and exit.
18 if the line is full of blanks or
19  characters then do not wrap line
20  (ie, WC set equal to WIDE).
21
22
23
```

```
scr #  172
  0 ( .WRAP ... WRAP BMP ) HEX
  1
  2  WIDE LDY, WR )Y CMP, EQ
  3  IF, DEY, DEY,
  4   BEGIN, DEY, MI
```

```
 0 LABEL WRAP ( -- )
 1 PURPOSE: call .WRAP.
 2
 3 FRAG BMP ( -- )
 4 PURPOSE: add the wrap count to the wrap
```

```
 5    IF, WIDE LDA, WC STA, RTS,
 6    ENDIF, WR )Y CMP, EQ
 7   UNTIL, INY, WC STY, RTS,
 8  ENDIF, WIDE LDA, WC STA, RTS,
 9
10 LABEL WRAP  YSAVE STY,
11  \ .WRAP JSR, YSAVE LDY, TNEXT,
12
13 FRAG BMP  CLC,
14  WC LDA, WR ADC, WR STA, CS
15  IF, WR 1+ INC, ENDIF,
16  EBOT CMP, WR 1+ LDA, EBOT 1+ SBC, NC
17  IF, RTS, ENDIF,
18  WR LDA, BEOT CMP,
19  WR 1+ LDA, BEOT 1+ SBC, NC
20  IF, WR LDA, GAP ADC, WR STA,
21   WR 1+ LDA, GAP 1+ ADC, WR 1+ STA,
22  ENDIF, RTS,
23
```

```
173
 0 ( LOCLIN ) HEX
 1
 2 LABEL LOCLIN  YSAVE STY,
 3  0 SP) LDA, X0 STA,
 4  1 SP) LDA, X0 1+ STA, INX, INX,
 5  PAGES LDY, INY,
 6  BEGIN, DEY,
 7   X0    LDA, PGS2 ,Y CMP,
 8   X0 1+ LDA, PGS3 ,Y SBC, CS
 9  UNTIL,  PAGE# STY,
10  PGS0 ,Y LDA, WR STA,
11  PGS1 ,Y LDA, WR 1+ STA,
12  X0 LDA, PGS2 ,Y SBC, LINREL STA,
13  OFF #B LDY, X3 STY,
14  BEGIN, X3 INC, X3 LDA, LINREL CMP, NE
15   IF, \ .WRAP JSR, \ BMP JSR, CLC,
16    C000 LDA, MI IF, \ .QUE JSR, ENDIF,
17   ENDIF, CS
18  UNTIL,
19  WR    LDA, LINADR STA,
20  WR 1+ LDA, LINADR 1+ STA,
21  YSAVE LDY, TNEXT,
22
23
```

```
 5  address. if EBOT < wrap address < BEOT
 6  then also add the GAP to the wrap
 7  address.
 8
 9 add wrap count to wrap address.
10 if the new wrap address exceeds EBOT
11  then exit.
12 otherwise if new wrap address is less
13   than BEOT
14  then add gap to the new wrap address.
15
16
17
18
19
20
21
22
23
```

```
 0 LABEL 2.LOCLIN  ( line-number -- )
 1 PURPOSE: given cumulative line number
 2  return with  LINREL, LINADR, and PAGE#
 3  for that line-number.
 4
 5 store line# in X0.
 6 store total # of pages in Y-reg.
 7 search backwards in page table from
 8  y-reg 1+ until the page is found for
 9  the line address in X0.
10 store this page# (y-reg) in PAGE#.
11 store the address of the page in WR.
12 calculate offset within page (LINREL).
13 .WRAP this page until line LINREL,
14   BMPing across gap if necessary.
15   attend to key queue if necessary.
16 store wrap address for the beginning of
17  the line containing the line-number
18  in LINADR.
19
20
21
22
23
```

```
scr #  174
 0 ( LOCCHR ) HEX
 1
 2 LABEL LOCCHR  YSAVE STY,
 3  0 SP) LDA, X0 STA,
 4  1 SP) LDA, X0 1+ STA, INX, INX,
 5  PAGES LDY, INY,
 6  BEGIN, DEY,
 7   X0    LDA, PGS0 ,Y CMP,
 8   X0 1+ LDA, PGS1 ,Y SBC, CS
 9  UNTIL,
10  PGS0 ,Y LDA, WR STA,
11  PGS1 ,Y LDA, WR 1+ STA,
12  PGS2 ,Y LDA, LINE# STA,
13  PGS3 ,Y LDA, LINE# 1+ STA,
14  PAGE# STY, 0 #B LDY, X3 STY,
15  BEGIN, X3 INC, \ .WRAP JSR,
```

```
 0 LABEL 2.LOCCHR  ( character-address -- )
 1 PURPOSE: given an address for a
 2  character in text this word then
 3  returns PAGE#, LINADR, LINREL and LINE#
 4  where the address was found.
 5
 6 store address in X0.
 7 load y-reg with total # of pages (PAGES)
 8 search backwards in page array for wrap
 9  address that contains the value in X0.
10 when it is found then update WR and
11  LINE# from page table.
12 store y-reg in PAGE#.
13 wrap lines and bump across gap if
14  necessary.
15 update LINADR, LINREL, LINE#.
```

```
    16   COOO LDA, MI IF, \ .QUE JSR, ENDIF,
    17   WR LDA, X2 STA,
    18   WR 1+ LDA, X2 1+ STA,
    19   \ BMP JSR, SEC,
    20   WR LDA, X0 SBC, X4 STA,
    21   WR 1+ LDA, X0 1+ SBC, CS
    22  UNTIL,
    23
175
   0 ( LOCCHR, .... ) HEX
   1
   2  X4 ORA, EQ
   3  IF, WR LDA, WR 1+ LDY,
   4  ELSE, X2 LDA, X2 1+ LDY, X3 DEC,
   5  ENDIF,
   6  LINADR STA, LINADR 1+ STY,
   7  X3 LDA, LINREL STA, CLC,
   8  LINE# ADC, LINE# STA, CS
   9  IF, LINE# 1+ INC, ENDIF,
  10  YSAVE LDY, TNEXT,
  11
  12
  13
  14
  15
  16
  17
  18
  19
  20
  21
  22
  23
```

```
scr #  176
   0 ( WC@ WR@ WR! REWINDOW ) HEX
   1
   2 LABEL WC@  DEX, DEX,
   3  WC LDA, 0 SP) STA,
   4  0 #B LDA, 1 SP) STA, TNEXT,
   5
   6 LABEL WR@  DEX, DEX,
   7  WR LDA, 0 SP) STA,
   8  WR 1+ LDA, 1 SP) STA, TNEXT,
   9
  10 LABEL WR!  0 SP) LDA, WR STA,
  11  1 SP) LDA, WR 1+ STA,
  12  INX, INX, TNEXT,
  13
  14 LABEL REWINDOW  YSAVE STY,
  15  0 SP) LDA, WND0 STA,
  16  1 SP) LDA, WND1 STA,  INX, INX,
  17  0 #B LDA, OLIN STA,  17 #B LDY,
  18  BEGIN, WND0 ,Y STA, WND1 ,Y STA,
  19   DEY, EQ
  20  UNTIL, YSAVE LDY, TNEXT,
  21
  22
  23
```

```
 0 LABEL WC@  ( -- n )
 1 PURPOSE: return the wrap count.
 2
 3 LABEL WR@  ( -- n )
 4 PURPOSE: return the wrap address.
 5
 6 LABEL WR! ( address -- )
 7 PURPOSE: store the address from the
 8  stack into the wrap address.
 9
10 LABEL REWINDOW  ( address -- )
11 PURPOSE: initialize the window table.
12 set up first line on screen with
13  address on stack (WND0,WND1 with the
14  Y-reg = 0).
15 put zeroes into rest of the WND0,WND1
16  elements (Y-reg decrementing from $17
17  to 1).
18 clear OLIN.
19
20
21
22
23
```

```
177
  0 ( FIXEND ?SCROLL ENDSCREEN? AFTERGAP )
  1 HEX
  2
  3 T: FIXEND
  4  BEOT EOT =
  5  IF -1 BEOT +TO 1C BEOT C! ENDIF ;
  6
  7 T: ?SCROLL   CLIN 18 =
  8  IF WR@ EOT U< DUP 0=
  9   IF DROP NARROW 0= ENDIF
 10   IF AUXIL SCROLL ENDIF ENDIF ;
 11
 12 T: ENDSCREEN?
 13  WR@ BEOT = IF ?SCROLL ENDIF ;
 14
 15 LABEL AFTERGAP  YSAVE STY,
 16  CLIN LDA, 0 #B SBC, OLIN STA,
 17  DEX, DEX, 0 #B LDY, 17 #B CMP, NE
 18  IF, DEY, ENDIF,
 19  0 SP) STY, 1 SP) STY, YSAVE LDY,
 20  TNEXT,
 21
 22
 23
```

```
  0 T: FIXEND  ( -- )
  1 PURPOSE: if the last character of text
  2  was deleted then replace it with
  3  another form feed character.
  4
  5 T: ?SCROLL ( -- )
  6 PURPOSE: scroll the display.
  7 scroll one line up
  8 if the current line is 18 and
  9  if the wrap address < EOT or
 10  if wrap address = EOT and you did not
 11   lex to the end.
 12
 13 T: ENDSCREEN? ( -- )
 14 PURPOSE: scroll display until wrap
 15  address equals the BEOT.
 16
 17 LABEL AFTERGAP  ( -- flag )
 18 PURPOSE: is current line offscreen?
 19 set OLIN=CLIN-1.
 20 if OLIN is not the last line then the
 21  flag is true.
 22 otherwise OLIN is the last line and the
 23  flag is false.
```

```
scr #  178
  0 ( XYNEXT YNEXT STOP? ) HEX
  1
  2 FRAG XYNEXT XSAVE LDX,
  3 FRAG YNEXT  YSAVE LDY, TNEXT,
  4 ;S
  5 LABEL STOP?
  6  DEX, DEX, 0 #B LDA,
  7  0 SP) STA, 1 SP) STA,
  8  C061 LDA, C062 ORA, MI
  9  IF, TNEXT, ENDIF,
 10  0 SP) DEC, 1 SP) DEC,
 11  TEOS 1+ LDA, WR 1+ CMP,
 12  TEOS LDA, WR SBC, NC
 13  IF, TNEXT, ENDIF,
 14  MQIN LDA, MQOUT CMP, NE
 15  IF, TNEXT, ENDIF,
 16  CHAR LDA, del 80 OR #B CMP, EQ
 17  IF, TNEXT, ENDIF,
 18  CHAR LDA, tab 80 OR #B CMP, CS
 19  IF, LEXXING LDA, EQ
 20   IF, TNEXT, ENDIF,
 21  ENDIF,
 22  0 SP) INC, 1 SP) INC,
 23  TNEXT,
179
  0 ( SAVEPAGE NEXTPAGE ) HEX
  1
  2 LABEL SAVEPAGE  ( -- )  YSAVE STY,
  3  LCT LDY, EQ
  4  IF, PCT LDY,
  5   WR    LDA, PGS0 ,Y STA,
  6   WR 1+ LDA, PGS1 ,Y STA,
  7   LCTR  LDA, PGS2 ,Y STA,
  8   LCTR 1+ LDA, PGS3 ,Y STA,
  9  ENDIF, YSAVE LDY, TNEXT,
```

```
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
  0 LABEL SAVEPAGE ( -- )
  1 PURPOSE: if the line count for the page
  2  (LCT) is zero then update a page in the
  3  page table.
  4
  5 INPUTS: LCT PCT WR LCTR
  6 OUTPUTS: PGS0 PGS1 PGS2 PGS3
  7
  8 NOTE: previously called PAGEBOUND.
  9
```

```
 10
 11 ;S
 12
 13 LABEL NEXTPAGE  ( addr -- page# )
 14  YSAVE STY, FF #B LDY,
 15  BEGIN,
 16   BEGIN, INY,
 17    A00 )Y LDA,    X0 STA, 0 SP) CMP,
 18    B00 )Y LDA, X0 1+ STA, 1 SP) SBC, NC
 19   UNTIL, Y0 STY,
 20   0 #B LDY, X0 )Y LDX, ff #B CPX, EQ
 21  UNTIL, 0 #B LDA, 1 SP) STA,
 22  Y0 LDA, 0 SP) STA, YSAVE LDY, TNEXT,
 23
```

```
 10
 11
 12
 13
 14 ;S
 15
 16 LABEL NEXTPAGE ( addr -- page# )
 17
 18 this is part of Jonathan's routine to
 19  speed up the updating of the page table
 20
 21
 22
 23
```

```
scr #  180
  0 ( PAGEWRAP ) HEX ;S
  1
  2 LABEL PAGEWRAP  ( -- )  YSAVE STY,
  3  BEGIN, \ .WRAP JSR,
  4   LCT INC, CLC, WC LDA, NE
  5   IF, WR ADC, WR STA, CS
  6    IF, WR 1+ INC, ENDIF, ENDIF,
  7   0 #B LDY, WR )Y LDA, ff #B CMP, EQ
  8   IF, INY, WR INC, CS
  9    IF, WR 1+ INC, ENDIF,
 10   ELSE, LCT LDA, LONG CMP, EQ
 11    IF, INY, ENDIF,
 12   ENDIF, DEY, EQ
 13  UNTIL,
 14  PCT INC, CLC, LCT LDA, LCTR ADC, CS
 15  IF, LCTR 1+ INC, ENDIF,
 16  0 #B LDA, LCT STA, YSAVE LDY, TNEXT,
 17
 18
 19
 20
 21
 22
 23
```

```
  0 ;S LABEL PAGEWRAP
  1
  2
  3
  4 this is part of Jonathan's routine to
  5  speed up the updating of the page table
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
181
  0 ( NOTMATCH? ) HEX ;S
  1
  2 LABEL NOTMATCH?  ( addr -- flag )
  3  XSAVE STX, YSAVE STY, 0FF #B LDY,
  4  SEC, 0 #B LDA, CUTPAGES SBC, TAX,
  5  D00 ,S LDA, 1 SP) CMP, EQ
  6  IF, C00 ,X LDA, 0 SP) CMP, EQ
  7   IF, INY, ENDIF, ENDIF,
  8  XSAVE LDX, 0 SP) STY, 1 SP) STY,
  9  YSAVE LDY, TNEXT,
 10
 11 LABEL FIXTABLE  ( -- )  YSAVE STY,
 12  SEC, 0 #B LDA, CUTPAGES SBC, TAY,
 13  SEC, LCTR LDA, C00 ,Y SBC, X0 STA,
 14  LCTR 1+ LDA, D00 ,Y SBC, X0 1+ STA,
 15  BEGIN, CLC,
 16   C00 ,Y LDA, X0 ADC, C00 ,Y STA,
 17   D00 ,Y LDA, X0 1+ ADC, D00 ,Y STA,
 18   INY, EQ
 19  UNTIL,
 20  CLC, LINES LDA, X0 ADC, LINES STA,
```

```
  0 ;S LABEL NOTMATCH?
  1
  2 LABEL FIXTABLE
  3
  4 these are part of Jonathan's routine to
  5  speed up the updating of the page table
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
```

```
 21  LINES 1+ LDA, XO 1+ ADC, LINES 1+ STA,
 22  CLC, PCT LDA, CUTPAGES ADC, PAGES STA,
 23  YSAVE LDY, TNEXT,
```

```
scr #  182
  0 ( DOPAGING ) HEX ;S
  1
  2 T: DOPAGING  -
  3  PRESET WRAPDONE
  4  IF BEOT NEXTPAGE OLDPAGE TO
  5   PAGES OLDPAGE - 1+ CUTPAGES TO
  6   E00 A00
  7   DO I OLDPAGE +
  8    I 100 + PAGES OLDPAGE - 1+ DUP >R -
  9    R> CMOVE
 10   100 +LOOP
 11   0 WRAPDONE TO
 12  ENDIF
 13  BEGIN WR@ BEOT U<
 14  WHILE SAVEPAGE PAGEWRAP
 15  REPEAT
 16  BEGIN STOP? IF EXIT ENDIF
 17   SAVEPAGE WR@ NOTMATCH?
 18  WHILE PAGEWRAP
 19  REPEAT FIXTABLE -1 WRAPDONE TO
 20  E00 A00
 21  DO I PCT + I 100 + CUTPAGES CMOVE
 22  100 +LOOP ;
 23
183
  0 ( SAVEPAGE ?ONPAGE ) HEX
  1
  2 LABEL ?ONPAGE  DEX, DEX,
  3  YSAVE STY, 0 #B LDY,
  4  WC STY, WR )Y LDA, ff #B CMP, EQ
  5  IF, INY, WC INC,
  6  ELSE, LCT LDA, LONG CMP, EQ
  7   IF, INY, ENDIF,
  8  ENDIF, DEY, PAGEFLAG STY,
  9  0 SP) STY, 1 SP) STY, YSAVE LDY,
 10  TNEXT,
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
scr #  184
  0 ( ?MORETEXT LASTPAGE ) HEX
  1
  2 LABEL ?MORETEXT  DEX, DEX,
  3  YSAVE STY, FF #B LDY,
  4  WR LDA, EOT CMP,
```

```
 0 ;S T: DOPAGING
 1
 2 this is part of Jonathan's routine to
 3  speed up the updating of the page table
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 LABEL ?ONPAGE  ( -- flag )
 1 PURPOSE: detect if currently on a page.
 2
 3  false = first character is a formfeed
 4   or an implicit page break belongs
 5   sets the wrap count WC accordingly
 6  true = don't change WC
 7
 8 NOTE: PAGEFLAG retains value of flag.
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 LABEL ?MORETEXT ( -- flag )
 1 PURPOSE: flag indicates if wrapping has
 2  reached the end of text.
 3
 4 if the wrap address >= EOT then true
```

```
 5  WR 1+ LDA, EOT 1+ SBC, CS
 6  IF, INY, ENDIF,
 7  0 SP) STY, 1 SP) STY, YSAVE LDY,
 8  TNEXT,
 9
10 LABEL LASTPAGE  YSAVE STY, PCT LDY,
11  OFF #B LDA,
12  BEGIN, INY, NE
13  WHILE, PGS0 ,Y STA, PGS1 ,Y STA,
14   PGS2 ,Y STA, PGS3 ,Y STA,
15  REPEAT, YSAVE LDY, TNEXT,
16
17
18
19
20
21
22
23
185
 0 ( INCPAGES ) HEX ;S
 1
 2  ( endaddress increase startpage -- )
 3 LABEL INCPAGES  YSAVE STY, 0 SP) LDY,
 4  INX, INX,
 5  BEGIN, INY, 2 SP) LDA, PGS0 ,Y CMP,
 6   3 SP) LDA, PGS1 ,Y SBC, NC
 7   IF, DEY, PCT STY, 0 #B LDA, LCT STA,
 8    PGS2 ,Y LDA, LCTR STA,
 9    PGS3 ,Y LDA, LCTR 1+ STA,
10    YSAVE LDY, INX, INX, INX, INX,
11    TNEXT,
12   ENDIF, CLC, 0 SP) LDA, PGS0 ,Y ADC,
13   PGS0 ,Y STA, WR STA,
14   1 SP) LDA, PGS1 ,Y ADC,
15   PGS1 ,Y STA, WR 1+ STA,
16  AGAIN,
17
18
19
20
21
22
23
```

```
 5  flag.
 6 otherwise false flag.
 7
 8
 9 LABEL LASTPAGE  ( -- )
10 PURPOSE: fills elements at the end of
11  the page table with $FF.
12  The value $FF is used by other words
13  when scanning backwards from the end
14  of the page table to find valid page
15  table elements.
16
17 from PCT+1 to the end of the page table
18  fill all page table elements with FF.
19
20
21
22
23

 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  186
 0 ( <ENDFORM> ENDFORM ) HEX
 1
 2 LABEL ENDFORM  YSAVE STY, OLIN LDY,
 3  WND0 ,Y LDA, WR    STA,
 4  WND1 ,Y LDA, WR 1+ STA,
 5  WND2 ,Y LDA, LCT STA,
 6  WND3 ,Y LDA, PCT STA,
 7  TOP LDA, OLIN ADC, LCTR STA,
 8  TOP 1+ LDA, 0 #B ADC, LCTR 1+ STA,
 9  YSAVE LDY,
10
11 T: <ENDFORM>
12  BEGIN ?MORETEXT
13  WHILE SAVEPAGE
14   ?ONPAGE IF WRAP ENDIF
15   ENDWRAP DROP
```

```
 0 LABEL ENDFORM  ( -- )
 1 PURPOSE: set up parameters then call
 2  <ENDFORM>.
 3 set up WR, LCT and PCT with
 4 values of the last line changed (OLIN)
 5 in window table (WND0,1,2,3) and
 6 update LCTR.
 7
 8 NOTE: no TNEXT, executes <ENDFORM>
 9
10 T: <ENDFORM>  ( -- )
11 PURPOSE: update page table by wrapping
12  from the current line until the end of
13  text or until interrupted by any key.
14
15 while there is still text to wrap
```

```
 16   QUE THOROUGH? 0=                          16 update page table if first line.
 17   IF ?BLINK STOP? IF EXIT ENDIF ENDIF       17 if not at a page break, wrap line.
 18  REPEAT  0 THOROUGH? TO                     18 point WR to beginning of next line.
 19  SAVEPAGE                                   19 if an interrupt event occurs exit
 20  LCTR LINES TO   PCT PAGES TO               20  unless desire to thoroughly update.
 21  LASTPAGE ;                                 21 update page table for last break.
 22                                             22 update LINES and PAGES.
 23                                             23 clear remainder of page table.
187
  0 ( PREALIGN +ALIGN ) HEX                     0 T: PREALIGN  ( -- )
  1                                             1 PURPOSE: prepare to update page table
  2 T: PREALIGN  80 WIDE - YWRAP TO             2  from the beginning of text.
  3  WIDE U2/ W/2 TO  BEOT EBOT - GAP TO        3
  4  BEOT EBOT 51 CMOVE                         4 initialize YWRAP, W/2, GAP,
  5  0 LCT TO 0 LCTR TO 0 PCT TO                5  LCT, LCTR, PCT, LINES, PAGES.
  6  -1 THOROUGH? TO BOT WR! ;                  6  move $51 text elements to EBOT for
  7                                             7   wrapping.
  8 ( old-EBOT old-BOT -- )                     8
  9 T: +ALIGN  PREALIGN                         9
 10  BOT SWAP - -1 INCPAGES <ENDFORM> ;        10 T: +ALIGN ( old-EBOT old-BOT --)
 11                                            11 PURPOSE: update page table in minimum
 12                                            12  amount of time by adding offset to
 13                                            13  page table elements before gap.
 14                                            14
 15                                            15 set up for align (PREALIGN).
 16                                            16 calculate endaddress and increase.
 17                                            17 -1 will start INCPAGES at the beginning
 18                                            18  of the page table.
 19                                            19 add increase to early pages.
 20                                            20 wrap lines to end of text (<ENDFORM>).
 21                                            21
 22                                            22
 23                                            23

scr #  188
  0 ( ENDWINDOW SETLINE ) HEX                   0 T: ENDWINDOW ( -- )
  1                                             1 PURPOSE: set end of window (EOW) if
  2 LABEL ENDWINDOW  EFLAG LDA, NE              2  necessary.
  3  IF, WR    LDA, EOW STA,                    3 set end of window (EOW) to
  4      WR 1+ LDA, EOW 1+ STA,                 4 the wrap address (WR) if EFLAG (end
  5  ENDIF,  TNEXT,                             5 flag?) is true.
  6                                             6
  7 LABEL SETLINE  INX, INX,                    7 LABEL SETLINE  ( line# -- )
  8  YSAVE STY, 0 SP) LDY,                      8 PURPOSE: updates WR, LCT, PCT, and WC
  9  WND0 ,Y LDA, WR STA,                       9  from line# element in window table.
 10  WND1 ,Y LDA, WR 1+ STA,                   10  if last line on screen update WC from
 11  WND2 ,Y LDA, LCT STA,                     11  EOW else from window table.
 12  WND3 ,Y LDA, PCT STA,                     12
 13  17 #B CPY, EQ                             13 <<<<** bug **>>>>
 14  IF, EOW LDA,                              14 if a line contains gap
 15  ELSE, WND0 1+ ,Y LDA,                     15 WC will be set incorrectly
 16  ENDIF, SEC, WR SBC, WC STA,               16
 17  YSAVE LDY, TNEXT,                         17
 18                                            18
 19                                            19
 20                                            20
 21                                            21
 22                                            22
 23                                            23
```

```
180
  0 ( FRESH SHOWLINE REFRESH ) HEX
  1
  2 T: SHOWLINE QUE ?ONPAGE
  3  IF WRAP ADJUST TOBUFF
  4  ELSE SHOWPAGE
  5  ENDIF DISP QUE ENDWRAP ;
  6
  7 T: FRESH PRESET
  8  BEGIN CLIN ?UPDATE DROP
  9   SAVEPAGE CLIN SHOWLINE
 10  WHILE ?SCROLL
 11  REPEAT
 12  1 EFLAG TO ENDSCREEN?
 13  AFTERGAP
 14  IF 18 CLIN
 15   DO I ?UPDATE
 16    IF I SHOWLINE DROP
 17    ELSE 0 EFLAG TO LEAVE
 18    ENDIF
 19   LOOP
 20  ENDIF AUXIL ENDWINDOW ;
 21
 22 T: REFRESH OFF FRESH RENCUR ENDFORM ;
 23
```

```
 0 T: SHOWLINE  ( -- flag ) display a line.
 1  true=end of selection displayed.
 2  if line is not a page break or CR then
 3   wrap this line, adjust, move to buffer
 4  else construct pagebreak symbols.
 5  display the line, adjust page table.
 6
 7 T: FRESH  ( -- )  refresh screen
 8  and update page table re: display.
 9  prepare text, CLIN, LCT PCT, LCTR
10  BEGIN update element in window array.
11   if page brk update page array.
12   display line.
13  WHILE eos not displayed
14   if this is last line then scroll.
15  REPEAT eos is last screen char scroll
16  set OLIN to CLIN-1
17  if not on last line.
18  then for each line changed
19   update window table, display line.
20  update auxiliary half of video.
21  update EOW if change beyond screen.
22
23
```

```
scr #  190
  0 ( REFRESHER SHOW RESHOW )  HEX
  1
  2 T: RESHOW  DUP SETLINE
  3  DO I ?UPDATE DROP I SHOWLINE DROP
  4  LOOP AUXIL ;
  5
  6 T: SHOW  18 0 RESHOW WR@ EOW TO ;
  7
  8 ( # -- | redisplay # lines before EOS )
  9 T: REFRESHER
 10  OLIN SWAP - 1- OMAX OLIN TO
 11  EOS TEOS TO ENDFORM -1 TEOS TO
 12  FRESH ;
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 T: REFRESH refresh screen, wrap pages.
 1
 2 T: RESHOW  ( end-line# start-line# -- )
 3 PURPOSE: show each line and then show
 4  the auxilliary video.
 5
 6 T: SHOW  ( -- )
 7 PURPOSE: display new screen using new
 8  parameters.
 9 updates LCT, PCT, and WR
10 for each line on screen
11  and until end of selection displayed
12  update element in window array
13  and display line or page break
14 if end of selection is displayed
15  and there are more lines to be shown
16  show remaining lines on screen
17 display auxiliary video
18 store wrap address into EOW
19
20 T: REFRESHER ( n -- )
21 PURPOSE: redisplay n lines before EOS.
22
23
```

```
191
  0 ( TOPLINE NEWND ) HEX
  1
  2 LABEL TOPLINE
  3  LINREL LDA, WND2 STA,
  4  PAGE# LDA, WND3 STA,
  5  0 #B LDA, WND2 1+ STA,
  6  0 #B LDA, WND3 1+ STA,
  7  TNEXT,
  8
  9 T: NEWND   E# TOP U< TOP 17 + E# U< OR
```

```
 0 LABEL TOPLINE ( -- )
 1 PURPOSE: set beginning of window array
 2  to LINREL and PAGE# and zero next byte.
 3
 4 T: NEWND  ( -- )
 5 PURPOSE: if new window then update
 6  parameters.
 7 if eos is not on screen or EOS = BOW
 8  then: set NUFLAG = true
 9  else: set NUFLAG = false
```

```
 10  EOS BOW =  OR DUP NUFLAG TO
 11  IF B# 17 + E# U<
 12   IF E# OB -
 13   ELSE E# B# OB + U<
 14    IF E# OB - ELSE B# ENDIF
 15   ENDIF OMAX
 16   LINES 18 - OMAX UMIN
 17   DUP LOCLIN TOP TO
 18   LINADR REWINDOW
 19   TOPLINE
 20  ENDIF ;
 21
 22 ;S
 23  LINES TOP 18 + U< TOP 0= 0= AND OR
```

```
 10  if entire selection won't fit
 11   or will fit in less than half screen
 12   put eos in middle of screen
 13  if entire select takes more than half
 14   set top line to be bos
 15  prevent negative or too large text
 16   pointers
 17  update LINREL, LINADR, PAGE#, and TOP
 18  initialize window table with
 19   LINADR, LINREL, and PAGE#
 20 NOTE1: returns flag in NUFLAG, true =
 21  display must be changed.
 22 NOTE2: E# and B# determine the new
 23  selection.
```

```
scr #  192
  0 ( NEWMARK OLDSHOW SHOWMARK ) HEX
  1
  2 ( lowside highside -- )
  3 T: NEWMARK  E# OLDE# TO B# OLDB# TO
  4  DUP EOS =
  5  IF DROP
  6  ELSE DUP LOCCHR LINE# E# TO EOS TO
  7  ENDIF DUP BOS =
  8  IF DROP
  9  ELSE DUP EOS 1- =
 10   IF E# 1-
 11   ELSE DUP LOCCHR LINE#
 12   ENDIF  B# TO BOS TO
 13  ENDIF ;
 14
 15 T: OLDSHOW
 16  E# OLDE# UMAX TOP - 2 + 18 UMIN
 17  B# OLDB# UMIN TOP - 2 - OMAX
 18  OVER 1- UMIN RESHOW ;
 19
 20 ( lowside highside -- )
 21 T: SHOWMARK  NEWMARK NEWND NUFLAG
 22  IF SHOW ELSE OLDSHOW ENDIF ;
 23
193
  0 ( ?UNSCROLL ) HEX ;S
  1
  2 T: ?UNSCROLL
  3  E# TOP - DUP 18 U<
  4  IF DUP OLIN TO PRESET
  5   18 CLIN
  6   DO CLIN ?UPDATE DROP PAGEBOUND
  7    ?ONPAGE
  8    IF WRAP ENDIF
  9    ENDWRAP DROP
 10    ?MORETEXT 0=
 11    IF PAGEBOUND
 12     CLIN 18 = 0= TOP AND
 13     IF -1 TOP +TO TOP LOCLIN
 14      LINADR REWINDOW TOPLINE
 15      DROP 0
 16     ENDIF LEAVE
 17    ENDIF
 18   LOOP OFF 18 OVER 1- OMAX RESHOW
 19   WR@ EOT TO
 20  ENDIF DROP ;
```

```
  0 T: NEWMARK  ( lowside highside -- )
  1 PURPOSE: update E# and B# (the line
  2  numbers for the EOS and BOS).
  3 save E# and B# in OLDE# and OLDB#.
  4 if EOS or BOS are new then update E# and
  5  B# using LOCCHR (which updates LINREL,
  6  PAGE#, LINE#, E#).
  7
  8
  9 T: OLDSHOW  ( -- )
 10 PURPOSE: show all lines in which
 11  selection may have changed keeping old
 12  display window.
 13
 14 T: SHOWMARK  ( lowside highside -- )
 15 PURPOSE: show selection on screen.
 16 update parameters (NEWMARK) for new
 17  selection.
 18 NUFLAG set true if EOS not on the
 19  current display (NEWND).
 20 if new text is to be displayed
 21  SHOW new selection.
 22 else show old selection (OLDSHOW).
 23
```

```
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
```

```
 21
 22
 23
```

```
scr #  194
  0
  1
  2
  3
  4
  5
  6
  7
  8
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
195
  0 ( CUT ) HEX
  1
  2 T: CUT  BOT >R BOS >R
  3  BOS LOCCHR LINE# B# TO
  4  BOC  BOT BOC -
  5  BOS BOT -  SEL  FLIP/TRIM
  6  SEL BOC + BOT - DUP BOS +TO
  7  DUP OEOS +TO
  8  DUP BOT +TO
  9  BOW + REWINDOW
 10  BOT BOS U< BOS +TO
 11  1C BOT C!
 12  BOS 1+ DUP EOS TO EBOT TO
 13  FIXEND
 14  R> R> +ALIGN
 15  B# E# TO  NEWND
 16  0 OLIN TO OFF FRESH RENCUR OFF
 17  FLUSH ;
 18
 19
 20
 21
 22
 23
```

```
scr #  196
  0 ( DELETE ) HEX
  1
  2 T: DELETE  EBOT BOT - EOT BEOT - + 2 =
  3  IF EXIT ENDIF
  4  OEOS EOS 1+ U< BOS OEOS U< AND
```

```
 21
 22
 23
```

```
  0 T: CUT  ( -- )
  1 PURPOSE: move selection to cut buffer,
  2  refresh screen, update as quickly as
  3  possible.
  4
  5 save BOT and BOS for +ALIGN.
  6 update B# since selection is deleted.
  7 delete old cut and move selection
  8  to the cut buffer.
  9 adjust for the old cut being removed:
 10  decrement BOS, OEOS, and BOT
 11  and update window table.
 12 if bos is not bot, decrement BOS.
 13 make sure bot has a form feed.
 14 update EOS and EBOT.
 15 put form feed at end of text.
 16 +align page table using BOT & BOS
 17  (initialize YWRAP, W/2, GAP, LCT,
 18   LCTR ,PCT, LINES, PAGES).
 19 force TOP to be too large for NEWND.
 20 set E# to B#
 21 update selection related variables:
 22  LINREL, LINADR, PAGE#, TOP
 23 cursor off, fresh screen, rencur.
```

```
  0 T: NIBBLE  ( -- )
  1 PURPOSE: delete one character
  2
  3  operate on one character only
  4  if at beginning of text then move up
  5   one character like creeper
  6  else (not at beginning)
  7   if narrow cursor and not at end of
  8    text then (remove char from right)
  9    delete character if not at end
 10    update BEOT if not at end
 11    update screen
 12  else (fat cursor) so move 1 character
 13   to the left and
 14   if at end of screen then display new
 15   put form feed at end of text (FIXEND)
 16    and refresh screen
 17  if OEOS is anywhere within gap, set
 18   OEOS to BOS
 19
 20
 21
 22
 23
```

```
  0 T: CREEPDOWN
  1 PURPOSE: copy char, update BEOT, EBOT
  2
  3 T: DELETE  ( -- )
  4 PURPOSE: delete character or selection
```

```
 5  IF BOS OEOS TO ENDIF
 6  BOS 1+ EOS -
 7  IF CUT
 8  ELSE BOT BOS =
 9   IF BEOT C@ EBOT C!  1 EOS +TO
10    1 BOS +TO 1 BEOT +TO 1 EBOT +TO
11    OFF FRESH LEXCUR ENDFORM
12   ELSE NARROW EOT BEOT = 0= AND
13    IF EOT BEOT = 0=
14     IF BEOT C@ BOS C! ENDIF
15     BEOT EOT - IF 1 BEOT +TO ENDIF
16     OFF FRESH LEXCUR ENDFORM
17    ELSE -1 EOS +TO -1 EBOT +TO
18     -1 BOS +TO EOS BOW =
19     IF TOP OC - OMAX DUP TOP TO
20      LOCLIN LINADR REWINDOW
21      TOPLINE
22     ENDIF FIXEND REFRESH
23  ENDIF ENDIF ENDIF -1 DIRTY TO ;
197
 0 ( ?COLLAPSE <ENTER> ENTER ) HEX
 1
 2 T: ?COLLAPSE  1 SEL U< EXTENDED OR
 3  IF 0 OLIN TO EOS OEOS TO
 4     0 EXTENDED TO ENDIF ;
 5
 6 T: <ENTER>  EOS 100 + BEOT U<
 7  OVER 01C = 0=  PAGES 0CA U< OR AND
 8  IF ?LEXXED ?COLLAPSE
 9   LONG 4 U< 80 PAGES U< AND
10   OVER 01D = AND  OVER 01C = OR
11   IF -1 THOROUGH? TO ENDIF
12   EOS C! 1 EOS +TO 1 EBOT +TO
13   EOS 1- BOS TO
14   FIXEND  FRESH -1 DIRTY TO
15  ELSE DROP BEEP
16  ENDIF ;
17
18 T: ENTER
19  OFF <ENTER> RENCUR OFF ENDFORM
20  PAGES 0CA U< 0=
21  IF DELETE BEEP ENDIF ;
22
23
```

```
 5
 6 exit if text is empty
 7 if a selection is made (ie, more than
 8  one character) then CUT
 9 else (operate on one character only)
10  if at beginning of text then move up
11   one character like creeper
12  else (not at beginning)
13   if narrow cursor and not at end of
14    text then (remove char from right)
15    delete character if not at end
16    update BEOT if not at end
17    update screen
18  else (fat cursor) so move 1 character
19   to the left and
20   if at end of screen  then display new
21   put form feed at end of text (FIXEND)
22    and refresh screen
23 set dirty bit

 0 T: ?COLLAPSE  ( -- )
 1 PURPOSE: reset OEOS.
 2 if selection contains 1 or more
 3 characters or EXTENDED then set OLIN
 4 and EXTENDED to 0 and set OEOS to EOS.
 5
 6 T: <ENTER>  ( char -- )
 7 PURPOSE: enter character into text and
 8  the screen.
 9 if there is enough room for adding
10   characters or new pages then
11  ?LEXXED, collapse selection.
12  if less than 4 lines/page and more than
13   $80 pages or page character and pages
14   >= $C0 then set THOROUGH? to true.
15  place char at end of selection and
16   move EOS and EBOT up one.
17  set BOS to EOS-1.
18  make certain page char at end of text.
19  FRESH screen.
20 else (no room) ignore and beep.
21
22 T: ENTER  ( char -- )
23 PURPOSE: enter character to text.
```

```
scr #  198
 0 ( TAB ) HEX
 1
 2 T: TAB EOS 100 + BEOT U<
 3  IF ?LEXXED  ?COLLAPSE
 4   XPOS 25 U<
 5   IF 5 XPOS 2* BANK +
 6    0 5 UM/MOD DROP -
 7    EOS OVER 20 FILL
 8    DUP EOS +TO DUP EBOT +TO
 9    EOS 1- BOS TO  FIXEND
10    REFRESH -1 DIRTY TO
11    PAGES 0CA U< 0=
12    IF EOS OVER - BOS TO
13     DUP NEGATE EBOT +TO
```

```
 0 T: TAB ( -- )
 1 PURPOSE: add spaces to next tab stop.
 2
 3 if there is enough room then
 4  reset lexxed and OEOS states.
 5  if the horizontal position < $25 then
 6   calculate next tab position, add
 7   spaces to text, update EOS and EBOT,
 8   make certain a form feed is at the
 9   end of the text, refresh screen.
10  else add a carriage return to the text.
11 else (not enough room) beep.
12
13
```

```
    14      DELETE BEEP ENDIF DROP
    15    ELSE 1D ENTER
    16    ENDIF
    17   ELSE BEEP
    18   ENDIF ;
    19
    20
    21
    22
    23
199
    0 ( NEWPAGES ) HEX
    1
    2 ( old-EBOT old-BOT -- )
    3 T: NEWPAGES
    4  FIXEND
    5  +ALIGN
    6  PAGES OCA U< 0=
    7  IF DELETE BEEP
    8  ELSE EOS LOCCHR
    9   LINE# E# TO  NEWND
   10   BOS OEOS TO
   11   0 OLIN TO
   12   OFF FRESH RENCUR OFF
   13   -1 DIRTY TO
   14  ENDIF ;
   15
   16
   17
   18
   19
   20
   21
   22
   23
```

```
   14
   15
   16
   17
   18
   19
   20
   21
   22
   23
 0 T: NEWPAGES  ( old-EBOT old-BOT -- )
 1 PURPOSE: update page table.
 2
 3 put form feed at end of text.
 4 redo page table.
 5 if there are not enough pages then
 6  delete selection.
 7 else display new selected area (NEWND).
 8  update OEOS.
 9  force FRESH to begin at OLIN = 0.
10  fat cursor.
11  set dirty bit.
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  200
    0 ( PASTE ) HEX
    1
    2 T: PASTE ?LEXXED BOC BOT =
    3  IF BEEP EXIT ENDIF
    4  EOS U2/ BOT BOC - U2/ + 80 +
    5  BEOT U2/ U<
    6  IF
    7   EOS BOS TO
    8   BOC BOT BOC - >R EOS R@ CMOVE
    9   R> DUP EOS +TO EBOT +TO
   10   EBOT BOT NEWPAGES
   11  ELSE
   12   BOC BOT BOC -  EBOT BOT - FLIP
   13   EBOT BOT BOC - - BOS TO
   14   7000 TOP TO
   15   EBOT BOT BOC BOT TO NEWPAGES
   16   BEEP
   17  ENDIF FLUSH ;
   18
   19
   20
   21
   22
   23
```

```
 0 T: INSERT  ( -- )
 1 PURPOSE: move from cut buffer to EOS.
 2
 3 ?LEXXED insures that LEXXED is 0.
 4 if enough room and there is something
 5  in the cut buffer then copy from cut
 6  buffer to EOS, update page table.
 7 else not enough room so actually move
 8  cut buffer to EOS by removing cut
 9  buffer entirely (FLIP), update page
10  table and BOT.
11 clear keyboard queue and strobe.
12
13
14
15
16
17
18
19
20
21
22
23
```

```
201
  0 ( LEX REX [SEARCH] ) HEX
  1
  2 T: LEX EOS EBOT 1+ U<
  3  IF BOT EBOT 1-
  4   EOS UMIN SEEK<
  5   ?DUP IF EXIT ENDIF
  6  ENDIF BEOT EOS BEOT U<
  7  IF EOT LEXLEN - 1+
  8  ELSE EOS ENDIF SEEK< ;
  9
 10 T: REX EBOT EOS 1+ U<
 11  IF BEOT EOS 1- UMAX EOT SEEK>
 12   ?DUP IF EXIT ENDIF
 13  ENDIF EOS EBOT U<
 14  IF EOS 1- ELSE BOT ENDIF
 15  EBOT LEXLEN - 1+ SEEK> ;
 16
 17 T: [SEARCH]  RESEEK
 18  IF EBOT EOS TO 0 RESEEK TO ENDIF
 19  XFLAG 1 =
 20  IF LEX ELSE REX ENDIF
 21  ?DUP 0= IF EBOT 1- ENDIF DUP 1+
 22  QUE SHOWMARK ;
 23
```

```
 0 T: LEX   ( -- addr | 0 )
 1 PURPOSE: search left for pattern.
 2  if EOS is in lower partition then
 3    search backwards starting PATT
 4    below EBOT/EOS 1-.
 5   if pattern is found then exit.
 6  if not found search upper partition
 7   if EOS is in lower partition
 8    then search entire upper partition.
 9    else search from EOS to BEOT.
10
11 T: REX   ( -- addr | 0 )
12 PURPOSE: search right for PATTern.
13  if not found search lower partition.
14  similar to LEX.
15
16 T: [SEARCH]  ( -- )
17 PURPOSE: search for character and
18  display (one character selected).
19 in the current direction
20 search until the pattern is found.
21 if the pattern wasn't found
22  put fat cursor at original selection.
23 show screen with one char selected.
```

```
scr #  202
  0 ( LXX RXX REP ) HEX
  1
  2 T: LXX EOS EBOT 1+ U<
  3  IF BOT EBOT 1-
  4   EOS 1- UMIN
  5   SEEK<  ?DUP IF EXIT ENDIF
  6  ENDIF BEOT EOS BEOT U<
  7  IF EOT LEXLEN - 1+
  8  ELSE EOS 1- ENDIF SEEK< ;
  9
 10 T: RXX EBOT EOS 1+ U<
 11  IF BEOT EOS UMAX EOT SEEK>
 12   ?DUP IF EXIT ENDIF
 13  ENDIF EOS EBOT U<
 14  IF EOS ELSE BOT ENDIF
 15  EBOT LEXLEN - 1+ SEEK> ;
 16
 17 T: REP  LEXLEN DUP
 18  IF DROP @K DROP XFLAG 1 =
 19   IF LXX ELSE RXX ENDIF
 20  ENDIF ?DUP 0= IF EBOT 1- ENDIF DUP 1+
 21  QUE SHOWMARK ;
 22 ;S
 23 -1 RESEEK TO
203
  0 ( SEARCH <SEARCH> ) HEX
  1
  2 LABEL <SEARCH> YSAVE STY,
  3  CHAR LDA, 7F #B AND, LRFLAG LDY, EQ
  4  IF, PATT LDY, 1F #B CPY, NE
  5   IF, INY, ENDIF,
  6  ENDIF,
  7  PATT STY, PATT ,Y STA, 0 #B LDY,
```

```
 0 T: LXX  ( -- addr | 0 )
 1 PURPOSE: repeat left search (again).
 2
 3  false = searched all of text, not found
 4  same as LEX except that search starts
 5   with EOS-1.
 6
 7
 8 T: RXX  ( -- addr | 0 )
 9 PURPOSE: repeat right search (again).
10
11  false = searched all of text, not found
12  same as REX except that search starts
13   with EOS.
14
15
16 T: REP  ( -- )
17 PURPOSE: repeat search (again key).
18
19  discard the again keystroke
20  search in same direction as before
21  show one character selection
22
23


 0 LABEL <SEARCH>  ( -- )
 1 PURPOSE: adds a character to pattern for
 2  searching.
 3
 4 goes to get a character to PATT.
 5 if there are already 32 chars in PATT
 6  then overwrite the last character.
 7
```

```
 8  LRFLAG STY, YSAVE LDY, TNEXT,
 9
10 T: SEARCH
11  <SEARCH> @K DROP [SEARCH] ;
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 8
 9 T: SEARCH  ( -- )
10 PURPOSE: search for character pattern in
11  the text.
12
13 get a character to PATT.
14 discard character from key queue.
15 lex to character, and display.
16
17
18
19
20
21
22
23
```

```
scr #  204
  0 ( DEL EXPAND ) HEX
  1
  2 T: DEL  @K DROP  1 LEXLEN U<
  3  IF EBOT EOS TO EBOT 1- BOS TO
  4   -1 PATT +! [SEARCH]
  5  ELSE 0 PATT ! EBOT 1- EBOT SHOWMARK
  6  ENDIF ;
  7
  8 T: EXPAND
  9  0 LOCAL1 TO 5 XFLAG TO
 10  EOS EBOT -
 11  IF EOS EBOT U<
 12   IF BOS EBOT ELSE EBOT 1- EOS ENDIF
 13   NEWMARK OLDSHOW
 14  ELSE OEOS EBOT -
 15   IF OEOS BEOT U<
 16    IF OEOS EBOT
 17    ELSE EBOT 1- OEOS
 18    ENDIF 0 EOS TO 0 BOS TO
 19    SHOWMARK
 20  ENDIF ENDIF
 21  BEOT EOT = NARROW TO BOS OEOS TO ;
 22
 23
205
  0 ( HARDPAGE SOFTPAGE ) HEX ;S
  1
  2 LABEL HARDPAGE ( addr -- )
  3  YSAVE STY, PAGE# LDY, INY,
  4  0 SP) LDA, PGS0 ,Y STA,
  5  1 SP) LDA, PGS1 ,Y STA,
  6  INX, INX, YSAVE LDY, TNEXT,
  7
  8 LABEL SOFTPAGE  ( flag -- )  YSAVE STY,
  9  0 SP) LDA, NE
 10  IF, LOCAL2 LDA, 1 #8 CMP, EQ
 11   IF,
 12    YPOS LDY, WND3 2 + ,Y LDA, TAY, CLC,
 13    PGS0 ,Y LDA, GAP    ADC, PGS0 ,Y STA,
 14    PGS1 ,Y LDA, GAP 1+ ADC, PGS1 ,Y STA,
 15   ELSE,
 16    YPOS LDY, WND3 ,Y LDA, TAY, SEC,
```

```
 0 T: DEL  ( -- )
 1 PURPOSE: during a LEXREX search delete
 2  a char from PATT.
 3
 4 discard delete keystroke.
 5 if PATT has more than one character
 6  decrements PATT, select char at EBOT-1
 7   search anew.
 8  else clear PATT, show current select.
 9
10
11 T: EXPAND  ( -- )
12 PURPOSE: if both lex keys pressed then
13  select and show text (ie, highlight).
14
15 set XFLAG to 5 (both lex keys down,
16  and selection is already expanded).
17 if selecting during a lex
18  show selected text.
19 else select new text block
20  and show new selection.
21 use fat cursor except at end of text.
22 store BOS into OEOS.
23

 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
```

```
 17    PGS0 ,Y LDA, GAP    SBC, PGS0 ,Y STA,    17
 18    PGS1 ,Y LDA, GAP 1+ SBC, PGS1 ,Y STA,    18
 19   ENDIF,                                    19
 20  ENDIF,                                     20
 21  INX, INX, YSAVE LDY, TNEXT,                21
 22                                             22
 23                                             23


scr #  206
  0 ( OUTLEX ) HEX                              0 T: MOVEGAP  ( -- )
  1                                             1 PURPOSE: moves gap and updates
  2 T: OUTLEX   TOP 17 + E# U<                  2  appropriate pointers to account for
  3  IF BOS EOS SHOWMARK ENDIF                  3  the completed leap
  4  EOS EBOT -                                 4
  5  IF EOS EBOT U< DUP                         5  if selection doesn't end past screen
  6   IF EOS EBOT GAP                           6   then display selection.
  7   ELSE EBOT EOS GAP NEGATE                  7  if lex moved toward beginning of text
  8   ENDIF ROT LOCCHR PAGE#                    8   then move text, update BEOT, EBOT.
  9   INCPAGES                                  9   else if screen no longer displays
 10   IF EBOT EOS - >R                         10    old cursor position then initialize
 11    EOS BEOT R@ - R@ CMOVE>                 11    window table, recalculate page table,
 12    R> NEGATE BEOT +TO                      12    and move text.
 13    EOS EBOT TO                             13    if this selection begins after the
 14   ELSE EOS BEOT - >R                       14     old cursor position then
 15    EBOT BOW U<                             15     subtract GAP from BOS.
 16    IF BOW GAP - REWINDOW ENDIF             16    update BEOT, EBOT, and EOS.
 17    BEOT EBOT R@ CMOVE                      17  set cursor to previous state unless at
 18    BOS BEOT U< 0=                          18   beginning then use thin cursor.
 19    IF GAP NEGATE BOS +TO ENDIF             19
 20    R@ BEOT +TO R> EBOT +TO                 20 NOTE1: after OUTLEX then EOS = EBOT.
 21    EBOT EOS TO                             21 NOTE2: the key control feature of OUTLEX
 22  ENDIF ENDIF NARROW BOT 1+ EOS U< AND      22  is if EOS is altered (ie, EOS <> EBOT),
 23  BEOT EOT = OR NARROW TO ;                 23  e.g., by a lexxing operation.
207
  0 ( PRELEX POSTLEX ) HEX                      0 T: PRELEX ( --)
  1                                             1 PURPOSE: prepare for LEXREX operations.
  2 T: PRELEX                                   2
  3  -1 LEXXING TO  XFLAG LOCAL2 TO             3 set LEXXING flag.
  4  1 LRFLAG TO -1 LOCAL1 TO                   4 set up other flags used by LEXREX:
  5  1 SEL U< OFF                               5  AXFLAG saves direction of lex key,
  6  IF LOCAL2 1 =                              6  LRFLAG used by <SEARCH>, set LOCAL1
  7   IF BOS DUP 1+ SHOWMARK LEXCUR             7  (reset by any LEXREX operation).
  8   ELSE EOS DUP 1- SWAP SHOWMARK             8 if a selection is highlighted then
  9    BEOT EOT =                               9  collapse to left or right depending
 10    IF LEXCUR ELSE RENCUR ENDIF             10  upon which lex key was pressed after
 11   ENDIF                                    11  turning cursor off, then lexcur.
 12   -1 EXTENDED TO 0 LOCAL1 TO               12 set up E# and B# (used by SHOWMARK ?).
 13   -1 RESEEK TO                             13
 14  ENDIF                                     14
 15  EOS LOCCHR  LINE# E# TO                   15 T: POSTLEX ( --)
 16  BOS LOCCHR  LINE# B# TO ; ( --)           16 PURPOSE: necessary housekeeping after
 17                                            17  LEXREX.
 18 T: POSTLEX                                 18
 19  NARROW EXTENDED OR EXTENDED TO QUE        19 setup EXTENDED.
 20  QIN QOUT TO                               20 clear the lex keys.
 21  CHAR 9B =  IF  0 CHAR TO  ENDIF           21 if an escape character then discard.
 22  0 LEXXING TO ; ( --)                      22 clear LEXXING flag.
 23                                            23


scr #  208
```

```
 0 ( CREEPSHOW)  HEX
 1
 2 T: CREEPSHOW  YPOS LOCAL2 1 =
 3  IF BOT BOS U<
 4   IF NARROW
 5    IF EBOT 1- C@ BEOT 1- C! -1 BEOT +TO
 6     -1 EBOT +TO BEOT C@ 1C =
 7     IF BEOT 1+ EBOT LOCCHR HARDPAGE
 8      0 LOCAL1 TO
 9     ELSE EBOT 1- C@ 1C =
10      IF 0 LOCAL1 TO ENDIF
11     ENDIF EBOT 1- EBOT SHOWMARK
12   ENDIF ENDIF
13  ELSE BEOT EOT U<
14   IF BEOT 50 + C@ EBOT 50 + C!
15    1 BEOT +TO 1 EBOT +TO
16    EBOT 1- C@ 1C =
17    IF EBOT BEOT 1- LOCCHR HARDPAGE
18     0 LOCAL1 TO
19    ELSE EBOT 2 - C@ 1C =
20     IF 0 LOCAL1 TO ENDIF
21    ENDIF EBOT 1- EBOT SHOWMARK
22  ENDIF ENDIF ;
23
```

```
 0 T: CREEPSHOW ( --)
 1 PURPOSE: adds single keystroke cursor
 2  movement left or right using lex keys.
 3
 4 if left cursor pressed then move 1 space
 5  to left if not below text and if
 6  previous cursor was LEXCUR (thin)
 7  (determined by the state of NARROW);
 8  if previous cursor was RENCUR (fat)
 9  then do nothing because POSTLEX will
10  set cursor with LEXCUR.
11  if a hard page character has been
12   passed then update page table.
13 otherwise right cursor has been pressed;
14  move right 1 space if not above text.
15  also, move 1 character from BEOT+$50 to
16  EBOT+$50 so that wrapping will work
17  properly (this mimicks part of FRESH).
18  if a hard page character has been
19   passed then update page table.
20  scroll screen if ipb at bottom
21
22
23
```

209

```
 0 ( CREEPER )
 1
 2 T: CREEPER  CREEPSHOW
 3  OEOS 1- BEOT U< EBOT 2 - OEOS U< AND
 4  IF LOCAL2 1 =
 5   IF BEOT ELSE EBOT 1-
 6   ENDIF OEOS TO
 7  ENDIF POSTLEX LOCAL1
 8  >R BOT 1+ EOS U<
 9  IF LEXCUR ELSE RENCUR ENDIF
10  YPOS 2DUP
11  2 + = R@ AND SOFTPAGE
12  2 - = R@ AND SOFTPAGE
13  NUFLAG R> AND DUP
14  YPOS 09 = AND SOFTPAGE
15  YPOS 0C = AND SOFTPAGE
16  0 OLIN TO ;
17
18
19
20
21
22
23
```

```
 0 T: CREEPER ( -- )
 1 PURPOSE: move cursor one character and
 2  maintain pagetable.
 3
 4 adjust OEOS so that it is not left in
 5  the gap (ie, maintains selection).
 6 housekeeping (POSTLEX).
 7 if at the very beginning of text use a
 8  fat cursor (RENCUR); all other times
 9  use a thin cursor (LEXCUR).
10 if a softpage has been passed on the
11  current display then update the page
12  table.
13 if a softpage has been passed on a new
14  display then update the page table.
15 set OLIN to zero so that the next
16  word that uses FRESH will result in
17  fixing a number of problems related to
18  the creeper mechanism. (Note: FRESH was
19  once a part of creeper but was taken
20  out to speed creeper up.)
21
22
23
```

scr # 210

```
 0 ( MOVE-GAP LEXREX ) HEX
 1
 2 T: MOVE-GAP  FLUSH  EOS EBOT -
 3  IF EOS EBOT U<
 4   IF BEOT ELSE EBOT 1- ENDIF
 5   OEOS TO
 6  ENDIF OUTLEX
 7  QUE 0 OLIN TO FRESH POSTLEX
 8  NARROW IF LEXCUR ELSE RENCUR ENDIF ;
```

```
 0 T: LEAPER  ( --)
 1 PURPOSE: perform the operations needed
 2  by DEL, SEARCH, REP and EXPAND.
 3 update OEOS.
 4 move text (OUTLEX).
 5 update screen (FRESH).
 6 housekeeping (POSTLEX).
 7 show thin cursor if lexxed, show fat
 8  cursor if expanded selection.
```

```
 9
10 T: LEXREX   PRELEX
11   NARROW >R
12   BEGIN  QUE ?LBLINK ?X  WHILE
13    ?S IF OFF SEARCH QUE LEXCUR ELSE
14    ?D IF OFF DEL    QUE LEXCUR ELSE
15    ?A IF OFF REP    QUE LEXCUR ELSE
16    ?E IF OFF EXPAND R> DROP 0 >R
17    ENDIF ENDIF ENDIF ENDIF
18   REPEAT R> EBOT EOS =
19   IF NARROW TO ELSE DROP ENDIF
20   OFF
21  LOCAL1
22  IF CREEPER ELSE MOVE-GAP ENDIF ;
23
```

```
 9
10 T: LEXREX  ( -- )  pattern search
11 PURPOSE: interpret and act upon lex
12  key press(es).
13 PRELEX sets flags and collapses if a
14  selection exits.
15 pole for searching, editting, repeating,
16  highlighting (highest priority to the
17  lowest priority).
18 if a search has failed then restore the
19  cursor to the same it was before the
20  search (i.e., fat or thin).
21 if no other operation has occurred then
22  move cursor (ie, CREEP cursor).
23 else move the gap.
```

211

```
 0 ( AUTOEXTEND )  HEX
 1
 2 T: AUTOEXTEND   SEL 2 U<
 3  IF EOS OEOS U<
 4   OFF EXPAND
 5   IF OUTLEX ENDIF
 6   NARROW IF LEXCUR ELSE RENCUR ENDIF
 7  ENDIF -1 EXTENDED TO ;
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 T: AUTOEXTEND
 1 PURPOSE:  to automatically highlight
 2  ("select", EXPAND) a section of text
 3  if BOS is not next to EOS.
 4
 5 if a selection can exist then turn off
 6  the cursor and expand the selection.
 7  if EOS < OEOS then outlex.
 8  if lexxed then show thin cursor
 9   (LEXCUR) else fat cursor (RENCUR).
10 set extended true.
11
12
13
14
15
16
17
18
19
20
21
22
23
```

scr # 212

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
```

```
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
```

```
 18                                      18
 19                                      19
 20                                      20
 21                                      21
 22                                      22
 23                                      23
213
  0 ( MS MEMIT ) HEX                     0 LABEL MS ( # -- )
  1                                      1 PURPOSE: wait # milliseconds.
  2 LABEL MS   ( # -- )  YSAVE STY,      2
  3  0 SP) INC, 1 SP) INC,               3 LABEL MEMIT  ( char -- )
  4  BEGIN, CA #B LDY,                   4 PURPOSE: send char to a super serial
  5   BEGIN, DEY, EQ UNTIL,              5  card in slot 2.
  6   0 SP) DEC, EQ IF, 1 SP) DEC, ENDIF, EQ  6
  7  UNTIL, INX, INX, YSAVE LDY, TNEXT,  7 load character into Y-reg.
  8                                      8 if super serial card exists then
  9 LABEL MEMIT  YSAVE STY, 0 SP) LDY,   9  if character is form feed then change
 10  INX, INX, SSC? LDA, NE             10   character value to $0C.
 11  IF, ff #B CPY, EQ IF, 0C #B LDY, ENDIF,  11  if character is a return then change
 12   cr #B CPY, EQ IF, 0D #B LDY, ENDIF,  12   character value to $0D.
 13   BEGIN, C0A9 LDA, 10 #B AND, NE    13  wait until status bit clear (bit $10
 14   UNTIL, C0A8 STY,                  14   at $C0A9) then send character
 15  ENDIF, YSAVE LDY, TNEXT,           15   (store character at $C0A8).
 16                                     16
 17                                     17 LABEL ?EMPTYBUF  ( -- )
 18                                     18 PURPOSE: send a control-S if full.
 19                                     19
 20                                     20 if RSTAT is true:  clear RSTAT
 21                                     21  wait for status to clear.
 22                                     22  send a control-S
 23                                     23


scr #  214
  0 ( ?M ?LE CONTROL ) HEX               0 ( ?M ?LE CONTROL ) HEX
  1                                      1
  2 LABEL ?M                             2 LABEL ?M  ( -- flag )
  3  YSAVE STY, 0 #B LDY,  DEX, DEX,     3 PURPOSE: indicate whether modem needs
  4  MQOUT LDA, MQIN CMP, NE             4  attention.
  5  IF, DEY, ENDIF,                     5
  6  0 SP) STY, 1 SP) STY, YSAVE LDY, TNEXT,  6 false if modem buffer is empty.  other
  7                                      7  typed chars are placed in key queue.
  8 T: ?LE   LINEND% 0< 0=               8
  9  IF BOS C@ LINEND% 2DUP              9
 10   OFF AND SWAP OVER -               10 T: ?LE  ( -- )
 11   IF DUP MEMIT ENDIF DROP           11 PURPOSE: send the line end character(s).
 12   SWAB OFF AND ?DUP                 12 NOTE: LINEND% can be 1 or 2 characters.
 13   IF SWAP OVER -                    13
 14    IF DUP MEMIT ENDIF               14
 15   ENDIF DROP                        15 LABEL CONTROL  ( -- )
 16  ENDIF ;                            16 PURPOSE: send a character entered from
 17                                     17  the keyboard to the modem.
 18 LABEL CONTROL  YSAVE STY,           18
 19  BEGIN, C000 LDY, 7F #B CPY, CS     19 wait for a key.
 20  UNTIL, C010 STA, SSC? LDA, NE      20 convert it to a control character.
 21  IF, BEGIN, C0A9 LDA, 10 #B AND, NE 21 send it.
 22   UNTIL, TYA, 1F #B AND, C0A8 STA,  22
 23  ENDIF, YSAVE LDY, TNEXT,           23 NOTE: this is the control-Z function.
215
  0 ( ?SEND SEND ) HEX                   0 LABEL ?SEND  ( -- )
  1                                      1 PURPOSE: used in SEND to stall until
```

```
 2 LABEL ?SEND
 3  BEGIN, TSTAT LDA, EQ UNTIL, TNEXT,
 4
 5 T: SEND   AUTOEXTEND
 6  BOS LOCCHR LINADR WR!
 7  WRAP ENDWRAP DROP WR@
 8  SEL 0
 9  DO ?SEND
10   BOS OVER =
11   IF ?LE 4 MS
12    BOS 1- LOCCHR LINE# TOP - OMAX
13    DUP 2 + SWAP RESHOW
14    WR! WRAP ENDWRAP DROP WR@
15   ENDIF
16   BOS C@ MEMIT
17   1 BOS +TO
18  LOOP EOS 1- BOS TO
19  DROP ?LE
20  0 OLIN TO FRESH
21  BEOT EOT = IF LEXCUR ELSE RENCUR ENDIF
22  -1 EXTENDED TO ;
23
```

```
 2  a control-Q is received.
 3
 4
 5 T: SEND  ( -- )
 6 PURPOSE: send text to modem.
 7
 8 autoextend selection.
 9 set modem for transmission.
10 send entire selection
11  at baud rate set by (BASIC) SE%
12  and display text after each line sent.
13  stall if receiver sends back a control
14   S, so wait for control-Q.
15 FRESH screen.
16 leave cursor fat at the end of the
17  transmission unless at the end of the
18  text (then thin cursor).
19
20
21
22
23
```

scr # 216

```
 0 ( .SWYFT .SENDSWYFT ?RECFULL )  HEX
 1
 2 FRAG .SWYFT  16 C, 13 C, 0D C,
 3  53 C, 77 C, 79 C, 66 C, 74 C,
 4  43 C, 61 C, 72 C, 64 C, 20 C,
 5  31 C, 30 C, 34 C, 33 C, 20 C,
 6  2F C, 2F C, 65 C, 0D C, 11 C,
 7
 8 FRAG .SENDSWYFT   0 #B LDY, Y0 STY,
 9  BEGIN, \ .SWYFT 1+ ,Y LDA, TAY,
10   BEGIN, C0A9 LDA, 10 #B AND, NE
11   UNTIL, C0A8 STY,
12   Y0 INC, Y0 LDY, \ .SWYFT CPY, CS
13  UNTIL, RTS,
14
15 LABEL ?RECFULL  ( -- )  RSTAT LDA, NE
16  IF, 0 #B LDA, RSTAT STA,
17   BEGIN, C0A9 LDA, 10 #B AND, NE
18   UNTIL, 11 #B LDA, C0A8 STA,
19  ENDIF, TNEXT, ( send control Q )
20
21
22
23
```

```
 0
 1 FRAG .MEMIT
 2 PURPOSE:  send the character that is in
 3  the Y register
 4
 5 FRAG .MQUE
 6 PURPOSE:  grab a character from the
 7  modem and place it in the Accumulator
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

217

```
 0 ( .INTERRUPT )  HEX
 1
 2 FRAG .INTERRUPT   PHA, TYA, PHA,
 3  C0A9 LDA, 08 #B AND, NE
 4  IF, C0A8 LDA, 7F #B AND,
 5   13 #B CMP, NE       ( control S )
 6   IF, 11 #B CMP, NE   ( control Q )
 7    IF, 20 #B CMP, NC
 8     IF, 0C #B CMP, EQ
 9      IF, ( send control S )
10       BEGIN, C0A9 LDA, 10 #B AND, NE
11       UNTIL, 13 #B LDA, C0A8 STA,
12       FF #B LDA, RSTAT STA,
```

```
 0 FRAG .VQUE ( -- )
 1 PURPOSE: receive a character from modem
 2
 3 FRAG .INTERRUPT ( -- )
 4 PURPOSE: process interrupts from modem
 5
 6 if there is a character to be read and
 7  if it is not a ^S and
 8   if it is not a ^Q then
 9    if a form feed then
10     send ^S, set RSTAT and set A-reg
11     with ff.
12    else (not a form feed)
```

```
13       ff #B LDA,
14      ELSE, 0D #B CMP, EQ
15       IF, cr #B LDA,
16       ELSE, 05 #B CMP, EQ
17        IF, \ .SENDSWYFT JSR,
18        ELSE, 07 #B CMP, EQ
19         IF, 0FF #B LDA, BELL? STA,
20        ENDIF, ENDIF,
21        PLA, TAY, PLA, RTI,
22     ENDIF, ENDIF, ENDIF,
23
```

```
13     if a carriage return load cr value.
14.    else (not a carriage return)
15      if it is a ^C then return "SWYFT".
16      else (not a ^C)
17       if it is a ^G then BEEP endif
18      endif
19      return from interrupt if ^C or ^G.
20     endif
21    endif endif
22
23
```

```
scr #  218
  0 ( .INTERRUPT ... )  HEX
  1
  2     MQIN LDY, MQUE ,Y STA, MQIN INC,
  3     SEC, MQOUT LDA, MQIN SBC,
  4     8 #B CMP, NC
  5     IF, ( send control S )
  6      BEGIN, C0A9 LDA, 10 #B AND, NE
  7      UNTIL, 13 #B LDA, C0A8 STA,
  8      FF #B LDA, RSTAT STA,
  9     ENDIF,
 10    ELSE, 0 #B LDA, TSTAT STA,
 11    ENDIF,
 12   ELSE, FF #B LDA, TSTAT STA,
 13  ENDIF, ENDIF,
 14  PLA, TAY, PLA, RTI,
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0
 1    otherwise load char into MQUE if room
 2     else wait till clear, send ^S,
 3      set RSTAT.
 4   else it is a ^Q, reset TSTAT
 5  else it is a ^S, set TSTAT
 6  restore A-reg and Y-reg
 7
 8 NOTE1:
 9  if a ^Z^C then send back SWYFT message.
10  if a ^Z^G then give a beep.
11  if a ^Z^S then do not allow
12   interruption.
13  if a ^Z^Q then allow interruption.
14  other control characters are ignored.
15  if a character then put into MQUE.
16
17 NOTE2:
18  RSTAT receiver status; set if no room
19   in MQUE to put character or a page
20   character received.
21  TSTAT transmitter status; set if a ^S,
22   reset if a ^Q.
23
```

```
219
  0 ( old .INTERRUPT )  HEX  ;S
  1
  2 FRAG .INTERRUPT   PHA, TYA, PHA,
  3  C0A9 LDA, 0F #B AND, NE
  4  IF, 07 #B AND, NE
  5   IF, 13 #B LDY,      ( error: send ^S )
  6    BEGIN, C0A9 LDA, 10 #B AND, NE
  7    UNTIL, C0A8 STY,
  8    32 #B LDA, Y0 STA,     ( wait 32 ms )
  9    BEGIN, CA #B LDY,
 10     BEGIN, DEY, EQ UNTIL,
 11        ( while also reading data line )
 12     C0A9 LDA, TAY, 08 #B AND, NE
 13     IF, TYA, 07 #B AND, EQ
 14      IF, 11 #B LDY,  ( char, no error )
 15       BEGIN, C0A9 LDA, 10 #B AND, NE
 16       UNTIL, C0A8 STY,       ( send ^Q )
 17       \ .RECEIVE JMP,
 18     ENDIF, ENDIF, Y0 DEC, EQ
 19    UNTIL, 11 #B LDY,         ( send ^Q )
 20    BEGIN, C0A9 LDA, 10 #B AND, NE
 21    UNTIL, C0A8 STY,
```

```
 0 T: MAPPEND  ( -- )
 1 PURPOSE:  transfer entire contents of
 2  modem buffer to text at OEOS.
 3
 4 collapse the selection.
 5 set OEOS.
 6 update MQOUT.
 7 make sure there is enough room for text
 8   and for pages.
 9 if OEOS is below EOS then move text up
10   and move modem que text in place.
11  update EOS and OEOS.
12  determine if a NEWMARK exits.
13  FIXEND, set dirty, update screen.
14  if the last character was a page and
15    there are more than $47 pages then
16    THOROUGHly update page table in
17    ENDFORM.
18   if there are less than $C7 pages then
19    check for full receive buffer.
20  else not enough room, BEEP and stop the
21   sender from transmitting any more.
```

```
 22   ENDIF, \ .RECEIVE JMP,                                    22
 23  ENDIF,  PLA, TAY, PLA, RTI,                                23


scr #  220
   0 ( MAPPEND ) HEX                                            0
   1                                                            1
   2 T: MAPPEND  ?COLLAPSE                                      2
   3  EOS OEOS UMIN BOT 1+ UMAX OEOS TO                         3
   4  MQUE MQOUT +                                              4
   5  MQIN DUP MQOUT U<                                         5
   6  IF DROP 0 100 ELSE DUP ENDIF                              6
   7  MQOUT - SWAP MQOUT TO                                     7
   8  BEOT EBOT 100 + - UMIN 0 OVER U<                          8
   9  PAGES 0C9 U< AND                                          9
  10  IF OEOS EOS U<                                           10
  11   IF OEOS 2DUP + EBOT OEOS - CMOVE>                       11
  12   ENDIF SWAP OVER OEOS SWAP CMOVE                         12
  13   OEOS LOCCHR LINE# >R                                    13
  14   DUP EBOT +TO DUP OEOS +TO                               14
  15   EOS + DUP 1- SWAP NEWMARK                               15
  16   FIXEND OFF -1 DIRTY TO                                  16
  17   E# R> - REFRESHER RENCUR                                17
  18   OEOS 1- C@ 01C = 47 PAGES U< AND                        18
  19   IF -1 THOROUGH? TO ENDIF ENDFORM                        19
  20   PAGES 0C7 U< IF ?RECFULL ENDIF                          20
  21  ELSE DROP DROP BEEP 13 MEMIT                             21
  22   C7 PAGES U< IF -1 THOROUGH? TO ENDFORM                  22
  23  ENDIF ENDIF ;                                            23
221
   0 ( .STARTU .ENDU STARTU ENDU ) HEX                          0 FRAG .STARTU
   1                                                            1 PURPOSE: print USTART string from USTART
   2 FRAG .STARTU  USTART 2 + LDA, NE                           2  string.
   3  IF, 0 #B LDY,        ( print USTART $ )                   3 NOTE: USTART 2+ has length of string.
   4   BEGIN, USTART 3 + ,Y LDX, Y0 STY,                        4
   5    <LEMIT> JSR, Y0 LDY, INY,                               5
   6    USTART 2 + CPY, EQ UNTIL, ENDIF, RTS,                   6 FRAG .ENDU
   7                                                            7 PURPOSE: print UEND string from UEND
   8 FRAG .ENDU  UEND 2 + LDA, 1 #B CMP, NE                     8  string.
   9  IF, 1 #B LDY,          ( print UEND $ )                   9 NOTE: UEND 2+ has length of string.
  10   BEGIN, UEND 3 + ,Y LDX, Y0 STY,                         10
  11    <LEMIT> JSR, Y0 LDY, INY,                              11 LABEL STARTU
  12    UEND 2 + CPY, EQ UNTIL, ENDIF, RTS,                    12 PURPOSE: start underline if UEND 3 + is
  13                                                           13  not zero and UFLAG is set.
  14 LABEL STARTU UEND 3 + LDA, NE IF,                         14
  15  UFLAG LDA, NE IF, YSAVE STY, XSAVE STX,                  15 LABEL ENDU
  16    \ .STARTU JSR, XSAVE LDX, YSAVE LDY,                   16 PURPOSE: end underline if UEND 3 + is
  17  ENDIF, ENDIF, TNEXT,                                     17  not zero and UFLAG is set.
  18                                                           18
  19 LABEL ENDU   UEND 3 + LDA, NE IF,                         19
  20  UFLAG LDA, NE IF, YSAVE STY, XSAVE STX,                  20
  21    \ .ENDU JSR, XSAVE LDX, YSAVE LDY,                     21
  22  ENDIF, ENDIF, TNEXT,                                     22
  23                                                           23


scr #  222
   0 ( LEMIT LCR LTYPE LMARGIN .USINGLE ) HEX                   0 LABEL LEMIT  ( char -- )
   1                                                            1 PURPOSE: print character.
   2 LABEL LEMIT  YSAVE STY,                                    2 save y-reg.
```

```
 3  0 SP) LDA, INX, INX,
 4  XSAVE STX, TAX, <LEMIT> JSR,
 5  XSAVE LDX, YSAVE LDY, TNEXT,
 6
 7 T: LCR  0D LEMIT
 8  .LF IF 0A LEMIT ENDIF ;
 9
10 T: LCRS   0MAX ?DUP
11  IF 0 DO LCR LOOP ENDIF ;
12
13 T: LMARGIN  .BL MARGIN% + ?DUP
14  IF 0 DO 20 LEMIT LOOP
15  ENDIF ;
16
17 FRAG .USINGLE
18  Y1 STX, \ .STARTU JSR, Y1 LDX,
19  <LEMIT> JSR, \ .ENDU JSR,
20  YSAVE LDY, XSAVE LDX, TNEXT,
21
22
23
223
 0 ( ULEMIT ) HEX
 1 LABEL ULEMIT  ( n -- ) YSAVE STY,
 2  1 SP) LDA, Y0 STA,  0 SP) LDA,
 3  INX, INX, XSAVE STX, TAX, UFLAG LDA, EQ
 4  IF, 5F #B CPX, EQ      ( UFLAG not set)
 5   IF, 0FF #B LDA,     ( underline char )
 6    UFLAG DUP STA, 1+ STA, ( set UFLAG )
 7    20 #B LDX, <LEMIT> JSR,     ( space )
 8    UEND 3 + LDA, NE    ( group u'line? )
 9    IF, \ .STARTU JSR, ENDIF,  ( start )
10   ELSE, <LEMIT> JSR, ENDIF,
11  ELSE, 5F #B CPX, EQ ( UFLAGset, not_?)
12   IF,  Y0 LDX, 5F #B CPX, EQ
13    IF, 20 #B LDX, UEND 3 + LDA, EQ
14     IF, \ .USINGLE JMP, ENDIF,     ( 1 )
15    ELSE, 0 #B LDA,             ( end _ )
16     UFLAG DUP STA, 1+ STA, ( clrUFLAG )
17     UEND 3 + LDA, NE          ( group? )
18     IF, \ .ENDU JSR, ENDIF, 20 #B LDX,
19    ENDIF,
20   ELSE, UEND 3 + LDA, EQ
21    IF, \ .USINGLE JMP, ENDIF,
22   ENDIF, <LEMIT> JSR,
23  ENDIF, YSAVE LDY, XSAVE LDX, TNEXT,
```

```
 3 remove character from stack
 4 save x-reg.
 5 transfer a-reg to x-reg and call <LEMIT>
 6 restore x and y registers.
 7
 8 T: LCR  ( -- )
 9 PURPOSE: print a carriage return and
10  also print a line feed if .LF is true.
11
12 T: LCRS  ( n -- )
13 PURPOSE: print n carr returns.
14  n can be zero.
15
16 T: LMARGINS
17 PURPOSE:  print the left margin.  also
18  prevents margins from being underlined
19  if underline is turned on.
20
21 T: .USINGLE
22 PURPOSE: single underline.
23

 0 LABEL ULEMIT
 1 PURPOSE: this word controls underlining
 2  sent to the printer.
 3
 4 underlining is turned on by an underline
 5  character (a space is printed in its
 6  place) and turned off by another
 7  underline unless there are two
 8  underlines right next to each other
 9  in which case an underline is printed,
10  and also turned off by two carriage
11  or by a pagebreak.
12
13 UFLAG true indicates that underlining
14  is currently in operation.
15 USTART is string for turning on u'line.
16 UEND is string for turning off u'line.
17  the first element contains a group flag
18  for backspace underlining: 0 means that
19  the printer must backup to underline
20  each character.
21
22
23
```

```
scr #  224
 0 ( LTYPE V@ V! ) HEX
 1
 2 T: LTYPE  LMARGIN STARTU
 3  CURR DUP DUP 50 + SWAP
 4  DO 20 I C@ 7F AND U<
 5   IF DROP I ENDIF
 6  LOOP 1+ CURR
 7  DO I C@ 7F U<
 8   IF I @ ULEMIT
 9   ELSE ENDU 20 LEMIT STARTU
10   ENDIF
11  LOOP ENDU ;
12
13 T: V!  V ?DUP
```

```
 0 T: LTYPE  ( -- )
 1 PURPOSE: print a line from CURR until
 2  control character encountered.
 3
 4 print leading blanks (LMARGIN).
 5 start underline.
 6 examine 80 characters in CURR buffer
 7  for control characters and for
 8  1D=carriage return.
 9 return address of control character.
10 print all characters substituting the
11  control character with a blank.
12
13
```

```
 14  IF SWAP SWAB SWAP ! ELSE DROP ENDIF ;
 15
 16 T: V@  V @ SWAB ;
 17
 18
 19
 20
 21
 22
 23
225
  0 ( ENDPAGE SETPRINTER ) HEX
  1
  2 T: ENDPAGE   UFLAG
  3  IF WR@ C@ 1C = 0= UFLAG TO ENDIF
  4  42 LPAGE% - ABOVE% - LINESCOUNT - LCRS
  5  PCT 8000 + PAGE% + PFLAG% 8000 + U< 0=
  6  IF PAGEPRINT ENDIF
  7  0 LINESCOUNT TO 0C LEMIT ;
  8
  9 T: SETPRINTER
 10  PBUF ADDR DUP 3 + >R
 11  R@ 2 + C@ HEAD% TO
 12  2 + C@ 3 - OMAX ?DUP
 13  IF R@ 3 + SWAP OVER + SWAP
 14   DO I C@ LEMIT LOOP
 15  ENDIF
 16  R@ 1+  C@   .BL TO
 17  R>     C@   .LF TO
 18  .LF IF 0D LEMIT ENDIF ;
 19
 20
 21
 22
 23

scr #  226
  0 ( PRINT ) HEX
  1 T: PRINT  AUTOEXTEND
  2  SETPRINTER
  3  BOS LOCCHR LINADR WR!
  4  LINREL LCT TO PAGE# PCT TO
  5  0 PRINTBREAK TO 0 UFLAG TO
  6  BEGIN LINESCOUNT 0=
  7   IF WR@ C@ 1C -
  8    IF ABOVE% HEAD% OMAX - LCRS
  9   ENDIF ENDIF ?ONPAGE
 10   IF WRAP ADJUST -1 PRINT? TO TOBUFF
 11    0 PRINT? TO LTYPE LCR
 12    1 SPACING 2 = IF LCR DROP 2 ENDIF
 13    LINESCOUNT +TO
 14    WR@ C@ 1D = IF 0 UFLAG TO ENDIF
 15   ELSE PRINTBREAK IF ENDPAGE ENDIF
 16   ENDIF ENDWRAP 0=
 17   WR@ EBOT 1- UMIN DUP BOS TO
 18   BOS BOW U< 0=
 19   IF 0 OLIN TO LCT PCT
 20    FRESH PCT TO LCT TO
 21   ENDIF WR! -1 PRINTBREAK TO
 22  UNTIL SHOW BEOT EOT =
 23  IF LEXCUR ELSE RENCUR ENDIF ;
```

```
 14 T: V! ( # char-pair -- )
 15 PURPOSE:  store a number in the BASIC
 16  variable; if it isn't found, do nothing
 17
 18
 19 T: V@  ( char-pair -- # )
 20 PURPOSE: fetch a value from a BASIC
 21  variable; if it isn't found, return
 22  value stored at 0 < ** bug? ** >.
 23
```

---

```
 0 T: ENDPAGE  ( -- )
 1 PURPOSE: print page number.
 2 turn off underlining if a hard page
 3  break is encountered.
 4 advance to line to print page# on
 5 print the page number only if
 6  page# is greater than (BASIC) PF%
 7 form feed to next page,
 8 clear LINESCOUNT
 9 inputs: LPAGE% ABOVE% LINESCOUNT
10         PFLAG%
11
12 T: SETPRINTER  ( -- )
13 PURPOSE: initialize the printer.
14 emit printer string from that saved by
15  user (see SAVESTRINGS and LOADSTRINGS)
16  to printer, skipping the first 3 bytes.
17 store first three bytes in:
18  .LF    false if cr does a line feed
19  .BL    # spaces needed for left margin
20  HEAD%  # lines past tear-off line a
21          form feed brings print head
22 emit a carriage return if it won't
23  send a linefeed to the printer
```

```
 0 T: PRINT  ( -- )
 1 PURPOSE: print selected area, line by
 2  line, to printer in slot 1.
 3
 4  allows a print job to be stopped and
 5   restarted and still look contiguous
 6   as long as it stops at the end of a
 7   line and starts on the next
 8  allows double spacing (BASIC: SP%=2)
 9  if there is a second carriage return
10   then turn underline flag off.
11  won't print a leading pagebreak
12
13  Inputs:
14   VECT points to printer rom code.
15   .LP holds printer initialization.'
16   BOS points to start of desired text.
17
18  Outputs:
19   BOS points to last character printed.
20   EXTENDED holds -1
21   WR points to ???
22
23
```

```
227
  0 ( save, load BASIC strings ) HEX
  1
  2     ( $name buffer max -- )
  3 T: SAVE$    OVER ADDR >R >R
  4  SWAP V DUP 1+ @ ROT -
  5  IF DUP C@ R> UMIN DUP R@ 2 + C!
  6   SWAP 1+ @ DUP R@ !
  7   R> 3 + ROT CMOVE
  8  ELSE R> R> DROP DROP DROP ENDIF ;
  9
 10     ( $name buffer -- )
 11 T: LOAD$    ADDR >R V DUP 1+ @ R@ @ -
 12  IF R@ 2 + C@ DUP >R OVER C!
 13   BASICO 6F + DUP @ R@ - DUP ROT !
 14   DUP ROT 1+ ! R> ?DUP
 15   IF R@ 3 + ROT ROT CMOVE 1 ENDIF
 16  ENDIF R> DROP DROP ;
 17
 18
 19
 20
 21
 22
 23
```

```
 0 T: SAVE$ ( $name buffer max -- )
 1 PURPOSE:  save a string entered by user
 2  so that when a NEW or RUN is invoked
 3  this string can be restored instead of
 4  the default string.
 5
 6 if the BASIC string and the user string
 7  do not match then store the length and
 8  move the contents from BASIC to the
 9  user string.
10 else drop all parameters.
11
12 T: LOAD$ ( $name buffer -- )
13 PURPOSE:  load a string back into the
14  BASIC string area.
15
16 if the BASIC string and the user string
17  do not match then store the length and
18  move the contents from the user string
19  to the BASIC string.
20 and drop all parameters.
21
22
23
```

```
scr #  228
  0 ( save, load PR$ string at PBUF ) HEX
  1
  2 T: SAVESTRINGS
  3  55D3 USTART 5 SAVE$
  4  55C5 UEND   5 SAVE$
  5  50D2 PBUF  1D SAVE$ ;
  6
  7 T: LOADSTRINGS
  8  55D3 USTART LOAD$
  9  55C5 UEND   LOAD$
 10  50D2 PBUF   LOAD$ ;
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 T: SAVESTRINGS ( -- )
 1 PURPOSE: to save the user strings for
 2  underline start, underline end, and
 3  printer initialization.
 4
 5
 6 T: LOADSTRINGS ( -- )
 7 PURPOSE: to restore the user strings
 8  for underline start, underline end,
 9  and printer initialization.
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
229
  0 ( DEFAULT PRINTER STRINGS ) HEX
  1
  2 FRAG .PRINT
  3  ( UEND ) 1 C, 1B C, 2D C, 30 C,
  4  ( USTART )    1B C, 2D C, 31 C,
  5  ( FX80 ) 0 C, 0 C, 5 C,
  6  1B C, 4D C, 1B C, 6C C, 8 C,
  7
```

```
 0 ( DEFAULT PRINTER STRINGS )
 1
 2 LABEL .PRINT
 3 PURPOSE: default printer strings for
 4  EPSON FX80.
 5
 6
 7
```

```
 8  ;S
 9  ( IMAGEWRITER ) 0 C, 0 C, 6 C,
10  1B C, 45 C,
11  1B C, 4C C, 30 C, 30 C, 38 C,
12  ( IDS ) 0 C, 0 C,
13  1E C, 1B C, 4A C, 2C C,
14  36 C, 30 C, 2C C, 24 C,
15  1B C, 52 C, 2C C, 31 C,
16  2C C, 24 C,
17  ( QANTX ) 1 C, 0 C,
18  1B C, 5B C, 36 C, 73 C,
19  1B C, 5B C, 32 C, 77 C,
20  ( QUME ) 1 C, 0C C,
21  ( MX80 ) 0 C, 10 C, 0F C,
22  ( PARALLEL CARD ) 0 C, 0 C,
23  9 C, 38 C, 30 C, 4E C, 9 C,
```

```
 8
 9
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11
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19
20
21
22
23
```

```
scr #  230
  0 ( DEFAULT BASIC zero page ) HEX
  1
  2 FRAG .DEFAULT-  100 ALLOT
  3  11 BLOCK HERE 100 - 100 CMOVE
  4
  5  LOMEM 1+            HERE 100 - 67 + !
  6  LOMEM 3 +           HERE 100 - 69 + !
  7  LOMEM 3 + 10 7 * +  HERE 100 - 6B + !
  8  LOMEM 3 + 10 7 * +  HERE 100 - 6D + !
  9  HIMEM 1F -          HERE 100 - 6F + !
 10  HIMEM               HERE 100 - 73 + !
 11  LOMEM 3 +           HERE 100 - AF + !
 12  4000                HERE 100 - FB + !
 13  0                   HERE 100 - FD + !
 14  0FF                 HERE 100 - FF + C!
 15
 16
 17
 18
 19
 20
 21
 22
 23
231
  0 ( DEFAULT BASIC variables ) HEX
  1
  2  0 C, 0 C, 0 C,
  3  C1CD , 0000 , 0 C, 0 , ( MARGIN% )
  4  CFD2 , 2001 , 0 C, 0 , ( ROOM% )
  5  C2C1 , 0600 , 0 C, 0 , ( ABOVE% )
  6  C9D7 , 5000 , 0 C, 0 , ( WIDE )
  7  C1D0 , 0000 , 0 C, 0 , ( PAGE% )
  8  C5C2 , 0600 , 0 C, 0 , ( BELOW% )
  9  D0CC , 0300 , 0 C, 0 , ( LPAGE% )
 10  C6D0 , 0200 , 0 C, 0 , ( PFLAG% )
 11  D0D3 , 0100 , 0 C, 0 , ( SPACING )
 12  C5CC , FFFF , 0 C, 0 , ( LINEND% )
 13  C5D3 , FFFF , 0 C, 0 , ( SEND% )
 14  CCD0 , 4200 , 0 C, 0 , ( PLEN% )
 15  D4C2 , BOV SWAB , 0 C, 0 , ( BOC )
 16
```

```
 0 FRAG .DEFAULT ( -- a )
 1 PURPOSE: used to set up page 0 and
 2  variables for BASIC.
 3
 4 copy image of BASIC page 0 from Lyon's
 5  disk. this image of BASIC was retrieved
 6  by Mino with his Wildcard.
 7 adjust it for these variables
 8  from byte 3 to 5B (hex)
 9 and the position of EDDE.
10 position of string is at HIMEM 18 -.
11 and some mysterious things:
12  4000        HERE 100 - FB + !
13  0           HERE 100 - FD + !
14  0FF         HERE 100 - FF + C!
15 the value $10 represents the number of
16  variables in BASIC.
17
18
19
20
21
22
23
```

```
 0 .DEFAULT continued...
 1
 2 define the following BASIC variables:
 3  include variables (ascii)
 4   MARGIN%   = 0      C1CD left margin
 5   ROOM%     = 201    CFD2 text available
 6   ABOVE%    = 0      C2C1 top margin
 7   WIDE%     = 50     C9D7 no. columns
 8   PAGE%     = 0      C1D0 page number
 9   BELOW%    = C      C5C2 bottom margin
10   LPAGE%    = 8      D0CC
11   PFLAG%    = 2      C6D0 page flag
12   SPACING   = 1      D0D3 single/double
13   LINEND%   = -1     C5CC send end line
14   SEND%     = -1     C5D3 modem initial.
15   PLEN%     = 42     CCD0 page length
16   BOC       = BOV    D4C2 bottom of text
```

```
 17  D250 ,  8 C, HIMEM 18 - , 0 , ( PR$ )
 18  D355 ,  3 C, HIMEM 1B - , 0 , ( US$ )
 19  C555 ,  4 C, HIMEM 1F - , 0 , ( UE$ )
 20  0 , 0 , 0 , 0 , 0 ,
 21
 22
 23
```

```
 17
 18   PR$              D250 printer initial
 19   US$              D355 u'line start
 20   UE$              C555 u'line end
 21
 22 NOTE: variable space is led by three
 23  zeroes and trailed by five zereos.
```

```
scr #  232
  0 ( INITBASIC DEFVARS ) HEX
  1
  2   ( BELONGS IN COLD START )
  3 LABEL INITBASIC   YSAVE STY, 0 #B LDY,
  4  BEGIN, \ .DEFAULT ,Y LDA,
  5   BASICO ,Y STA, INY, EQ
  6  UNTIL, YSAVE LDY,
  7
  8 LABEL DEFVARS  YSAVE STY,
  9  BASICO 69 + LDA, XO STA,
 10  BASICO 6A + LDA, XO 1+ STA,
 11  10 7 * 3 + 5 + #B LDY,
 12  BEGIN, \ .DEFAULT 103 + ,Y LDA,
 13   XO )Y STA, DEY, MI
 14  UNTIL,
 15  OF #B LDY,  ( bytes in .PRINT )
 16  HIMEM 1F - DUP OFF AND #B LDA, XO STA,
 17  BASICO 6F + STA,
 18  SWAB OFF AND #B LDA, XO 1+ STA,
 19  BASICO 70 + STA,
 20  BEGIN, \ .PRINT ,Y LDA, XO )Y STA,
 21   DEY, MI
 22  UNTIL, YSAVE LDY, TNEXT,
 23
233
  0 ( RESETVARS ) HEX
  1
  2 T: RESETVARS
  3  GAP 100 - D2CF V!
  4  WIDE      D7C9 V!
  5  ABOVE%    C1C2 V!
  6  BELOW%    C2C5 V!
  7  PAGE%     D0C1 V!
  8  MARGIN%   CDC1 V!
  9  LPAGE%    CCD0 V!
 10  PFLAG%    D0C6 V!
 11  SPACING   D3D0 V!
 12  LINEND%   CCC5 V!
 13  SEND%     D3C5 V!
 14  PLEN%     D0CC V!
 15  BOC       C2D4 V! ;
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 LABEL INITBASIC  ( -- )
 1 PURPOSE: copy DEFAULT to BASICO ($1000)
 2  then do DEFVARS.
 3
 4 copy BASIC page 0 from .DEFAULT to
 5  BASICO.  later this is moved into page
 6  zero before calling BASIC.
 7
 8
 9 LABEL DEFVARS  ( -- )
10 PURPOSE: define BASIC variables.
11
12 move BASIC variables ($42 bytes)
13  from DEFAULT + $103 to BASICO + $69.
14 force change in zero page values so
15  that user strings can be preserved.
16 move printer strings to BASIC area.
17
18
19 NOTE: the value $10 represents the
20  number of BASIC variables present.
21
22
23
```

```
 0 T: RESETVARS  ( -- )
 1 PURPOSE: place Swyft default values into
 2  the BASIC variables.
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  234
  0 ( VALIDATE ) HEX
  1
  2 T: VALIDATE  -
  3     D2CF V
  4  IF CDC1 V  IF C1C2 V  IF C2C5 V
  5  IF D7C9 V  IF D0C1 V  IF CCD0 V
  6  IF D0C6 V  IF D3D0 V  IF CCC5 V
  7  IF D3C5 V  IF D0CC V  IF C2D4 V
  8  IF 50D2 V  IF 55D3 V  IF 55C5 V
  9   IF 1 EXIT ENDIF
 10  ENDIF ENDIF ENDIF ENDIF ENDIF
 11  ENDIF ENDIF ENDIF ENDIF ENDIF
 12  ENDIF ENDIF ENDIF ENDIF ENDIF
 13  DEFVARS
 14  RESETVARS
 15  LOADSTRINGS
 16  BASIC0 69 + @ 70 + DUP
 17  BASIC0 6B + !
 18  BASIC0 6D + ! 0 ;
 19
 20
 21
 22
 23
```

```
 0 T: VALIDATE  ( -- flag )
 1 PURPOSE: checks to see if all the
 2  proper BASIC values have been set.
 3 true = all required variables present.
 4 false = something missing.
 5
 6 if all the values are not there then
 7  redefine all variables (DEFVARS).
 8  reset their value (RESETVARS and
 9   LOADSTRINGS).
10  tell basic where to find them.
11
12 NOTE: the value $70 is 7 times the
13  number of variables (both integers and
14  strings).
15
16
17
18
19
20
21
22
23
```

```
235
  0 ( F>B ) HEX
  1
  2 LABEL F>B ( FORTH TO BASIC )
  3  XSAVE STX, TSX, SSAVE STX,
  4  YSAVE STY,
  5
  6  4F #B LDX,
  7  BEGIN, 50 ,X LDA, FORTH0 ,X STA,
  8   BASIC0 50 + ,X LDA, 50 ,X STA,
  9   DEX, MI
 10  UNTIL, 3F #B LDX,
 11  BEGIN, 1C0 ,X LDA, FORTH1 ,X STA,
 12   BASIC1 ,X LDA, 1C0 ,X STA, DEX, MI
 13  UNTIL,
 14
 15  CLC, <ZPMOVE> JSR,
 16  SSAV LDX, TXS, SEI, RETN LDA, MI
 17  IF, <D444> JMP,
 18  ENDIF, OFF #B LDA, RETN STA,
 19  XSAV LDX, YSAV LDY, PSAV LDA,
 20  PHA, ASAV LDA, PLP,
 21  <RTS> JMP,
 22
 23
```

```
 0 LABEL F>B  ( -- )
 1 PURPOSE: transfer control from Forth
 2  to BASIC.
 3 save X and S registers.
 4 save second $50 bytes from page 0
 5  at FORTH0, replacing them from BASIC0.
 6 save last $40 bytes from page 1
 7  at FORTH1, replacing them from BASIC1.
 8 for disk based Swyft <ZPMOVE> moves
 9  pages 0 and 1 from aux to main memory.
10 in ROM Swyft <ZPMOVE> is simply an RTS.
11 set return stack pointer (from BASIC0).
12 the first time through:
13  jump to D444, beginning of BASIC.
14   it will return to B>F or
15   it will emit characters through CH>F.
16 consecutive times through:
17  store -1 in RETN
18  restore registers (X, Y, P, A)
19  return to BASIC to where it emitted
20   characters.
21
22
23
```

```
scr #  236
  0 ( CH>F ) HEX
  1
  2 FRAG .CH>F  -
  3  7F #B AND, RETNCHR STA,
  4  SEC, <ZPMOVE> JSR,
  5  SEC, CH LDA, COL# SBC, RETN STA,
  6  RETNCHR LDA, 0D #B CMP, EQ
  7  IF, 0 #B LDA, CH STA, 57B STA,
```

```
 0 FRAG .CH>F  ( -- )
 1 PURPOSE: receive characters emitted by
 2  BASIC.
 3
 4  strip high byte and save character
 5   in RETNCHR.
 6  in disk version <ZPMOVE> copies
 7    pages 0 and 1 from main to aux.
```

```
 8   COL# STA, cr #B LDA, RETNCHR STA,
 9  ELSE, CH INC, CH LDA, 57B STA,
10   COL# STA,
11  ENDIF, RETNCHR LDA,
12
13  CLC, CS IF,
14  ( skip <ZPMOVE> in B>F )
15
16
17
18
19
20
21
22
23
237
 0 ( B>F ) HEX
 1
 2 FRAG .B>F
 3  SEC, <ZPMOVE> JSR,
 4  ENDIF,  ( skip <ZPMOVE> from C>F )
 5  CLI,
 6  PHP, ASAV STA, PLA, PSAV STA,
 7  XSAV STX, YSAV STY, TSX, SSAV STX,
 8
 9  4F #B LDX,
10  BEGIN,
11   50 ,X LDA, BASIC0 50 + ,X STA,
12   FORTH0 ,X LDA, 50 ,X STA,
13   DEX, MI
14  UNTIL, 3F #B LDX,
15  BEGIN,
16   1C0 ,X LDA, BASIC1 ,X STA,
17   FORTH1 ,X LDA, 1C0 ,X STA,
18   DEX, MI
19  UNTIL,
20
21  SSAVE LDX, TXS, XSAVE LDX, YSAVE LDY,
22  TNEXT,
23
```

```
 8 in ROM version <ZPMOVE> is RTS.
 9 store difference in cursor horizontal
10  position in RETN.
11 if the char is a carriage return then
12  store 0 in cursor position,
13  update 80-column enhanced ($57B),
14  convert RETNCHR to a Swyft return.
15 else increment cursor position and
16  update 80-column enhanced ($57B).
17 restore received character to A reg.
18 continue with .B>F after skipping
19  <ZPMOVE> in .B>F....
20
21
22
23

 0 FRAG B>F  ( -- )
 1 PURPOSE: return from BASIC or CH>F to
 2  Forth.
 3
 4 in disk version <ZPMOVE>
 5  and if not from .CH>F then
 6  copy pages 0 and 1 from main to aux.
 7 save registers (A, P, X, Y, S)
 8 exchange BASIC and Forth pages zero:
 9  copy $50 bytes from $50 to BASIC0
10   and from FORTH0 to $50.
11 exchange BASIC and Forth pages one:
12  copy $3F bytes from $1C0 to BASIC1
13   and from FORTH0 to $1C0.
14 restore registers (S, X)
15 return to TOBASIC
16
17
18
19
20
21
22
23
```

```
scr #  238
 0 ( erase 1st 2 tracks )   HEX
 1
 2 FRAG .NEWDISK. ( -- )
 3 C0E8 LDA, 0 #B LDA, C0EF STA, C0ED STA,
 4 ( //c IWM INITIALIZATION )
 5 C0EE LDA, C0E9 LDA,   ( turn on drive )
 6 50 #B LDY,            ( step 80 phases )
 7 BEGIN, TYA, 3 #B AND, .A ASL,
 8  TAX, C0E1 ,X LDA,        ( step motor )
 9  56 #B LDA, FCA8 JSR,          ( delay )
10  C0E0 ,X LDA, DEY, MI     ( step motor )
11 UNTIL,
12 C0EF LDA,      ( Turn on write current )
13 FF #B LDA, FCA8 JSR,           ( delay )
14 FF #B LDA, FCA8 JSR,           ( delay )
15 C0E3 LDA, 56 #B LDA, FCA8 JSR, ( step )
16 C0E5 LDA, C0E2 LDA, 56 #B LDA,   ( to )
```

```
 0 FRAG .NEWDISK  ( -- )
 1 PURPOSE: erase a Swyft disk when the
 2  phrase "CALL 3600" is calculated.
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
```

```
 17 FCA8 JSR, C0E4 LDA,       ( next track )
 18 FF #B LDA, FCA8 JSR,          ( delay )
 19 FF #B LDA, FCA8 JSR,          ( delay )
 20 C0EE LDA, C0E8 LDA, RTS,   ( Turn off )
 21              ( write current and drive )
 22
 23
239
  0 ( soft switch words for rom card ) HEX
  1
  2 FRAG .MONITOR   C0B1 STA, C08A STA,
  3        FF69 JMP,
  4 FRAG .B/F   C0B0 STA,
  5        \ .B>F JMP,
  6 FRAG .XNEXT C0B0 STA, YSAVE LDY, TNEXT,
  7 FRAG .RTS   C0B1 STA, RTS,
  8 FRAG .D444  C0B1 STA,
  9        OFF #B LDX, 1 #B LDY,
 10        4C #B LDA, FDF0 STA, D444 JMP,
 11 FRAG .CH/F  C0B0 STA,
 12        7F #B AND, RETNCHR STA,
 13        \ .CH>F JMP,
 14 FRAG .XFER  X5 1+ STA, X5 STY,
 15        C0B2 STA, X5 )JMP,
 16 FRAG .LEMIT2  <LEMIT> JSR,
 17        C0B2 STA, RTS,
 18 FRAG .BOOT
 19  C08A STA, C0B1 STA, FFFC )JMP,
 20  C0B0 STA, D204 JMP, NOP,
 21  D200 , 3E9 , 3 A5 XOR C,
 22 FRAG .CDISK YSAVE STY, XSAVE STX,
 23        <NDISK> JSR, \ XYNEXT JMP,
```

```
 17
 18
 19
 20
 21
 22
 23

  0 ( SOFT SWITCH WORDS FOR ROM CARD ) HEX
  1
  2 FRAG .MONITOR jump to the Apple monitor
  3
  4 FRAG .B/F jump to BASIC/FORTH interface
  5
  6 FRAG .XNEXT return from bank 2 routine.
  7 FRAG .RTS return from BASIC.
  8 FRAG .D444 jump to BASIC.
  9
 10
 11 FRAG .CH/F return character to Forth.
 12
 13
 14 FRAG .XFER jump to bank 2 routine.
 15
 16 FRAG .LEMIT2 print character.
 17
 18 FRAG .BOOT boot disk.
 19
 20
 21
 22 FRAG .CDISK erase Swyft disk.
 23
```

```
scr #  240
  0 ( soft switch words for rom card ) HEX
  1
  2 FRAG .START  C08D LDA, C08D LDA,
  3  C0B1 STA, D0 #B LDA, X0 1+ STA,
  4  0 #B LDY, X0 STY,
  5  BEGIN,
  6   BEGIN, X0 )Y LDA, X0 )Y STA, INY, EQ
  7   UNTIL,  X0 1+ INC, EQ
  8  UNTIL,
  9  B0 #B LDA, E063 STA,
 10  4C #B LDA, D43C STA,
 11  <B/F> OFF AND #B LDA, D43D STA,
 12  <B/F> SWAB OFF AND #B LDA, D43E STA,
 13  <CH/F> OFF AND #B LDA, FDF1 STA,
 14  <CH/F> SWAB OFF AND #B LDA, FDF2 STA,
 15  C08F LDA, C08F LDA, <XNEXT> JMP,
 16
 17 FRAG .LEMIT  SEI, C0B1 STA,
 18  0 #B LDY, 36 STY, C1 #B LDY, 37 STY,
 19  60 #B LDY, FDF0 STY,
 20  TXA, FDED JSR,
 21  36 LDA, F75 STA,
 22  FD #B LDA, 37 STA, F0 #B LDA, 36 STA,
 23  C0B0 STA, CLI, RTS,
```

```
  0 FRAG .START  ( -- )
  1 PURPOSE: prepare to call BASIC.
  2 set up for BASIC ($C08D).
  3 copy BASIC and monitor rom to equivalent
  4  space in ram and modify.
  5
  6 NOTE: $D43C is JMP <B/F> and
  7  $FDF1 is <CH/F>.
  8
  9
 10
 11 FRAG .LEMIT  ( -- )
 12 PURPOSE: print character from x-reg.
 13
 14 turn romcard off.
 15 replace Apple output vector $36 with
 16  soft hook in slot one ($C100).
 17 call output routine $FDED.
 18 restore original output vector in $36
 19  ($FDF0).
 20 self-modify .LEMIT to store new vector
 21  at $36 ($C102) next time through.
 22 turn romcard on.
 23
```

```
241
  0 ( .FRAGMENTS FOR ROM CARD ) HEX
  1
  2 LABEL ROM-FRAGMENTS
  3  YSAVE STY, OF #B LDY, BEGIN,
  4  \ .LEMIT2     ,Y LDA, <LEMIT2> ,Y STA,
  5  \ .CDISK      ,Y LDA, <CDISK>  ,Y STA,
  6  \ .XNEXT      ,Y LDA, <XNEXT>  ,Y STA,
  7  \ .MONITOR    ,Y LDA, <MON>    ,Y STA,
  8  \ .B/F        ,Y LDA, <B/F>    ,Y STA,
  9  \ .D444       ,Y LDA, <D444>   ,Y STA,
 10  \ .CH/F       ,Y LDA, <CH/F>   ,Y STA,
 11  \ .XFER       ,Y LDA, <XFER>   ,Y STA,
 12  \ .RTS        ,Y LDA, <RTS>    ,Y STA,
 13  DEY, MI UNTIL, 2F #B LDY, BEGIN,
 14  \ .LEMIT      ,Y LDA, <LEMIT>  ,Y STA,
 15  \ .BOOT 10 -  ,Y LDA, 3D0      ,Y STA,
 16  DEY, MI UNTIL, 5F #B LDY, BEGIN,
 17  \ .NEWDISK    ,Y LDA, <NDISK>  ,Y STA,
 18  \ .START      ,Y LDA, <START>  ,Y STA,
 19  DEY, MI UNTIL,
 20  60 #B LDA, <ZPMOVE> STA,
 21  YSAVE LDY, TNEXT,
 22
 23
```

```
0 LABEL ROM-FRAGMENTS ( -- )
1 PURPOSE: copy routines that can't
2  operate in romcard to an area in ram.
3
4  .START      to <START>
5  .RTS        to <RTS>
6  .CH/F       to <CH/F>
7  .D444       to <D444>
8  .B/F        to <B/F>
9  .LEMIT      to <LEMIT>
10 .XNEXT      to <XNEXT>
11 .XFER       to <XFER>
12 .MONITOR    to <MON>
13 .BANK1      to <BANK1>
14 .BOOT 10 -  to 3D0
15 RTS,        to <ZPMOVE>
16
17 NOTE: the same space can be loaded with
18  fragments used by the disk version
19  which manage bank switching differently
20
21
22
23
```

```
scr #  242
  0 ( soft switch words for disk ram ) HEX
  1
  2 FRAG D.MONITOR  <MAIN> JSR, C08A LDA,
  3          FF69 JMP,
  4 FRAG D.B/F  C009 STA, C003 STA,
  5          C005 STA, \ .B>F JMP,
  6 FRAG D.XNEXT C08F LDA, C08F LDA,
  7          YSAVE LDY, TNEXT,
  8 FRAG D.RTS  C008 STA, C002 STA,
  9          C004 STA, RTS,
 10 FRAG D.AUX     PLA, TAY, PLA, C009 STA,
 11 C003 STA, C005 STA, PHA, TYA, PHA, RTS,
 12 FRAG D.MAIN    PLA, TAY, PLA, C008 STA,
 13 C002 STA, C004 STA, PHA, TYA, PHA, RTS,
 14 FRAG D.D444  <MAIN> JSR,
 15          OFF #B LDX, 1 #B LDY,
 16          4C #B LDA, FDF0 STA, D444 JMP,
 17 FRAG D.CH/F  C009 STA, C003 STA,
 18          C005 STA, \ .CH>F JMP,
 19 FRAG D.XFER  X5 1+ STA, X5 STY,
 20          C083 LDA, C083 LDA, X5 )JMP,
 21 FRAG D.CDISK  YSAVE STY, XSAVE STX,
 22    <MAIN> JSR, <NDISK> JSR, <AUX> JSR,
 23    \ XYNEXT JMP,
243
  0 ( soft switch words for disk ram ) HEX
  1
  2 FRAG D.ZPMOVE  300 STA, 301 STX,
  3  302 STY, PLA, 303 STA, PLA, 304 STA,
  4  0 #B LDY,
  5  BEGIN, NC
  6   IF,   0 ,Y LDA, TAX, 100 ,Y LDA,
  7         C008 STA, 100 ,Y STA, TXA,
```

```
 0 ( SOFT SWITCH WORDS FOR DISK RAM ) HEX
 1
 2 FRAG D.MONITOR set up main memory then
 3                call the Apple monitor.
 4 FRAG D.B/F BASIC/Forth interface.
 5
 6 FRAG D.XNEXT return from bank 2 routine.
 7
 8 FRAG D.RTS reset banks.
 9
10 FRAG D.AUX set up auxilliary ram.
11
12 FRAG D.MAIN set up main ram.
13
14 FRAG D.D444 set up main ram and then
15             jump to BASIC.
16
17 FRAG D.CH/F return character from BASIC.
18
19 FRAG D.XFER jump to bank 2 routine.
20
21 FRAG D.CDISK set up main memory, erase
22  Swyft disk, return to auxilliary memory
23
```

```
 0 ( SOFT SWITCH WORDS FOR DISK RAM ) HEX
 1
 2 FRAG D.ZPMOVE
 3 PURPOSE: move page 0 from auxilliary
 4  memory to main, or vice versa; carry
 5  flag determines direction in the disk
 6  version only.
 7 save registers beginning at $300.
```

```
 8         0 ,Y STA, C009 STA,
 9   ELSE, C008 STA, 0 ,Y LDA, TAX,
10         100 ,Y LDA, C009 STA,
11         100 ,Y STA, TXA, 0 ,Y STA,
12   ENDIF, INY, EQ
13  UNTIL, 304 LDA, PHA, 303 LDA, PHA,
14  302 LDY, 301 LDX, 300 LDA, RTS,
15
16 FRAG D.LEMIT  SEI, <MAIN> JSR,
17  C1 #B LDY, 37 STY, 0 #B LDY, 36 STY,
18  60 #B LDY, FDF0 STY, TXA,
19  FDED JSR,  36 LDA, F79 STA,
20  FD #B LDA, 37 STA, F0 #B LDA, 36 STA,
21  <AUX> JSR, CLI, RTS,
22
23 FRAG D.LEMIT2  <LEMIT> JMP,
```

```
 8 if carry clear then move from auxilliary
 9  to main.
10 else carry set so
11  move from main memory to auxilliary.
12 restore registers.
13
14 FRAG D.LEMIT
15 PURPOSE: print character. x-reg has the
16  character.
17 set up main memory.
18 modify Apple vectors.
19 output character.
20 restore auxilliary memory.
21
22 FRAG D.LEMIT2
23 PURPOSE: jump to printer routine.
```

```
scr #  244
 0 ( soft switch words for disk ram ) HEX
 1
 2 FRAG D.START -
 3  <MAIN> JSR, C08D LDA, C08D LDA,
 4  D0 #B LDA, X0 1+ STA, 0 #B LDY, X0 STY,
 5  BEGIN,
 6   BEGIN, X0 )Y LDA, X0 )Y STA, INY, EQ
 7   UNTIL,  X0 1+ INC, EQ
 8  UNTIL,
 9  B0 #B LDA, E063 STA,
10  4C #B LDA, D43C STA,
11  <B/F>     DUP 0FF AND #B LDA, D43D STA,
12           SWAB 0FF AND #B LDA, D43E STA,
13  <CH/F>    DUP 0FF AND #B LDA, FDF1 STA,
14           SWAB 0FF AND #B LDA, FDF2 STA,
15  <AUX> JSR, <XNEXT> JMP,
16
17 FRAG D.BOOT
18  <AUX> JSR, C08F LDA, C08F LDA,
19  FFF6 LDA, FFFE STA, FFF7 LDA, FFFF STA,
20  D204 JMP,
21  C08A LDA, <MAIN> JSR,
22  0 #B LDA, 3F4 STA, FFFC )JMP, NOP, NOP,
23  D200 , 3C8 , 3 A5 XOR C,
```

```
 0 ( SOFT SWITCH WORDS FOR DISK RAM ) HEX
 1
 2 FRAG D.START
 3 PURPOSE: prepare for BASIC.
 4 set up main memory.
 5 set up for BASIC ($C08D).
 6 move and modify (see .START).
 7 restore auxilliary memory.
 8
 9
10
11
12 FRAG D.BOOT
13 PURPOSE: boot disk.
14
15
16
17
18
19
20
21
22
23
```

```
245
 0 ( D:FRAGMENTS FOR DISK RAM ) HEX
 1
 2 LABEL DISK-FRAGMENTS
 3  YSAVE STY, 5F #B LDY, BEGIN,
 4  \ D.BOOT 28 - ,Y LDA, 3A0      ,Y STA,
 5  \ D.ZPMOVE    ,Y LDA, <ZPMOVE> ,Y STA,
 6  \ D.LEMIT     ,Y LDA, <LEMIT>  ,Y STA,
 7  \ D.START     ,Y LDA, <START>  ,Y STA,
 8  \ .NEWDISK    ,Y LDA, <NDISK>  ,Y STA,
 9  DEY, MI UNTIL, F #B LDY, BEGIN,
10  \ D.LEMIT2    ,Y LDA, <LEMIT2> ,Y STA,
11  \ D.CDISK     ,Y LDA, <CDISK>  ,Y STA,
12  \ D.AUX       ,Y LDA, <AUX>    ,Y STA,
13  \ D.MAIN      ,Y LDA, <MAIN>   ,Y STA,
14  \ D.XNEXT     ,Y LDA, <XNEXT>  ,Y STA,
15  \ D.MONITOR   ,Y LDA, <MON>    ,Y STA,
16  \ D.B/F       ,Y LDA, <B/F>    ,Y STA,
```

```
 0 LABEL DISK-FRAGMENTS ( -- )
 1 PURPOSE: copy routines that can't
 2  operate in ramcard to an area in ram.
 3
 4  D.BOOT 28 - to 3A0
 5  D.ZPMOVE    to <ZPMOVE>
 6  D.LEMIT     to <LEMIT>
 7  D.START     to <START>
 8   .NEWDISK   to <NDISK>
 9  D.LEMIT2    to <LEMIT2>
10  D.XNEXT     to <XNEXT>
11  D.MONITOR   to <MON>
12  D.B/F       to <B/F>
13  D.D444      to <D444>
14  D.CH/F      to <CH/F>
15  D.XFER      to <XFER>
16  D.MAIN      to <MAIN>
```

```
 17  \ D.D444       ,Y LDA, <D444>    ,Y STA,
 18  \ D.CH/F       ,Y LDA, <CH/F>    ,Y STA,
 19  \ D.XFER       ,Y LDA, <XFER>    ,Y STA,
 20  \ D.RTS        ,Y LDA, <RTS>     ,Y STA,
 21  DEY, MI UNTIL,
 22  YSAVE LDY, TNEXT,
 23
```

```
 17  D.AUX        to <AUX>
 18  D.RTS        to <RTS>
 19
 20 NOTE: the same space can be loaded with
 21  fragments used by the rom version
 22  which manage bank switching differently
 23
```

```
scr #  246
  0 ( START ) HEX
  1
  2 ( BELONGS IN WARM START )
  3 LABEL START  YSAVE STY, ROM? LDA, EQ
  4  IF, 00 #B LDA, 3C STA, 42 STA,
  5   03 #B LDA, 3D STA, 43 STA,
  6   11 #B LDA, 3F STA, FF #B LDA, 3E STA,
  7   CLC, C311 JSR,
  8  ENDIF, <START> JMP,
  9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 LABEL START  ( -- )
 1 PURPOSE: set up for BASIC.
 2 if using the disk version of Swyft
 3  (i.e., ROM? is equal to zero) then
 4  move from auxilliary to main from
 5  $300 through $11FF to $300.
 6
 7 NOTE: called by WARM.
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
247
  0 ( FRAGMENTS MOVE-VARS ) HEX
  1
  2 T: FRAGMENTS ROM? IF ROM-FRAGMENTS
  3  ELSE DISK-FRAGMENTS ENDIF ;
  4
  5 FRAG .MOVE-VARS  ROM? LDA, EQ
  6  IF, LOMEM
  7   DUP SWAB OFF AND #B LDA,
  8   3D STA, 43 STA,
  9   OFF AND #B LDA, 3C STA, 42 STA,
 10   BOV 1-
 11   DUP SWAB OFF AND #B LDA, 3F STA,
 12   OFF AND #B LDA, 3E STA,
 13   C311 JSR,
 14  ENDIF, RTS,
 15
 16
 17
 18
 19
 20
 21
 22
 23
```

```
 0 T: FRAGMENTS ( -- )
 1 PURPOSE: decide which set of machine
 2  code routines (disk versus rom) to
 3  copy from rom space to their own ram
 4  space.
 5 input: ROM? is zero if using the disk
 6  based version of Swyft.
 7
 8 FRAG .MOVE-VARS  ( -- )
 9 PURPOSE: move BASIC variables in disk
10  version of Swyft.
11 in the disk version only:
12  move, between aux to main memory,
13  BASIC variables (1200-15FF)
14  and input buffer (200-2FF)
15
16
17
18
19
20
21
22
23
```

```
scr #  248
  0 ( BEFORE AFTER ) HEX
  1
  2 LABEL BEFORE -YSAVE STY,
  3  \ .MOVE-VARS JSR, 0 #B LDY,
  4  BEGIN, BASIC0 ,Y LDA, 0 ,Y STA, INY,
  5   50 #B CPY, EQ
  6  UNTIL, A0 #B LDY,
  7  BEGIN, BASIC0 ,Y LDA, 0 ,Y STA, INY, EQ
  8  UNTIL,
  9  ROM? LDA, EQ
 10  IF, 02 #B LDA, 3D STA, 43 STA, 3F STA,
 11   00 #B LDA, 3C STA, 42 STA,
 12   FF #B LDA, 3E STA,
 13   CLC, C311 JSR,
 14  ENDIF, YSAVE LDY, TNEXT,
 15
 16 LABEL AFTER  YSAVE STY, 0 #B LDY,
 17  BEGIN, 0 ,Y LDA, BASIC0 ,Y STA, INY,
 18   50 #B CPY, EQ
 19  UNTIL, A0 #B LDY,
 20  BEGIN, 0 ,Y LDA, BASIC0 ,Y STA, INY, EQ
 21  UNTIL, SEC, \ .MOVE-VARS JSR,
 22  YSAVE LDY, TNEXT,
 23
```

```
 0 LABEL BEFORE ( -- )
 1 PURPOSE: prepare for BASIC.
 2  if the disk version then move BASIC
 3   variables (.MOVE-VARS).
 4  copy the first $50 and the last $60
 5   bytes from BASIC0 to page 0.
 6  if the disk based Swyft then
 7   move from aux to main memory,
 8   the basic variables and page 2.
 9
10 LABEL AFTER ( -- )
11 PURPOSE: return from BASIC.
12  copy the first 50 and the last 60
13   (hex) bytes from page 0 to BASIC0.
14  if the disk version then move BASIC
15   variables (.MOVE-VARS).
16
17
18
19
20
21
22
23
```

```
249
  0 ( ?MOVETEXT ) HEX
  1
  2 ( shiftamount -- )
  3 T: MOVETEXT  DUP >R
  4  BOC 2DUP + EOS BOC - R> 0<
  5  IF CMOVE ELSE CMOVE> ENDIF
  6  BOT >R EBOT >R
  7  DUP BOC +TO DUP BOT +TO
  8  DUP BOS +TO DUP EOS +TO
  9  DUP EBOT +TO OEOS +TO
 10  FIXEND R> R> +ALIGN
 11  TOP LOCLIN LINADR REWINDOW TOPLINE
 12  OFF FRESH RENCUR OFF
 13  0 NEWBOTTOM TO ;
 14
 15 T: ?MOVETEXT  C2D4 V@ >R
 16  R@ BOC - DUP NEWBOTTOM TO
 17  IF BEOT EOS 100 + - BOC + R@ U<
 18   R@ BOTTOM U< OR
 19   IF BOC C2D4 V! 0 NEWBOTTOM TO
 20  ENDIF ENDIF R> DROP ;
 21
 22
 23
```

```
 0 T: MOVETEXT ( shiftamount -- )
 1 PURPOSE: move the beginning of text so
 2  that more (or less) room is available
 3  for writing programs.
 4
 5 move bytes up or down from BOC to
 6  BOC+shiftamount.
 7 save old EBOT and BOT values (for use
 8  by +ALIGN).
 9 update BOC, BOT, BOS, EOS, EBOT, OEOS
10  by adding shiftamount.
11 put a form feed at the end (FIXEND).
12 align the page table (using old EBOT and
13  old BOT).
14 rewindow and show a fresh display.
15 turn NEWBOTTOM off.
16
17 T: ?MOVETEXT ( -- )
18 PURPOSE: prevent text from moving too
19  far down.
20 if BT% does not equal BOC and
21  if it is not possible to move text down
22  then keep the BOC the same.
23
```

```
scr #  250
  0 ( MARGIN-CHANGES ) HEX
  1 T: MARGIN-CHANGES  CDC1 V@ MARGIN% -
  2  IF  CDC1 V@ OMAX 30 UMIN
  3   DUP MARGIN% TO CDC1 V! ENDIF
  4
  5  DOCC V@ PLEN% -
  6  IF LINES PAGES - 0 DOCC V@
  7   ABOVE% BELOW% + 1+ UMAX OFF UMIN
```

```
 0 T: MARGIN-CHANGES
 1 PURPOSE: after a BASIC command update
 2  margins (ie, left margin, page length,
 3  header, footer).  Note that there is an
 4  interaction of these variables (ie,
 5  they affect each other). in particular,
 6  PLEN% (page length) is not set below
 7  values of ABOVE% plus BELOW%; also
```

```
 8   ABOVE% - BELOW% -                          8  PLEN% cannot be set so that page table
 9   UM/MOD SWAP 0= 0= - CA U<                  9  overflows.
10   IF DOCC V@ OMAX                           10
11    ABOVE% BELOW% + 1+ UMAX OFF UMIN         11 left margin can range from 0 to $30.
12    DUP PLEN% TO DOCC V!                     12
13   ELSE PLEN% DOCC V! ENDIF ENDIF            13 page length ranges from ab%+be%+1 to SFF
14                                             14 if the change in page length will not
15  C1C2 V@ ABOVE% -                           15  overflow the page table then make the
16  IF C1C2 V@ OMAX                            16  change; otherwise reset BASIC value,
17   PLEN% 1- BELOW% - UMIN HEAD% OMAX         17  set error# to 19
18   UMAX DUP ABOVE% TO C1C2 V! ENDIF          18
19                                             19 top margin ranges from pl%+be%-1 to he%.
20  C2C5 V@ BELOW% -                           20
21  IF C2C5 V@ OMAX PLEN% 1-                   21 bottom margin ranges from pl%+ab%-1 to
22   ABOVE% - UMIN LPAGE% 2 + OMAX             22  lp%+2.
23   UMAX DUP BELOW% TO C2C5 V! ENDIF  ;       23
```

```
251
 0 ( WIDTHCHANGE SPACINGCHANGE ) HEX            0 T: WIDTHCHANGE ( -- )
 1                                              1 PURPOSE: change the horizontal width of
 2 T: WIDTHCHANGE                               2  the text. width will not be changed if
 3  D7C9 V@ WIDE -                              3  it would cause too many pages for the
 4  IF D7C9 V@ WIDE U< DUP                      4  page table.
 5   IF DROP OCA 0                              5
 6    WIDE 0 D7C9 V@                            6 if the BASIC variable WI% and WIDE are
 7    UM/MOD SWAP 0= 0= -                       7   not the same then
 8    UM/MOD SWAP 0= 0= - PAGES U<              8  if the new width is less than the
 9   ENDIF 0=                                   9    current width then
10   IF D7C9 V@ 50 UMIN 10 UMAX                10   figure out if the new width would
11    DUP D7C9 V! WIDE TO                      11    overflow the page table.
12    7000 TOP TO BOT BOT NEWPAGES             12  if there would be no overflow then make
13   ELSE WIDE D7C9 V!                         13   the change.
14  ENDIF ENDIF ;                              14  else keep the same width with no
15 ;S                                          15   change, set error# to 19
16 T: SPACINGCHANGE                            16
17  SPACING D3D0 V@ OMAX 2 UMIN U<             17 NOTE: the width can range from $10 to
18  IF LINES PAGES - 0 PLEN% ABOVE% -          18  $50.
19   BELOW% - U2/ UM/MOD SWAP 0= 0= - CA U<    19
20   IF 2 SPACING TO 2 ELSE 1 ENDIF D3D0 V!    20
21  ELSE D3D0 V@ OMAX 2 UMIN DUP               21
22   SPACING TO D3D0 V! ENDIF ;                22
23                                             23
```

```
scr #  252
 0 ( CHECKCHANGES ) HEX                         0 T: CHECKCHANGES  ( -- )
 1 T: CHECKCHANGES WIDTHCHANGE                  1 PURPOSE: adjust Swyft for changes in
 2  MARGIN-CHANGES DOC1 V@ PAGE% -              2  BASIC variables.
 3  IF DOC1 V@ PAGE% TO                         3
 4   7000 TOP TO EBOT BOT NEWPAGES ENDIF        4 after BASIC returns to Forth then make
 5  SPACING D3D0 V@ OMAX 2 UMIN U<              5  changes in the following if needed:
 6  IF LINES PAGES - 0 PLEN% ABOVE% -           6 width (WIDTHCHANGE)
 7   BELOW% - U2/ UM/MOD SWAP 0= 0= - CA U<     7 margin (MARGIN-CHANGES)
 8   IF 2 SPACING TO 2 ELSE 1 ENDIF D3D0 V!     8 pagination (PAGE%)
 9  ELSE D3D0 V@ OMAX 2 UMIN DUP                9 page length (PLEN%)
10   SPACING TO D3D0 V! ENDIF                  10 spacing  (SPACING)
11  PLEN% BELOW% - ABOVE% - SPACING 2 =        11  ( else set error# to 19 )
12  IF 0 2 UM/MOD + ENDIF                      12 margin above (ABOVE%)
13  DUP LONG -                                 13 margin below (BELOW%)
14  IF DUP LONG TO 7000 TOP TO                 14 page flag (PFLAG%)
15   BOT BOT NEWPAGES                          15 modem initialization (SEND% and
16  ENDIF DROP                                 16  SETMODEM)
17  CCD0 V@ LPAGE% -                           17 printer strings (SAVESTRINGS)
18  IF CCD0 V@ OMAX 1 UMAX BELOW% 2 - UMIN     18 ram key translation and command tables
19   DUP LPAGE% TO CCD0 V! ENDIF               19  (?RAMKEYS)
20  DOC6 V@ PFLAG% TO CCC5 V@ LINEND% TO       20 bottom of text (?MOVETEXT)
```

```
253
  0 ( TOINPUT APPEND ) HEX
  1
  2 ( address count -- )
  3 T: TOINPUT
  4  0 OVER 200 + !
  5  200 SWAP CMOVE
  6  300 200
  7  DO I C@ ?DUP
  8   IF 20 U<
  9    IF 20 I C!
 10   ENDIF ENDIF
 11  LOOP ;
 12
 13 ( char -- | insert char at OEOS )
 14 T: APPEND  EBOT C!
 15  1 EBOT +TO 1 EOS +TO
 16  -1 DIRTY TO FIXEND ;
 17
 18
 19
 20
 21
 22
 23
```

```
 0 T: TOINPUT ( address count -- )
 1 PURPOSE: pass characters to BASIC.
 2
 3 move from text address to BASIC input
 4  area by the count of bytes.
 5 insure that no character is less than
 6  $20.
 7
 8
 9 T: APPEND  ( char -- )
10 PURPOSE: insert character from BASIC at
11   OEOS.
12
13 if text is full, discard and beep.
14 enter a character arriving from BASIC
15  at the end of selection,
16  updating pointers, and setting DIRTY.
17
18
19
20
21
22
23
```

```
scr #  254
  0 ( TOBASIC ) HEX
  1
  2 ( address count -- )
  3
  4 T: TOBASIC  TOINPUT VALIDATE DROP
  5  OFF RETN TO  0 COL# TO
  6  0 BASIC0 24 + C!
  7  RESETVARS LOADSTRINGS BEFORE
  8  BEGIN F>B
  9   PAGES 0CA U<
 10   EBOT 100 + BEOT U< AND DUP 0=
 11   IF BEEP OFF OFF C! ENDIF
 12   RETN 7F U< AND
 13  WHILE RETN ?DUP
 14   IF 0 DO 20 APPEND LOOP
 15   ENDIF RETNCHR 7 =
 16   IF BEEP
 17   ELSE RETNCHR 1D UMAX DUP APPEND
 18    21 U< IF FRESH ENDIF
 19   ENDIF
 20  REPEAT AFTER FRESH VALIDATE
 21  IF CHECKCHANGES ENDIF ;
 22
 23
255
  0 ( BASIC ) HEX
  1
  2 T: BASIC
  3  AUTOEXTEND OFF
  4  BOS EOS OVER WR!
  5  BEGIN WRAP WR@ WC@
  6   ENDWRAP DROP WR@ >R
  7   >R 2DUP - R> UMIN
```

```
 0 T: TOBASIC  ( address count -- )
 1 PURPOSE: call BASIC to interpret one
 2  line and place its output into text.
 3 only display text after a space or
 4  carriage return, and when done
 5 respond to changes to control variables.
 6
 7 move text to BASIC area, validate
 8  variables, set RETN and COL# to zero,
 9  set BASIC0 ADDR 24 + to zero.
10 reset BASIC variables.
11 BEFORE sets up BASIC for disk version.
12 begin call BASIC interface
13 while RETN and enough pages and room
14  insert spaces in text (RETN gives
15   the horizontal position).
16  if a BASIC error
17  then beep, set error# to 15
18  else insert character in text
19   (BASIC character returned in RETNCHR).
20   fresh screen
21 repeat AFTER resets disk vers from BASIC
22 if any BASIC variables have changed
23  then recalculate text format

 0 T: BASIC  ( -- )
 1 PURPOSE: interpret multiple lines of
 2  BASIC and insert response in text.
 3
 4 autoextend selection.
 5 turn off cursor.
 6 interpret selected lines and place their
 7  output into text (TOBASIC).
```

```
 8   TOBASIC                                          8 leave the selection selected.
 9   DUP 1- R> DUP WR! U<                             9 show fat cursor
10  UNTIL EBOT OVER - >R                             10  unless at the end of the text.
11  DUP BEOT R@ - R@ CMOVE                           11 wrap text (ENDFORM).
12  R> NEGATE BEOT +TO DUP EBOT TO                   12 if the bottom of text has been changed
13  BOS OEOS TO                                      13  then movetext.
14  NEWMARK NEWND SHOW                               14
15  BEOT EOT =                                       15
16  IF LEXCUR ELSE RENCUR ENDIF                      16
17  0 OLIN TO ENDFORM                                17
18  NEWBOTTOM IF NEWBOTTOM MOVETEXT ENDIF            18
19  -1 EXTENDED TO ;                                 19
20                                                   20
21                                                   21
22                                                   22
23                                                   23
```

```
scr #  256
  0 ( FIND-PREV ) HEX ;S                            0 ( sort words ) ;S
  1                                                 1
  2 ( addr -- addr )                                2 this is Mino's sort routine that was not
  3 LABEL FIND-PREV   YSAVE STY,                    3  implemented.
  4  0 SP) LDA, TAY, 0 #B LDA, X0 STA,              4
  5  1 SP) LDA, X0 1+ STA,                          5 LABEL FIND-PREV
  6  BEGIN, DEY, OFF #B CPY, EQ                     6
  7   IF, X0 1+ DEC, ENDIF,                         7
  8   X0 )Y LDA, 0D #B CMP, NE                      8 LABEL FIND-NEXT
  9   IF, 01C #B CMP, ENDIF, EQ                     9
 10  UNTIL,                                         10
 11  TYA, 0 SP) STA, X0 1+ LDA, 1 SP) STA,          11
 12  YSAVE LDY, TNEXT,                              12
 13                                                 13
 14 ( addr -- addr )                                14
 15 LABEL FIND-NEXT   YSAVE STY,                    15
 16  0 SP) LDA, TAY, 0 #B LDA, X0 STA,              16
 17  1 SP) LDA, X0 1+ STA,                          17
 18  BEGIN, INY, EQ IF, X0 1+ INC, ENDIF,           18
 19   X0 )Y LDA, 0D #B CMP, NE                      19
 20   IF, 01C #B CMP, ENDIF, EQ                     20
 21  UNTIL,                                         21
 22  TYA, 0 SP) STA, X0 1+ LDA, 1 SP) STA,          22
 23  YSAVE LDY, TNEXT,                              23
257
  0 ( COMPARE ) HEX ;S                              0 ( sort words ) ;S
  1 ( addr1 len1 addr2 len2 -- flag )               1
  2 LABEL COMPARE  1 SP) LDA, 5 SP) CMP, EQ         2 this is Mino's sort routine that was not
  3  IF, 0 SP) LDA, 4 SP) CMP, ENDIF, CS            3  implemented.
  4  IF, 4 SP) LDA, X0 STA,                         4
  5   5 SP) LDA, X0 1+ STA,                         5
  6  ELSE, 0 SP) LDA, X0 STA,                       6 LABEL COMPARE
  7   1 SP) LDA, X0 1+ STA,        ENDIF,           7
  8  BEGIN, X0 LDA, X0 1+ ORA, X1 STA, SEC,         8
  9   2 X) LDA, 6 X) SBC, EQ                        9
 10   IF, 0FF #B LDA, ELSE, 0 #B LDA, ENDIF,       10
 11   X1 ORA, NE                                    11
 12  WHILE, X0 DEC, X0 LDA, 0FF #B CMP, EQ          12
 13   IF, X0 1+ DEC, ENDIF,                         13
 14   CLC, 6 SP) LDA, 01 #B ADC, 6 SP) STA,         14
 15        7 SP) LDA, 00 #B ADC, 7 SP) STA,         15
 16   CLC, 2 SP) LDA, 01 #B ADC, 2 SP) STA,         16
```

```
17        3 SP) LDA, 00 #B ADC, 3 SP) STA,
18  AGAIN, X1 LDA, EQ
19  IF, SEC, 0 SP) LDA, 4 SP) SBC,
20   1 SP) LDA, 5 SP) SBC, ENDIF, NC
21  IF, OFF #B LDA, ELSE, 00 #B LDA, ENDIF,
22  INX, INX, INX, INX, INX, INX,
23  0 SP) STA, 1 SP) STA, TNEXT,
```

```
scr #  258
  0 ( SWAP-NEXT ) HEX ;S
  1
  2 T: SWAP-NEXT -
  3  CURPOS DUP 1- FIND-NEXT
  4  DUP 1+ OVER FIND-NEXT
  5  OVER - FILLED-LEN MIN >R >R OVER -
  6  FIELD-LEN MIN R> R> COMPARE
  7  IF CURPOS 1- DUP FIND-NEXT
  8   DUP FIND-NEXT DUP >R OVER - >R DUP 1+
  9   R> REVERSE OVER - >R DUP 1+ R>
 10   R> REVERSE R> OVER - SWAP 1+ SWAP
 11   REVERSE -1 SWAPPED TO
 12  ENDIF, ;
 13
 14
 15
 16 NOTE: this word has been embedded into
 17  the next word, SORT.
 18
 19
 20
 21
 22
 23
```

```
0 ( sort words ) ;S
1
2 this is Mino's sort routine that was not
3  implemented.
4
5 T: SWAP-NEXT
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
259
  0 ( SORT ) HEX ;S
  1
  2 T: SORT  EOS OEOS TO BEOT EOS EOT BEOT -
  3  DUP EOS + TOT TO CMOVE BOS DUP
  4  FIND-PREV DUP 1+ BOS TO - DUP OFFSET TO
  5  EOS DUP FIND-PREV
  6    - SWAP - OMAX FIELD-LEN TO
  7  BEGIN 0 SWAPPED TO START-ADDR CURPOS TO
  8   BEGIN  CURPOS DUP 1- FIND-NEXT DUP 1+
  9    OVER FIND-NEXT OVER - FILLED-LEN UMIN
 10    >R >R OVER - FIELD-LEN UMIN R> R>
 11    COMPARE
 12    IF CURPOS 1- DUP FIND-NEXT
 13     DUP FIND-NEXT DUP >R OVER - >R DUP
 14     1+ R> REVERSE OVER - >R DUP 1+ R>
 15     R> REVERSE R> OVER - SWAP 1+ SWAP
 16     REVERSE -1 SWAPPED TO
 17    ENDIF
 18    CURPOS FIND-NEXT 1+ DUP CURPOS TO
 19    EOS 1- FIND-PREV  1+ DUP LASTREC TO =
 20   UNTIL LASTREC EOS TO SWAPPED 0=
 21  UNTIL EOS TOT OVER - EOT OVER - SWAP
 22  CMOVE   EOT TOT - BEOT TO   EOS EBOT TO
 23  7000 TOP TO   BOT BOT NEWPAGES ;
```

```
0 ( sort words ) ;S
1
2 this is Mino's sort routine that was not
3  implemented.
4
5 T: SORT
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  260
  0                                    0 LABEL ACT ( -- )
  1                                    1 PURPOSE: turn disk on.
  2                                    2
  3                                    3 LABEL DEACT ( -- )
  4                                    4 PURPOSE: turn disk off.
  5                                    5
  6                                    6 T: PROT?  ( -- flag )
  7                                    7 RESULT: true if disk is write protected.
  8                                    8
  9                                    9 T: SEEK ( # -- )
 10                                   10 PURPOSE: seek to track #
 11                                   11
 12                                   12 T: RECAL ( -- )
 13                                   13 PURPOSE: bang up against seek stop and
 14                                   14  call that track 0.
 15                                   15
 16                                   16 T: DISKON  ( -- )
 17                                   17 PURPOSE: set up disk for test of EDDE or
 18                                   18  Apple header.
 19                                   19 go to 1st text track:
 20                                   20 turn disk on, wait 224 milliseconds,
 21                                   21 recalibrate, and seek to track 1
 22                                   22
 23                                   23
261
  0 ( ACT DEACT PROT? DON SEEK HOME ) HEX    0 T: READ  ( t -- )
  1                                    1 PURPOSE: read track t.
  2 LABEL ACT C0EA LDA, C0E9 LDA, TNEXT,    2
  3                                    3 seek to track t.
  4 LABEL DEACT C0E8 LDA, TNEXT,       4 read track.
  5                                    5 if track # does not match then
  6 T: PROT?  C0ED C@ DROP 7F C0EE C@ U< ;   6  recalibrate, seek, read.
  7                                    7  if still no match
  8 ( track# -- )                      8  then beep, set error# to 31
  9 T: SEEK 2* <SEEK> 0A MS ;          9 if the checksum does not match then
 10                                   10  reread.
 11 T: RECAL  50 TRACK TO 0 SEEK ;    11  if still no match
 12                                   12  then beep, set error# to 32
 13 T: DISKON ACT E0 MS RECAL 1 SEEK ;   13
 14                                   14 NOTE: during a read a valid checksum
 15                                   15  is zero (0).
 16                                   16
 17                                   17
 18                                   18
 19                                   19
 20                                   20
 21                                   21
 22                                   22
 23                                   23

scr #  262
  0 ( READ ) HEX                       0 T: GET  ( -- )
  1                                    1 PURPOSE: copy an extended selection from
  2 ( track# -- )-                     2  disk to ram.
  3 T: READ  >R R@ SEEK <READ>         3
  4  B3FF C@ R@ -                      4 turn disk on, seek to track 0.
  5  IF RECAL R@ SEEK <READ>           5 not an edde disk:
  6   B3FF C@ R@ -                     6  turn disk off, set error# to 7, stop
  7   IF BEEP                          7 else read track 0.
```

```
 8  ENDIF ENDIF CHECKSUM
 9  IF <READ> CHECKSUM
10   IF BEEP
11  ENDIF ENDIF R> DROP ;
12
13 ;S During a read, a valid checksum is 0
14
15 LABEL TLEN
16  DEX, DEX, 0C #B LDA, 1 SP) STA,
17  0 #B LDA, 0 SP) STA, TNEXT,
18
19
20
21
22
23
```

```
263
 0 ( GET ) HEX
 1 T: GET ACT E0 MS ?EDDE
 2  IF 1 READ B400 ORIGIN ADDR - DUP >R
 3   EOS ADDR + @  BOS ADDR R> + @
 4   DUP ORIGIN ADDR - FIRST TO - SIZE TO
 5   BEOT U2/ EBOT U2/ SIZE U2/ + 80 + U<
 6   IF DEACT BEEP EXIT ENDIF  SIZE CT TO
 7   EOS BOS TO  EOS OEOS TO  EOS PTR TO
 8   FIRST 0 C00 UM/MOD 1+ READ
 9   >R  B400 R@ + PTR SIZE
10   C00 R@ - UMIN CMOVE
11   R>  C00 - SIZE + F400 OVER U<
12   IF DROP 0 ENDIF SIZE TO
13   CT SIZE - DUP FIRST +TO PTR +TO
14   BEGIN SIZE
15   WHILE FIRST 0 C00 UM/MOD
16    1+ READ DROP
17    B400 PTR SIZE C00 UMIN DUP >R CMOVE
18    R@ PTR +TO R@ FIRST +TO
19    R> NEGATE SIZE +TO
20   REPEAT  CT EBOT +TO CT EOS +TO
21   EBOT CT - BOT NEWPAGES FLUSH
22   -1 EXTENDED TO -1 DIRTY TO
23  ENDIF DEACT ;
```

```
scr #  264
 0
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
```

```
 8  get disk's selection parameters.
 9  first=bos-origin size=ct=eos-bos.
10  check: selection won't fit: beep stop.
11  otherwise, move selection from disk to
12   current text, update page table,
13   clear queues, set dirty bit.
14 turn disk off.
15
16
17
18
19
20
21
22
23
```

```
 0 T: <LOAD> ( #tracks -- )
 1 PURPOSE: load #tracks from disk.
 2 copy code fragments to $0800.
 3 show sign on message.
 4 set disk# and olddisk# from disk.
 5 read all tracks and clear dirty bit.
 6
 7 T: LOAD  ( -- )
 8 PURPOSE: load only the number of tracks
 9  necessary (SAVED) and reinsert gap.
10 read and load parameters.
11 load compressed text.
12 restore gap to text.
13 warmstart.
14
15
16
17
18
19
20
21
22
23
```

```
 0 T: DRAG ( -- )
 1 PURPOSE: drag text from the current
 2  universe to the text on another disk.
 3
 4 calculate # of tracks needed for saving.
 5 read track 1.
 6 find out # of tracks used on disk.
 7 if there are enough tracks left on disk
 8  move selected text to top of text area.
 9  <load> text from disk.
10  turn off drive.
11  set dirty bit.
12  move selected text to EBOT (3 reverses)
13   and restore gap.
14  make sure last character is form feed.
15  add selection to EBOT.
16  align page table.
```

```
17
18
19
20
21
22
23
```

```
17  delete selection if too many pages.
18  show display.
19  warmstart.
20 else drop return stack and turn drive
21  off.
22 error# is 5 means no more room
23 error# is 6 means too many pages
```

```
265
  0 ( .LTABLE ) HEX
  1
  2 FRAG .LTABLE
  3 \ NOOP       , ( 0 )
  4 \ DELETE     , ( 1 )
  5 \ PRINT      , ( 2 )
  6 \ NOOP       , ( 3  was SORT )
  7 \ NOOP       , ( 4   DISK - was SAVE )
  8 \ SEND       , ( 5 )
  9 \ GET        , ( 6 )
 10 \ PASTE      , ( 7 )
 11 \ BASIC      , ( 8 )
 12 \ .MON       , ( 9   was MON )
 13 \ NOOP       , ( 0A  was BOOT7.5 )
 14 \ NOOP       , ( 0B  was BOOTABLE )
 15 \ CONTROL    , ( 0C  was STOPSEND )
 16 \ NOOP       , ( 0D  was STARTSEND )
 17 \ NOOP       , ( 0E)
 18 \ NOOP       , ( 0F)
 19 \ NOOP       , ( 10)
 20 \ NOOP       , ( 11)
 21 \ NOOP       , ( 12)
 22 \ NOOP       , ( 13)
 23 \ NOOP       , ( 14)
```

```
 0 T: WRITE  ( t -- flag )
 1 PURPOSE: write to disk track t.
 2 seek to track t
 3 store serial # at B3FC
 4 and checksum   at B3FE
 5 store track #  at B3FF
 6 write the track (see <WRITE>)
 7 check for "ED DE DA" header
 8  not there: recalibrate, seek, write
 9  still not there:
10   beep, return zero, set error# to 30
11 return 1 for success
12
13 T: APPLEDISK  ( -- )
14 PURPOSE: boot Apple disk.
15 if text is dirty and
16  if text is empty then boot Apple disk.
17  else beep, set error# to 4
18 else boot Apple disk.
19
20
21
22
23
```

```
scr #  266
  0 ( LOOKUP LTABLE ) HEX
  1
  2 \ NOOP       ,-( 15 )
  3 \ NOOP       , ( 16 )
  4 \ NOOP       , ( 17 )
  5 \ NOOP       , ( 18 )
  6 \ NOOP       , ( 19 )
  7 \ NOOP       , ( 1A )
  8 \ TAB        , ( 1B )
  9 \ ENTER      , ( 1C::ASCII CHARS )
 10 EDDE         , ( magic number )
 11
 12 LABEL LOOKUP  0 SP) LDA, ff #B CMP, CS
 13  IF, \ ENTER JMP,
 14  ENDIF, INX, INX, .A ASL,
 15  YSAVE STY, TAY,
 16  RTABLE     ,Y LDA, X5 STA,
 17  RTABLE 1+ ,Y LDA, X5 1+ STA,
 18  YSAVE LDY, X5 )JMP,
 19
 20
 21
 22
 23
```

```
 0 T: WRITES  ( address hi+1 lo -- flag )
 1 PURPOSE: write a range of tracks to the
 2  disk.
 3 write tracks lo through hi, inclusive
 4 in 3K hunks, beginning at address
 5 true = success
 6
 7 WARNING: the flag is FALSE after
 8  successfully writing the last C00 bytes
 9  in memory (from F400 to FFFF) so do not
10  use the flag if you are writing the
11  last C00 bytes.
12
13
14
15
16
17
18
19
20
21
22
23
```

```
267
  0 ( BUG RP! MAIN ) HEX
  1
  2 LABEL BUG ( -- flag )
  3  YSAVE STY, 0 #B LDY, SP0 #B CPX, NE
  4  IF, SP0 #B LDX, DEY, ENDIF,
  5  DEX, DEX, 0 SP) STY, 1 SP) STY,
  6  YSAVE LDY, TNEXT,
  7
  8 LABEL RP!  ( -- )  TXA, 04F #B LDX,
  9  TXS, TAX, TNEXT,
 10
 11 T: MAIN  RP!
 12  BEGIN ?X
 13   IF LEXREX
 14   ELSE
 15    ?K IF @K DUP >R LOOKUP R> LASTC TO
 16    ENDIF
 17    ?M IF MAPPEND ENDIF
 18    BELL? IF BEEP 0 BELL? TO ENDIF
 19   ENDIF
 20   QUE ?BLINK
 21   BUG IF BEEP BEEP BEEP BEEP ENDIF
 22  AGAIN ;
 23
```

```
scr #  268
  0 ( WARM ) HEX
  1
  2 T: WARM  DEACT FRAGMENTS START
  3  0 LEXXING TO 0 BELL? TO
  4  FLUSH
  5  SETDISP
  6  36A5 39E !
  7  SETMODEM
  8  0 LINESCOUNT TO
  9  0 PRINT? TO
 10  ?RAMKEYS
 11  -1 TEOS TO
 12  PREALIGN <ENDFORM>
 13  TOP LOCLIN LINADR REWINDOW
 14  FRESH
 15  NARROW EOT BEOT = OR
 16  IF LEXCUR ELSE RENCUR ENDIF
 17  MAIN ;
 18
 19
 20
 21
 22
 23
```

```
269
  0 ( ?RAMKEYS ) HEX
  1
  2 LABEL ?RAMKEYS  ( -- )
  3  \ .MSG0 0B + RTABLE 3A +
  4  2DUP LDA, CMP, EQ
  5  IF, >R 2DUP 1+ LDA, 1+ CMP, EQ
  6   IF, >R 2DUP 2 + LDA, 2 + CMP, EQ
  7    IF, >R 3 + LDA, 3 + CMP, EQ
```

```
 0 T: SAVE  ( -- )
 1 PURPOSE: save the text to disk.
 2  assumes EDDE disk turning at track 1
 3  with matching old disk #
 4
 5  if write protected then beep
 6  else collapse the gap, get new disk#
 7   calculate the number of tracks needed
 8    to save the text and store in SAVED
 9   write text to disk
10   if successful then old disk number
11    equals the newly disk number
12    calculated disk number, clear the
13    dirty bit, write boot 0 and
14    if that is successful,
15     write the rest of the program image
16   else restore original disk number
17   move text back into its original
18    position.
19
20 T: IMAGE  ( flag -- )
21 PURPOSE: Write edde image if TRUE
22  in blocks $13 thru $16
23
```

```
 0 T: DISK  ( -- )
 1 PURPOSE: smart disk command.
 2 turn disk on.
 3 check up to two times for EDDE header.
 4 if a Swyft disk and
 5  if text is empty then load.
 6  else (not empty) <read> the disk and
 7   if disk# matches then save.
 8   else (not the same disk) and
 9    if dirty and
10     if the whole text has been selected
11       then drag the text else beep.
12    else (not dirty) and
13     if the bootup# = olddisk# and
14      if the last command was Disk
15      then save.
16      else beep and set error# to 2
17     else (no match) and
18      if there is a selection then drag.
19      else load.
20 else seek to track 0 and
21  if Apple disk then load
22  else save text, write edde image (disk)
23 turn disk off.
```

```
 0
 1
 2
 3
 4
 5
 6
 7
```

```
 8     IF, TNEXT,
 9  R> R> R> ENDIF, ENDIF, ENDIF, ENDIF,
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  270
  0 ( RAMKEYS ) HEX
  1
  2 LABEL RAMKEYS. ( -- )
  3  \ .XLAT DUP OFF AND #8 LDA, X0 STA,
  4         SWAB OFF AND #8 LDA, X0 1+ STA,
  5  HIMEM   DUP OFF AND #8 LDA, X1 STA,
  6         SWAB OFF AND #8 LDA, X1 1+ STA,
  7  \ .LTABLE DUP OFF AND #8 LDA, X2 STA,
  8         SWAB OFF AND #8 LDA, X2 1+ STA,
  9  RTABLE  DUP OFF AND #8 LDA, X3 STA,
 10         SWAB OFF AND #8 LDA, X3 1+ STA,
 11  YSAVE STY, 1F #8 LDY,
 12  BEGIN, X0 )Y LDA, X1 )Y STA, DEY, MI
 13  UNTIL, 3F #8 LDY,
 14  BEGIN, X2 )Y LDA, X3 )Y STA, DEY, MI
 15  UNTIL, RTABLE 3A + \ .MSG0 0B +
 16  2DUP LDA, STA,
 17  2DUP 1+ LDA, 1+ STA,
 18  2DUP 2 + LDA, 2 + STA,
 19  3 + LDA, 3 + STA,
 20  YSAVE LDY, TNEXT,
 21
 22
 23
```

```
 0 FRAG .LTABLE   ( -- )
 1 PURPOSE: main control character
 2  execution vector table.
 3
 4 control keys are translated by using the
 5  .XLAT table into an index which is used
 6  to access the command table, .LTABLE.
 7  control keys that are not used can have
 8  a NOOP in the command table, .LTABLE,
 9  and/or a zero for that key in the
10  .XLAT table (or both).
11 both .XLAT and .LTABLE are downloaded
12  into ram so that they may be modified
13  by the user with a BASIC program.
14 the magic number is used to reinitialize
15  the ram tables.  this number is the
16  version number in .MSG0.
17
18
19
20
21
22
23
```

```
271
  0 ( INIT <INIT> ) HEX
  1
  2 LABEL INIT  0 #8 LDA, BOTTOM STA,
  3  BOV SWAB OFF AND #8 LDA, BOTTOM 1+ STA,
  4  EOV 1- OFF AND #8 LDA, EOT STA,
  5  EOV 1- SWAB OFF AND #8 LDA, EOT 1+ STA,
  6  30 #8 LDA, YWRAP STA,
  7
  8 T: <INIT>  0 QOUT TO 0 QIN TO 0 CHAR TO
  9  0 MQIN TO 0 MQOUT TO 0 TOP TO
 10  50 WIDE TO 36 LONG TO  BOTTOM BOT TO
 11  BOT BOC TO BOT 1+ EBOT TO BOT BOS TO
 12  EOT 1- BEOT TO 1D1C BEOT ! EBOT EOS TO
 13  BOS OEOS TO BEOT EBOT - GAP TO
 14  0 LCT TO  0 PCT TO SERIAL# OLDISK# TO
 15  1C BOT C! BOT REWINDOW
 16  -1 EXTENDED TO 0 NARROW TO 0 DIRTY TO
```

```
 0 LABEL LOOKUP  ( index -- )
 1 PURPOSE: execute element of LTABLE.
 2
 3 if the index is greater than a form
 4  feed (1C) then process it as a
 5  character.
 6 remove character from stack, multiply by
 7  2 (ie, ASL), store value from RTABLE +
 8  2*index in X5 and jump to the address
 9  at X5.
10
11 NOTE: RTABLE is ram equiv to LTABLE.
12
13
14
15
16
```

```
17  100 BL1 TO 200 BL0 TO
18  INITBASIC SAVESTRINGS
19  -1 LINEND% TO 1609 SEND% TO
20  2 PFLAG% TO 0 PAGE% TO 1 SPACING TO
21  0 .LF TO 0 .BL TO 0 MARGIN% TO
22  6 ABOVE% TO 6 BELOW% TO 3 LPAGE% TO
23  42 PLEN% TO RAMKEYS ;
```

```
scr #  272
  0 ( <LOAD> OLDLOAD LOAD ) HEX
  1
  2 T: <LOAD>     >R B400 800 C00 CMOVE
  3  FRAGMENTS SIGNON
  4  B3FC @ DUP DISK# TO OLDISK# TO
  5  1400 R> 1+ 2
  6  DO I READ  B400 OVER C00 CMOVE  C00 +
  7  LOOP DROP 0 DIRTY TO ;
  8
  9 T: OLDLOAD  ACT E0 MS 1 SEEK ?EDDE
 10  IF 1 READ 0F <LOAD> WARM ENDIF ;
 11
 12 T: LOAD  1 READ B400 ORIGIN ADDR -
 13  SAVED ADDR + @ <LOAD>
 14  EBOT BEOT EOT 1+ OVER - CMOVE>
 15  WARM ;
 16
 17
 18
 19
 20 ;S
 21 \ OLDLOAD \ .LTABLE ROM - AIM + 6 + !
 22
 23
```

```
273
  0 ( DRAG ) HEX
  1
  2 T: DRAG   SEL 0 C00 UM/MOD SWAP 0= 0= -
  3  1 READ
  4  B400 SAVED ADDR 800 - + @ >R
  5  0F R@ - U<
  6  IF R>
  7   BOS EOT 1+ SEL - SEL DUP >R CMOVE>
  8   <LOAD> DEACT -1 DIRTY TO
  9   EBOT EOT 1+ OVER - REVERSE
 10   BEOT EOT 1+ OVER - REVERSE
 11   EBOT R@ REVERSE
 12   FIXEND
 13   R> EBOT DUP >R +TO
 14   R@ BOT +ALIGN
 15  PAGES 07F U<
 16   IF R> EBOT SHOWMARK WARM ENDIF
 17   DELETE BEEP
 18  ELSE BEEP DEACT
 19  ENDIF R> DROP ;
 20
 21
 22
 23
```

```
 0 LABEL TIMEOUT?  ( -- flag )
 1 PURPOSE: count down the timer, returning
 2  TRUE when it gets to 0.  If the value
 3  of TIMER is between 128 and 256,
 4  prepare the system so that DISK is
 5  fooled into loading the disk in the
 6  drive.
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
 0 LABEL STACK?  ( -- flag )
 1
 2 LABEL RP!  ( -- )
 3
 4 T: MAIN  RP!
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
scr #  274
  0 ( WRITE APPLEDISK ) HEX
  1
  2 ( disk# track# -- flag )
  3
  4 T: WRITE  >R R@ SEEK
  5  B3F0 10 0 FILL
  6  DISK# B3FC  !
  7  0     B3FE C!
  8  R@    B3FF C!
  9  CHECKSUM B3FE C!
 10  <WRITE> ?EDDE 0=
 11  IF RECAL R@ SEEK
 12   <WRITE> ?EDDE 0=
 13   IF BEEP DEACT R> DROP 0 EXIT
 14  ENDIF ENDIF R> DROP 1 ;
 15
 16 T: APPLEDISK   DIRTY
 17  IF EBOT BOT - EOT BEOT - + 2 =
 18   IF ABOOT ELSE BEEP ENDIF
 19  ELSE ABOOT ENDIF ;
 20
 21
 22
 23
```

```
0 T: WARM
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```

```
275
  0 ( WRITES ) HEX
  1
  2 ( address hi-track+1 lo-track -- flag )
  3 ( true = success )
  4
  5 T: WRITES
  6  DO DUP B400 C00 CMOVE
  7   I WRITE 0=
  8   IF DROP 0 LEAVE
  9   ENDIF C00 + 10 MS
 10  LOOP ;
 11
 12 ;S   WARNING, the flag is FALSE after
 13  successfully writing the last C00
 14  bytes in memory ( from F400 - FFFF )
 15  so don't use the flag if you are
 16  writing the last C00 bytes.
 17
 18
 19
 20
 21
 22
 23
```

```
0 FRAG .VECS
1 PURPOSE: this is a copy of the vectors
2 needed for the custom modem support:
3  \ .MQUE  JMP,                ( .IVEC )
4  \ .MEMIT JMP,                ( .OVEC )
5  RTS, NOP, NOP,               ( .SVEC )
6  RTS,                         ( .QVEC )
7  they are moved to $1594 by RAMKEYS
8
9 LABEL ?RAMKEYS ( -- )
10 PURPOSE: reload ramtable if RTABLE+3A
11  does not equal the version number.
12
13 if the value at RTABLE+3A is equal to
14  the version number then exit.
15 otherwise execute the next definition,
16  RAMKEYS....
17
18
19
20
21
22
23
```

```
scr #  276
  0 ( SAVE ) HEX
  1
  2 ( -- |   assumes EDDE disk turning at
  3  track 0 with matching old disk #)
  4
  5 T: SAVE  PROT?
  6  IF BEEP
```

```
0 LABEL RAMKEYS ( -- )
1 PURPOSE: copy key and command
2  translation tables into ram.
3
4 prepare to copy:
5  store the address of .XLAT in X0.
6  store the address of HIMEM in X1.
```

```
 7  ELSE 4 LASTC TO
 8   BEOT EBOT EOT 1+ BEOT - CMOVE
 9   DISK# SERIAL# DISK# TO
10   EBOT EOT BEOT - +
11   800 - 1+ 0 C00 UM/MOD SWAP
12   0= 0= - SAVED TO
13   800 SAVED 1+ 1 WRITES
14   IF DROP DISK# OLDISK# TO 0 DIRTY TO
15    0 SEEK WRITE0
16   ELSE DISK# TO
17   ENDIF EBOT BEOT EOT 1+ OVER - CMOVE>
18  ENDIF ;
19
20 ;S   ROM? 0= D000 13 11
21      DO DUP CMOVE2 C00 + I WRITE 0=
22       IF DROP 0 LEAVE ENDIF 30 MS LOOP
23      IF D000 17 13 WRITES DROP
277
 0 ( DISK ) HEX
 1 T: DISK    DISKON ?EDDE DUP 0=
 2  IF DROP RECAL 1 SEEK ?EDDE ENDIF
 3  IF <READ> B3FA @ EDDE =
 4   IF GET EXIT ENDIF
 5   EBOT BOT - EOT BEOT - + 2 =
 6   IF LOAD
 7   ELSE <READ> B3FC @ DISK# =
 8    IF OLDISK# SAVE OLDISK# TO
 9    ELSE DIRTY
10     IF BOS BOT 2 + U<
11      EOT 2 - BEOT U< AND
12      IF DRAG ELSE BEEP ENDIF
13     ELSE B3FC @ OLDISK# =
14      IF LASTC 4 = SERIAL# DISK# = AND
15        IF SAVE ELSE BEEP ENDIF
16      ELSE 1 SEL U<
17       IF DRAG ELSE LOAD ENDIF
18   ENDIF ENDIF ENDIF ENDIF
19  ELSE 0 SEEK ?APPLE
20   IF APPLEDISK ELSE SAVE ENDIF
21  ENDIF DEACT ;
22
23 \ DISK \ .LTABLE ROM - AIM + 8 + !
```

```
 7  store the address of .LTABLE in X2.
 8  store the address of RTABLE in X3.
 9 copy $20 bytes from .XLAT to HIMEM.
10 copy $40 bytes from .LTABLE to RTABLE.
11 store the version number (at .MSG0+$0C)
12  to RTABLE+3A.
13
14 NOTE: this is why the position of the
15  version number in .MSG0, on screen 111,
16  should not be changed unless a similar
17  change is made elsewhere.
18
19
20
21
22
23

 0 LABEL INIT ( -- ) Initialize for no disk
 1  BOTTOM from BOV.  EOT from EOV.
 2  YWRAP is $30, as it counts from $30
 3  to $7F for a total of dec 80 (columns)
 4  before it turns negative. Calls <INIT>.
 5 T: <INIT> ( -- )
 6  clear the key and modem queue.
 7  set page format to hex 50 wide (80)
 8                   by hex 36 long (54)
 9  CHAR holds a "null" (0) = empty
10  start display at top
11  nothing in the cut buffer.
12  beginning of text is a formfeed (1C)
13  select the formfeed
14  eot is a CR (1D) and formfeed (1C).
15  total line and page count is zero.
16  REWINDOW from beginning of text.
17  LEXXED state=false  EXTENDED true.
18  calc GAP (- $100 = room%).
19  INITBASIC. save printer string in PBUF.
20  initialize for FX80 printer.
21  set page length to $42.
22  save printer string in PBUF.
23  load tables into ram.
```

```
scr #  278
 0 ( COLD BOOT ) HEX
 1
 2 T: COLD  DEACT
 3  ORIGIN ADDR 1000 0 FILL FRAGMENTS
 4  400 MS INIT WARM ;
 5
 6 T: BOOT  C010 C@ 86 =
 7  IF 0 CHAR C! COLD
 8  ENDIF DISKON 0 80 0
 9  DO 7F C0EC C@ U< + LOOP
10  NEGATE 8 U<   IF COLD ENDIF
11  ?EDDE         IF <READ> B3FA @ EDDE =
12   IF COLD ELSE LOAD ENDIF ENDIF
13  0 SEEK ?APPLE IF ABOOT ENDIF
14  COLD ;
15
```

```
 0 T: COLD
 1 PURPOSE: initialize for no disk.
 2 turn disk off.
 3 clear all variables to zero.
 4 load in code fragments.
 5 wait 400 milliseconds
 6 INITialize text variables and BASIC.
 7 WARM start.
 8
 9 T: BOOT  ( -- )
10 PURPOSE: boot Swyft system and copy text
11  from an Edde disk.
12 turn disk on.
13 if holding ^F then do a coldstart.
14 if disk is unformatted (cannot find
15  a header) then do a COLD start.
```

```
 16                                          16 if an Edde disk then load it.
 17                                          17 if an apple disk then boot it.
 18                                          18 if disk is none of the above then do a
 19                                          19  COLD start.
 20                                          20
 21                                          21
 22                                          22
 23                                          23
279
  0 ( .RESET RESET ) HEX                     0 FRAG .RESET  ( -- )
  1                                          1 PURPOSE: handle 6502 RESET or NMI.
  2 FRAG .RESET  ( -- )  ROM? LDA, NE        2 if this is the romcard version then
  3  IF,    C080 LDA,                        3  turn on romcard (LDA$C080).
  4  ELSE,  <AUX> JSR, C08F LDA, C08F LDA,    4 else turn on the bank 1 (JSR<AUX>)
  5   \ .INTERRUPT DUP FF AND #8 LDA,        5  and store the receive interrupt vector
  6   FFFE STA,                              6  at $FFFE (6502 IRQ)--this is needed
  7   SWAB FF AND #8 LDA, FFFF STA,          7  since the //c stores an interrupt for
  8  ENDIF, D200 JMP,                        8  the mouse there.
  9                                          9 jump to D200 and start Swyft.
 10 T: RESET                                10
 11  FRAGMENTS SETDISP SIGNON               11 T: RESET  ( -- )
 12  7F C061 C@ U< IF ABOOT ENDIF           12 PURPOSE: respond to control-reset and to
 13  7F C062 C@ U< IF COLD ENDIF            13  control-apple-reset.
 14  39E @ 36A5 =  IF WARM ENDIF            14 load rom or disk code fragments.
 15  BOOT ;                                 15 set up 80 column display.
 16                                         16 SIGNON here prevents garbage on screen.
 17 ;S Upon reset, the //c stores its mouse 17 if open apple reset, boot the disk.
 18  interrupt vector at the RECEIVE        18 if closed apple reset, do a COLD start.
 19  interrupt (FFFE).  "RESET fixes it.    19 if a warm start has been done
 20                                         20  do it again.
 21  Ctrl-open apple-reset does a mem test  21 if none of the above then do a BOOT.
 22  in the disk version, instead of COLD   22
 23                                         23 NOTE: stored at D00A for reset.


scr #  280
  0 ( last pointers )  HEX                   0 ( last pointers ) HEX
  1                                          1
  2 ( hard reset vectors for Edde card )     2 set up reset, nonmaskable interrupt and
  3 \ .INTERRUPT AIM 2FFE + ! ( irq )        3  interrupt request vectors
  4 \ .RESET     AIM 2FFC + ! ( reset )      4 vectors for reset and entry points
  5 \ .RESET     AIM 2FFA + ! ( nmi )        5
  6 EDDE         AIM 2FF8 + ! ( romcard id ) 6 move $200 bytes to the end of bank 2
  7 \ .INTERRUPT AIM 2FF6 + ! ( copy of irq) 7  for the boot track 0 image
  8                                          8  there are $200 less bytes in bank 2
  9 ( emplace track 0 boot image )           9  available than seen on the printout
 10 HEX 12 BLOCK 200 + AIM 200 - 200 CMOVE  10  for compilation
 11                                         11
 12                                         12
 13                                         13
 14                                         14
 15                                         15
 16                                         16
 17                                         17
 18                                         18
 19                                         19
 20                                         20
 21                                         21
 22                                         22
 23                                         23
```

We claim:

1. In a computer system having a display device, a memory device, an entry device and processing means for displaying symbols and a cursor on the display device in response to signals from the entry device, a method for creating and modifying a string of symbols, in response to signals from the entry device, the method comprising the steps of:

displaying on the display device a string of symbols;

displaying on the display device a cursor, said cursor occupying a display region and having a first cursor part occupying a first part of the display region and a second cursor part occupying a second part of the display region adjacent the first part of the display region, the first part of the display region including a symbol in the string of symbols;

in response to signals of a first type from the entry device, said first type of signals including signals representing an entered symbol, inserting the entered symbol into the string of symbols at the second part of the display region; and

in response to signals of a second type from the entry device, said second type of signals designating a deletion operation, performing the designated deletion operation by deleting the symbol included in the first part of the display region.

2. The method of claim 1, further comprising the steps of:

in response to signals of a third type from the entry device, moving said cursor to a desired location on the display device indicated by said third type of signals, and coalescing the cursor by positioning the first part of the cursor and the second part of the cursor at a single symbol occupying the desired location.

3. The method of claim 1 wherein the display region is a first display region and said inserting step further comprises moving the cursor to a second display region having a first part including the inserted symbol.

4. The method of claim 2 further comprising the step of: in response to signals of a fourth type from said entry device, extending the first part of the display region to include a plurality of symbols.

5. An apparatus for creating and modifying a string of symbols, the apparatus comprising:

a processing unit;

entry means, coupled to said processing unit, for transmitting signals to said processing unit;

display means coupled to said processing unit for displaying symbols and a cursor at specified locations in response to signals from said processing unit;

said processing unit comprising means for generating signals for:

displaying, on said display means, a string of symbols;

displaying, on said display means, a cursor, said cursor occupying a display region and having a first cursor part occupying a first part of the display region and a second cursor part occupying a second part of the display region adjacent the first part of the display region, the first part of the display region including a symbol in the string of symbols, and

in response to to a first type of signals from said entry means inserting an entered symbol into the string of symbols at the second part of the display region, said first type of signals including signals representing the entered symbol; and

in response to a second type of signals from said entry means, performing a deletion operation by deleting the symbol included in the first part of the display region;

in response to a third type of signals from said entry means, moving the cursor to a desired location on the display means indicated by said third type of signals and coalescing the cursor by positioning the first part of the cursor and the second part of the cursor on a single symbol occupying the desired location; and

in response to signals of a fourth type from the entry device, extending the first part of the display region to include a plurality of symbols.

6. In a computer system having an entry device, a display device and processing means for displaying symbols and a cursor on the display device in response to signals from the entry device, a method for indicating loci of operations, the method comprising the steps of:

displaying a string of symbols on the display device;

displaying a cursor on the display device, said cursor having a first part and a second part;

positioning the first part of the cursor at a first region on the display, the first region including a symbol in the string of symbols;

positioning the second part of the cursor at a second region on the display adjacent to the first region;

in response to signals of a first type from the entry device, said first type of signals including signals representing an entered symbol, inserting the entered symbol into the string of symbols by displaying the entered symbol at the second region, moving the first part of the cursor to the second region and moving the second part of the cursor to a third region on the display adjacent the second region;

in response to externally-supplied signals of a second type, deleting the symbol included in the first region.

7. The method of claim 6 further comprising the step of:

in response to signals of a third type from the entry device, said third type of signals specifying a target location, moving the cursor to the target location and coalescing the cursor by positioning both parts of the cursor on a single symbol occupying the target location.

8. The method of claim 6 wherein the first part of the cursor is displayed in reverse video and the second part of the cursor is displayed as a blinker.

9. The method of claim 8 further comprising the step of: in response to signals of a fourth type from said entry device, extending the first display region to include a plurality of symbols.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION

PATENT NO. : 4,806,916

DATED : February 21, 1989

INVENTOR(S) : Jef Raskin, James Winter, Renwick Curry

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

IN THE APPENDIX: Please insert the following copyright notice at the first page of the Source Code Appendix:

--Copyright 1988 Information Appliance, Inc.--

**Signed and Sealed this**

**Twenty-first Day of November, 1989**

*Attest:*

JEFFREY M. SAMUELS

*Attesting Officer* *Acting Commissioner of Patents and Trademarks*